



# Hydrogeological Assessment Report 1386 & 1394 Greely Lane, Ottawa, Ontario

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Prepared for:  
Cassidy EW Construction Consultant Ltd.

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## 1.0 Introduction

Cambium Inc. (Cambium) was retained by Cassidy EW Construction Consultant Ltd. (the Client) to complete a hydrogeological assessment and terrain analysis for the proposed redevelopment of the land located at 1386 and 1394 Greely Lane, Ottawa, Ontario (the Site).

The purpose of the field work and testing was to obtain information on the general subsurface and groundwater conditions at the Site by means of groundwater monitoring well measurements, as well as field and laboratory tests. This report addresses the hydrogeological aspects of the subsurface conditions at the Site. Cambium has also completed a Geotechnical Investigation (Cambium, 2023a) and a Phase Two Environmental Site Assessment (Cambium, 2023b) prior to the hydrogeological assessment and relevant details of these investigations have been incorporated into this report. Detailed information from the Geotechnical Investigation and the Phase Two Environmental Site Assessment were provided under separate cover.

This report provides the results of the hydrogeological assessment and should be read in conjunction with the “Standard Limitations” in Section 12.0, which forms an integral part of this document. The reader’s attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report. The data, interpretations, and recommendations contained in this report pertain to a specific project as described in the report and are not applicable to any other project or site location. If the project is modified in concept, location, or elevation, or if the project is not initiated within eighteen months of the date of the report, Cambium should be given an opportunity to confirm that the recommendations in this report are still valid.

### 1.1 Site Description

The Site is an irregularly shaped 0.47 ha (1.15 acres) property that is developed for commercial use. It contains a single-storey commercial car wash building, two temporary sea-can storage units, and an additional single storey metal storage building adjacent to the commercial building. A driveway connects to the adjacent Greely Lane at two locations on the north side of the site. The remainder of the property is landscaped, with the southern portion of



the Site predominantly occupied by a septic bed raised at a higher elevation than the grade. The Site is bound by Greely Lane to the east, Parkway Road to the south, and commercial/light industrial use to the north and west.

Based on discussions with the Client and preliminary site sketches provided to Cambium, it understood that the proposed plan is to construct one 1,110 m<sup>2</sup> (12,000 ft<sup>2</sup>) building for light industrial use which will be divided in three 370 m<sup>2</sup> (4,000 ft<sup>2</sup>) units with two loading bays, two washrooms, and an estimated five employees for each unit. The building will be constructed slab-on-grade with perimeter foundations that will extend to below the local frost penetration depths. The development will include at grade parking and driveways to access delivery doors at the backs of each building.

The proposed finished floor elevations (FFE) have not yet been determined; however, it is anticipated that the grades of the Site will not differ significantly from the current grades of the property, exclusive of the raised septic bed on the southern property. The grade there will be lowered as a result of removal of the septic bed.

The regional location of the Site is identified on Figure 1, the property and surrounding areas are outlined on Figure 2, and a Site plan is included in Appendix A.



## **2.0 Physical Setting**

### **2.1 Topography and Drainage**

Based on regional topographic maps the Site area is relatively flat with a gentle slope to the east-southeast towards the North Castor River. The Site has a raised septic bed located in the southern portion of the property with a topographic high of approximately 100 meters above sea level (masl).

The Site is located within the Castor River quaternary watershed and the North Castor River is located approximately 250 m south-southeast of the Site. North Castor River subsequently flows eastward into South Nation River, which is a tributary to Ottawa River.

Regionally, surface elevation decreases to the east toward Ottawa River. It is assumed that local drainage will follow the local surficial topography and flow towards the south-southeast ultimately discharging into the North Castor River. Based on the location of the nearest water bodies and topographic relief, the inferred that the regional groundwater flow direction is easterly.

### **2.2 Physiography**

The Site is located in the physiographic region known as the Russell and Prescott Sand Plains (Chapman & Putnam, 1984). The Russell and Prescott Sand Plains region covers an area of approximately 1,490 km<sup>2</sup> extending from Ottawa to Hawkesbury. The Sand Plains are a relatively flat region with a clay valley located to the south, which was formed as a delta by the Ottawa River and tributaries of the Champlain Sea. The sand deposits have a thickness of 5 m to 10 m in the northern region of the plains and thin towards the clay plains of the south. The sand plains consist of coarser grained sands to the north grading into fine sand to silt in the south. The region is underlain by stratified red and grey clays (Appendix A).

### **2.3 Overburden Geology**

According to Miscellaneous Release – Data 128 from the Ontario Geological Survey (2010) the predominant overburden of the Site consists of coarse-textured glaciomarine deposits (sand, gravel, minor silt and clay) (Appendix A).



## 2.4 Bedrock Geology

According to Miscellaneous Release – Data 219 from the Ontario Geological Survey (2007), the bedrock in the area of the Site consists of the Beekmantown Group. The Beekmantown Group consists of two formations: the March and Oxford Formations. The bedrock of the Site consists of the Oxford Formation and is described as dolostone, minor shale and sandstone (Appendix A).

## 2.5 Vulnerable and Regulated Areas

The Site is situated within the South Nation Source Protection Area, under jurisdiction of the South Nation Conservation Authority, as per the Source Water Protection Information Atlas (SPIA) from the Ministry of the Environment, Conservation and Parks (MECP) (2024a). The Site is within the following areas:

- Intake Protection Zone 3 (IPZ-3) with a vulnerability score of 7
- Significant Ground Water Recharge Area (SGRA) with a vulnerability score of N/A
- Highly Vulnerable Aquifer (HVA) with a vulnerability score of 6

IPZs are areas surrounding water courses and lakes which have surface water intakes for water supply. There is potential that contaminants spilled within IPZs may reach intakes more quickly than the ability to take appropriate action to shut down the intake should a spill occur. IPZ-3s are defined as event-based areas only. They are areas that can contribute contaminants under an extreme event (e.g., high winds or heavy rain) at a concentration that would result in deterioration of untreated source water. Best management practices should be used to minimize the potential for the release of chemicals to the environment during future operations at the Site.

SGRAs are landscape surfaces which allow a high volume of water to infiltrate into the ground. A recharge area is classified as significant if the recharge rate for a particular area is greater than the average watershed recharge rate by 15% or more and the area has a hydrological connection to a surface water body or to an aquifer that is a source of groundwater for a drinking water system (Ministry of the Environment, Conservation and Parks, 2021). SGRAs



are delineated using models which consider topography, surficial soil, land cover and climate. The SGRA in the vicinity of the Site does not have a vulnerability score associated with it. Efforts should be made to maintain the Site pre-development water balance as much as practicable following redevelopment. Water balance information is presented in Section 7.0.

HVAs are aquifers that are more sensitive to contamination as a result of the proximity to surface (shallow aquifers). By default, all HVA's have a vulnerability score of 6. Best management practices should be used to minimize the potential for the release of chemicals to the subsurface environment during future operations at the Site.

A review of the Natural Heritage System database from the Ministry of Natural Resources and Forestry (2024) indicates the Site is not located within any Areas of Natural and Scientific Interest.

The Site does not fall under a regulated area, as per the South Nation Conservation Authority or O.Reg. 41/24.

The source protection, natural heritage, and conservation area mapping is attached in Appendix A.



### **3.0 Subsurface Investigation**

Cambium staff completed a borehole investigation at the Site on March 7<sup>th</sup> to 8<sup>th</sup>, 2023, to assess subsurface conditions. A total of nine boreholes, designated as BH101-23 through BH109-23, were advanced at the Site to depths ranging from approximately 3.7 to 6.7 meters below ground surface (mbgs). Test pit locations are shown in Figure 4 and test pit logs are included in Appendix B.

#### **3.1 Borehole Logs**

Subsurface conditions generally consist of surficial deposits of pavements or topsoil overlying a relatively thin deposit of fill overlying native deposits of clays and silts.

A summary of general lithological details obtained from the investigation is presented below.

##### **Topsoil**

Topsoil was encountered from the surface of all boreholes with the exception BH101-23 and BH108-23. The thickness of the topsoil ranges from 0.10 to 0.91 m.

##### **Asphaltic Concrete**

Asphaltic concrete was encountered from the surface of BH101-23 and BH108-23 that were advanced in the existing paved areas. The thickness of the asphalt measures 0.08 and 0.05 m in BH101-23 and BH108-23, respectively.

##### **Base Material**

Pavement base material was encountered underlying the asphaltic concrete. The base material is composed of brown gravelly sand with some silt. The thickness of the material measures 380 and 560 mm in BH101-23 and BH108-23, respectively.

##### **Fill Material**

Fill material other than the pavement structure was encountered at all borehole locations. The fill material varies slightly in composition between borehole locations but is predominantly composed of silty sandy. The material ranges from trace gravel to gravelly, and trace clay was



noted in BH105-23 and BH107-23. Roots were noted within the fill material in BH102-23. The fill material varies in colour between brown and grey depending on location.

The thickness of the fill material ranges from 0.1 to 1.4 m and extends to depth ranging from 0.3 to 1.5 mbgs.

### **Clayey Silt**

Native deposits of grey, sandy, clayey silt were encountered underlying the fill material at all borehole locations at depths ranging from 0.3 to 1.5 mbgs. A notable decrease in clay content was observed in BH103-23 and BH104-23 at a depth of 2.3 mbgs as the material transitions to the non-cohesive underlying deposits.

Boreholes BH108-23 and BH109-23 terminated within the clayey silt deposits at depths of 1.5 mbgs. The deposit was fully penetrated at all other borehole locations. The thickness of the deposits at these locations ranges from 0.9 to 2.3 m, and the deposits extend to depths ranging from 2.3 to 3.2 mbgs.

### **Silty Sand**

A native deposit of grey silty sand was observed in BH101-23 underlying the clayey silt deposit at a depth of 2.6 mbgs. The deposit measures 0.5 m in thickness and extends to a depth of 3.1 mbgs. A seam similar in composition was noted in BH104-23 at a depth of 3.1 mbgs. The seam measured 0.10 m.

### **Silt**

Native deposits of silt were encountered underlying the clayey silt and silty sand in boreholes BH101-23 through BH107-23. The deposit is grey in colour and contains some sand to sandy and trace clay.

The silt deposits were encountered at depths ranging from 2.3 to 3.2 mbgs. Where encountered, all boreholes terminated within the silt at depths ranging from 3.7 to 6.7 mbgs.





## Groundwater

Groundwater was observed at all borehole locations during drilling. Unstabilized groundwater level measurements were recorded upon completion of drilling and monitoring wells were installed in three locations (BH105-23, BH106-23, and BH107-23) to enable further characterization. A subsequent monitoring event was completed as part of Phase II ESA work, as well as during hydraulic testing detailed later in this report (Section 4.3). As demonstrated in Table 1, there is significant variability in groundwater levels, which is expected within shallow unconfined aquifers. A figure illustrating the approximate groundwater flow direction based on water levels measured April 19, 2024 is provided in Figure 3.

**Table 1 Summary of Measured Water Levels**

Borehole ID	Water Level (mbgs)			Water Level (masl)		
	Post-drilling	March 15, 2023*	April 19, 2024	Post-drilling	March 15, 2023*	April 19, 2024
BH101-23	1.1	-	-	97.9	-	-
BH102-23	1.5	-	-	97.2	-	-
BH103-23	0.9	-	-	97.8	-	-
BH104-23	0.6	-	-	98.2	-	-
BH105-23	2.0	1.30	0.62	96.9	98.91	98.29
BH106-23	1.5	0.89	0.30	97.1	98.64	98.34
BH107-23	1.8	1.14	0.36	96.3	98.12	97.76
BH108-23	0.8	-	-	98.3	-	-
BH109-23	1.1	-	-	97.5	-	-

\* water level measured prior to well development

Further well construction details for the three monitoring wells are provided in Table 2.



**Table 2 Monitoring Well Construction Details**

Well ID	Surface Elevation (masl)	Well Depth (mbgs)	Well Casing Stick-up (mags <sup>1</sup> )	Screen Details	
				Top of Screen (mbgs)	Bottom of Screen (mbgs)
BH105-23	98.91	3.06	0.92	0.62	3.06
BH106-23	98.64	2.75	1.00	0.31	2.75
BH107-23	98.12	3.05	0.75	0.61	3.05

<sup>1</sup> meters above ground surface

All monitoring wells with water were developed after installation. Development involved purging ten well volumes of groundwater or three times dry from the wells by hand pumping with Waterra tubing and a foot valve.

### 3.2 Physical Laboratory Testing

Physical laboratory testing, including grain size distribution analysis, was completed on four soil samples to confirm textural classification identified during field logging and obtain percolation rate estimates. Analysis results are based on the Unified Soil Classification System (USCS) scale. A summary of results is provided in Table 3. Complete laboratory analysis reports are provided in Appendix C.

**Table 3 Grain Size Distribution Analysis Results**

Sample Location	Depth (mbgs)	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	T-time (min/cm)
BH101-23 SS3	1.5 to 2.1	Sandy Clayey Silt	0	22	57	21	40
BH101-23 SS6	3.8 to 4.4	Silt some Sand trace Clay	0	19	77	4	20
BH104-23 SS4	2.3 to 2.9	Sandy Silt some Clay	0	25	57	18	35
BH104-23 SS6	3.8 to 4.4	Sandy Silt trace Clay	0	22	74	4	20



4.0 Hydrogeological Assessment

The results obtained for the shallow groundwater assessment are discussed in the following subsections.

4.1 MECP Well Records Assessment

Cambium accessed the MECP Water Well Information System (WWIS) to review water well records within 500 m of the Site (Ministry of the Environment, Conservation and Parks, 2024b). A total of 73 records were identified, 64 of which describe wells installed into bedrock and 9 installed into overburden. The records identified two monitoring/test wells, two abandoned wells, three recharge well and the remaining wells were either water supply wells or unknown use. The locations of wells records identified within 500 m of the Site are illustrated in Figure 4. A summary of water well information, including total depth, static water level, and recommended pumping rate, is presented in Table 4. Further details are provided Appendix D. One well with well record ID 7448964 is identified to be present at the Site by the WWIS. No details are provided on the record, however.

Table 4 MECP Water Well Information Summary

		Depth (mbgs)	Depth Water Found (mbgs)	Static Water Level (mbgs)	Recommended Pumping Rate (L/min)
Bedrock Wells Count = 64	Minimum	10.67	9.75	1.00	18.00
	Maximum	101.50	100.58	15.00	182.00
	Average	32.18	27.79	4.41	55.90
Overburden Wells Count = 9	Minimum	4.88	13.11	4.00	23.00
	Maximum	50.00	16.76	5.00	46.00
	Average	15.90	14.66	4.23	38.26

A summary of other information outlined in the well records is provided below:

- The general lithology described by the well records is a sequence of overburden overlying limestone which is subsequently underlain by sandstone.



- The overburden is described as predominantly sand which is overlain by a clay layer in some locations. Gravel is also present at depth at some wells.
- The average contact depth between overburden materials and limestone bedrock is 16.5 mbgs (4.0 to 63.4 mbgs).
- Water supply in the area surrounding the Site is primarily derived from the bedrock aquifer. Based on the high static water level recorded compared to the depth that water was found, it is inferred that the bedrock aquifer is at least partially confined.
- The bedrock aquifer is productive, with a geometric mean recommended pumping rate of approximately 56 L/min for bedrock wells.

## 4.2 Door-to-Door Well Survey

A door-to-door survey of all accessible properties within 500 m of the property was conducted by Cambium staff on April 22<sup>nd</sup>, 2024, to confirm details in the public record and to identify any wells not included in the MECP records assessment. Due to the commercial and industrial development of the surrounding area, a number of properties were not accessible to the general public. Five properties were visited, and in-person interviews were conducted with available office workers regarding the condition and details of their water supply well(s), including the method of construction, water level, pump intake, well, and water level depths, water use, and general water quality and well yield.

If the property was accessible but a representative was not available, a letter was left in the mailbox with a pre-paid return envelope. The letter explained the nature of the proposed project and the survey and provided direct contact information for Cambium's project manager.

Details and responses from the well use survey are provided in Appendix D. Generally, workers indicated that the water supply for the surrounding area is not good quality due to hardness and suspect iron and sulphur.

## 4.3 Groundwater Quality

Groundwater quality samples were collected BH106-24 during hydraulic testing activities on April 19, 2024.



Samples were submitted for analysis of general organic and inorganic chemistry to Caduceon Environmental Laboratories in Ottawa, which is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). Samples were stored at a temperature between 0°C and 10°C prior to and during transport.

Water quality results were compared against Provincial Water Quality Objectives (PWQO) and City of Ottawa Sewer Discharge Bylaw 2003-514 guidelines. Certificates of Analysis for the samples are included in Appendix E. A summary of parameters exceeding the PWQO and Sewer By-law criteria is provided in Table 5, Table 6, and Table 7.

**Table 5 Summary of Results Exceeding PWQO Criteria**

Parameter	Units	PWQO Criteria	BH106-23	
			2024/04/22 (Total)	2024/08/10 (Dissolved)
Phosphorus	ug/L	10	<b>8,720</b>	<10
Arsenic	ug/L	5	<b>27.5</b>	1.0
Cadmium	ug/L	0.1	<b>1.12</b>	<b>0.211</b>
Cobalt	ug/L	0.9	<b>103</b>	<b>1.1</b>
Copper	ug/L	5	<b>301</b>	<b>5.4</b>
Lead	ug/L	1	<b>76.8</b>	0.08
Thallium	ug/L	0.3	<b>1.82</b>	<0.05
Uranium	ug/L	5	<b>11.4</b>	4.68
Vanadium	ug/L	6	<b>327</b>	0.3
Benzo[a]anthracene	ug/L	0.0004	<0.05*	-
Benzo(g,h,i)perylene	ug/L	0.00002	<0.05*	-
Butyl Benzyl Phthalate	ug/L	0.2	<1*	-
Chrysene	ug/L	0.0001	<0.05*	-
Dibenzo(a,h)anthracene	ug/L	0.002	<0.05*	-
Fluoranthene	ug/L	0.0008	<0.05*	-
Phenanthrene	ug/L	0.03	<0.05*	-
Formaldehyde	ug/L	0.8	<8*	-
Nonylphenols	ug/L	0.04	<1*	-

**Bolded** numbers indicate exceedance with respect to applicable guideline value

\* Laboratory Reporting Limit exceeds PWQO value



**Table 6 Summary of Results Exceeding Storm Sewer By-law Criteria**

Parameter	Units	Storm Sewer Criteria	BH106-23	
			2024/04/22 (Total)	2024/08/10 (Filtered/Dissolved)
Total Suspended Solids	mg/L	15	<b>9,480</b>	<3
Phosphorus	mg/L	0.4	<b>8.72</b>	<0.01
Arsenic	mg/L	0.02	<b>0.0275</b>	0.001
Chromium	mg/L	0.08	<b>0.249</b>	<0.0011
Copper	mg/L	0.04	<b>0.301</b>	0.054

***Bolded** numbers indicate exceedance with respect to applicable guideline value*

**Table 7 Summary of Results Exceeding Sanitary Sewer By-law Criteria**

Parameter	Units	Sanitary Sewer Criteria	BH106-23	
			2024/04/22 (Total)	2024/08/10 (Filtered/Dissolved)
Total Suspended Solids	mg/L	350	<b>9,480</b>	<3

***Bolded** numbers indicate exceedance with respect to applicable guideline value*

Based on the results of the chemical analysis, the following comments on groundwater quality are made.

- Both the unfiltered and filtered samples had numerous parameters measured at concentrations in excess of PWQO criteria. Treatment of excavation water would be required prior to discharge to off-site surface receiving environments.
- The method detection limit concentrations for many total metals and semi-volatile organics were greater than some of the PWQO criteria for these parameters. This is a limitation of laboratory analysis and is not confirmation that the guideline value was exceeded.
- Total suspended solids (TSS), phosphorus, arsenic, chromium, and copper concentrations were above City of Ottawa Storm Sewer Discharge guidelines in the unfiltered sample. The filtered sample had concentrations less than guideline values for all parameters, indicating that filtration is a suitable treatment method to enable discharge to this receptor.



- The filtered water quality sample had concentrations less than City of Ottawa Sanitary Sewer Discharge guideline values for all parameters, indicating that filtration is a suitable treatment method to enable discharge to this receptor.
- It is recommended that a water quality sample of treated water be submitted for laboratory analysis prior to discharge during construction activities to confirm the treatment system adequately reduces elevated parameters to acceptable concentrations.

#### 4.4 Single Well Hydraulic Tests

Cambium staff visited the Site on April 19<sup>th</sup>, 2024, to perform in-situ single well hydraulic tests (SWHTs) on select monitoring wells.

Rising head tests were conducted in each well by inducing an instantaneous change in head (water level) in the monitoring wells. Water level changes were achieved by introducing/removing a solid slug.

Water level recovery was monitored using a Solinst Levellogger pressure transducer data logger, with manual measurements collected simultaneously at regular intervals.

The hydraulic conductivity of the geological formations adjacent to the screened portion of each well was estimated via the AquiferTest Pro software using the Hvorslev method (Hvorslev, 1951). A summary of results is presented in Table 8. Detailed analytical reports are provided in Appendix F.

Estimated hydraulic conductivities for the tested wells screened within the silty clay unit ranged between  $1.9 \times 10^{-9}$  and  $2.2 \times 10^{-7}$  m/s, with an overall geometric mean value of  $1.2 \times 10^{-8}$  m/s. These values are consistent with published values for the tested materials (unconsolidated silt) (Freeze & Cherry, 1979).



**Table 8 Hydraulic Conductivity Estimates derived via SWHTs**

Monitoring Well	Screened Lithology	Hydraulic Conductivity, K (m/s)			
		Test 1	Test 2	Test 3	Geometric Mean
BH105-24	Silty sand to Sandy clayey silt	$6.4 \times 10^{-9}$	$3.4 \times 10^{-9}$	-	$4.6 \times 10^{-9}$
BH106-24	Sandy clayey silt	$2.2 \times 10^{-7}$	$1.9 \times 10^{-7}$	$2.1 \times 10^{-7}$	$2.1 \times 10^{-7}$
BH107-24	Sandy clayey silt to silt	$1.9 \times 10^{-9}$	-	-	$1.9 \times 10^{-9}$
<b>Geometric Mean</b>					<b><math>1.2 \times 10^{-8}</math></b>





## 5.0 Dewatering Assessment

The requirements for construction dewatering generally depend on the Site's soil and groundwater conditions including soil type, soil permeability or hydraulic conductivity, local groundwater levels, and the design of the proposed works, such as the foundation/basement elevation or pipe invert level, as well as the size of proposed structure/excavation. The following subsections detail the specific excavation parameters and anticipated dewatering rates for the Site.

### 5.1 Excavation Design Parameters

It is understood that the footprint of the proposed slab-on-grade building will be approximately 1,110 m<sup>2</sup>.

For construction purposes, it is assumed that excavation for footings will occur along a linear perimeter with dimensions of 23 m by 55 m. It is further assumed that during footing emplacement, groundwater will be temporarily lowered to a minimum of 1 m below the frost line to ensure dry conditions during footing construction, to a total depth of 2.5 mbgs.

For permanent operations, due to the high-water levels at the Site, permanent dewatering will be required to ensure water levels beneath the building remain below the frost line level (approximately 1.5 mbgs) throughout the year. A maximum water level of 0.30 mbgs was measured in BH106-23 on April 19, 2024.

### 5.2 Estimated Dewatering Rate – Construction Phase

An estimated dewatering rate for the construction phase of the proposed development was calculated a modified Dupuit-Forchheimer equation developed for linear excavations according to Powers, Corwin, Schmall, & Kaeck (2007):

$$Q = \frac{\pi K(H^2 - h^2)}{\ln(R_0/r_s)} + 2 \left[ \frac{xK(H^2 - h^2)}{2L} \right]$$



Where:

$Q$  = dewatering rate ( $m^3/s$ )

$K$  = hydraulic conductivity ( $m/s$ )

$H$  = initial hydraulic head in aquifer ( $m$ )

$h$  = target hydraulic head (initial hydraulic head – target drawdown) ( $m$ )

$R_0$  = distance to radial source (from excavation center)

$r_s$  = equivalent single well radius = width of trench/2 ( $m$ )

$x$  = unit length of trench ( $m$ )

$L$  = distance to line source (from excavation center) =  $R_0/2$  ( $m$ )

A summary of calculated dewatering rates for per 50 m linear excavation, given a target depth to water of 2.5 mbgs, is provided in Table 9. Detailed calculations are provided in Appendix G.

**Table 9 Calculated Construction Dewatering Rates**

	Hydraulic Conductivity (K)	Radius of Influence (from excavation edge)	Dewatering Rate (Q)	
	m/s	m	m <sup>3</sup> /day	L/s
Minimum	$1.9 \times 10^{-9}$	0.3	0.14	0.002
Maximum	$2.1 \times 10^{-7}$	3.0	4.70	0.05
Geometric Mean	$1.2 \times 10^{-8}$	0.7	0.65	0.01

Using the hydraulic conductivity estimates presented in Table 9, the estimated radius of influence from the edge of the excavation ranges from 0.3 to 3.0 m (average 0.7 m). The estimated dewatering rate ranges from 0.14 m<sup>3</sup>/day (140 L/day, or 0.002 L/s) to 4.70 m<sup>3</sup>/day (4,700 L/day, or 0.05 L/s), with a geometric mean average value of 0.65 m<sup>3</sup>/day (650 L/day, or 0.01 L/s).

Applying a safety factor of 2 to account for uncertainty resulting from heterogeneity of subsurface materials and other unknown factors, the estimated dewatering rate for 50 m sections of footing excavation ranges from 0.28 m<sup>3</sup>/day (280 L/day, or 0.004 L/s) to 9.4 m<sup>3</sup>/day (9,400 L/day, or 0.10 L/s), with a geometric mean average value of 1.30 m<sup>3</sup>/day (1,300 L/day, or 0.02 L/s).



It is noted that the above equation is designed to represent steady state pumping conditions. In general, at the beginning of the pumping, the pumping rate required to lower Site water levels to acceptable levels may be greater than the rate estimated for steady state conditions as incoming water replaces the volume of excavated soils. Additionally, the above equation does not account for any precipitation that may occur during the construction process.

### 5.3 Estimated Dewatering Rate – Operational Phase

An estimated dewatering rate for the operational phase of the proposed development was calculated using a modified Dupuit-Forchheimer equation (Powers, Corwin, Schmall, & Kaeck, 2007). Calculations for a square dewatering area with an equivalent radius were employed.

$$Q = \frac{\pi K(H^2 - h^2)}{\ln(R_0/r_s)}$$

Where:

$Q$  = dewatering rate ( $m^3/s$ )

$K$  = hydraulic conductivity ( $m/s$ )

$H$  = initial hydraulic head in aquifer ( $m$ )

$h$  = target hydraulic head (initial hydraulic head – target drawdown) ( $m$ )

$R_0$  = zone of influence (from excavation center) =  $3000(H - h)\sqrt{K}$  ( $m$ )

$r_s$  = equivalent single well radius

For square excavations, the equivalent radius ( $r_s$ ) can be determined as the radius of a circle with the same area as the excavation, or with the same perimeter as the excavation.

Here, the equivalent area method was used such that

$$r_s = \sqrt{\frac{\text{excavation area}}{\pi}}$$

A summary of calculated dewatering rates for per 50 m linear excavation, given a target depth to water of 2.5 mbgs, is provided in Table 10. Detailed calculations are provided in Appendix G



**Table 10 Calculated Permanent Dewatering Rate**

	Hydraulic Conductivity (K)	Radius of Influence (from excavation edge)	Dewatering Rate (Q)	
	m/s	m	m <sup>3</sup> /day	L/s
Minimum	1.9 x10 <sup>-9</sup>	0.2	0.4	0.005
Maximum	2.1 x10 <sup>-7</sup>	1.6	4.6	0.05
Geometric Mean	1.2 x10 <sup>-8</sup>	0.4	1.1	0.01

Using the hydraulic conductivity estimates presented in Table 10, the estimated radius of influence from the edge of the building footprint ranges from 0.2 to 1.6 m (average 0.4 m). The estimated dewatering rate ranges from 0.4 m<sup>3</sup>/day (400 L/day, or 0.005 L/s) to 4.6 m<sup>3</sup>/day (4,600 L/day, or 0.05 L/s), with a geometric mean average value of 1.1 m<sup>3</sup>/day (1,100 L/day, or 0.01 L/s).

Applying a safety factor of 2 to account for uncertainty resulting from heterogeneity of subsurface materials and other unknown factors, the estimated permanent dewatering rate for the building footprint ranges from 0.8 m<sup>3</sup>/day (800 L/day, or 0.01 L/s) to 9.2 m<sup>3</sup>/day (9,200 L/day, or 0.10 L/s), with a geometric mean average value of 2.2 m<sup>3</sup>/day (2,200 L/day, or 0.02 L/s).

It is noted that the above calculations are an approximation only, which can be further refined based on results observed during the construction phase of the proposed development. Cambium recommends reassessment of dewatering rates once construction nears the completion stage.

#### **5.4 Assessment of Required Regulatory Permits or Registration**

Any construction dewatering or other water taking in Ontario is governed by the Ontario Water Resources Act (OWRA) (Ontario Regulation 387/04 and/or Ontario Regulation 63/16) and/or the Environmental Protection Act (Registrations under Part II.2).

As of July 1, 2025, O.Reg. 63/16 will be amended such that temporary construction dewatering greater than 50,000 L/day registration of the water taking must be completed through the



Environmental Activity and Sector Registry (EASR) prior to the start of dewatering. Additionally, O.Reg. 387/04 will be amended such that low-risk foundation drainage systems, used primarily for residential purposes, that take less than 379,000 L/day of groundwater will be exempt from requiring environmental permissions.

As the maximum estimated dewatering rate for both construction activities and long-term building operation is less than 9,500 L/day, neither a PTTW nor an EASR registration will be required for the proposed development.



## **6.0 Water Supply Assessment**

### **6.1 Test Well Installation and Inspection**

Test Well 1 (TW1; Well Tag No. A379053, Appendix D) was installed by Air Rock Drilling Company on May 21, 2025. TW1 was completed in a landscaped area in the southeast corner of the Site to a depth of 55 mbgs. The identified lithology is clay from 0 to 11.6 mbgs, boulders/hardpan from 11.6 to 14.7 mbgs, and limestone bedrock to completion depth. Three water bearing units of indeterminate thickness were identified at 22.6, 38.2, and 53 mbgs.

The borehole has a 0.025 m diameter from ground surface to 16.5 mbgs, and a diameter of 0.016 m from 16.5 to 55 mbgs. A 0.016 m inside diameter steel casing was installed from 0.6 m above ground surface to a depth of 16.5 mbgs. Grout was emplaced in the annular space around the casing. A Cambium technician, under the supervision of the hydrogeologist who signed this report, observed the installation and grouting of the well casing (no well screen was installed). The signed and sealed well inspection report certifying that the well meets the minimum well construction requirements in the Wells Regulation and recommendations in this report is provided in Appendix D.

The remaining borehole was then completed and left as open hole in limestone bedrock. All three water bearing zones are below the bottom of the casing. The driller's well yield test provided an estimated pumping rate of 57 L/min, and the recommended pump depth was 30 mbgs.

### **6.2 Hydraulic Pumping Test**

An 8-hour hydraulic pumping test was completed on TW1 by Cambium staff on May 29, 2025. Prior to the test, a Solinst Levellogger (logger) was installed in TW1 and OW1 (the pre-existing water supply well on the site) to monitor water levels before, during, and after the pumping test. Manual measurements were also recorded during the pumping tests to mitigate the possibility of equipment failure. Well water levels measured during pumping test activities are provided in Appendix H. OW1 was not used for at least 12 hours prior to the start of the pumping test, nor was it used during the test or subsequent recovery period.



TW1 was chlorinated by Air Rock Drillers 48 hours prior to testing. The static water level in TW1 prior to the pumping test was 1.73 mbgs and the pump was installed at approximately 50 mbgs, resulting an available drawdown of approximately 48.21 m (height of static water level above pump).

Water from the pumping test was discharged to the drainage ditch at the perimeter of the site, in a downslope direction approximately 15 m from the test well. The pumping rate for the test was controlled by a valve on the discharge line.

Hydraulic testing began at 8:03 a.m. for a duration of 8 hours. The total sewage design flow for the proposed development is 1,800 L/day (Section 8.1.1). Assuming water use is limited to a standard (8-hour) working day, this corresponds to an average rate of 225 L/hour (3.75 L/min).

To account for periods of peak demand, the flow rate during the initial 15 minutes of the test was set to 5 times the average demand (approximately 19 L/min). The pumping rate was then increased and maintained at approximately 10 times the average demand (38 L/min) for the remainder of the test. The total volume of water discharged from TW1 during the pumping test was approximately 17,955 L.

Rainfall of 11.6 mm was recorded at the Ottawa Airport Climate Station (ID # 6106001) on the day of the pumping test (Appendix H). This is reflected in monitoring data collected in TW1 and OW1 during the pumping test. After an initial water level decrease up to 0.25 m within the first hour following the start of pumping, the water level in TW1 gradually increased for the duration of the test. A similar trend was observed in OW1, which experienced a maximum drawdown of approximately 0.1 m within the first hour before progressively increasing throughout the day. Water level fluctuations in TW1 and OW1 mirrored each other, both in terms of timing and magnitude (Appendix H).

The pump in TW was shut off at 4:03 pm. At this time, the water level in TW1 was 1.79 mbgs, which is equivalent to a water level increase of 0.06 m since the start of testing and represents approximately 0.1% of the total available drawdown in the well.



Following pump cessation, water levels were measured for 60 minutes. The water level recovered to greater than 100% of the initial water level in both TW1 and OW1 immediately upon termination of the pumping test.

### **6.3 Aquifer Parameter Analysis**

Drawdown measurements recorded for TW1 during the pumping test were analyzed with Aqtesolv software to obtain an estimate of transmissivity for the water supply aquifer using the Theis method. Although transmissivity of the aquifer is inferred to be very high due to the negligible drawdown over the course of the pumping test, concurrent recovery of the aquifer(s) during the test precludes a reliable estimate of the precise value. A report for the aquifer analysis illustrating the recharge trend in the data is included in Appendix H. Although results are presented based on a Theis analysis of the results, they are considered highly uncertain.

### **6.4 Groundwater Quality Analysis**

Field water quality parameters were measured regularly during pumping to ensure baseline aquifer water qualities were established prior to sampling. Field parameter measurements are summarized in Table 11. All water testing equipment was calibrated prior to use as per manufacturer's instructions; further details about equipment type. Residual chlorine was monitored during the supplemental sampling event and was confirmed to be less than 0.01 ppm before sample collection occurred.

Two sets of water quality samples were collected from TW1 and analyzed for the subdivision suite as well as trace metals and volatile organic compounds. The first sample (TW1-1) was collected three hours into the pumping test, and the second sample (TW1-2) within the final hour of the test.

Samples were collected in laboratory supplied containers which included preservatives as required. They were subsequently stored at a temperature between 0 and 10 °C prior to and during transport. Samples were submitted along with laboratory supplied COC forms to Caduceon Environmental Laboratories in Ottawa, Ontario, which is accredited by the Canadian Association for Laboratory Accreditation Inc. All samples were submitted within the required hold-time period.





**Table 11 Pumping Test Field Parameter Measurements**

Test Hour	Temperature (°C)	Dissolved Oxygen (mg/L)	Electrical Conductivity (µs/cm)	pH	Oxygen Reduction Potential (mV)	Turbidity (NTU)	Chlorine (mg/L)
1	11.2	1.69	663	7.37	-9.4	4.44	<0.01
2	11.5	1.82	669	7.34	-9.4	5.89	<0.01
3	11.6	1.99	682	7.33	-9.3	7.05	<0.01
4	11.4	1.94	684	7.31	-9.6	5.21	<0.01
5	11.3	1.92	688	7.32	-12.8	3.95	<0.01
6	11.7	1.92	690	7.36	-28.2	2.83	<0.01
7	11.8	1.91	691	7.42	-46.1	2.62	<0.01

Water quality results were compared against the Ontario Drinking Water Quality Standards (ODWQS) criteria for parameters outlined in Procedure D-5-5 Tables 1, 2, and 3 (Ministry of the Environment, 1996a). A complete summary of water quality results and certificate of lab analyses are provided in Appendix E. Parameters reported at concentrations exceeding ODWQS criteria are outlined in Table 12.

**Table 12 Summary of Results Exceeding ODWQS Standards**

Parameter	Units	ODWQS Criteria	TW Concentration	
			TW1-1	TW1-2
Hardness (as CaCO <sub>3</sub> )	mg/L	80-100	<b>389</b>	<b>394</b>
Total Dissolved Solids (Ion Sum)	mg/L	500	<b>510</b>	<b>522</b>
Turbidity	NTU	5	<b>8.4</b>	3.4
Total Iron	mg/L	0.3	0.205	<b>0.326</b>
Sodium	mg/L	20 / 200	<b>38.9</b>	<b>40.0</b>

As suggested by the field parameter measurements, water quality was consistent between samples. All measured parameters were less than the corresponding health related criteria. Hardness, total dissolved solids, turbidity, and total iron exceeded their respective aesthetic/operational guidelines but are below the corresponding Maximum Concentration



Considered Reasonably Treatable (MCCRT). Turbidity decreased significantly between sampling events, suggesting well development during pumping resolved the issue.

Sodium exceeded the "warning level" concentration of 20 mg/L for people on sodium-reduced diets. As water softening is required to address hardness, a sodium-free softener is recommended. Alternatively, a separate tap supplying unsoftened water could be used for drinking purposes.

A detailed assessment of surrounding land use was completed during the Phase Two ESA (Cambium, 2023b). All contaminants of potential concern were less than the Table 6 Site Characterization Standards in all soil and groundwater samples. All VOC concentrations measured during the pumping test were below the project laboratory's limit of reporting and indicate there are no significant impacts to the quality of the water supply aquifer from historical activities at the Site or surrounding lands.



## 7.0 Water Balance Assessment

A water balance assessment was completed to determine the potential change in groundwater recharge that could occur due to the proposed development. Generally, any property can be categorized into three broad types of areas: paved, roof, and landscape/vegetated. Currently, the Site is developed as a car wash, with paved roadways and parking and landscaping around the existing septic bed. In the post-development scenario, the amount of paved and roof areas at the Site will increase and the amount of landscape/vegetated area will decrease. This has the potential to impact the amount of water that infiltrates into the ground and is available to replenish natural ground- and surface-water systems, which must be considered as part of the development process.

To compare the difference in infiltration that may result from the proposed development, a water balance calculation was completed to determine the amount of surplus water that is currently generated at the Site. Site characteristics such as surficial soil type, topography, and the amount of pervious and impervious areas were then used to estimate the volume of water infiltrating at the Site. Calculations were completed for both pre-and post-development scenarios, so that a comparison could be made to identify potential changes in infiltration as well as mitigation measures which could be employed to reduce development impacts.

Figure 6 presents the post-development plans of the proposed development. As a detailed breakdown of landscape and building details are yet to be determined, the paved, roof, and landscape areas for the developed lots were calculated based on an assumption that each surface type comprises 10%, 50%, and 40% of the total developed lot area, respectively. Table 13 provides a summary of statistics for the total areas for each type of surface at the Site for both pre- and post-development scenarios. Further discussion of each component completed for the water balance assessment is provided in the following subsections.



**Table 13 Summary of Pre- and Post-Development Areas**

Type of Land Coverage	Pre-Development Areas (m <sup>2</sup> )	Post-Development Areas (m <sup>2</sup> )
Paved Area	811	2,246
Roof Area	365	1,261
Landscape/Vegetated Area	3,502	1,171
<b>Total (m<sup>2</sup>)</b>	<b>4,678</b>	<b>4,678</b>

## 7.1 Water Budget and Total Water Surplus

Based on the Thornthwaite and Mather methodology (1957), the water balance is an accounting of water in the hydrologic cycle. Precipitation (P) falls as rain and snow. It can run off towards lakes and streams (R), infiltrate to the groundwater table (I), or evaporate from the ground or be used for transpiration by vegetation (ET). When long-term average values of P, R, I, and ET are used, there is minimal or no net change to groundwater storage ( $\Delta S$ ).

The annual water budget can be expressed as:

$$P = R + I + ET + \Delta S$$

Where:

$P$  = Precipitation (mm/yr)

$R$  = Run-off (mm/yr)

$I$  = Infiltration (mm/yr)

$ET$  = Evapotranspiration (mm/yr)

$\Delta S$  = Change in soil water storage (mm/yr)

Total water surplus is defined as the difference between precipitation and evapotranspiration. It is the amount of water per unit area that can either infiltrate into on-site soils or be directed off-site as runoff. An assumption for the calculation of water surplus is that changes in soil water storage are negligible over the course of a year. It is also assumed that the catchment area for the water balance described above is completely contained within Site boundaries (i.e. the model does not account for catchment areas that extend off-site).



An annual water budget for the Site was calculated using the thirty-year climate normal data (1981-2010) provided by Environment Canada for the Ottawa MacDonald-Cartier International Airport (Climate ID 6106000), located approximately 114 km north (Environment Canada, 2024). A detailed table outlining the calculations is provided in Appendix I. In summary, the average annual precipitation and evapotranspiration at the Site is estimated to be 944 mm/yr and 547 mm/yr, respectively. Therefore, the water surplus at the Site is estimated to be 397 mm/yr.

7.2 Annual Infiltration and Runoff

To determine the amount of water infiltrated into on-site soils annually, the total volume of water available is multiplied by an infiltration factor (IF). The total volume of water available is obtained by multiplying the water surplus value determined from the water balance described above by the total permeable landscape area at the Site. The infiltration factor, which ranges from 0 to 1, is estimated based on topography, soils and cover as per the Stormwater Management Planning and Design Manual (Ministry of the Environment, 2003). As outlined in Table 14, the infiltration factor at the Site was assigned a value of 0.6.

Table 14 Determination of Infiltration Factor

Factor	Value
Topography	Flat land, avg. slope < 0.6 m/km = 0.3
Soil	Silty Loam = 0.2
Cover	Cultivated Land = 0.1
Infiltration Factor (IF)	0.6

The annual volume of water that infiltrates at the site is calculated as follows:

$$I \text{ (m}^3\text{/yr)} = \text{Water Surplus (m/yr)} * \text{Total landscape area(m}^2\text{/yr)} * \text{Infiltration Factor}$$

The annual infiltration at the Site is expected to vary based on a number of factors (i.e. actual precipitation, variation in soil composition, soil compaction, etc.).

The annual runoff that occurs at the Site varies between permeable and impermeable surfaces. On permeable landscape surfaces, the runoff is calculated as the difference between total precipitation and annual infiltration. On impermeable surfaces where there is no



infiltration, the runoff is calculated as 90% of precipitation, with the remaining 10% of precipitation lost directly to evaporation.

Annual infiltration and runoff volumes were calculated for the Site for both pre- and post-development scenarios. Details of the calculations are provided in Appendix I. A discussion of the water balance used to calculate the infiltration and runoff volumes for each scenario is provided in Section 7.3 and Section 7.4.

### 7.3 Pre-Development Water Balance

The water balance for existing conditions at the Site is summarized in Table 15. The pre-development infiltration rate and runoff rate was calculated to be 834 m<sup>3</sup>/yr and 1,555 m<sup>3</sup>/yr, respectively.

**Table 15 Pre-Development Water Balance**

Land Use		Area (m <sup>2</sup> )	Precipitation (m <sup>3</sup> )	Evapotranspiration (m <sup>3</sup> )	Infiltration (m <sup>3</sup> )	Run-off (m <sup>3</sup> )
Impervious Areas	Paved Area	811	766	77	-	689
	Roof Area	365	345	34	-	310
Pervious Areas	Landscape Area	3,502	3,306	1,916	834	556
<b>Total</b>		<b>4,678</b>	<b>4,416</b>	<b>2,027</b>	<b>834</b>	<b>1,555</b>

### 7.4 Post-Development Water Balance

A comparison of water balances for the pre-development and post-development scenarios is summarized in Table 17. There is a net infiltration deficit of approximately 555 m<sup>3</sup>/yr, compared to the pre-development infiltration. The run-off rate upon development of the Site is projected to increase by 1,610 m<sup>3</sup>/yr.



**Table 16 Post-Development Water Balance**

Land Use		Area (m <sup>2</sup> )	Precipitation (m <sup>3</sup> )	Evapotranspiration (m <sup>3</sup> )	Infiltration (m <sup>3</sup> )	Run-off (m <sup>3</sup> )
Impervious Areas	Paved Area	2,246	2,120	212	-	1,908
	Roof Area	1,261	1,190	119	-	1,071
Pervious Areas	Landscape Area	1,171	1,105	641	279	186
<b>Total</b>		<b>4,678</b>	<b>4,416</b>	<b>972</b>	<b>279</b>	<b>3,166</b>

*Assuming no infiltration occurring in paved and roof areas, and 10% of precipitation to be evaporated from paved and roof areas.*

## 7.5 Water Balance Comparison

A comparison of water balances for the pre-development and post-development scenarios is summarized in Table 17. There is a net infiltration deficit of approximately 555 m<sup>3</sup>/yr, compared to the pre-development infiltration. The run-off rate upon development of the Site is projected to increase by 1,610 m<sup>3</sup>/yr.

**Table 17 Water Balance Comparison**

	Precipitation (m <sup>3</sup> )	Evapotranspiration (m <sup>3</sup> )	Infiltration (m <sup>3</sup> )	Run-off (m <sup>3</sup> )
<b>Pre-Development</b>	4,416	2,027	834	1,555
<b>Post-Development</b>	4,416	972	279	3,166
<b>Change in Volume</b>	-	-1,055	-555	1,610
<b>Change in %</b>	-	-52	-67	104

## 7.6 Required Infiltration from Roof Runoff

To compensate for the post-development infiltration deficit, a portion of roof run-off water can be captured and directed towards infiltration. As the infiltration deficit volume is 555 m<sup>3</sup>/yr and the total roof run-off volume is projected to be 1,071 m<sup>3</sup>/yr, the percentage of roof run-off that is required to be redirected to maintain pre-development infiltration volumes is 52%. These details are summarized in Table 18.



**Table 18 Requirement of Infiltration from Roof Runoff**

<b>Volume of Pre-Development Infiltration (m<sup>3</sup>/yr)</b>	<b>834</b>
<b>Volume of Post-Development Infiltration (m<sup>3</sup>/yr)</b>	<b>279</b>
<b>Deficit from Pre to Post Development Infiltration (m<sup>3</sup>/yr)</b>	<b>555</b>
<b>Percentage of Roof Runoff required to match the pre-development infiltration (%)</b>	<b>52</b>

## 7.7 Water Balance Assessment Summary

Based on the calculations detailed in the preceding subsections, a summary of the water balance assessment is as follows:

- Impervious post-development area (roof and pavement) is projected to increase by approximately 2,331 m<sup>2</sup> when compared to pre-development conditions.
- Without implementing any mitigation measures, it is estimated that the reduction of pervious surfaces at the Site will create a net deficit in infiltration of approximately 555 m<sup>3</sup>/yr.
- To regain the lost volume of water infiltrated, a diversion of approximately 52% of roof run-off would be required to maintain pre-development water balance conditions (assuming 100% of diverted water is infiltrated).
- Implementation of Low Impact Development measures would enhance the Site's ability to infiltrate diverted roof run-off water into pervious areas. Due to the high groundwater levels however, a civil design engineer should be involved in designing any suitable infiltration measures across the Site.





## **8.0 Wastewater Assessment**

### **8.1 Conceptual Wastewater Design**

Part 8 of the Ontario Building Code (OBC) details the design, construction, operation, and maintenance of sewage systems. A conceptual peak sewage design flow was calculated following a review of OBC Table 8.2.1.3.B is summarized as follows:

- Warehouse: 150 L/day/loading bay x 4 loading bays = 600 L/day
- Factory: 75 L/employee per 8 hr shift x 16 person occupancy = 1,200 L/day
  - Total sewage design flow = **1,800 L/day**

#### **8.1.1 Concept Design Details**

A daily sewage design flow volume of 1,800 L/day is calculated for the proposed light industrial building.

#### **8.1.2 Treatment Unit**

It is understood the client is proposing to use a Waterloo Biofilter advanced treatment system which includes:

- Anaerobic Digester with Internal Pump Chamber (Model ADIPC-6000)
- Biofilter Tank (Model BFCN-4800)
- WaterNOx-LS Tank (for nitrogen removal)

#### **8.1.3 Leaching Bed**

Following the subsurface investigation, native soils were observed to be similar, consisting of a surficial layer of topsoil and silty sand fill to depths ranging from 0.3 to 1.0 mbgs overlying sandy clayey silt and sandy silt. Groundwater was encountered between 0.6 and 2.0 mbgs across all boreholes. Soil sample results are summarized in Section 3.2 above and have estimated percolation rates between 20 and 40 min/cm.



Considering the available land constraints and using a conservative estimated percolation rate of 40 min/cm, a partially raised Type A area bed has been conceptually designed below using the following information and calculations:

- Design flow (Q) = 1,800 L/day
- Native Soil T-time (T) = 40 min/cm
- Configuration: partially raised
- Stone area =  $Q/75$  when  $Q < 3,000$  L/day =  $1,800/75 = 24 \text{ m}^2$ 
  - Proposed concept design: 5.6 m x 4.5 m = 25.2 m<sup>2</sup>
- Mantle area (imported sand fill) =  $QT/400 = 1,800 \times 40 / 400 = 180 \text{ m}^2$ 
  - Proposed concept design: 21.6 m x 8.5 m = 183.6 m<sup>2</sup>

Based on the filter bed mantle requirement, the total bed footprint would be approximately 21.6 m by 8.5 m, as shown on Figure 7.

The Type A Area Bed will likely require to be raised above original grade. Assuming a raised height of 1.0 m, setback distances shown on Figure 7 were increased accordingly.

The area of the Site appears to provide adequate space for the installation of an on-site sewage system and appears to meet the required setback distances outlined in OBC Tables 8.2.1.6.A and 8.2.1.6.B. However, this should be considered and evaluated during the detailed sewage system design stage. The Site conditions appear feasible to install an on-site sewage system.

## 8.2 Septic System Impact Assessment

Guideline D-5-4 (Ministry of the Environment, 1996b) outlines a three-step process for assessing potential groundwater impact from individual on-site sewage systems. The first two steps involve lot size and system isolation considerations. If risk is identified through either of these two steps, the assessment must progress to the third step, which is detailed consideration of nitrate loading and contaminant attenuation.



### 8.3 Step One: Lot Size Consideration

As the Site size is less than 1 ha, the assessment automatically progresses to Step Two.

### 8.4 Step Two: System Isolation Considerations

Water supply at the Site and surrounding area is predominately sourced from a bedrock aquifer which is overlain by a significant layer of overburden material (Section 4.1). Given this information, it is expected that the water supply aquifer will be hydraulically isolated from the proposed septic system at the Site. Regardless of the potential isolation, based on the small lot site size and the large amount of impermeable ground surface, nitrate loading is a consideration for the Site. As such, the assessment progresses to Step Three.

#### 8.4.1 Step Three: Assessment of Nitrate Loading and Contaminant Attenuation

A daily flow of 1,800 L/day of sewage effluent is anticipated at the Site. Total nitrogen (all species) ultimately converts to nitrate through the wastewater treatment process. Nitrate is considered to be the critical contaminant in sewage effluent. A nitrate loading of 40 grams/lot/day is typically used to determine the effluent loading from conventional septic systems on the receiving groundwater system. The proposed Waterloo Biofilter advanced treatment system, (Section 8.1.2), has an add-on nitrate reduction tank (WaterNOx-LS) which takes a nominal amount of additional space and can achieve between 80.3% and 91.6% reduction in total nitrogen (Appendix J). Provided the WaterNOx-LS tank is installed and using the conservative 80.3% total nitrogen reduction, the system will have a theoretical nitrate loading of 7.88 g/day. This value is used in the following equations.

A mass balance calculation is used to determine the sewage loading for nitrate on the property boundary:

$$C_t = \frac{Q_e C_e + Q_i C_i}{Q_t}$$

Where:

$Q_t$  = Total volume ( $Q_e + Q_i$ )

$C_t$  = Total concentration of nitrate at the property boundary



$Q_e$	=	Volume of septic effluent
$C_e$	=	Concentration of nitrate in effluent (7.88 mg/L)
$Q_i$	=	Volume of available dilution water
$C_i$	=	Concentration of nitrate in infiltration water (0.1 mg/L)

#### 8.4.2 Estimate of Nitrate Concentrations at Lot Boundaries

The predictive assessment indicates the proposed development will result in an estimated nitrate concentration of 5.3 mg/L at lot boundaries if wastewater is treated via the proposed Waterloo Biofilter advanced treatment system and only dilution water from infiltration within permeable areas is considered. The treatment system capable of 80.3% or greater nitrate reduction is well below the ODWQS criteria of 10 mg/L using only dilution water from infiltration within permeable areas.

A summary of these results is provided in Table 19. Detailed calculations are included in Appendix I.

**Table 19 Predictive Assessment of Nitrate Concentration**

Variable	Waterloo Biofilter Advanced Treatment System
$Q_e$ (L/day)	1,800
$C_e$ (mg/L)	7.88
$Q_i$ (L/day)	891
$C_i$ (mg/L)	0.1
$Q_t$ (L/day)	2,691
$C_t$ (mg/L)	5.3



## 9.0 Conclusions and Recommendations

Cambium was retained by the Client to complete a hydrogeological assessment for proposed redevelopment of the land located at 1386 and 1394 Greely Lane, Ottawa, Ontario.

Development plans include construction of one 1,110 m<sup>2</sup> (12,000 ft<sup>2</sup>) slab-on grade building which will be divided in three 370 m<sup>2</sup> (4,000 ft<sup>2</sup>) light industrial use units.

The subsurface investigation completed at the site indicates the lithology is comprised primarily of surficial deposits of pavements or topsoil overlying a relatively thin deposit of fill overlying native deposits of clays and silts. T-times estimated from laboratory analysis of soil samples collected from the native deposits range from 20 to 40 min/cm.

Monitoring wells installed in three locations (BH105-23, BH106-23, and BH107-23) indicate water levels vary across the site and fluctuate seasonally. A minimum water level of 1.3 mbgs was measured in BH105-23 on March 15, 2023, and a maximum water level of 0.30 mbgs was measured in BH106-23 on April 19, 2024. Hydraulic testing (rising head slug tests) provided hydraulic conductivity estimates for the shallow aquifer ranging from  $1.9 \times 10^{-9}$  to  $2.2 \times 10^{-7}$  m/s with a geometric mean estimate of  $1.2 \times 10^{-8}$  m<sup>2</sup>/s.

### 9.1 Construction Dewatering

#### Water Quality Analysis

Analysis of water quality samples from BH106-23 identified a number of parameters with concentrations exceeding PWQO criteria in both unfiltered and filtered samples. All parameters had concentrations below City of Ottawa storm and sanitary sewer discharge guidelines, indicating that filtration is a suitable treatment method to enable discharge to these receptors. Should on-site treatment and discharge to surface (i.e. drainage ditch) be the preferred option for dewatering, it is recommended that a water quality sample of treated water be submitted for laboratory analysis prior to discharge during construction activities to confirm the treatment system adequately reduces elevated parameters to acceptable concentrations.



## Dewatering Assessment

Due to the high groundwater levels at the Site, dewatering during both the construction phase and permanent building operation will be required. During construction, it is estimated that an average dewatering rate of 1.30 m<sup>3</sup>/day (1,300 L/day, or 0.02 L/s) will be needed to achieve dry conditions per 50 m section of footing excavation. This rate represents steady state pumping conditions and higher volumes may be required to lower Site water levels to acceptable levels during the initial stage of pumping. Additionally, the estimate does not account for any precipitation that may occur during the construction process.

For permanent operations, it is estimated that an estimated average dewatering rate of 2.2 m<sup>3</sup>/day (2,200 L/day, or 0.02 L/s) will be required to ensure water levels beneath the building remain below the frost line level (approximately 1.5 mbgs) throughout the year. It is recommended that dewatering rates be reassessed however, once building construction nears the completion stage.

The maximum estimated dewatering rate for both construction activities and long-term building operation are less than 9,500 L/day. As such, neither a PTTW nor an EASR registration will be required for the proposed development.

The monitoring wells installed for the hydrogeological assessment should be decommissioned in accordance with O.Reg. 903 prior to redevelopment of the Site.

## **9.2 Private Servicing**

### Water Supply

Test Well 1 was installed on May 21, 2025, in a landscaped area in the southeast corner of the Site to a depth of 55 mbgs. The identified lithology is clay from 0 to 11.6 mbgs, boulders/hardpan from 11.6 to 14.7 mbgs, and limestone bedrock to completion depth. Three water bearing units of indeterminate thickness were identified at 22.6, 38.2, and 53 mbgs. A Cambium technician observed the installation and grouting of the well casing (no well screen was installed).



An 8-hour hydraulic pumping test was completed on TW1 by Cambium staff on May 29, 2025 and the pre-existing water supply well on the Site was used to monitor water levels before, during, and after the pumping test. OW1 was not used for at least 12 hours prior to the start of the pumping test, nor was it used during the test or subsequent recovery period.

The total sewage design flow for the proposed development is 1,800 L/day corresponds to an average rate of 3.75 L/min for an 8-hour business day. To account for periods of peak demand, the flow rate during the initial 15 minutes of the test was set to 5 times the average demand (approximately 19 L/min). The pumping rate was then increased and maintained at approximately 10 times the average demand (38 L/min) for the remainder of the test. The total volume of water discharged from TW1 during the pumping test was approximately 17,955 L.

Rainfall of 11.6 mm was recorded on the day of the pumping test and resulted in a gradual increase in water level in both TW1 and OW1 over the duration of the test. Water level fluctuations in TW1 and OW1 mirrored each other, both in terms of timing and magnitude.

Following pump cessation, water levels were measured for 60 minutes. The water level recovered to greater than 100% of the initial water level in both TW1 and OW1 immediately upon termination of the pumping test.

Cambium notes that the pre-existing water supply well must be appropriately abandoned with consideration to Wells Regulation when it is no longer in use.

### Water Balance

It is projected that impervious post-development area (roof and pavement) will increase by approximately 2,331 m<sup>2</sup> when compared to pre-development conditions, which will create a net deficit in infiltration to groundwater of approximately 555 m<sup>3</sup>/yr if no mitigation measures are implanted.

To regain the lost volume of water infiltrated, a diversion of approximately 52% of roof run-off would be required to maintain pre-development water balance conditions (assuming 100% of diverted water is infiltrated).

Implementation of Low Impact Development measures would enhance the Site's ability to infiltrate diverted roof run-off water into pervious areas. Due to the high groundwater levels



however, a civil design engineer should be involved in designing any suitable infiltration measures across the Site.

### Conceptual Wastewater Design

A daily sewage design flow volume of 1,800 L/day was calculated for the proposed light industrial building. Given the site lithology and estimated T-times, a total septic bed footprint of approximately 21.6 m by 8.5 m, with a 6,000 L septic tank and a Waterloo Biofilter advanced treatment system, will be required. The bed will be at least partially raised due to Site conditions, with the specific height to be determined during the final building design.

The predictive assessment indicates the proposed development will result in an estimated nitrate concentration of 5.3 mg/L at lot boundaries if wastewater is treated via the proposed Waterloo Biofilter advanced treatment system and only dilution water from infiltration within permeable areas is considered.

Overall, the Site conditions appear feasible to install an on-site sewage system, and there is adequate space for the installation which appears to meet the required OBC setback distances. However, this should be considered and evaluated during the detailed sewage system design stage.

It is noted that the existing septic system at the Site must be appropriately decommissioned in line with guidelines provided by the Ottawa Septic System Office.





## 10.0 Closing

We trust that the information in this submission meets your current requirements. If you have any questions regarding the contents of this report, please contact the undersigned.

Respectfully submitted,

### Cambium Inc.

DocuSigned by:

C9F8935E96D14CC...

Jeremy Tracey, P.Eng.  
 Project Manager

DocuSigned by:

6C8CA15FD6B4444...

Warren Young, P.Eng.  
 Coordinator, Hydrogeologist

DocuSigned by:

677F3F2E4427404...

Kevin Warner, M.Sc., P.Geo. (Ltd), BCIN  
 Group Manager – Water & Wastewater



\\cambiumincstorage.file.core.windows.net\projects\17200 to 17299\17281-002 Cassidy EW Construction Consultant Ltd - HydroG - Greely Lane\Deliverables\REPORT - HydroG\Final\2025-07-25 RPT HydroG Greely Ln - Rev1.docx



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## 12.0 Standard Limitations

### Limited Warranty

In performing work on behalf of a client, Cambium relies on its client to provide instructions on the scope of its retainer and, on that basis, Cambium determines the precise nature of the work to be performed. Cambium undertakes all work in accordance with applicable accepted industry practices and standards. Unless required under local laws, other than as expressly stated herein, no other warranties or conditions, either expressed or implied, are made regarding the services, work or reports provided.

### Reliance on Materials and Information

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A site assessment is created using data and information collected during the investigation of a site and based on conditions encountered at the time and particular locations at which fieldwork is conducted. The information, sample results and data collected represent the conditions only at the specific times at which and at those specific locations from which the information, samples and data were obtained and the information, sample results and data may vary at other locations and times. To the extent that Cambium's work or report considers any locations or times other than those from which information, sample results and data was specifically received, the work or report is based on a reasonable extrapolation from such information, sample results and data but the actual conditions encountered may vary from those extrapolations.

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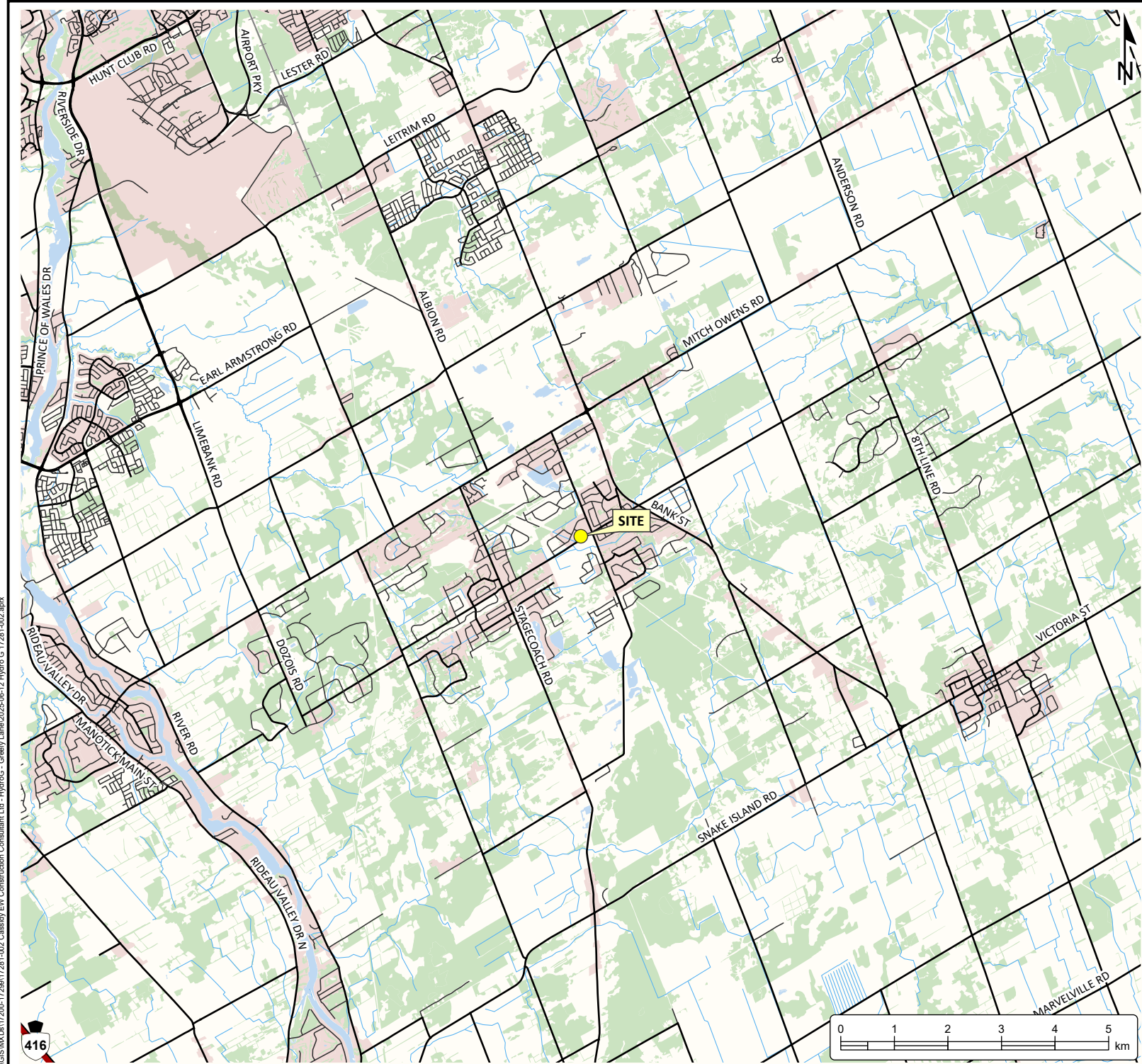


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## Appended Figures

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**HYDROGEOLOGICAL  
ASSESSMENT REPORT**  
CASSIDY EW CONSTRUCTION  
CONSULTANT LTD.  
1386 and 1387 Greely Lane  
Ottawa, Ontario

**LEGEND**

- Highway
- Major Road
- Minor Road
- Railway
- Watercourse
- Built Up Area
- Wooded Area
- Water Area

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**SITE LOCATION PLAN**

Project No.: 17281-002	Date: June 2025
Scale: 1:100,000	Rev.: Projection: NAD 1983 UTM Zone 18N
Created by: NLB	Checked by: KH
Figure: <b>1</b>	



**HYDROGEOLOGICAL  
ASSESSMENT REPORT**  
CASSIDY EW CONSTRUCTION  
CONSULTANT LTD.  
1386 and 1387 Greely Lane  
Ottawa, Ontario

**LEGEND**

-  Test Well
-  Observation Well
-  Monitoring Well
-  Borehole
-  Benchmark
-  Site (approximate)

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**SITE PLAN WITH  
BOREHOLE LOCATIONS**

Project No.: 17281-002		Date: June 2025	
Scale: 1:600		Rev.: NAD 1983 UTM Zone 17N	
Created by: NLB	Checked by: KH	Figure: <b>2</b>	





### HYDROGEOLOGICAL ASSESSMENT REPORT

CASSIDY EW CONSTRUCTION CONSULTANT LTD.  
1386 and 1387 Greely Lane  
Ottawa, Ontario

#### LEGEND

(98.29) Groundwater Elevations  
April 2024

Benchmark

Borehole

Monitoring Well

Test Well

Observation Well

Groundwater Contour  
April 2024

Site (approximate)

Groundwater Flow Direction  
April 2024

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### GROUNDWATER CONFIGURATION PLAN

Project No.: 17281-002	Date: June 2025
Scale: 1:600	Rev.: Rev.: Projection: NAD 1983 UTM Zone 18N
Created by: LD	Checked by: KH
Figure: <b>3</b>	





# **HYDROGEOLOGICAL ASSESSMENT REPORT** CASSIDY EW CONSTRUCTION CONSULTANT LTD. 1386 and 1387 Greely Lane Ottawa, Ontario

## **LEGEND**

- Water Well Record
- 500m Study Area
- Site (approximate)

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## **MECP WELL RECORDS WITHIN 500m**

Project No.: 17281-002	Date: June 2025
Scale: 1:6,000	Rev.: KH
Created by: NLB	Checked by: KH
Figure: 4	





Pre-Development	Area (m <sup>2</sup> )
Roofed	365
Paved	811
Landscaped	3,502
Total	4,678

**HYDROGEOLOGICAL  
ASSESSMENT REPORT**  
CASSIDY EW CONSTRUCTION  
CONSULTANT LTD.  
1386 and 1387 Greely Lane  
Ottawa, Ontario

**LEGEND**

- Roofed
- Paved
- Landscaped
- Site (approximate)

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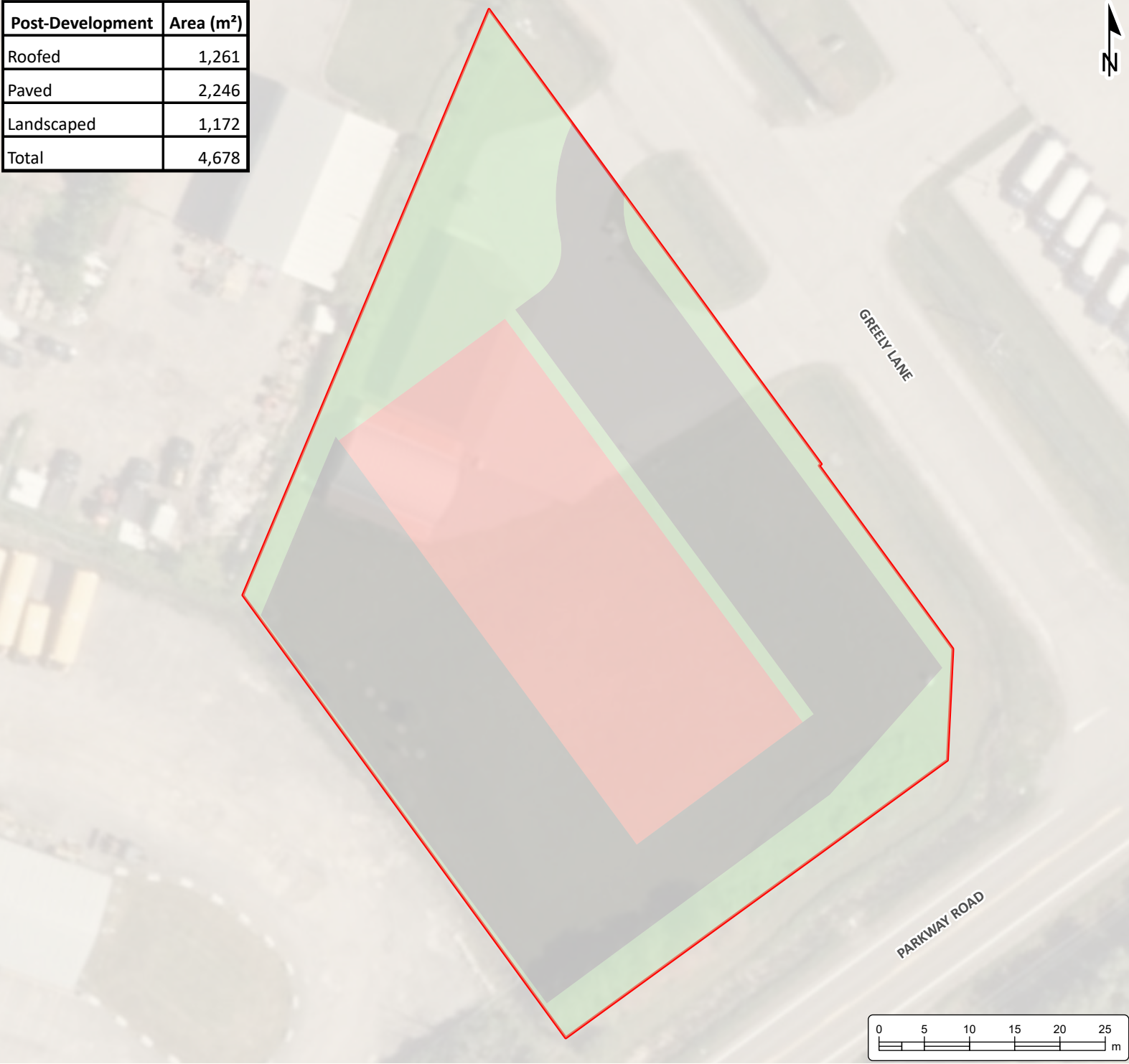


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**PRE-DEVELOPMENT PLAN**

Project No.: 17281-002		Date: June 2025	
		Rev.:	
Scale: 1:600		Projection: NAD 1983 UTM Zone 18N	
Created by: NLB	Checked by: KH		Figure: <b>5</b>

Post-Development	Area (m²)
Roofed	1,261
Paved	2,246
Landscaped	1,172
Total	4,678



**HYDROGEOLOGICAL  
ASSESSMENT REPORT**  
CASSIDY EW CONSTRUCTION  
CONSULTANT LTD.  
1386 and 1387 Greely Lane  
Ottawa, Ontario

**LEGEND**

- Roofed
- Paved
- Landscaped
- Site (approximate)

**Notes:**  
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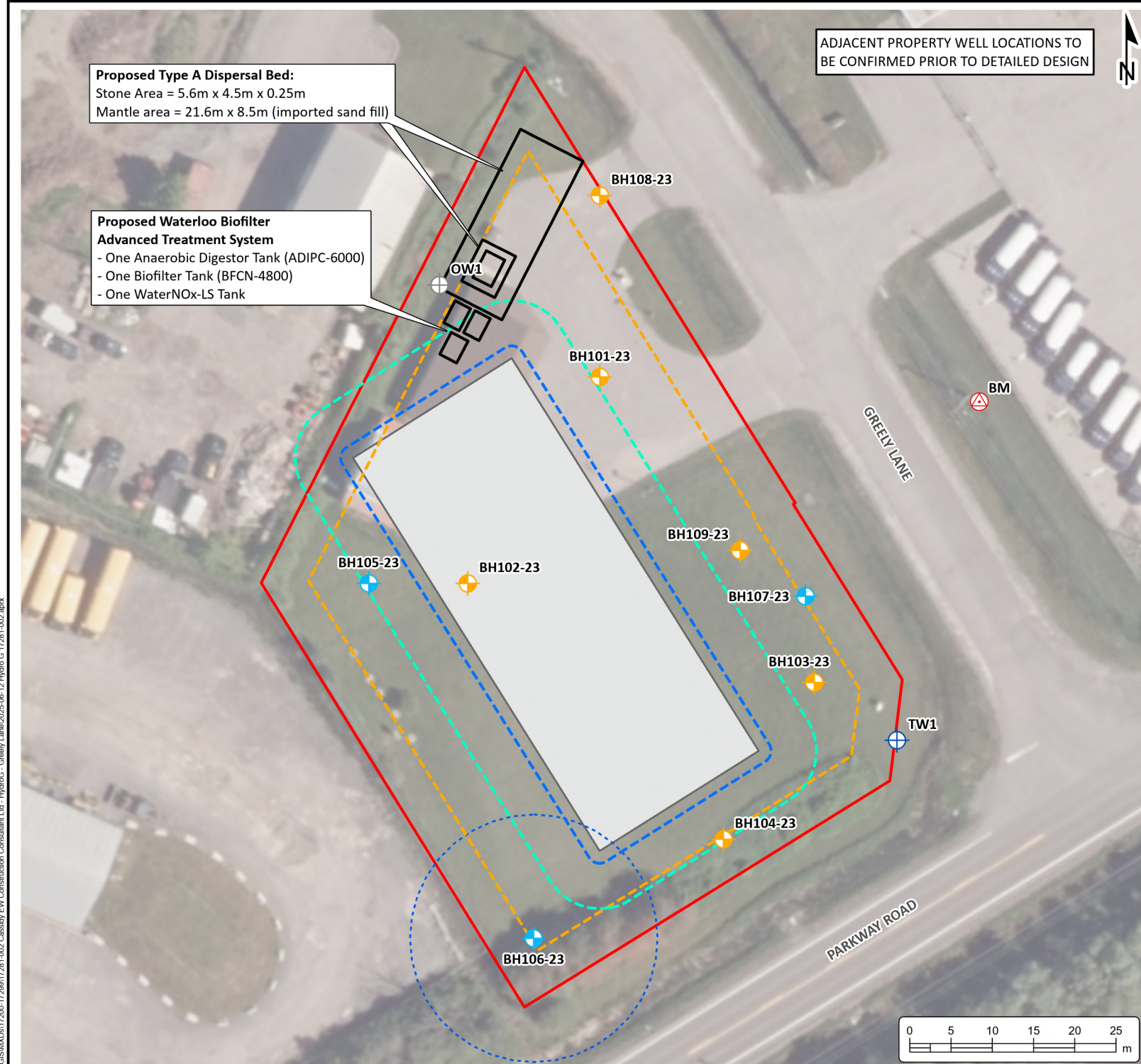


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**POST-DEVELOPMENT PLAN**

Project No.: 17281-002	Date: June 2025
Scale: 1:600	Rev.: Rev.
Created by: NLB	Checked by: KH
Figure: <b>6</b>	





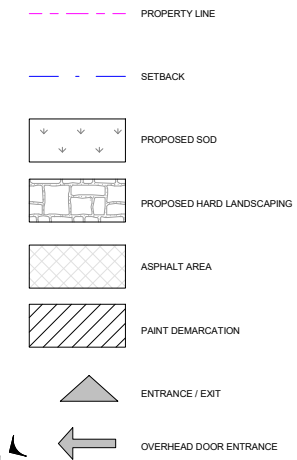


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## **Appendix A**

### **Property and Land Information**

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**BRYDEN GIBSON**  
ARCHITECTS INCORPORATED

6 Somerset Street West, Suite 200, Ottawa Ontario, K1Y 4T7  
Telephone: 613.724.9914 E-mail: [architecture@brydengibson.com](mailto:architecture@brydengibson.com)

## Proposed Site Plan- Phase 2















# Source Protection Information Atlas Map

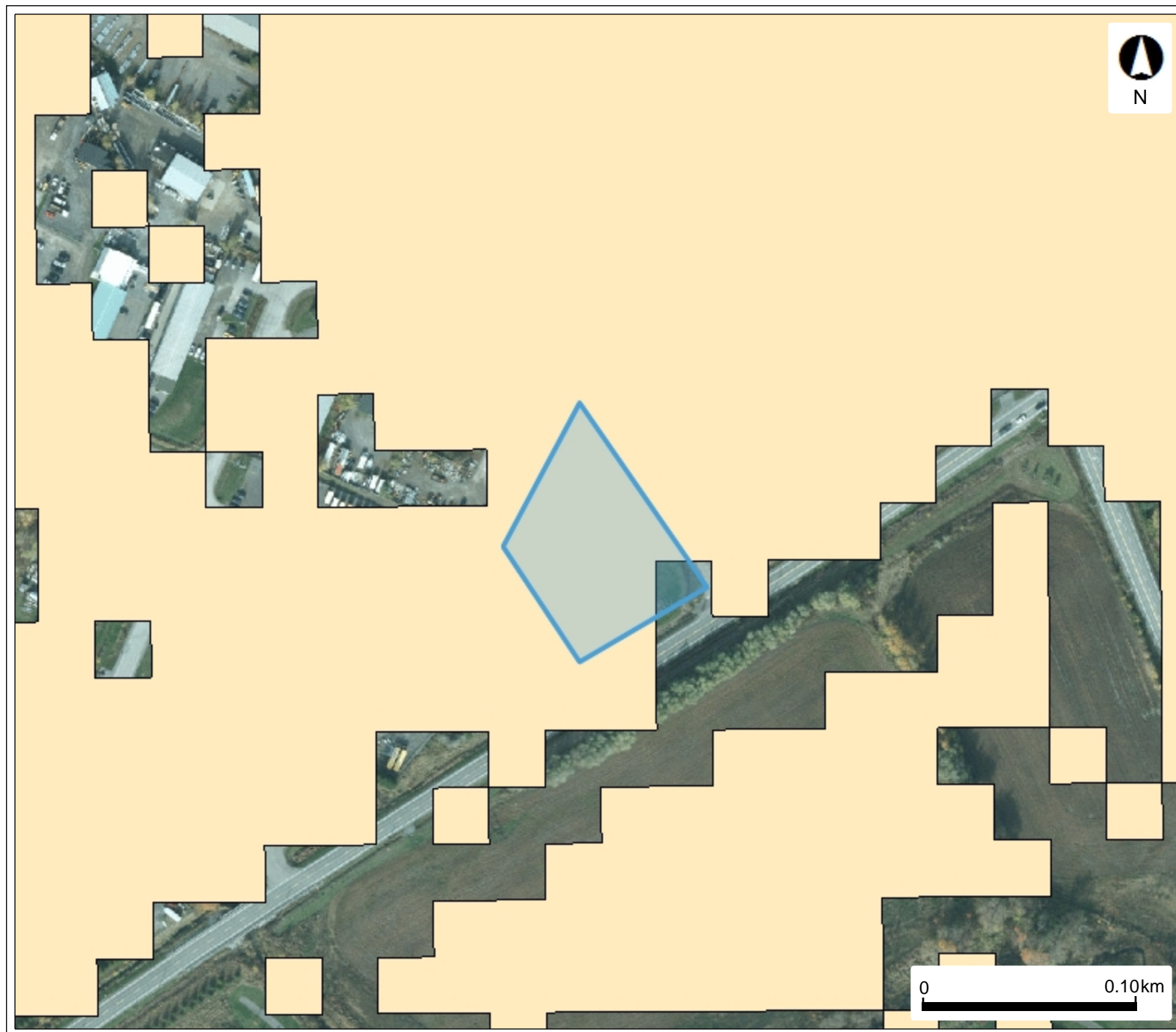


## Legend

- Highly Vulnerable Aquifers
- Intake Protection Zone 3

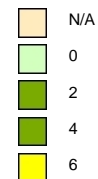
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# Source Protection Information Atlas - SGRA Map



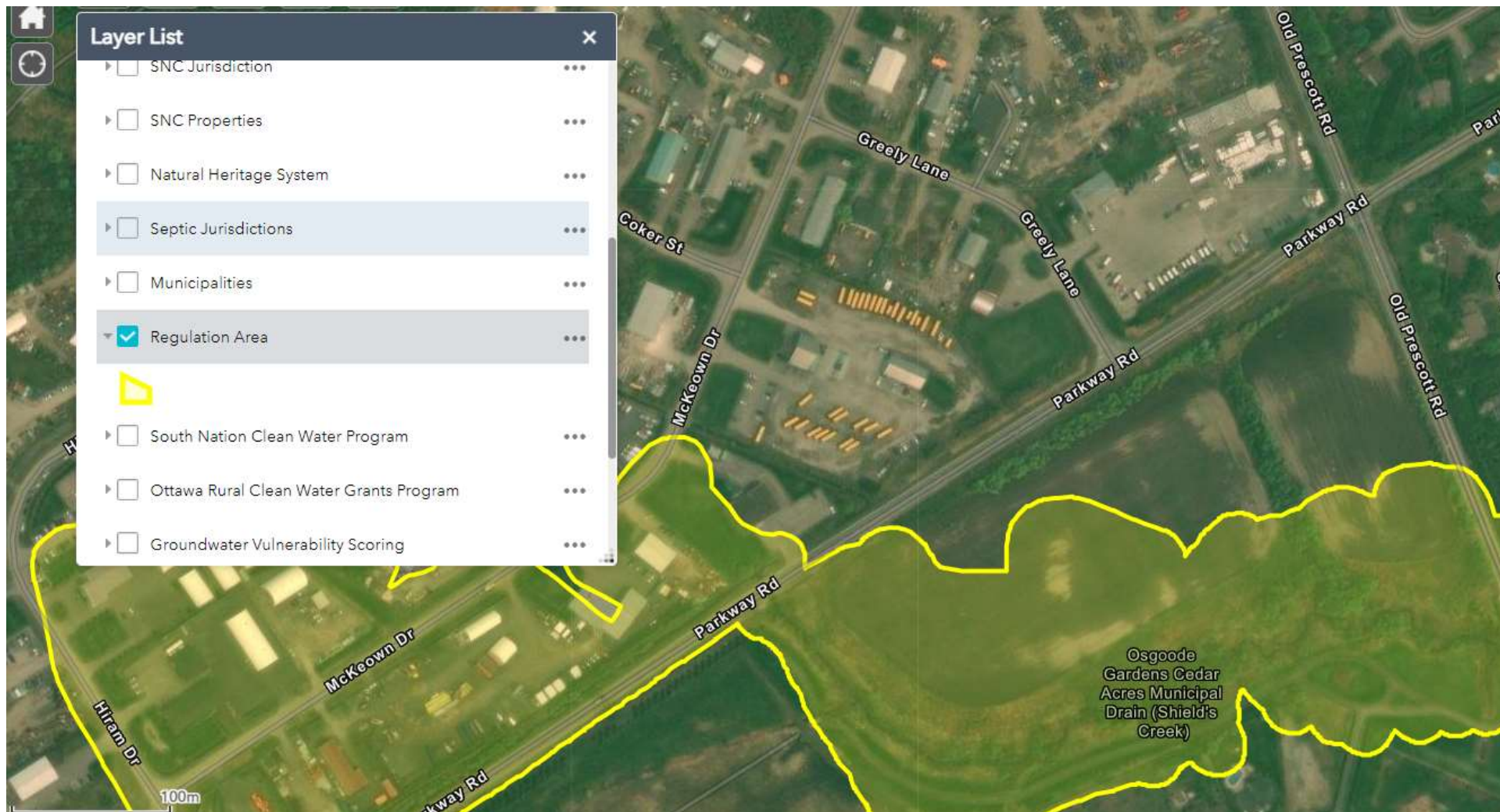
## Legend

Significant Groundwater Recharge Area



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## **Appendix B**

## **Borehole Logs**

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Cassidy EW  
**Client:** Construction  
**Contractor:** OGS Inc.  
**Project No.:** 17281-001 - B  
**Location:** Ottawa, ON

**Project Name:** 1386 & 1394 Greely Lane  
**Method:** Track Mounted Hollow Stem Auger  
**Elevation:** 99.01 mASL  
**UTM:** 18 T **N:** 5011868 **E:** 455169

**Log of Borehole:** BH101-23  
**Page:** 1 of 1  
**Date Completed:** March 8, 2023

SUBSURFACE PROFILE				SAMPLE													
Elevation (m)	Depth	Lithology	Description	Elevation Depth	Number	Type	% Recovery	SPT (N)	Atterberg Limits (%)			Shear Strength Cu, kPa				Well Installation	Log Notes
									LL PL PI			nat V. rem V.					
									25	50	75	20	40	60	80		
									% Moisture			SPT (N)					
									25	50	75	20	40	60	80		
99	0		ASPHALT: 75 mm	98.93													
			FILL: (SM) GRAVELLY SAND: brown, moist, some silt [base material]	98.55	1A	SS	100	75	10%						75		
98.5	0.5		FILL: (SM) SILTY SAND: grey, moist, gravelly	98.46	1B	SS			12.7%								
					2A	SS			18.8%								
98	1		(ML) sandy CLAYEY SILT: grey, cohesive, w>PL, firm	97.94	2B	SS	83	7	18.8%					7			
97.5	1.5				3	SS	75	4	18.8%					4			
97	2																
					4A	SS			21%								
96.5	2.5		(SM) SILTY SAND: grey, wet, trace clay	96.42	4B	SS	67	9	19.5%					9			
96	3		(ML) SILT: grey, non-cohesive, wet, compact, some sand, trace clay	95.96													
					5	SS	63	15	17.1%					15			
95.5	3.5																
			-becomes moist, dense		6	SS	67	46	13.3%					46			
95	4																
			-becomes very dense		7	SS	88	88	14%								
94.5	4.5																
94	5																
93.5	5.5		-becomes wet, compact		8	SS	67	20	18%					20			
93	6																
			Borehole terminated @ 6.1 mbgs target depth achieved.	92.91													
92.5	6.5																
92	7																
91.5																	

1.5m: ATT SS3:  
19.8%LL 12.5%PL

Borehole caved at 2.1  
mbgs. Groundwater  
encountered at 1.1  
mbgs following  
completion.

GRAIN SIZE DISTRIBUTION	SAMPLE	GRAVEL	SAND	SILT	CLAY
SS1B	20	53	27		
SS3	0	22	57	21	
SS6	0	19	77	4	

Logged By: FI

Input By: BV

Peterborough, Barrie, Whitby, Kingston, Ottawa



Cassidy EW  
**Client:** Construction  
**Contractor:** OGS Inc.  
**Project No.:** 17281-001 - B  
**Location:** Ottawa, ON

**Project Name:** 1386 & 1394 Greely Lane  
**Method:** Track Mounted Hollow Stem Auger  
**Elevation:** 98.72 mASL  
**UTM:** 18 T **N:** 5011843 **E:** 455153

**Log of Borehole:** BH102-23  
**Page:** 1 of 1  
**Date Completed:** March 8, 2023

SUBSURFACE PROFILE				SAMPLE													
Elevation (m)	Depth	Lithology	Description	Elevation Depth	Number	Type	% Recovery	SPT (N)	Atterberg Limits (%)			Shear Strength Cu, kPa				Well Installation	Log Notes
									LL	PL	PI	nat V <sub>r</sub>	rem V <sub>r</sub>	6	8		
									% Moisture			SPT (N)					
									25	50	75	20	40	60	80		
98.7	0		<b>TOPSOIL:</b> 100 mm	98.62	1A	SS											
			<b>FILL:</b> (SM) SILTY SAND: brown, wet, compact, gravelly, with roots	0.10	1B	SS	63	11									
98.2	0.5																
				97.75	2A	SS											
97.7	1		<b>(ML) sandy CLAYEY SILT:</b> grey, cohesive, w>PL, firm	0.97	2B	SS	92	4									
97.2	1.5																
96.7	2																
				-becomes soft													
96.2	2.5																
95.7	3		<b>(ML) SILT:</b> grey, non-cohesive, wet, compact, some sand, trace clay	3.05	5	SS	42	18									
95.2	3.5		-becomes very dense														
94.7	4																
94.2	4.5																
93.7	5																
93.2	5.5																
92.7	6																
92.2	6.5																
91.7	7																
91.2																	
																Borehole caved at 4.0 mbgs. Groundwater measured at 1.5 mbgs following completion.	
GRAINSIZE DISTRIBUTION																SAMPLE GRAVEL SAND SILT CLAY	

Borehole caved at 4.0  
mbgs. Groundwater  
measured at 1.5 mbgs  
following completion.

GRAINSIZE [SAMPLE] GRAVEL | SAND | SILT | CLAY  
DISTRIBUTION



Cassidy EW  
**Client:** Construction  
**Contractor:** OGS Inc.  
**Project No.:** 17281-001 - B  
**Location:** Ottawa, ON

**Project Name:** 1386 & 1394 Greely Lane  
**Method:** Track Mounted Hollow Stem Auger  
**Elevation:** 98.71 mASL  
**UTM:** 18 T **N:** 5011831 **E:** 455195

**Log of Borehole:** BH103-23  
**Page:** 1 of 1  
**Date Completed:** March 8, 2023

SUBSURFACE PROFILE				SAMPLE								
Elevation (m)	Depth	Lithology	Description	Elevation Depth	Number	Type	% Recovery	SPT (N)	Atterberg Limits (%)	Shear Strength Cu, kPa	Well Installation	Log Notes
									LL PL PI	nat V. rem V.		
									25 50 75	20 40 60 80		
									% Moisture	SPT (N)		
									25 50 75	20 40 60 80		
98.7	0		TOPSOIL: 300 mm	98.41	1A	SS			39.1%	2		
				0.30	1B	SS	67	2	22%			
98.2	0.5		FILL: (SM) SILTY SAND: grey, wet, trace gravel									
				97.72	2A	SS			22.4%			
97.7	1		(ML) sandy CLAYEY SILT: grey, cohesive, w>PL, firm	0.99	2B	SS	79	4	19.3%	4		
			-becomes stiff									
97.2	1.5											
					3	SS	88	8	16.7%	8		
96.7	2		-decrease in clay content, becomes CL-ML									
96.2	2.5				4	SS	92	10	15.6%	10		
95.7	3			95.66								
			(ML) sandy SILT: grey, non-cohesive, wet, compact, trace clay	3.05	5	SS	88	17	14.3%	17		
95.2	3.5											
94.7	4				6	SS	79	15	14.1%	15		
94.2	4.5		-becomes dense									
					7	SS	71	39	13.6%	39		
93.7	5											
93.2	5.5				8	SS	71	47	13.7%	47		
92.7	6			92.61								
			Borehole terminated @ 6.1 mbgs target depth achieved.	6.10								
92.2	6.5											
91.7	7											
91.2												
GRAINSIZE DISTRIBUTION												
SAMPLE GRAVEL SAND SILT CLAY												

Borehole caved at 4.9 mbgs. Groundwater measured at 0.9 mbgs following completion.

GRAINSIZE [SAMPLE] GRAVEL | SAND | SILT | CLAY  
 DISTRIBUTION





Cassidy EW  
**Client:** Construction  
**Contractor:** OGS Inc.  
**Project No.:** 17281-001 - B  
**Location:** Ottawa, ON

**Project Name:** 1386 & 1394 Greely Lane  
**Method:** Track Mounted Hollow Stem Auger  
**Elevation:** 98.78 mASL  
**UTM:** 18 T **N:** 5011812 **E:** 455184

**Log of Borehole:** BH104-23  
**Page:** 1 of 1  
**Date Completed:** March 8, 2023

SUBSURFACE PROFILE				SAMPLE																
Elevation (m)	Depth	Lithology	Description	Elevation Depth	Number	Type	% Recovery	SPT (N)	Atterberg Limits (%)			Shear Strength Cu, kPa				Well Installation	Log Notes			
									LL	PL	PI	25	50	75	20			40	60	80
									% Moisture			SPT (N)								
25	50	75	20	40	60	80														
98.8	0		TOPSOIL: 125 mm	98.65	1A	SS														
			FILL: (SM) SILTY SAND: brown, wet, very loose	0.13	1B	SS														
98.3	0.5				1C	SS	42	3												
97.8	1		(ML) sandy CLAYEY SILT: grey, cohesive, w>PL, firm	0.97	2A	SS														
					2B	SS	75	4												
97.3	1.5																			
96.8	2		-decrease in clay content, becomes CL-ML, soft		3	SS	79	4												
96.3	2.5				4	SS	100	3												
95.8	3		-100 mm silty sand seam	95.55																
95.3	3.5		(ML) sandy SILT: grey, non-cohesive, wet, compact, trace clay	3.23	5	SS	83	10												
94.8	4				6	SS	75	26												
94.3	4.5																			
93.8	5				7	SS	83	28												
93.3	5.5		-becomes dense																	
92.8	6				8	SS	79	39												
92.3	6.5		Borehole terminated @ 6.1 mbgs target depth achieved.	6.10																
91.8	7																			
91.3																				

38.1%

18.5%

31.3%

20.7%

20%

18.2%

18%

16.3%

14.3%

13.9%

13.9%

3

3

4

4

4

3

10

26

28

39

2.3m: ATT SS4:  
18.5%LL 13.1%PL

Borehole caved at 4.6 mbgs. Groundwater measured at 0.6 mbgs following completion.

GRAINSIZE DISTRIBUTION

SAMPLE	GRAVEL	SAND	SILT	CLAY
SS4	0	25	57	18
SS6	0	22	74	4

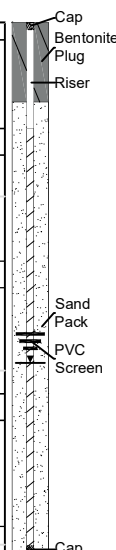


**Client:** Cassidy EW  
**Contractor:** OGS Inc.  
**Project No.:** 17281-001 - B  
**Location:** Ottawa, ON

**Project Name:** 1386 & 1394 Greely Lane  
**Method:** Track Mounted Hollow Stem Auger  
**Elevation:** 98.91 mASL  
**UTM:** 18 T N: 5011843 E: 455141

**Log of Borehole:** BH105-23  
**Page:** 1 of 1  
**Date Completed:** March 8, 2023

SUBSURFACE PROFILE				SAMPLE											
Elevation (m)	Depth	Lithology	Description	Elevation Depth	Number	Type	CSV (ppm)	OV (ppm)	% Recovery	SPT (N)/DCPT	Atterberg Limits (%) LL PL PI	Shear Strength Cu, kPa nat V. rem V.	SPT (N) / DCPT	Well Installation	Log Notes
											25 50 75	20 40 60 80	25 50 75	20 40 60 80	
											% Moisture				
											25 50 75	20 40 60 80	20 40 60 80		
98.9	0		<b>TOPSOIL:</b> 150 mm	98.76	1A	SS	ND	ND				37.1%			
			<b>FILL:</b> (SM) SILTY SAND: brown, wet, loose, some gravel, trace clay	0.15	1B	SS	ND	ND	67	7		19.3%	7		
98.4	0.5														
			-becomes grey, decrease in silt content		2A	SS	ND	ND				12.1%			
97.9	1				2B	SS	ND	ND	63	11		15.4%	11		
97.4	1.5			97.39											
			<b>(ML) sandy CLAYEY SILT:</b> grey, cohesive, w>PL, firm	1.52	3	SS	ND	ND	92	4		19.9%	4		
96.9	2														
				96.47	4A	SS	ND	ND				20%			
96.4	2.5		<b>(ML) SILT:</b> grey, non-cohesive, wet, loose, some sand, trace clay	2.44	4B	SS	ND	ND	63	5		18.1%	5		
95.9	3														
			-becomes compact												
95.4	3.5			95.25	5	SS	ND	ND	50	16		16.1%	16		
				3.66											
94.9	4		Borehole terminated @ 3.7 mbgs target depth achieved.												
94.4	4.5														
93.9	5														
93.4	5.5														
92.9	6														
92.4	6.5														
91.9	7														
91.4															



Groundwater measured at 2.0 mbgs following completion.

GRAINSIZE [SAMPLE] GRAVEL SAND SILT CLAY DISTRIBUTION



**Client:** Cassidy EW  
**Contractor:** OGS Inc.  
**Project No.:** 17281-001 - B  
**Location:** Ottawa, ON

**Project Name:** 1386 & 1394 Greely Lane  
**Method:** Track Mounted Hollow Stem Auger  
**Elevation:** 98.64 mASL  
**UTM:** 18 T N: 5011800 E: 455161

**Log of Borehole:** BH106-23  
**Page:** 1 of 1  
**Date Completed:** March 7, 2023

SUBSURFACE PROFILE				SAMPLE															
Elevation (m)	Depth	Lithology	Description	Elevation Depth	Number	Type	CSV (ppm)	OV (ppm)	% Recovery	SPT (N)/DCPT	Atterberg Limits (%)			Shear Strength Cu, kPa				Well Installation	Log Notes
											LL PL PI			nat V. rem V.					
											25	50	75	20	40	60	80		
											% Moisture			SPT (N) / DCPT					
											25	50	75	20	40	60	80		
98.6	0		<b>TOPSOIL:</b> 125 mm	98.51	1A	SS	ND	ND											
			<b>FILL:</b> (SM) SILTY SAND: brown, wet, very loose, trace gravel	0.13	1B	SS	ND	ND											
98.1	0.5				1C	SS	ND	ND	54	3									
97.6	1		<b>(ML) sandy CLAYEY SILT:</b> grey, cohesive, w>PL, soft	0.86	2A	SS	ND	ND											
					2B	SS	ND	ND	75	3									
97.1	1.5		-becomes firm																
96.6	2				3	SS	ND	ND	100	5									
96.1	2.5				4	SS	ND	ND	92	6									
95.6	3			95.59															
			<b>(ML) sandy SILT:</b> grey, non-cohesive, wet, compact, trace clay	3.05	5	SS	ND	ND	75	15									
95.1	3.5			94.98															
			Borehole terminated @ 3.7 mbgs target depth achieved.	3.66															
94.6	4																		
94.1	4.5																		
93.6	5																		
93.1	5.5																		
92.6	6																		
92.1	6.5																		
91.6	7																		
91.1																			

Cap

Bentonite Plug Riser

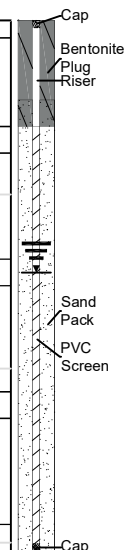
Sand Pack

PVC Screen

Cap

Groundwater measured at 1.5 mbgs following completion.

GRAINSIZE [SAMPLE] GRAVEL SAND SILT CLAY DISTRIBUTION



Groundwater  
measured at 1.5 mbgs  
following completion.

GRAINSIZE DISTRIBUTION [SAMPLE] GRAVEL SAND SILT CLAY



Cassidy EW  
**Client:** Construction  
**Contractor:** OGS Inc.  
**Project No.:** 17281-001 - B  
**Location:** Ottawa, ON

**Project Name:** 1386 & 1394 Greely Lane  
**Method:** Track Mounted Hollow Stem Auger  
**Elevation:** 98.12 mASL  
**UTM:** 18 T **N:** 5011845 **E:** 455203

**Log of Borehole:** BH107-23  
**Page:** 1 of 1  
**Date Completed:** March 8, 2023


SUBSURFACE PROFILE				SAMPLE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
Elevation (m)	Depth	Lithology	Description	Elevation Depth	Number	Type	CSV (ppm)	OV (ppm)	% Recovery	SPT (N)/DCPT	Atterberg Limits (%)			Shear Strength Cu, kPa				Well Installation	Log Notes																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
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98.1	0		<b>TOPSOIL:</b> 75 mm	98.04	1A	SS	ND	ND																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												</



Cassidy EW  
**Client:** Construction  
**Contractor:** OGS Inc.  
**Project No.:** 17281-001 - B  
**Location:** Ottawa, ON

**Project Name:** 1386 & 1394 Greely Lane  
**Method:** Track Mounted Hollow Stem Auger  
**Elevation:** 99.06 mASL  
**UTM:** 18 T **N:** 5011890 **E:** 455169

**Log of Borehole:** BH108-23  
**Page:** 1 of 1  
**Date Completed:** March 8, 2023

SUBSURFACE PROFILE				SAMPLE											
Elevation (m)	Depth	Lithology	Description	Elevation Depth	Number	Type	% Recovery	SPT (N)	Atterberg Limits (%)	Shear Strength Cu, kPa	Well Installation	Log Notes			
									LL	PL			PI	nat V <sub>r</sub>	rem V <sub>r</sub>
									25	50			75	20	40
									% Moisture	SPT (N)					
									25	50	75	20	40	60	80
99.1	0		ASPHALT: 50 mm	99.01											
	FILL: (SM) GRAVELLY SAND, brown, wet, some silt [base material]		0.05	1A	SS	100	64	14.2%			64				
98.6	0.5		FILL: (SM) SAND and SILT: grey, wet	0.61	1B	SS			31.5%						
								16.6%							
98.1	1		(ML) sandy CLAYEY SILT: grey, non-cohesive, w>PL, firm	1.07	2A	SS									
97.6	1.5			97.54	2B	SS	67	3	20.1%		3				
			Borehole terminated @ 1.5 mbgs target depth achieved.	1.52											
97.1	2											Borehole remained open. Groundwater measured at 0.8 mbgs following completion.			
96.6	2.5														
96.1	3														
95.6	3.5														
95.1	4														
94.6	4.5														
94.1	5														
93.6	5.5														
93.1	6														
92.6	6.5														
92.1	7														
91.6															
									GRAINSIZE DISTRIBUTION		SAMPLE GRAVEL SAND SILT CLAY				
									SS18		0 63 37				

Logged By: FI

Input By: BV

Peterborough, Barrie, Whitby, Kingston, Ottawa



Cassidy EW  
**Client:** Construction  
**Contractor:** OGS Inc.  
**Project No.:** 17281-001 - B  
**Location:** Ottawa, ON

**Project Name:** 1386 & 1394 Greely Lane  
**Method:** Track Mounted Hollow Stem Auger  
**Elevation:** 98.60 mASL  
**UTM:** 18 T **N:** 5011847 **E:** 455186

**Log of Borehole:** BH109-23  
**Page:** 1 of 1  
**Date Completed:** March 7, 2023

SUBSURFACE PROFILE				SAMPLE																
Elevation (m)	Depth	Lithology	Description	Elevation Depth	Number	Type	% Recovery	SPT (N)	Atterberg Limits (%)			Shear Strength Cu, kPa				Well Installation	Log Notes			
									LL	PL	PI	nat V <sub>c</sub> rem V <sub>c</sub>								
									25	50	75	20	40	60	80					
									% Moisture			SPT (N)								
									25	50	75	20	40	60	80					
98.6	0		TOPSOIL: 915 mm		1	SS	25	2	44.3%			2				Borehole remained open. Groundwater measured at 1.1 mbgs following completion.				
98.1	0.5																			
97.6	1		FILL: (SM) SILTY SAND: grey, wet	2A	SS				28.9%											
97.1	1.5	(ML) sandy CLAYEY SILT: grey, non-cohesive, w>PL, soft	2B	SS	83	3		20.4%				3								
96.6	2	Borehole terminated @ 1.5 mbgs target depth achieved.																		
96.1	2.5																			
95.6	3																			
95.1	3.5																			
94.6	4																			
94.1	4.5																			
93.6	5																			
93.1	5.5																			
92.6	6																			
92.1	6.5																			
91.6	7																			
91.1																				
GRAINSIZE DISTRIBUTION																SAMPLE	GRAVEL	SAND	SILT	CLAY

Borehole remained open. Groundwater measured at 1.1 mbgs following completion.



---

## **Appendix C**

### **Grain Size Analysis Results**

---



Grain Size Distribution Chart

Project Number:

17281-002

Client:

Cassidy E.W. Construction Consultant Ltd.

Project Name:

Hydrogeological Assessment - 1386 & 1394 Greely Lane, Ottawa

Sample Date:

March 7-8, 2023

Sampled By:

Farhan Imtiaz - Cambium Inc.

Location:

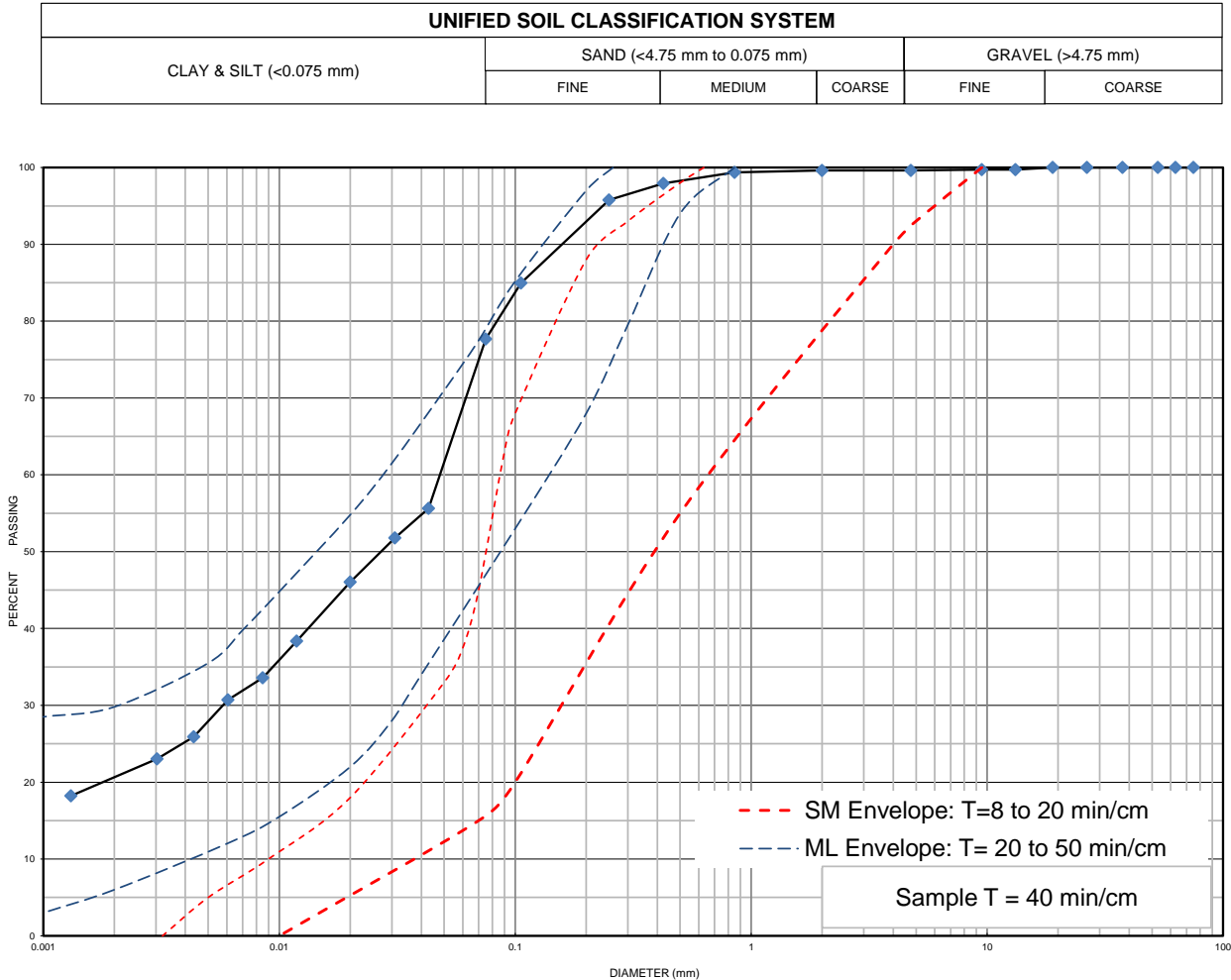
BH 101-23 SS 3

Depth:

1.5 m to 2.1 m

Lab Sample No:

S-23-0475



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 101-23	SS 3	1.5 m to 2.1 m	0	22	57	21	18.8
Description		Classification	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
Sandy Clayey Silt		ML	0.0480	0.0058	-	-	-

Additional information availabe upon request

Issued By:

(Senior Project Manager)

Date Issued:

March 20, 2024





Grain Size Distribution Chart

Project Number:

17281-002

Client:

Cassidy E.W. Construction Consultant Ltd.

Project Name:

Hydrogeological Assessment - 1386 & 1394 Greely Lane, Ottawa

Sample Date:

March 7-8, 2023

Sampled By:

Farhan Imtiaz - Cambium Inc.

Location:

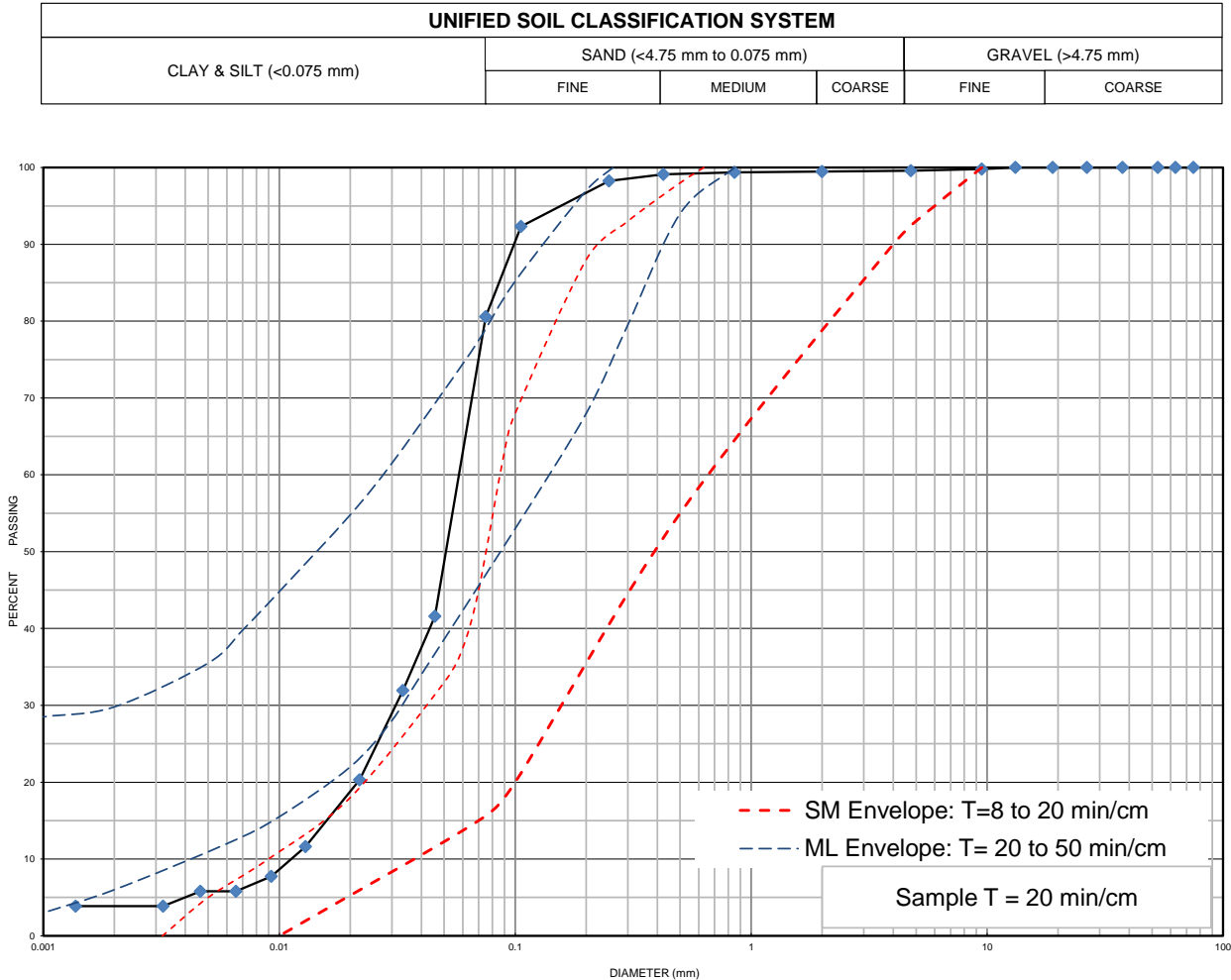
BH 101-23 SS 6

Depth:

3.8 m to 4.4 m

Lab Sample No:

S-23-0476



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 101-23	SS 6	3.8 m to 4.4 m	0	19	77	4	13.3

Description	Classification	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
Silt some Sand trace Clay	ML	0.057	0.032	0.012	4.75	1.50

Additional information availabe upon request

Issued By:

(Senior Project Manager)

Date Issued:

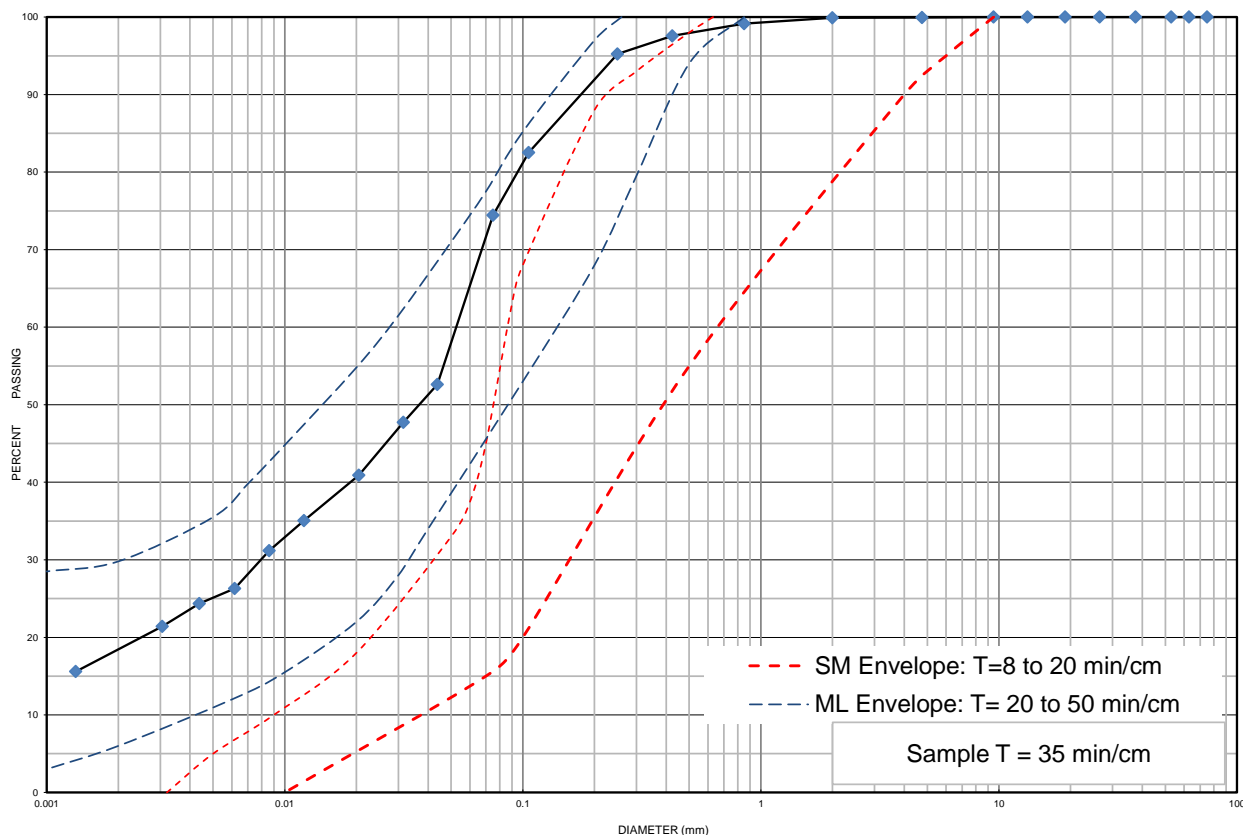
March 20, 2024



## Grain Size Distribution Chart

**Project Number:** 17281-002      **Client:** Cassidy E.W. Construction Consultant Ltd.  
**Project Name:** Hydrogeological Assessment - 1386 & 1394 Greely Lane, Ottawa  
**Sample Date:** March 7-8, 2023      **Sampled By:** Farhan Imtiaz - Cambium Inc.  
**Location:** BH 104-23 SS 4      **Depth:** 2.3 m to 2.9 m      **Lab Sample No:** S-23-0477

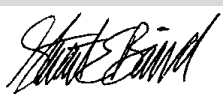
UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 104-23	SS 4	2.3 m to 2.9 m	0	25	57	18	18.0
Description		Classification	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
Sandy Silt some Clay		ML	0.053	0.008	-	-	-

Additional information available upon request

Issued By:   
 (Senior Project Manager)

Date Issued: March 20, 2024

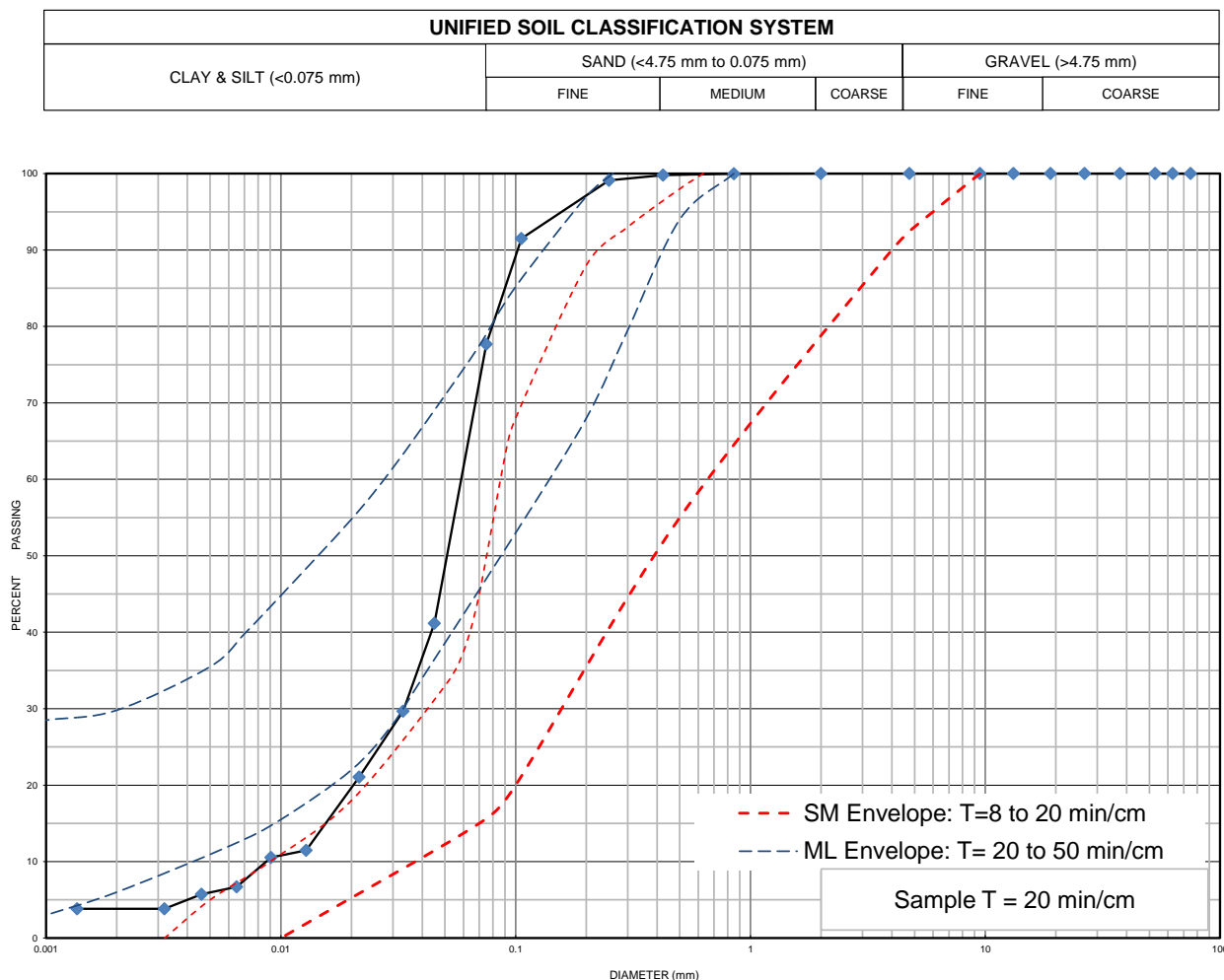
Cambium Inc. (Laboratory)  
 866.217.7900 | cambium-inc.com  
 194 Sophia St. | Peterborough | ON | K9H 1E5

Form: L6V.2 - Grad.Hydo



## Grain Size Distribution Chart

**Project Number:** 17281-002      **Client:** Cassidy E.W. Construction Consultant Ltd.  
**Project Name:** Hydrogeological Assessment - 1386 & 1394 Greely Lane, Ottawa  
**Sample Date:** March 7-8, 2023      **Sampled By:** Farhan Imtiaz - Cambium Inc.  
**Location:** BH 104-23 SS 6      **Depth:** 3.8 m to 4.4 m      **Lab Sample No:** S-23-0478



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 104-23	SS 6	3.8 m to 4.4 m	0	22	74	4	14.3
Description	Classification	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>	
Sandy Silt trace Clay	ML	0.0590	0.0340	0.0087	6.78	2.25	

Additional information available upon request

Issued By:   
 (Senior Project Manager)

Date Issued: March 20, 2024



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## **Appendix D**

### **Well Inventory Survey Results**

# Water Well Records Summary Report

Produced by Cambium Inc. using MOECP Water Well Information System (WWIS)

All units in meters unless otherwise specified



<b>Well ID:</b> 1507224	<b>Easting:</b> 455211	<b>UTM Zone</b> 18
<b>Construction Date:</b> 1965-09-22	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 100 m - 300 m
<b>Well Depth:</b> 20.7	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 23
<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 23
<b>Water First Found:</b> 16.8	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 0 : 30
<b>Static Level:</b> 6		

Layer:	Driller's Description:	Top:	Bottom:
1	MEDIUM SAND	0	4.57
2	LIMESTONE	4.57	20.7

<b>Well ID:</b> 1507232	<b>Easting:</b> 454801	<b>UTM Zone</b> 18
<b>Construction Date:</b> 1964-07-06	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 100 m - 300 m
<b>Well Depth:</b> 20.4	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 32
<b>Well Diameter (cm):</b> 5.08	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 23
<b>Water First Found:</b> 20.4	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 2 : 0
<b>Static Level:</b> 2		

Layer:	Driller's Description:	Top:	Bottom:
1	MEDIUM SAND	0	5.49
2	BOULDERS	5.49	14.0
3	LIMESTONE	14.0	20.4

<b>Well ID:</b> 1507234	<b>Easting:</b> 454851	<b>UTM Zone</b> 18
<b>Construction Date:</b> 1964-07-06	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 100 m - 300 m
<b>Well Depth:</b> 20.7	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 45
<b>Well Diameter (cm):</b> 5.08	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 23
<b>Water First Found:</b> 20.7	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 2 : 0
<b>Static Level:</b> 1		

Layer:	Driller's Description:	Top:	Bottom:
1	MEDIUM SAND	0	5.49
2	BOULDERS	5.49	14.3
3	LIMESTONE	14.3	20.7

<b>Well ID:</b> 1507313	<b>Easting:</b> 455541	<b>UTM Zone</b> 18
<b>Construction Date:</b> 1966-12-06	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 100 m - 300 m
<b>Well Depth:</b> 18.3	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 27
<b>Well Diameter (cm):</b> 12.7	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 23
<b>Water First Found:</b> 15.2	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 0
<b>Static Level:</b> 6		

Layer:	Driller's Description:	Top:	Bottom:
1	GRAVEL	0	5.49
2	LIMESTONE	5.49	18.3

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<b>Well ID:</b> 1509840	<b>Easting:</b> 455391	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1968-08-21	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 100 m - 300 m		
<b>Well Depth:</b> 12.8	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 45		
<b>Well Diameter (cm):</b> 10.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 23		
<b>Water First Found:</b> 12.8	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 0 : 30		
<b>Static Level:</b> 6				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	TOPSOIL	0	0.91	
2	HARDPAN	0.91	3.96	
3	LIMESTONE	3.96	12.8	

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<b>Well ID:</b> 1510585	<b>Easting:</b> 455331	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1970-05-28	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 100 m - 300 m		
<b>Well Depth:</b> 32.9	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 45		
<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 36		
<b>Water First Found:</b> 32	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 0		
<b>Static Level:</b> 5				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	TOPSOIL	0	1.52	
2	GRAVEL	1.52	5.18	
3	LIMESTONE	5.18	32.9	

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<b>Well ID:</b> 1512221	<b>Easting:</b> 455604	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1973-01-12	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 300 m - 1 km		
<b>Well Depth:</b> 14.6	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 91		
<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 23		
<b>Water First Found:</b> 14.0	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 0		
<b>Static Level:</b> 4				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	SAND	0	2.74	
2	SAND	2.74	12.2	
3	LIMESTONE	12.2	14.6	

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<b>Well ID:</b> 1513408	<b>Easting:</b> 455523	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1973-09-10	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b> 10.7	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 36		
<b>Well Diameter (cm):</b> 12.7	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 23		
<b>Water First Found:</b> 9.75	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 57		
<b>Static Level:</b> 6				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	HARDPAN	0	7.62	
2	LIMESTONE	7.62	10.7	



<b>Well ID:</b> 1513421	<b>Easting:</b> 455556	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1973-09-26	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 300 m - 1 km		
<b>Well Depth:</b> 13.1	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 68		
<b>Well Diameter (cm):</b> 12.7	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 45		
<b>Water First Found:</b> 13.1	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 10		
<b>Static Level:</b> 5				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	HARDPAN	0	13.1	

<b>Well ID:</b> 1515384	<b>Easting:</b> 455451	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1976-06-19	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b> 38.1	<b>Water Kind</b> Not stated	<b>Pump Rate (LPM):</b> 18		
<b>Well Diameter (cm):</b>	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 18		
<b>Water First Found:</b> 12.8	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 2 : 0		
<b>Static Level:</b> 6				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	SAND	0	5.79	
1	SAND	0	5.79	
1	SAND	0	5.79	
1	SAND	0	5.79	
2	LIMESTONE	5.79	38.1	
2	LIMESTONE	5.79	38.1	
2	LIMESTONE	5.79	38.1	
2	LIMESTONE	5.79	38.1	

<b>Well ID:</b> 1515531	<b>Easting:</b> 455551	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1976-08-13	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b> 16.8	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 91		
<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 68		
<b>Water First Found:</b> 16.1	<b>Primary Water Use:</b> Municipal	<b>Pumping Duration (h:m):</b> 1 : 30		
<b>Static Level:</b> 6				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	GRAVEL	0	8.23	
2	HARDPAN	8.23	15.2	
3	SANDSTONE	15.2	15.5	
4	UNKNOWN TYPE	15.5	16.8	

<b>Well ID:</b> 1517024	<b>Easting:</b> 455530	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1979-07-09	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b> 15.5	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 91		
<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 55		
<b>Water First Found:</b> 14.6	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 30		
<b>Static Level:</b> 6				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	HARDPAN	0	4.88	
2	SAND	4.88	13.7	
3	GRAVEL	13.7	14.3	
4	LIMESTONE	14.3	15.5	

<b>Well ID:</b> 1517148	<b>Easting:</b> 455430	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1979-10-05	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b> 16.8	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 91		
<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 45		
<b>Water First Found:</b> 13.7	<b>Primary Water Use:</b> Livestock	<b>Pumping Duration (h:m):</b> 1 : 30		
<b>Static Level:</b> 2				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	HARDPAN	0	11.6	
2	SAND	11.6	13.7	
3	LIMESTONE	13.7	16.8	

<b>Well ID:</b> 1517152	<b>Easting:</b> 455530	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1979-10-05	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b> 15.5	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 114		
<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 68		
<b>Water First Found:</b> 14.9	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 30		
<b>Static Level:</b> 5				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	SAND	0	10.7	
2	HARDPAN	10.7	12.2	
3	LIMESTONE	12.2	15.5	

<b>Well ID:</b> 1517154	<b>Easting:</b> 455530	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1979-10-05	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b> 16.2	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 82		
<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 45		
<b>Water First Found:</b> 14.9	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 30		
<b>Static Level:</b> 6				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	SAND	0	13.1	
2	LIMESTONE	13.1	16.1	

<b>Well ID:</b> 1517156	<b>Easting:</b> 455530	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1979-10-05	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b> 15.2	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 82		
<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 36		
<b>Water First Found:</b> 14.3	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 2 : 20		
<b>Static Level:</b> 5				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	SAND	0	12.5	
2	LIMESTONE	12.5	15.2	

<b>Well ID:</b> 1517638	<b>Easting:</b> 455630	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1981-09-08	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b> 12.5	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 136		
<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 23		
<b>Water First Found:</b> 12.2	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 0		
<b>Static Level:</b> 4				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	

1	CLAY	0	9.45
2	SHALE	9.45	12.5

<b>Well ID:</b> 1518000	<b>Easting:</b> 455630	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1982-11-29	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b> 13.1	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 91		
<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 45		
<b>Water First Found:</b> 12.8	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 0		
<b>Static Level:</b> 5				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	TOPSOIL	0	1.83	
2	QUICKSAND	1.83	12.2	
3	SAND	12.2	12.5	
4	LIMESTONE	12.5	13.1	

<b>Well ID:</b> 1518291	<b>Easting:</b> 455630	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1983-06-20	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b> 14.6	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 45		
<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 23		
<b>Water First Found:</b> 14.3	<b>Primary Water Use:</b> Public	<b>Pumping Duration (h:m):</b> 1 : 0		
<b>Static Level:</b> 4				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	SILT	0	3.66	
2	TILL	3.66	11.9	
3	STONES	11.9	14.6	

<b>Well ID:</b> 1518419	<b>Easting:</b> 455430	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1983-08-24	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b> 19.8	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 136		
<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 23		
<b>Water First Found:</b> 19.2	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 0		
<b>Static Level:</b> 2				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	SAND	0	3.35	
2	SAND	3.35	9.14	
3	HARDPAN	9.14	17.1	
4	LIMESTONE	17.1	19.8	

<b>Well ID:</b> 1518420	<b>Easting:</b> 455430	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 1983-08-24	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b> 19.8	<b>Water Kind</b> FRESH	<b>Pump Rate (LPM):</b> 68		
<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 23		
<b>Water First Found:</b> 19.2	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 0		
<b>Static Level:</b> 2				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	SAND	0	1.22	
2	SAND	1.22	6.1	
3	HARDPAN	6.1	15.2	
4	SAND	15.2	16.8	

<b>Well ID:</b> 1518698	<b>Easting:</b> 455530	<b>UTM Zone</b> 18			
<b>Construction Date:</b> 1983-11-24	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m			
	<b>Well Depth:</b> 22.9	<b>Water Kind</b>	FRESH	<b>Pump Rate (LPM):</b>	45
	<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b>	Water Supply	<b>Recommended Pump Rate:</b>	23
	<b>Water First Found:</b> 20.4	<b>Primary Water Use:</b>	Domestic	<b>Pumping Duration (h:m):</b>	1 : 0
	<b>Static Level:</b> 4				
	<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
	1	SAND	0	2.44	
	2	SAND	2.44	11.6	
	3	SAND	11.6	14.6	
	4	HARDPAN	14.6	18.3	
	5	LIMESTONE	18.3	22.9	

<b>Well ID:</b> 1520434	<b>Easting:</b> 455527	<b>UTM Zone</b> 18			
<b>Construction Date:</b> 1986-02-20	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 100 m - 300 m			
	<b>Well Depth:</b> 19.5	<b>Water Kind</b>	FRESH	<b>Pump Rate (LPM):</b>	68
	<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b>	Water Supply	<b>Recommended Pump Rate:</b>	68
	<b>Water First Found:</b> 15.9	<b>Primary Water Use:</b>	Domestic	<b>Pumping Duration (h:m):</b>	0 : 30
	<b>Static Level:</b> 5				
	<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
	1	GRAVEL	0	1.83	
	1	GRAVEL	0	1.83	
	2	CLAY	1.83	7.32	
	2	CLAY	1.83	7.32	
	3	CLAY	7.32	13.4	
	3	CLAY	7.32	13.4	
	4	LIMESTONE	13.4	19.5	
	4	LIMESTONE	13.4	19.5	

<b>Well ID:</b> 1522346	<b>Easting:</b> 455172	<b>UTM Zone</b> 18			
<b>Construction Date:</b> 1988-06-21	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 100 m - 300 m			
	<b>Well Depth:</b> 38.4	<b>Water Kind</b>	FRESH	<b>Pump Rate (LPM):</b>	91
	<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b>	Water Supply	<b>Recommended Pump Rate:</b>	91
	<b>Water First Found:</b> 29	<b>Primary Water Use:</b>	Industrial	<b>Pumping Duration (h:m):</b>	1 : 30
	<b>Static Level:</b> 3				
	<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
	1	SAND	0	2.44	
	2	SAND	2.44	17.1	
	3	LIMESTONE	17.1	38.4	

<b>Well ID:</b> 1522347	<b>Easting:</b> 455239	<b>UTM Zone</b> 18			
<b>Construction Date:</b> 1988-06-21	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 100 m - 300 m			
	<b>Well Depth:</b> 18.9	<b>Water Kind</b>	FRESH	<b>Pump Rate (LPM):</b>	182
	<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b>	Recharge Well	<b>Recommended Pump Rate:</b>	2E+
	<b>Water First Found:</b> 18.3	<b>Primary Water Use:</b>	Cooling And A	<b>Pumping Duration (h:m):</b>	0 : 45
	<b>Static Level:</b> 3				
	<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	

	1	SAND	0	2.74						
	2	SAND	2.74	17.4						
	3	LIMESTONE	17.4	18.9						
Well ID: 1522348	Easting: 455254		UTM Zone 18							
Construction Date: 1988-06-21	Northing: 5E+06		Positional Accuracy: margin of error : 100 m - 300 m							
	Well Depth:	18.9	Water Kind	FRESH	Pump Rate (LPM):	182				
	Well Diameter (cm):	15.2	Final Status	Recharge Well	Recommended Pump Rate:	2E+				
	Water First Found:	18.3	Primary Water Use:	Cooling And A	Pumping Duration (h:m):	1 : 0				
	Static Level:	3								
	Layer:	Driller's Description:	Top:	Bottom:						
	1	SAND	0	2.74						
	2	SAND	2.74	17.4						
	3	LIMESTONE	17.4	18.9						
Well ID: 1522551	Easting: 455474		UTM Zone 18							
Construction Date: 1988-08-18	Northing: 5E+06		Positional Accuracy: margin of error : 100 m - 300 m							
	Well Depth:	19.8	Water Kind	FRESH	Pump Rate (LPM):	91				
	Well Diameter (cm):	15.2	Final Status	Recharge Well	Recommended Pump Rate:	45				
	Water First Found:	15.9	Primary Water Use:	Cooling And A	Pumping Duration (h:m):	0 : 45				
	Static Level:	3								
	Layer:	Driller's Description:	Top:	Bottom:						
	1	SAND	0	2.74						
	1	SAND	0	2.74						
	2	TILL	2.74	10.7						
	2	TILL	2.74	10.7						
	3	GRAVEL	10.7	14.6						
	3	GRAVEL	10.7	14.6						
	4	LIMESTONE	14.6	19.8						
	4	LIMESTONE	14.6	19.8						
Well ID: 1522552	Easting: 455484		UTM Zone 18							
Construction Date: 1988-08-18	Northing: 5E+06		Positional Accuracy: margin of error : 100 m - 300 m							
	Well Depth:	19.8	Water Kind	FRESH	Pump Rate (LPM):	91				
	Well Diameter (cm):	15.2	Final Status	Water Supply	Recommended Pump Rate:	45				
	Water First Found:	17.1	Primary Water Use:	Domestic	Pumping Duration (h:m):	0 : 45				
	Static Level:	2								
	Layer:	Driller's Description:	Top:	Bottom:						
	1	SAND	0	2.44						
	1	SAND	0	2.44						
	2	TILL	2.44	9.75						
	2	TILL	2.44	9.75						
	3	GRAVEL	9.75	14.6						
	3	GRAVEL	9.75	14.6						
	4	LIMESTONE	14.6	19.8						
	4	LIMESTONE	14.6	19.8						

**Well ID:** 1529728  
**Construction Date:** 1997-12-22

**Easting:** 455273  
**Northing:** 5E+06

**UTM Zone** 18  
**Positional Accuracy:** margin of error : 100 m - 300 m

**Well Depth:** 23.2  
**Well Diameter (cm):** 15.2  
**Water First Found:** 17.1  
**Static Level:** 2

**Water Kind** Not stated  
**Final Status** Water Supply  
**Primary Water Use:** Domestic

**Pump Rate (LPM):** 227  
**Recommended Pump Rate:** 23  
**Pumping Duration (h:m):** 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	1.22
2	CLAY	1.22	2.74
3	CLAY	2.74	10.4
4	SAND	10.4	15.5
5	LIMESTONE	15.5	18.9
6	LIMESTONE	18.9	23.2

**Well ID:** 1532070  
**Construction Date:** 2001-07-17

**Easting:** 455043  
**Northing:** 5E+06

**UTM Zone** 18  
**Positional Accuracy:** margin of error : 10 - 30 m

**Well Depth:** 18.3  
**Well Diameter (cm):** 15.2  
**Water First Found:** 16.8  
**Static Level:** 4

**Water Kind** Not stated  
**Final Status** Water Supply  
**Primary Water Use:** Commerical

**Pump Rate (LPM):** 45  
**Recommended Pump Rate:** 45  
**Pumping Duration (h:m):** 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	1.52
1	SAND	0	1.52
2	CLAY	1.52	11.9
2	CLAY	1.52	11.9
3	COARSE GRAVEL	11.9	18.3
3	COARSE GRAVEL	11.9	18.3

**Well ID:** 1533428  
**Construction Date:** 2002-12-17

**Easting:** 455042  
**Northing:** 5E+06

**UTM Zone** 18  
**Positional Accuracy:** margin of error : 100 m - 300 m

**Well Depth:** 68  
**Well Diameter (cm):** 15.2  
**Water First Found:** 65.8  
**Static Level:** 11

**Water Kind** Not stated  
**Final Status** Water Supply  
**Primary Water Use:** Domestic

**Pump Rate (LPM):** 45  
**Recommended Pump Rate:** 23  
**Pumping Duration (h:m):** 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	1.22
1	TOPSOIL	0	1.22
2	SAND	1.22	3.66
2	SAND	1.22	3.66
3	CLAY	3.66	9.14
3	CLAY	3.66	9.14
4	SAND	9.14	17.7
4	SAND	9.14	17.7
5	LIMESTONE	17.7	48.8
5	LIMESTONE	17.7	48.8
6	SANDSTONE	48.8	68

<b>Well ID:</b> 1533469	<b>Easting:</b> 455311	<b>UTM Zone</b> 18
<b>Construction Date:</b> 2002-12-23	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 100 m - 300 m
<b>Well Depth:</b> 102	<b>Water Kind</b> Not stated	<b>Pump Rate (LPM):</b> 41
<b>Well Diameter (cm):</b> 20.3	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 41
<b>Water First Found:</b> 101	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 0
<b>Static Level:</b> 15		
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top: Bottom:</b>
1	SAND	0 18.9
1	SAND	0 18.9
2	LIMESTONE	18.9 57.3
2	LIMESTONE	18.9 57.3
3	LIMESTONE	57.3 69.2
3	LIMESTONE	57.3 69.2
4	SANDSTONE	69.2 102
4	SANDSTONE	69.2 102

<b>Well ID:</b> 1534585	<b>Easting:</b> 455214	<b>UTM Zone</b> 18
<b>Construction Date:</b> 2004-03-31	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 100 m - 300 m
<b>Well Depth:</b> 41.8	<b>Water Kind</b> Not stated	<b>Pump Rate (LPM):</b> 84
<b>Well Diameter (cm):</b>	<b>Final Status</b> Test Hole	<b>Recommended Pump Rate:</b> 36
<b>Water First Found:</b> 41.1	<b>Primary Water Use:</b> Not Used	<b>Pumping Duration (h:m):</b> 6 : 0
<b>Static Level:</b> 3		
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top: Bottom:</b>
1	CLAY	0 10.1
1	CLAY	0 10.1
2	SANDSTONE	10.1 15.2
2	SANDSTONE	10.1 15.2
3	LIMESTONE	15.2 41.8
3	LIMESTONE	15.2 41.8

<b>Well ID:</b> 1536286	<b>Easting:</b> 454797	<b>UTM Zone</b> 18
<b>Construction Date:</b> 2006-04-12	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 10 - 30 m
<b>Well Depth:</b> 45.7	<b>Water Kind</b>	<b>Pump Rate (LPM):</b> 91
<b>Well Diameter (cm):</b>	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 91
<b>Water First Found:</b> 43.2	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 :
<b>Static Level:</b> 10		
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top: Bottom:</b>
1	SAND	0 12.2
1	SAND	0 12.2
2	LIMESTONE	12.2 45.7
2	LIMESTONE	12.2 45.7



<b>Well ID:</b> 1536661	<b>Easting:</b> 454807	<b>UTM Zone</b> 18	
<b>Construction Date:</b> 2006-09-07	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 10 - 30 m	
<b>Well Depth:</b> 25	<b>Water Kind</b>	<b>Pump Rate (LPM):</b> 91	
<b>Well Diameter (cm):</b>	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 91	
<b>Water First Found:</b> 16.8	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 0	
<b>Static Level:</b> 3			
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>
1	SAND	0	5.18
1	SAND	0	5.18
1	SAND	0	5.18
1	SAND	0	5.18
2	CLAY	5.18	11
2	CLAY	5.18	11
2	CLAY	5.18	11
2	CLAY	5.18	11
3	LIMESTONE	11	25
3	LIMESTONE	11	25
3	LIMESTONE	11	25
3	LIMESTONE	11	25

<b>Well ID:</b> 1536715	<b>Easting:</b> 454725	<b>UTM Zone</b> 18			
<b>Construction Date:</b> 2006-10-11	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 10 - 30 m			
	<b>Well Depth:</b> 56.7	<b>Water Kind</b>		<b>Pump Rate (LPM):</b> 91	
	<b>Well Diameter (cm):</b>	<b>Final Status</b>	Water Supply	<b>Recommended Pump Rate:</b> 91	
	<b>Water First Found:</b> 54.3	<b>Primary Water Use:</b>	Domestic	<b>Pumping Duration (h:m):</b> 1 : 0	
	<b>Static Level:</b> 10				
	<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
	1	CLAY	0	2.74	
	1	CLAY	0	2.74	
	2	SAND	2.74	13.1	
	2	SAND	2.74	13.1	
	3	LIMESTONE	13.1	46.0	
	3	LIMESTONE	13.1	46.0	
	4	SANDSTONE	46.0	56.7	
	4	SANDSTONE	46.0	56.7	

<b>Well ID:</b> 7040754	<b>Easting:</b> 454738	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 2007-02-12	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 10 - 30 m		
	<b>Well Depth:</b> 48.8	<b>Water Kind</b>		<b>Pump Rate (LPM):</b> 91
	<b>Well Diameter (cm):</b>	<b>Final Status</b> Water Supply		<b>Recommended Pump Rate:</b> 91
	<b>Water First Found:</b> 19.8	<b>Primary Water Use:</b> Domestic		<b>Pumping Duration (h:m):</b> 1 : 0
	<b>Static Level:</b> 10			
	<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>
	1	SAND	0	12.5
	1	SAND	0	12.5
	1	SAND	0	12.5

1	SAND	0	12.5
2	LIMESTONE	12.5	45.7
2	LIMESTONE	12.5	45.7
2	LIMESTONE	12.5	45.7
2	LIMESTONE	12.5	45.7
3	SANDSTONE	45.7	48.8
3	SANDSTONE	45.7	48.8
3	SANDSTONE	45.7	48.8
3	SANDSTONE	45.7	48.8

**Well ID:** 7048698**Construction Date:** 2007-08-29**Easting:** 454767**Northing:** 5E+06**UTM Zone** 18**Positional Accuracy:** margin of error : 10 - 30 m**Well Depth:** 48.8**Well Diameter (cm):****Water First Found:** 45.7**Static Level:** 9**Water Kind****Final Status****Primary Water Use:** Domestic

Water Supply

**Pump Rate (LPM):** 91**Recommended Pump Rate:** 91**Pumping Duration (h:m):** 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	12.2
1	SAND	0	12.2
1	SAND	0	12.2
1	SAND	0	12.2
2	LIMESTONE	12.2	43
2	LIMESTONE	12.2	43
2	LIMESTONE	12.2	43
2	LIMESTONE	12.2	43
3	SANDSTONE	43	48.8
3	SANDSTONE	43	48.8
3	SANDSTONE	43	48.8
3	SANDSTONE	43	48.8

**Well ID:** 7104239**Construction Date:** 2008-04-28**Easting:** 455341**Northing:** 5E+06**UTM Zone** 18**Positional Accuracy:** margin of error : 10 - 30 m**Well Depth:** 18.9**Well Diameter (cm):****Water First Found:****Static Level:****Water Kind****Final Status****Primary Water Use:**

Abandoned-Ot

**Pump Rate (LPM):****Recommended Pump Rate:****Pumping Duration (h:m):**

Layer:	Driller's Description:	Top:	Bottom:
1		0	18.9

**Well ID:** 7120715**Construction Date:** 2009-03-19**Easting:** 455600**Northing:** 5E+06**UTM Zone** 18**Positional Accuracy:** margin of error : 30 m - 100 m**Well Depth:** 50**Well Diameter (cm):****Water First Found:****Static Level:** 4**Water Kind****Final Status****Primary Water Use:****Pump Rate (LPM):** 82**Recommended Pump Rate:** 46**Pumping Duration (h:m):** 1 :

Layer:	Driller's Description:	Top:	Bottom:
1		0	50

<b>Well ID:</b> 7130148		<b>Easting:</b> 455051		<b>UTM Zone</b> 18	
<b>Construction Date:</b> 2009-09-22		<b>Northing:</b> 5E+06		<b>Positional Accuracy:</b> margin of error : 10 - 30 m	
<b>Well Depth:</b> 4.88		<b>Water Kind</b>		<b>Pump Rate (LPM):</b>	
<b>Well Diameter (cm):</b> 5.2		<b>Final Status</b>		Monitoring an	<b>Recommended Pump Rate:</b>
<b>Water First Found:</b>		<b>Primary Water Use:</b>		Monitoring an	<b>Pumping Duration (h:m):</b>
<b>Static Level:</b>					
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>		
1	GRAVEL	0	0.61		
1	GRAVEL	0	0.61		
1	GRAVEL	0	0.61		
1	GRAVEL	0	0.61		
2	SAND	0.61	1.5		
2	SAND	0.61	1.5		
2	SAND	0.61	1.5		
2	SAND	0.61	1.5		
3	CLAY	1.5	2.74		
3	CLAY	1.5	2.74		
3	CLAY	1.5	2.74		
3	CLAY	1.5	2.74		
4	SILT	2.74	4.88		
4	SILT	2.74	4.88		
4	SILT	2.74	4.88		
4	SILT	2.74	4.88		

<b>Well ID:</b> 7156846	<b>Easting:</b> 454720	<b>UTM Zone</b> 18			
<b>Construction Date:</b> 2010-12-29	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 10 - 30 m			
<b>Well Depth:</b> 36.6		<b>Water Kind</b> Untested		<b>Pump Rate (LPM):</b> 91	
<b>Well Diameter (cm):</b> 15.2		<b>Final Status</b> Water Supply		<b>Recommended Pump Rate:</b> 91	
<b>Water First Found:</b> 19.8		<b>Primary Water Use:</b> Domestic		<b>Pumping Duration (h:m):</b> 1 :	
<b>Static Level:</b> 1					
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>		
1	SAND	0	8.53		
1	SAND	0	8.53		
1	SAND	0	8.53		
2	SAND	8.53	16.5		
2	SAND	8.53	16.5		
2	SAND	8.53	16.5		
3	LIMESTONE	16.5	36.6		
3	LIMESTONE	16.5	36.6		
3	LIMESTONE	16.5	36.6		

<b>Well ID:</b> 7157870	<b>Easting:</b> 455093	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 2011-01-17	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 10 - 30 m		
<b>Well Depth:</b> 54.9	<b>Water Kind</b> Untested	<b>Pump Rate (LPM):</b> 91		
<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 91		
<b>Water First Found:</b> 53.0	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 0		
<b>Static Level:</b> 3				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	SAND	0	17.1	
1	SAND	0	17.1	
1	SAND	0	17.1	
1	SAND	0	17.1	
1	SAND	0	17.1	
1	SAND	0	17.1	
1	SAND	0	17.1	
1	SAND	0	17.1	
2	LIMESTONE	17.1	54.9	
2	LIMESTONE	17.1	54.9	
2	LIMESTONE	17.1	54.9	
2	LIMESTONE	17.1	54.9	
2	LIMESTONE	17.1	54.9	
2	LIMESTONE	17.1	54.9	
2	LIMESTONE	17.1	54.9	
2	LIMESTONE	17.1	54.9	

<b>Well ID:</b> 7159015	<b>Easting:</b> 455214	<b>UTM Zone</b> 18	
<b>Construction Date:</b> 2011-02-10	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 10 - 30 m	
<b>Well Depth:</b>	<b>Water Kind</b>	<b>Pump Rate (LPM):</b>	
<b>Well Diameter (cm):</b>	<b>Final Status</b> Abandoned-Ot	<b>Recommended Pump Rate:</b>	
<b>Water First Found:</b>	<b>Primary Water Use:</b>	<b>Pumping Duration (h:m):</b>	
<b>Static Level:</b>			
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>

<b>Well ID:</b> 7183294	<b>Easting:</b> 455487	<b>UTM Zone</b> 18			
<b>Construction Date:</b> 2012-06-29	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 100 m - 300 m			
<b>Well Depth:</b> 32		<b>Water Kind</b>	Untested	<b>Pump Rate (LPM):</b>	91
<b>Well Diameter (cm):</b> 15.2		<b>Final Status</b>	Water Supply	<b>Recommended Pump Rate:</b>	91
<b>Water First Found:</b> 30.2		<b>Primary Water Use:</b>	Domestic	<b>Pumping Duration (h:m):</b>	1 :
<b>Static Level:</b> 4					
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>		
1	CLAY	0	1.83		
2	SAND	1.83	12.8		
3	LIMESTONE	12.8	30.2		
4	LIMESTONE	30.2	32		

**Well ID:** 7183299**Easting:** 454693**UTM Zone** 18**Construction Date:** 2012-06-29**Northing:** 5E+06**Positional Accuracy:** margin of error : 30 m - 100 m**Well Depth:** 61.3**Water Kind**

Untested

**Pump Rate (LPM):** 55**Well Diameter (cm):** 15.1**Final Status**

Water Supply

**Recommended Pump Rate:** 55**Water First Found:** 56.4**Primary Water Use:** Domestic**Pumping Duration (h:m):** 1 :**Static Level:** 5

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	1.52
1	SAND	0	1.52
1	SAND	0	1.52
1	SAND	0	1.52
2	CLAY	1.52	6.40
2	CLAY	1.52	6.40
2	CLAY	1.52	6.40
2	CLAY	1.52	6.40
3	SAND	6.40	18.3
3	SAND	6.40	18.3
3	SAND	6.40	18.3
3	SAND	6.40	18.3
4	LIMESTONE	18.3	34.8
4	LIMESTONE	18.3	34.8
4	LIMESTONE	18.3	34.8
4	LIMESTONE	18.3	34.8
5	SANDSTONE	34.8	54.6
5	SANDSTONE	34.8	54.6
5	SANDSTONE	34.8	54.6
5	SANDSTONE	34.8	54.6
6	SANDSTONE	54.6	56.4
6	SANDSTONE	54.6	56.4
6	SANDSTONE	54.6	56.4
6	SANDSTONE	54.6	56.4
7	SANDSTONE	56.4	61.3
7	SANDSTONE	56.4	61.3
7	SANDSTONE	56.4	61.3
7	SANDSTONE	56.4	61.3

**Well ID:** 7187406**Easting:** 455459**UTM Zone** 18**Construction Date:** 2012-09-20**Northing:** 5E+06**Positional Accuracy:** margin of error : 30 m - 100 m**Well Depth:** 29.9**Water Kind**

Untested

**Pump Rate (LPM):** 82**Well Diameter (cm):** 15.9**Final Status**

Water Supply

**Recommended Pump Rate:** 46**Water First Found:** 18.3**Primary Water Use:** Domestic**Pumping Duration (h:m):** 1 :**Static Level:** 4

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	2.74

1	TOPSOIL	0	2.74
2	CLAY	2.74	4.87
2	CLAY	2.74	4.87
3	SAND	4.87	9.14
3	SAND	4.87	9.14
4	GRAVEL	9.14	11.3
4	GRAVEL	9.14	11.3
5	LIMESTONE	11.3	29.9
5	LIMESTONE	11.3	29.9

**Well ID:** 7187693**Easting:** 455312**UTM Zone** 18**Construction Date:** 2012-09-22**Northing:** 5E+06**Positional Accuracy:** margin of error : 30 m - 100 m**Well Depth:** 27.4**Water Kind**

Untested

**Pump Rate (LPM):** 91**Well Diameter (cm):** 15.9**Final Status**

Water Supply

**Recommended Pump Rate:** 91**Water First Found:** 24.7**Primary Water Use:**

Domestic

**Pumping Duration (h:m):** 1 :**Static Level:** 3

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	11.6
1	SAND	0	11.6
2	LIMESTONE	11.6	24.7
2	LIMESTONE	11.6	24.7
3	LIMESTONE	24.7	27.4
3	LIMESTONE	24.7	27.4

**Well ID:** 7194027**Easting:** 455351**UTM Zone** 18**Construction Date:** 2012-12-21**Northing:** 5E+06**Positional Accuracy:** margin of error : 30 m - 100 m**Well Depth:** 61**Water Kind**

Untested

**Pump Rate (LPM):** 91**Well Diameter (cm):** 15.4**Final Status**

Water Supply

**Recommended Pump Rate:** 91**Water First Found:** 33.2**Primary Water Use:**

Domestic

**Pumping Duration (h:m):** 1 : 0**Static Level:** 9

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	15.2
1	SAND	0	15.2
1	SAND	0	15.2
1	SAND	0	15.2
2	LIMESTONE	15.2	33.2
2	LIMESTONE	15.2	33.2
2	LIMESTONE	15.2	33.2
2	LIMESTONE	15.2	33.2
3	LIMESTONE	33.2	52.4
3	LIMESTONE	33.2	52.4
3	LIMESTONE	33.2	52.4
3	LIMESTONE	33.2	52.4
4	SANDSTONE	52.4	58.5
4	SANDSTONE	52.4	58.5

4	SANDSTONE	52.4	58.5
4	SANDSTONE	52.4	58.5
5	SANDSTONE	58.5	61
5	SANDSTONE	58.5	61
5	SANDSTONE	58.5	61
5	SANDSTONE	58.5	61

**Well ID:** 7197490**Easting:** 454766**UTM Zone** 18**Construction Date:** 2013-02-19**Northing:** 5E+06**Positional Accuracy:** margin of error : 30 m - 100 m**Well Depth:** 42.7**Water Kind**

Untested

**Pump Rate (LPM):** 91**Well Diameter (cm):** 14.9**Final Status**

Water Supply

**Recommended Pump Rate:** 91**Water First Found:** 36.3**Primary Water Use:** Domestic**Pumping Duration (h:m):** 1 :**Static Level:** 3

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	17.4
1	SAND	0	17.4
1	SAND	0	17.4
1	SAND	0	17.4
2	LIMESTONE	17.4	36.3
2	LIMESTONE	17.4	36.3
2	LIMESTONE	17.4	36.3
2	LIMESTONE	17.4	36.3
3	LIMESTONE	36.3	37.5
3	LIMESTONE	36.3	37.5
3	LIMESTONE	36.3	37.5
3	LIMESTONE	36.3	37.5
4	LIMESTONE	37.5	42.7
4	LIMESTONE	37.5	42.7
4	LIMESTONE	37.5	42.7
4	LIMESTONE	37.5	42.7

**Well ID:** 7200356**Easting:** 454958**UTM Zone** 18**Construction Date:** 2013-04-15**Northing:** 5E+06**Positional Accuracy:** margin of error : 100 m - 300 m**Well Depth:** 61**Water Kind**

Untested

**Pump Rate (LPM):** 91**Well Diameter (cm):** 14.9**Final Status**

Water Supply

**Recommended Pump Rate:** 91**Water First Found:** 46.9**Primary Water Use:** Domestic**Pumping Duration (h:m):** 1 : 0**Static Level:** 5

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	13.7
1	SAND	0	13.7
1	SAND	0	13.7
1	SAND	0	13.7
2	LIMESTONE	13.7	42.1
2	LIMESTONE	13.7	42.1
2	LIMESTONE	13.7	42.1



2	LIMESTONE	13.7	42.1
3	SANDSTONE	42.1	46.9
3	SANDSTONE	42.1	46.9
3	SANDSTONE	42.1	46.9
3	SANDSTONE	42.1	46.9
4	SANDSTONE	46.9	55.5
4	SANDSTONE	46.9	55.5
4	SANDSTONE	46.9	55.5
4	SANDSTONE	46.9	55.5
5	SANDSTONE	55.5	61
5	SANDSTONE	55.5	61
5	SANDSTONE	55.5	61
5	SANDSTONE	55.5	61

**Well ID:** 7204662**Construction Date:** 2013-07-16**Easting:** 455133**Northing:** 5E+06**UTM Zone** 18**Positional Accuracy:** margin of error : 30 m - 100 m**Well Depth:** 91.4**Well Diameter (cm):** 15.6**Water First Found:** 89**Static Level:** 10**Water Kind**

Untested

**Final Status**

Water Supply

**Primary Water Use:**

Domestic

**Pump Rate (LPM):** 55**Recommended Pump Rate:** 55**Pumping Duration (h:m):** 1 : 0

<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>
1	SAND	0	3.35
1	SAND	0	3.35
2	SAND	3.35	10.4
2	SAND	3.35	10.4
3	SAND	10.4	18.3
3	SAND	10.4	18.3
4	LIMESTONE	18.3	38.1
4	LIMESTONE	18.3	38.1
5	SANDSTONE	38.1	41.5
5	SANDSTONE	38.1	41.5
6	LIMESTONE	41.5	49.1
6	LIMESTONE	41.5	49.1
7	SANDSTONE	49.1	89
7	SANDSTONE	49.1	89
8	SANDSTONE	89	91.4
8	SANDSTONE	89	91.4

**Well ID:** 7204663**Construction Date:** 2013-07-16**Easting:** 454826**Northing:** 5E+06**UTM Zone** 18**Positional Accuracy:** margin of error : 30 m - 100 m**Well Depth:** 61**Well Diameter (cm):** 15.6**Water First Found:** 48.2**Static Level:** 10**Water Kind**

Untested

**Final Status**

Water Supply

**Primary Water Use:**

Domestic

**Pump Rate (LPM):** 55**Recommended Pump Rate:** 55**Pumping Duration (h:m):** 1 : 0

<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>
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1	SAND	0	4.27
1	SAND	0	4.27
1	SAND	0	4.27
1	SAND	0	4.27
2	SILT	4.27	11.6
2	SILT	4.27	11.6
2	SILT	4.27	11.6
2	SILT	4.27	11.6
3	SAND	11.6	14.3
3	SAND	11.6	14.3
3	SAND	11.6	14.3
3	SAND	11.6	14.3
4	LIMESTONE	14.3	40.2
4	LIMESTONE	14.3	40.2
4	LIMESTONE	14.3	40.2
4	LIMESTONE	14.3	40.2
5	LIMESTONE	40.2	48.2
5	LIMESTONE	40.2	48.2
5	LIMESTONE	40.2	48.2
5	LIMESTONE	40.2	48.2
6	LIMESTONE	48.2	57.6
6	LIMESTONE	48.2	57.6
6	LIMESTONE	48.2	57.6
6	LIMESTONE	48.2	57.6
7	LIMESTONE	57.6	61
7	LIMESTONE	57.6	61
7	LIMESTONE	57.6	61
7	LIMESTONE	57.6	61

<b>Well ID:</b> 7209271	<b>Easting:</b> 454896	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 2013-10-10	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
	<b>Well Depth:</b> 54.9	<b>Water Kind</b> Untested	<b>Pump Rate (LPM):</b> 91	
	<b>Well Diameter (cm):</b> 15.6	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 91	
	<b>Water First Found:</b> 21.0	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 0	
	<b>Static Level:</b> 4			

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	6.1
1	SAND	0	6.1
1	SAND	0	6.1
1	SAND	0	6.1
1	SAND	0	6.1
1	SAND	0	6.1
2	SAND	6.1	14.6

1	SAND	0	4.27
1	SAND	0	4.27
1	SAND	0	4.27
1	SAND	0	4.27
2	SILT	4.27	11.6
2	SILT	4.27	11.6
2	SILT	4.27	11.6
2	SILT	4.27	11.6
3	SAND	11.6	14.3
3	SAND	11.6	14.3
3	SAND	11.6	14.3
3	SAND	11.6	14.3
4	LIMESTONE	14.3	40.2
4	LIMESTONE	14.3	40.2
4	LIMESTONE	14.3	40.2
4	LIMESTONE	14.3	40.2
5	LIMESTONE	40.2	48.2
5	LIMESTONE	40.2	48.2
5	LIMESTONE	40.2	48.2
5	LIMESTONE	40.2	48.2
6	LIMESTONE	48.2	57.6
6	LIMESTONE	48.2	57.6
6	LIMESTONE	48.2	57.6
6	LIMESTONE	48.2	57.6
7	LIMESTONE	57.6	61
7	LIMESTONE	57.6	61
7	LIMESTONE	57.6	61
7	LIMESTONE	57.6	61

<b>Well ID:</b> 7209271	<b>Easting:</b> 454896	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 2013-10-10	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
	<b>Well Depth:</b> 54.9	<b>Water Kind</b> Untested	<b>Pump Rate (LPM):</b> 91	
	<b>Well Diameter (cm):</b> 15.6	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 91	
	<b>Water First Found:</b> 21.0	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 : 0	
	<b>Static Level:</b> 4			

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	6.1
1	SAND	0	6.1
1	SAND	0	6.1
1	SAND	0	6.1
1	SAND	0	6.1
1	SAND	0	6.1
2	SAND	6.1	14.6

2	SAND	6.1	14.6
2	SAND	6.1	14.6
2	SAND	6.1	14.6
2	SAND	6.1	14.6
2	SAND	6.1	14.6
3	LIMESTONE	14.6	21.0
3	LIMESTONE	14.6	21.0
3	LIMESTONE	14.6	21.0
3	LIMESTONE	14.6	21.0
3	LIMESTONE	14.6	21.0
3	LIMESTONE	14.6	21.0
4	LIMESTONE	21.0	42.4
4	LIMESTONE	21.0	42.4
4	LIMESTONE	21.0	42.4
4	LIMESTONE	21.0	42.4
4	LIMESTONE	21.0	42.4
4	LIMESTONE	21.0	42.4
5	SANDSTONE	42.4	44.8
5	SANDSTONE	42.4	44.8
5	SANDSTONE	42.4	44.8
5	SANDSTONE	42.4	44.8
5	SANDSTONE	42.4	44.8
5	SANDSTONE	42.4	44.8
6	SANDSTONE	44.8	51.8
6	SANDSTONE	44.8	51.8
6	SANDSTONE	44.8	51.8
6	SANDSTONE	44.8	51.8
6	SANDSTONE	44.8	51.8
6	SANDSTONE	44.8	51.8
7	SANDSTONE	51.8	54.9
7	SANDSTONE	51.8	54.9
7	SANDSTONE	51.8	54.9
7	SANDSTONE	51.8	54.9
7	SANDSTONE	51.8	54.9
7	SANDSTONE	51.8	54.9

Well ID: 7217217  
Construction Date: 2014-03-03

Easting: 455459  
Northing: 5E+06

UTM Zone 18  
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 32.3  
Well Diameter (cm): 15.2  
Water First Found: 30.2  
Static Level: 6

Water Kind Untested  
Final Status Water Supply  
Primary Water Use: Domestic

Pump Rate (LPM): 91  
Recommended Pump Rate: 91  
Pumping Duration (h:m): 1 :

Layer: Driller's Description: Top: Bottom:

1	SAND	0	14.3
1	SAND	0	14.3
2	LIMESTONE	14.3	30.2
2	LIMESTONE	14.3	30.2
3	LIMESTONE	30.2	32.3
3	LIMESTONE	30.2	32.3

<b>Well ID:</b> 7228009	<b>Easting:</b> 455435	<b>UTM Zone</b> 18
<b>Construction Date:</b> 2014-09-22	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m
<b>Well Depth:</b> 61	<b>Water Kind</b> Untested	<b>Pump Rate (LPM):</b> 91
<b>Well Diameter (cm):</b> 15.1	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 91
<b>Water First Found:</b> 26.2	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 :
<b>Static Level:</b> 8		

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	15.2
1	SAND	0	15.2
1	SAND	0	15.2
1	SAND	0	15.2
1	SAND	0	15.2
1	SAND	0	15.2
2	LIMESTONE	15.2	26.2
2	LIMESTONE	15.2	26.2
2	LIMESTONE	15.2	26.2
2	LIMESTONE	15.2	26.2
2	LIMESTONE	15.2	26.2
2	LIMESTONE	15.2	26.2
3	LIMESTONE	26.2	40.8
3	LIMESTONE	26.2	40.8
3	LIMESTONE	26.2	40.8
3	LIMESTONE	26.2	40.8
3	LIMESTONE	26.2	40.8
3	LIMESTONE	26.2	40.8
4	LIMESTONE	40.8	54.9
4	LIMESTONE	40.8	54.9
4	LIMESTONE	40.8	54.9
4	LIMESTONE	40.8	54.9
4	LIMESTONE	40.8	54.9
4	LIMESTONE	40.8	54.9
5	SANDSTONE	54.9	59.1
5	SANDSTONE	54.9	59.1
5	SANDSTONE	54.9	59.1
5	SANDSTONE	54.9	59.1
5	SANDSTONE	54.9	59.1

5	SANDSTONE	54.9	59.1
6	SANDSTONE	59.1	61
6	SANDSTONE	59.1	61
6	SANDSTONE	59.1	61
6	SANDSTONE	59.1	61
6	SANDSTONE	59.1	61
6	SANDSTONE	59.1	61

**Well ID:** 7230319**Construction Date:** 2014-10-29**Easting:** 455162**Northing:** 5E+06**UTM Zone** 18**Positional Accuracy:** margin of error : 30 m - 100 m**Well Depth:** 90.5**Well Diameter (cm):** 15.2**Water First Found:** 88.7**Static Level:** 10**Water Kind**

Untested

**Final Status**

Water Supply

**Primary Water Use:**

Domestic

**Pump Rate (LPM):** 55**Recommended Pump Rate:** 55**Pumping Duration (h:m):** 1 :

Layer:	Driller's Description:	Top:	Bottom:
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1	SAND	0	9.14
1	SAND	0	9.14
2	GRAVEL	9.14	17.7
2	GRAVEL	9.14	17.7
3	LIMESTONE	17.7	43
3	LIMESTONE	17.7	43
4	LIMESTONE	43	48.2
4	LIMESTONE	43	48.2
5	SANDSTONE	48.2	88.7
5	SANDSTONE	48.2	88.7
6	SANDSTONE	88.7	90.5
6	SANDSTONE	88.7	90.5

**Well ID:** 7240506**Construction Date:** 2015-04-24**Easting:** 455080**Northing:** 5E+06**UTM Zone** 18**Positional Accuracy:** margin of error : 30 m - 100 m**Well Depth:** 61**Well Diameter (cm):** 15.1**Water First Found:** 41.8**Static Level:** 4**Water Kind**

Untested

**Final Status**

Water Supply

**Primary Water Use:**

Domestic

**Pump Rate (LPM):** 36**Recommended Pump Rate:** 36**Pumping Duration (h:m):** 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
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1	CLAY	0	16.8
1	CLAY	0	16.8
1	CLAY	0	16.8
1	CLAY	0	16.8
2	LIMESTONE	16.8	41.8
2	LIMESTONE	16.8	41.8
2	LIMESTONE	16.8	41.8
2	LIMESTONE	16.8	41.8
3	LIMESTONE	41.8	51.8
3	LIMESTONE	41.8	51.8



3	LIMESTONE	41.8	51.8
3	LIMESTONE	41.8	51.8
4	SANDSTONE	51.8	59.1
4	SANDSTONE	51.8	59.1
4	SANDSTONE	51.8	59.1
4	SANDSTONE	51.8	59.1
5	SANDSTONE	59.1	61
5	SANDSTONE	59.1	61
5	SANDSTONE	59.1	61
5	SANDSTONE	59.1	61

**Well ID:** 7243021**Construction Date:** 2015-06-15**Easting:** 455306**Northing:** 5E+06**UTM Zone** 18**Positional Accuracy:** margin of error : 30 m - 100 m**Well Depth:** 54.9**Well Diameter (cm):** 15.2**Water First Found:** 22.9**Static Level:** 2**Water Kind**

Untested

**Final Status**

Water Supply

**Primary Water Use:**

Domestic

**Pump Rate (LPM):** 91**Recommended Pump Rate:** 91**Pumping Duration (h:m):** 1 :

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	14.9
1	CLAY	0	14.9
1	CLAY	0	14.9
1	CLAY	0	14.9
2	LIMESTONE	14.9	22.9
2	LIMESTONE	14.9	22.9
2	LIMESTONE	14.9	22.9
2	LIMESTONE	14.9	22.9
3	LIMESTONE	22.9	52.4
3	LIMESTONE	22.9	52.4
3	LIMESTONE	22.9	52.4
3	LIMESTONE	22.9	52.4
4	LIMESTONE	52.4	54.9
4	LIMESTONE	52.4	54.9
4	LIMESTONE	52.4	54.9
4	LIMESTONE	52.4	54.9

**Well ID:** 7243032**Construction Date:** 2015-06-15**Easting:** 455258**Northing:** 5E+06**UTM Zone** 18**Positional Accuracy:** margin of error : 30 m - 100 m**Well Depth:** 48.8**Well Diameter (cm):** 15.9**Water First Found:** 46.9**Static Level:** 3**Water Kind**

Untested

**Final Status**

Water Supply

**Primary Water Use:**

Domestic

**Pump Rate (LPM):** 68**Recommended Pump Rate:** 68**Pumping Duration (h:m):** : 10

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	15.9
1	CLAY	0	15.9
1	CLAY	0	15.9

1	CLAY	0	15.9
2	LIMESTONE	15.9	26.2
2	LIMESTONE	15.9	26.2
2	LIMESTONE	15.9	26.2
2	LIMESTONE	15.9	26.2
3	LIMESTONE	26.2	46.9
3	LIMESTONE	26.2	46.9
3	LIMESTONE	26.2	46.9
3	LIMESTONE	26.2	46.9
4	LIMESTONE	46.9	48.8
4	LIMESTONE	46.9	48.8
4	LIMESTONE	46.9	48.8
4	LIMESTONE	46.9	48.8

<b>Well ID:</b> 7243033	<b>Easting:</b> 455335	<b>UTM Zone</b> 18
<b>Construction Date:</b> 2015-06-15	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m
<b>Well Depth:</b> 65.5	<b>Water Kind</b> Untested	<b>Pump Rate (LPM):</b> 91
<b>Well Diameter (cm):</b> 15.2	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 91
<b>Water First Found:</b> 57.9	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 :
<b>Static Level:</b> 9		

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	14.6
1	CLAY	0	14.6
1	CLAY	0	14.6
1	CLAY	0	14.6
2	LIMESTONE	14.6	48.8
2	LIMESTONE	14.6	48.8
2	LIMESTONE	14.6	48.8
2	LIMESTONE	14.6	48.8
3	LIMESTONE	48.8	57.9
3	LIMESTONE	48.8	57.9
3	LIMESTONE	48.8	57.9
3	LIMESTONE	48.8	57.9
4	LIMESTONE	57.9	63.4
4	LIMESTONE	57.9	63.4
4	LIMESTONE	57.9	63.4
4	LIMESTONE	57.9	63.4
5	LIMESTONE	63.4	65.5
5	LIMESTONE	63.4	65.5
5	LIMESTONE	63.4	65.5
5	LIMESTONE	63.4	65.5

**Well ID:** 7252399**Easting:** 455519**UTM Zone** 18**Construction Date:** 2015-11-17**Northing:** 5E+06**Positional Accuracy:** margin of error : 30 m - 100 m

**Well Depth:** 25  
**Well Diameter (cm):** 15.2  
**Water First Found:** 17.7  
**Static Level:** 3

**Water Kind** Untested  
**Final Status** Water Supply  
**Primary Water Use:** Domestic

**Pump Rate (LPM):** 91  
**Recommended Pump Rate:** 91  
**Pumping Duration (h:m):** 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	9.14
1	SAND	0	9.14
1	SAND	0	9.14
1	SAND	0	9.14
2	LIMESTONE	9.14	17.7
2	LIMESTONE	9.14	17.7
2	LIMESTONE	9.14	17.7
2	LIMESTONE	9.14	17.7
3	LIMESTONE	17.7	22.9
3	LIMESTONE	17.7	22.9
3	LIMESTONE	17.7	22.9
3	LIMESTONE	17.7	22.9
4	LIMESTONE	22.9	25
4	LIMESTONE	22.9	25
4	LIMESTONE	22.9	25
4	LIMESTONE	22.9	25

**Well ID:** 7252400**Easting:** 455399**UTM Zone** 18**Construction Date:** 2015-11-17**Northing:** 5E+06**Positional Accuracy:** margin of error : 30 m - 100 m

**Well Depth:** 48.8  
**Well Diameter (cm):** 15.9  
**Water First Found:** 44.2  
**Static Level:** 2

**Water Kind** Untested  
**Final Status** Water Supply  
**Primary Water Use:** Domestic

**Pump Rate (LPM):** 91  
**Recommended Pump Rate:** 91  
**Pumping Duration (h:m):** 1 :

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	8.84
1	SAND	0	8.84
1	SAND	0	8.84
1	SAND	0	8.84
2	LIMESTONE	8.84	44.2
2	LIMESTONE	8.84	44.2
2	LIMESTONE	8.84	44.2
2	LIMESTONE	8.84	44.2
3	LIMESTONE	44.2	46.9
3	LIMESTONE	44.2	46.9
3	LIMESTONE	44.2	46.9
3	LIMESTONE	44.2	46.9
4	LIMESTONE	46.9	48.8

4	LIMESTONE	46.9	48.8
4	LIMESTONE	46.9	48.8
4	LIMESTONE	46.9	48.8

**Well ID:** 7255451**Easting:** 455289**UTM Zone** 18**Construction Date:** 2016-01-06**Northing:** 5E+06**Positional Accuracy:** margin of error : 30 m - 100 m**Well Depth:** 64.0**Water Kind**

Untested

**Pump Rate (LPM):** 91**Well Diameter (cm):** 15.6**Final Status**

Water Supply

**Recommended Pump Rate:** 91**Water First Found:** 62.5**Primary Water Use:**

Domestic

**Pumping Duration (h:m):** 1 : 0**Static Level:** 8

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	15.9
1	CLAY	0	15.9
1	CLAY	0	15.9
1	CLAY	0	15.9
2	LIMESTONE	15.9	48.8
2	LIMESTONE	15.9	48.8
2	LIMESTONE	15.9	48.8
2	LIMESTONE	15.9	48.8
3	LIMESTONE	48.8	49.1
3	LIMESTONE	48.8	49.1
3	LIMESTONE	48.8	49.1
3	LIMESTONE	48.8	49.1
4	LIMESTONE	49.1	62.5
4	LIMESTONE	49.1	62.5
4	LIMESTONE	49.1	62.5
4	LIMESTONE	49.1	62.5
5	LIMESTONE	62.5	64.0
5	LIMESTONE	62.5	64.0
5	LIMESTONE	62.5	64.0
5	LIMESTONE	62.5	64.0

**Well ID:** 7265398**Easting:** 455315**UTM Zone** 18**Construction Date:** 2016-06-21**Northing:** 5E+06**Positional Accuracy:** margin of error : 30 m - 100 m**Well Depth:** 73.2**Water Kind**

Untested

**Pump Rate (LPM):** 91**Well Diameter (cm):** 15.9**Final Status**

Water Supply

**Recommended Pump Rate:** 91**Water First Found:** 70.7**Primary Water Use:**

Domestic

**Pumping Duration (h:m):** 1 : 0**Static Level:** 8

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	15.9
1	SAND	0	15.9
1	SAND	0	15.9
1	SAND	0	15.9
1	SAND	0	15.9
1	SAND	0	15.9

2	LIMESTONE	15.9	48.8
2	LIMESTONE	15.9	48.8
2	LIMESTONE	15.9	48.8
2	LIMESTONE	15.9	48.8
2	LIMESTONE	15.9	48.8
2	LIMESTONE	15.9	48.8
3	SANDSTONE	48.8	55.5
3	SANDSTONE	48.8	55.5
3	SANDSTONE	48.8	55.5
3	SANDSTONE	48.8	55.5
3	SANDSTONE	48.8	55.5
3	SANDSTONE	48.8	55.5
4	SANDSTONE	55.5	59.1
4	SANDSTONE	55.5	59.1
4	SANDSTONE	55.5	59.1
4	SANDSTONE	55.5	59.1
4	SANDSTONE	55.5	59.1
4	SANDSTONE	55.5	59.1
5	SANDSTONE	59.1	70.7
5	SANDSTONE	59.1	70.7
5	SANDSTONE	59.1	70.7
5	SANDSTONE	59.1	70.7
5	SANDSTONE	59.1	70.7
5	SANDSTONE	59.1	70.7
6	SANDSTONE	70.7	73.2
6	SANDSTONE	70.7	73.2
6	SANDSTONE	70.7	73.2
6	SANDSTONE	70.7	73.2
6	SANDSTONE	70.7	73.2
6	SANDSTONE	70.7	73.2

<b>Well ID:</b> 7296379	<b>Easting:</b> 454770	<b>UTM Zone</b> 18			
<b>Construction Date:</b> 2017-10-03	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m			
<b>Well Depth:</b> 67.1		<b>Water Kind</b> Untested		<b>Pump Rate (LPM):</b> 91	
<b>Well Diameter (cm):</b> 15.9		<b>Final Status</b> Water Supply		<b>Recommended Pump Rate:</b> 91	
<b>Water First Found:</b> 64.9		<b>Primary Water Use:</b> Domestic		<b>Pumping Duration (h:m):</b> 1 : 0	
<b>Static Level:</b> 7					
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>		
1	CLAY	0	3.05		
1	CLAY	0	3.05		
1	CLAY	0	3.05		
1	CLAY	0	3.05		
2	GRAVEL	3.05	17.7		

2	GRAVEL	3.05	17.7
2	GRAVEL	3.05	17.7
2	GRAVEL	3.05	17.7
3	LIMESTONE	17.7	46.0
3	LIMESTONE	17.7	46.0
3	LIMESTONE	17.7	46.0
3	LIMESTONE	17.7	46.0
4	SANDSTONE	46.0	63.7
4	SANDSTONE	46.0	63.7
4	SANDSTONE	46.0	63.7
4	SANDSTONE	46.0	63.7
5	SANDSTONE	63.7	64.9
5	SANDSTONE	63.7	64.9
5	SANDSTONE	63.7	64.9
5	SANDSTONE	63.7	64.9
6	SANDSTONE	64.9	67.1
6	SANDSTONE	64.9	67.1
6	SANDSTONE	64.9	67.1
6	SANDSTONE	64.9	67.1

<b>Well ID:</b> 7301342		<b>Easting:</b> 455482		<b>UTM Zone</b> 18	
<b>Construction Date:</b> 2017-12-14		<b>Northing:</b> 5E+06		<b>Positional Accuracy:</b> margin of error : 30 m - 100 m	
<b>Well Depth:</b> 36.6		<b>Water Kind</b> Untested		<b>Pump Rate (LPM):</b> 91	
<b>Well Diameter (cm):</b> 15.9		<b>Final Status</b> Water Supply		<b>Recommended Pump Rate:</b> 91	
<b>Water First Found:</b> 35.4		<b>Primary Water Use:</b> Domestic		<b>Pumping Duration (h:m):</b> 1 : 0	
<b>Static Level:</b> 3					
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>		
1	SAND	0	10.1		
1	SAND	0	10.1		
1	SAND	0	10.1		
1	SAND	0	10.1		
2	LIMESTONE	10.1	36.6		
2	LIMESTONE	10.1	36.6		
2	LIMESTONE	10.1	36.6		
2	LIMESTONE	10.1	36.6		

<b>Well ID:</b> 7318099	<b>Easting:</b> 455258	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 2018-09-10	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b> 61		<b>Water Kind</b>	Untested	<b>Pump Rate (LPM):</b> 91
<b>Well Diameter (cm):</b> 15.2		<b>Final Status</b>	Water Supply	<b>Recommended Pump Rate:</b> 91
<b>Water First Found:</b> 57		<b>Primary Water Use:</b>	Domestic	<b>Pumping Duration (h:m):</b> 1 :
<b>Static Level:</b> 8				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	CLAY	0	4.27	
1	CLAY	0	4.27	



2	SAND	4.27	15.2
2	SAND	4.27	15.2
3	LIMESTONE	15.2	41.8
3	LIMESTONE	15.2	41.8
4	SANDSTONE	41.8	45.7
4	SANDSTONE	41.8	45.7
5	SANDSTONE	45.7	57
5	SANDSTONE	45.7	57
6	SANDSTONE	57	61
6	SANDSTONE	57	61

**Well ID:** 7324334**Construction Date:** 2018-12-11**Easting:** 455498**Northing:** 5E+06**UTM Zone** 18**Positional Accuracy:** margin of error : 30 m - 100 m**Well Depth:** 18.3**Well Diameter (cm):** 15.9**Water First Found:** 15.2**Static Level:** 5**Water Kind** Untested**Final Status** Water Supply**Primary Water Use:** Domestic**Pump Rate (LPM):** 46**Recommended Pump Rate:** 46**Pumping Duration (h:m):** 1 :

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	7.31
1	SAND	0	7.31
2	SAND	7.31	11.3
2	SAND	7.31	11.3
3	LIMESTONE	11.3	15.2
3	LIMESTONE	11.3	15.2
4	LIMESTONE	15.2	18.3
4	LIMESTONE	15.2	18.3

**Well ID:** 7336839**Construction Date:** 2019-07-10**Easting:** 455307**Northing:** 5E+06**UTM Zone** 18**Positional Accuracy:** margin of error : 30 m - 100 m**Well Depth:** 25**Well Diameter (cm):** 15.9**Water First Found:** 22**Static Level:** 2**Water Kind** Untested**Final Status** Water Supply**Primary Water Use:** Domestic**Pump Rate (LPM):** 91**Recommended Pump Rate:** 91**Pumping Duration (h:m):** 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	12.5
1	SAND	0	12.5
2	LIMESTONE	12.5	22
2	LIMESTONE	12.5	22
3	LIMESTONE	22	25
3	LIMESTONE	22	25

<b>Well ID:</b> 7341123	<b>Easting:</b> 455360	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 2019-09-06	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b>	<b>Water Kind</b>	<b>Pump Rate (LPM):</b>		
<b>Well Diameter (cm):</b>	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b>		
<b>Water First Found:</b>	<b>Primary Water Use:</b>	<b>Pumping Duration (h:m):</b> :		
<b>Static Level:</b>				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
<b>Well ID:</b> 7357357	<b>Easting:</b> 455292	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 2020-04-28	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b> 24.7	<b>Water Kind</b> Untested	<b>Pump Rate (LPM):</b> 91		
<b>Well Diameter (cm):</b> 15.6	<b>Final Status</b> Water Supply	<b>Recommended Pump Rate:</b> 91		
<b>Water First Found:</b> 22.9	<b>Primary Water Use:</b> Domestic	<b>Pumping Duration (h:m):</b> 1 :		
<b>Static Level:</b> 3				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	
1	CLAY	0	15.2	
1	CLAY	0	15.2	
2	LIMESTONE	15.2	24.7	
2	LIMESTONE	15.2	24.7	
<b>Well ID:</b> 7364564	<b>Easting:</b> 455536	<b>UTM Zone</b> 18		
<b>Construction Date:</b> 2020-08-13	<b>Northing:</b> 5E+06	<b>Positional Accuracy:</b> margin of error : 30 m - 100 m		
<b>Well Depth:</b>	<b>Water Kind</b>	<b>Pump Rate (LPM):</b>		
<b>Well Diameter (cm):</b>	<b>Final Status</b>	<b>Recommended Pump Rate:</b>		
<b>Water First Found:</b>	<b>Primary Water Use:</b>	<b>Pumping Duration (h:m):</b>		
<b>Static Level:</b>				
<b>Layer:</b>	<b>Driller's Description:</b>	<b>Top:</b>	<b>Bottom:</b>	

Hydrogeological Assessment  
Cassidy EW Construction Consultant Ltd.  
Ref. No.: 17281-002  
2024-04-29

# Well Use Survey Summary Report

[illegible]

Hydrogeological Assessment  
Cassidy EW Construction Consultant Ltd.  
Ref. No.: 17281-002  
2024-04-29

## ***Well Use Survey Summary Report***

Hydrogeological Assessment  
Cassidy EW Construction Consultant Ltd.  
Ref. No.: 17281-002  
2024-04-29

[illegible]

Hydrogeological Assessment  
Cassidy EW Construction Consultant Ltd.  
Ref. No.: 17281-002  
2024-04-29

## Well Use Survey Summary Report



**CERTIFICATE OF WELL COMPLIANCE**

I, Jeremy Hanna (License T3632), **AIR ROCK DRILLING CO. LTD.**, DO HEREBY CERTIFY, that I am licensed to drill water wells in the Province of Ontario, and that I have supervised the drilling of a well on the

**PROPERTY OF:** DANDEX DEVELOPMENTS INC.

**LOCATED AT :** # 1386 GREELY LANE Greely

**LOT #** P/L 4&5 **CON #** 4 **PLAN #** 4M-351 **S/L #** Part Block 3

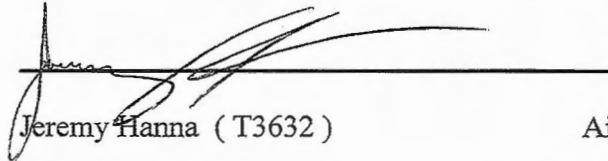
**Geographical Township** OSGOODE

**of** OTTAWA - CARLETON

I CERTIFY FURTHER that, I am aware of the well drilling requirements, the guidelines, recommendations and regulations of the Ministry of the Environment governing well installations in the Province of Ontario, and the standards specified in any subdivision agreement and hydrogeological report applicable to this site and City Standards.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased, grouted (cement or bentonite) as applicable and constructed in strict conformity with the standards required.

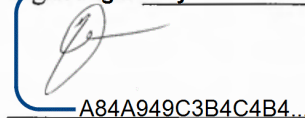
Signed this 21 ST day of MAY 2025,

  
Jeremy Hanna ( T3632 )

Air Rock Drilling Co. Ltd. ( C-7681 )

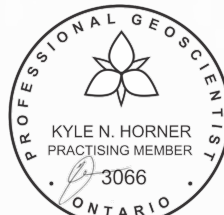
The Engineer / Hydrologist on behalf of the Landowner set out above Certifies that He/She has Inspected the well and it was constructed in accordance with the specifications In Ministry of Environment Regulation 903

Signed <sup>11th</sup> day of June, 2025

  
A84A949C3B4C4B4...

HYDROLOGIST / ENGINEER  
(Signature / STAMP )

Signed by.



2025-06-11

2025225

TAG A 379053

Cassidy EW Construction

**Ontario** Conservation and Parks **Regulation 903 Ontario Water Resources Act**

Measurements recorded in: ☐ Metric ☒ Imperial

**Well Record**

Page \_\_\_\_\_ of \_\_\_\_\_

**Well Owner's Information**

First Name \_\_\_\_\_ Last Name/Organization **Cassidy EW Construction** E-mail Address \_\_\_\_\_ ☐ Well Constructed by Well Owner

Mailing Address (Street Number/Name) **1-1011 Thomas Spratt Place** Municipality **Ottawa** Province **ON** Postal Code **K1G 5L5** Telephone No. (inc. area code) \_\_\_\_\_

**Well Location**

Address of Well Location (Street Number/Name) **1386 Greely Lane** Township **Osgoode** Lot **P/L 4&5** Concession **4**

County/District/Municipality **Ottawa Carleton** City/Town/Village **Greely** Province **Ontario** Postal Code \_\_\_\_\_

UTM Coordinates Zone Easting Northing Municipal Plan and Sublot Number **4M-351** Other **Block 3**

NAD 83 **18 455205 5011824**

**Overburden and Bedrock Materials/Abandonment Sealing Record** (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m)
From	To			
	Clay			0' 38'
	Boulders	4 Hard Pan		38' 48'
Grey & Black	Limestone			48' 74'
Grey & Black	Limestone			74' 125'
Grey & Black	Limestone			125' 174'
Grey & Black	Limestone			174' 180'

**\* DAN DAX DEVELOPMENTS INC. \***

**Annular Space**

Depth Set at (m)	Type of Sealant Used (Material and Type)	Volume Placed (m³)
From	To	
54'	44'	10.92
44'	0'	25.20

**Method of Construction**

☐ Cable Tool ☐ Diamond ☐ Public ☐ Commercial ☐ Not used

☐ Rotary (Conventional) ☐ Jetting ☐ Domestic ☐ Municipal ☐ Dewatering

☐ Rotary (Reverse) ☐ Driving ☐ Livestock ☐ Test Hole ☐ Monitoring

☐ Boring ☐ Digging ☐ Irrigation ☐ Cooling & Air Conditioning

☒ Air percussion ☐ Other, specify \_\_\_\_\_

**Construction Record - Casing**

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m)	Status of Well
			From To	
6 1/4"	Steel	.188"	+2' 54'	<input checked="" type="checkbox"/> Water Supply
6 1/8"	Open Hole		54' 180'	<input type="checkbox"/> Replacement Well

**Construction Record - Screen**

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m)	Status of Well
			From To	
				<input type="checkbox"/> Test Hole
				<input type="checkbox"/> Recharge Well
				<input type="checkbox"/> Dewatering Well
				<input type="checkbox"/> Observation and/or Monitoring Hole
				<input type="checkbox"/> Alteration (Construction)
				<input type="checkbox"/> Abandoned, Insufficient Supply
				<input type="checkbox"/> Abandoned, Poor Water Quality
				<input type="checkbox"/> Abandoned, other, specify _____
				<input type="checkbox"/> Other, specify _____

**Water Details**

Water found at Depth (m)	Kind of Water: <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Contested
74'	<input type="checkbox"/> Gas <input checked="" type="checkbox"/> Other, specify _____
125'	<input type="checkbox"/> Gas <input checked="" type="checkbox"/> Other, specify _____
174'	<input type="checkbox"/> Gas <input checked="" type="checkbox"/> Other, specify _____

**Well Contractor and Well Technician Information**

Business Name of Well Contractor **Air Rock Drilling Co. Ltd.** Well Contractor's Licence No. **C7681**

Business Address (Street Number/Name) **6650 Franktown Road** Municipality **Richmond**

Province **ON** Postal Code **K0A 2Z0** Business E-mail Address **air-rock@sympatico.ca**

Bus. Telephone No. (inc. area code) **6138382170** Name of Well Technician (Last Name, First Name) **Gauthier, Chris**

Well Technician's Licence No. **T15044** Signature of Technician and/or Contractor **[Signature]** Date **2025-06-30**

**Results of Well Yield Testing**

After test of well yield, water was: ☐ Clear and sand free ☒ Other, specify **Not tested**

If pumping discontinued, give reason: \_\_\_\_\_

Pump intake set at (m) **170**

Pumping rate (l/min / GPM) **20 +**

Duration of pumping **1 hrs + 0 min**

Final water level end of pumping (m) **8.6**

If flowing give rate (l/min/GPM) \_\_\_\_\_

Recommended pump depth (m) **100**

Recommended pump rate (l/min/GPM) **15**

Well production (l/min/GPM) **20**

Disinfected? ☒ Yes ☐ No

**Map of Well Location**

Please provide a map below following instructions on the back **[Map]**

**70 FT** **#1386 GREELY LANE** **60 FT** **Parkway Road**

Comments: **SET AT 100 FEET (3/4 HP 15 GPM)**

Well owner's information package delivered ☒ Yes ☐ No

Date Package Delivered **2025-05-27**

Ministry Use Only

Audit No. **2427114**

Received **2025-05-28**



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## **Appendix E**

### **Groundwater Quality Lab Results**

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**CERTIFICATE OF ANALYSIS****Final Report****C.O.C.: G 107579****REPORT No: 24-010898 - Rev. 1****Report To:**

Cambium Environmental - Kingston  
625 Fortune Crescent  
#1  
Kingston, ON K7P 0L5

**CADUCEON Environmental Laboratories**

2378 Holly Lane  
Ottawa, ON K1V 7P1

**Attention: Kyle Horner**

DATE RECEIVED: 2024-Apr-22  
DATE REPORTED: 2024-Jul-30  
SAMPLE MATRIX: Ground Water

CUSTOMER PROJECT: 17280-002  
P.O. NUMBER:

Analyses	Qty	Site Analyzed	Authorized	Date Analyzed	Lab Method	Reference Method
Anions (Liquid)	1	OTTAWA	PCURIEL	2024-Apr-24	A-IC-01	SM 4110B
BOD5 (Liquid)	1	KINGSTON	JYEARWOOD	2024-Apr-24	BOD-001	SM 5210B
Cond/pH/Alk Auto (Liquid)	1	OTTAWA	SBOUDREAU	2024-Apr-22	COND-02/PH-02/A LK-02	SM 2510B/4500H/ 2320B
Cyanide Total (Liquid)	1	KINGSTON	JMACINNES	2024-Apr-23	CN-001	SM 4500-CN-E
Formaldehyde (Subcontracted)	1	TESTMARK	SISLAM	2024-Apr-26		Subcontracted
Ion Balance (Calc.)	1	OTTAWA	ASCHNEIDER		CP-028	MECP E3196
Chromium VI (Liquid)	1	OTTAWA	STAILLON	2024-Apr-25	D-CRVI-01	MECP E3056
ICP/MS Total (Liquid)	1	OTTAWA	AOZKAYMAK	2024-Apr-24	D-ICPMS-01	EPA 6020
ICP/OES Total (Liquid)	1	OTTAWA	APRUDYVUS	2024-Apr-29	D-ICP-01	SM 3120B
ICP/OES (Liquid)	1	OTTAWA	APRUDYVUS	2024-Apr-24	D-ICP-01	SM 3120B
Mercury (Liquid)	1	OTTAWA	TBENNETT	2024-Apr-24	D-HG-02	SM 3112B
NDMA Liquid (Subcontract)	1	SGS_LAKEFIELD	SISLAM	2024-May-30		Subcontracted
Ammonia (Liquid)	1	KINGSTON	JYEARWOOD	2024-Apr-24	NH3-001	SM 4500NH3
Nonylphenols (Subcontracted)	1	SGS_LAKEFIELD	SISLAM	2024-Apr-30		Subcontracted
OC Pesticides (Liquid)	1	KINGSTON	CSUMMERHAYS	2024-Apr-23	PESTCL-001	EPA 8081
Oil & Grease (Liquid)	1	KINGSTON	MLANE	2024-Apr-25	O&G-001	SM 5520
Phenols (Liquid)	1	KINGSTON	JMACINNES	2024-Apr-25	PHEN-01	MECP E3179
Sulphide (Liquid)	1	KINGSTON	EHINCH	2024-Apr-23	H2S-001	SM 4500-S2
SVOC - Semi-Volatiles (Liquid)	1	KINGSTON	EASIEDU	2024-Apr-24	NAB-W-001	EPA 8270D
TP & TKN (Liquid)	1	KINGSTON	KDIBBITS	2024-Apr-29	TPTKN-001	MECP E3516.2
TSS (Liquid)	1	KINGSTON	MCLOSS	2024-Apr-23	TSS-001	SM 2540D
Turbidity (Liquid)	1	OTTAWA	STAILLON	2024-Apr-23	A-TURB-01	SM 2130B
VOC-Volatiles Full (Water)	1	RICHMOND_HILL	FLENA	2024-Apr-24	C-VOC-02	EPA 8260

R.L. = Reporting Limit

NC = Not Calculated

Test methods may be modified from specified reference method unless indicated by an \*



**Michelle Dubien**  
**Data Specialist**

The analytical results reported herein refer to the samples as received and relate only to the items tested. Reproduction of this analytical report in full or in part is prohibited without prior consent from Caduceon Environmental Laboratories.

					Client I.D.
					BH106
					Sample I.D.
					24-010898-1
					Date Collected
					2024-Apr-19
Parameter	Units	R.L.	Limits		-
Alkalinity(CaCO3) to pH4.5	mg/L	5			283
pH @25°C	pH units	-	11.0, 9.0	SAN, STORM	7.85
Turbidity	NTU	0.1			7070
Fluoride	mg/L	0.1	10	SAN	<0.1
Sulphate	mg/L	1	1500	SAN	84
BOD5	mg/L	3	300, 25.0	SAN, STORM	3
Total Suspended Solids	mg/L	3	350, 15.0	SAN, STORM	9480
Phosphorus (Total)	mg/L	0.01	10, 0.4	SAN, STORM	8.72
Total Kjeldahl Nitrogen	mg/L	0.1	100	SAN	6.3
Ammonia (N)-Total (NH3+NH4)	mg/L	0.05			0.15
Ammonia (N)-unionized	mg/L	0.01			<0.01
Sulphide	mg/L	0.01	2	SAN	0.01
Cyanide (Total)	mg/L	0.005	2, 0.02	SAN, STORM	<0.005
Phenolics	mg/L	0.001	1, 0.008	SAN, STORM	<0.001
Hardness (as CaCO3)	mg/L	0.02			368
Aluminum	mg/L	0.01			0.07
Barium	mg/L	0.001			0.165
Calcium	mg/L	0.02			105
Iron	mg/L	0.005			0.020
Magnesium	mg/L	0.02			25.6
Tungsten	mg/L	0.01			<0.01



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Data Specialist

					Client I.D.
					BH106
					Sample I.D.
					24-010898-1
					Date Collected
					2024-Apr-19
Parameter	Units	R.L.	Limits		-
Zinc	mg/L	0.005			<0.005
Zirconium	mg/L	0.003			<0.003
Hardness (as CaCO3)	mg/L	-			789
Aluminum (Total)	mg/L	0.01	50	SAN	0.03
Bismuth (Total)	mg/L	0.02	5	SAN	<0.02
Boron (Total)	mg/L	0.005	25	SAN	0.028
Cadmium (Total)	mg/L	0.005	0.02, 0.008	SAN, STORM	<0.005
Calcium (Total)	mg/L	0.02			97.7
Chromium (Total)	mg/L	0.002	5, 0.08	SAN, STORM	<0.002
Cobalt (Total)	mg/L	0.005	5	SAN	<0.005
Copper (Total)	mg/L	0.002	3, 0.04	SAN, STORM	0.008
Iron (Total)	mg/L	0.005			<0.005
Lead (Total)	mg/L	0.02	5, 0.12	SAN, STORM	<0.02
Magnesium (Total)	mg/L	0.02			27.3
Manganese (Total)	mg/L	0.001	0.05, 5	STORM, SAN	0.003
Molybdenum (Total)	mg/L	0.01	5	SAN	<0.01
Nickel (Total)	mg/L	0.01	3, 0.08	SAN, STORM	<0.01
Silver (Total)	mg/L	0.005	5, 0.12	SAN, STORM	<0.005
Tin (Total)	mg/L	0.05	5	SAN	<0.05
Titanium (Total)	mg/L	0.005	5	SAN	<0.005
Tungsten (Total)	mg/L	0.01			<0.01



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					Client I.D.
					BH106
					Sample I.D.
					24-010898-1
					Date Collected
					2024-Apr-19
Parameter	Units	R.L.	Limits		-
Vanadium (Total)	mg/L	0.005	5	SAN	<0.005
Zinc (Total)	mg/L	0.005	3, 0.04	SAN, STORM	<0.005
Zirconium (Total)	mg/L	0.003			<0.003
Antimony (Total)	mg/L	0.0001	5	SAN	0.0007
Arsenic (Total)	mg/L	0.0001	0.02, 1	STORM, SAN	0.0275
Beryllium (Total)	mg/L	0.0001			0.0032
Cadmium (Total)	mg/L	0.000015	0.008	STORM	0.00112
Chromium (Total)	mg/L	0.001	0.08	STORM	0.249
Cobalt (Total)	mg/L	0.0001			0.103
Copper (Total)	mg/L	0.0001	0.04	STORM	0.301
Lead (Total)	mg/L	0.00002	0.12	STORM	0.0768
Molybdenum (Total)	mg/L	0.0001			0.0076
Nickel (Total)	mg/L	0.0002	0.08	STORM	0.189
Selenium (Total)	mg/L	0.001	0.02, 5	STORM, SAN	<0.001
Silver (Total)	mg/L	0.0001	0.12	STORM	0.0011
Thallium (Total)	mg/L	0.00005			0.00182
Uranium (Total)	mg/L	0.00005			0.0114
Vanadium (Total)	mg/L	0.0001			0.327
Chromium (VI)	mg/L	0.01			<0.01
Mercury	mg/L	0.00002	0.001, 0.0004	SAN, STORM	<0.00002
Anion Sum	meq/L	-			16.6



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					Client I.D.	BH106
					Sample I.D.	24-010898-1
					Date Collected	2024-Apr-19
Parameter	Units	R.L.	Limits			-
Cation Sum	meq/L	-				15.3
% Difference	%	-				4.03
Ion Ratio	-	-				1.08
Sodium Adsorption Ratio	-	-				4.28
TDS (Ion Sum Calc)	mg/L	1				893
TDS(calc.)/EC(actual)	-	-				0.540
Conductivity Calc	µmho/cm	-				1590
Conductivity Calc / Conductivity	-	-				0.959
Langelier Index(25°C)	-	-				0.800
Saturation pH (25°C)	-	-				7.05
pH (Client Data)	pH units	-				6.97
Temperature (Client Data)	°C	-				9.9



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					Client I.D.
					BH106
					Sample I.D.
					24-010898-1
					Date Collected
					2024-Apr-19
Parameter	Units	R.L.	Limits		-
Benzene	mg/L	0.0005	0.01, 0.002	SAN, STORM	<0.0005
Bromodichloromethane	mg/L	0.002	0.35	SAN	<0.002
Bromoform	mg/L	0.005	0.63	SAN	<0.005
Bromomethane	mg/L	0.0005	0.11	SAN	<0.0005
Carbon Tetrachloride	mg/L	0.0002	0.057	SAN	<0.0002
Chlorobenzene	mg/L	0.0005	0.057	SAN	<0.0005
Chloroethane	mg/L	0.003	0.27	SAN	<0.003
Chloroform	mg/L	0.001	0.08, 0.002	SAN, STORM	<0.001
Chloromethane (Methyl Chloride)	mg/L	0.002	0.19	SAN	<0.002
Dibromochloromethane	mg/L	0.002	0.057	SAN	<0.002
Ethylene Dibromide	mg/L	0.0002	0.028	SAN	<0.0002
Dichlorobenzene,1,2-	mg/L	0.0005	0.088, 0.0056	SAN, STORM	<0.0005
Dichlorobenzene,1,3-	mg/L	0.0005	0.036	SAN	<0.0005
Dichlorobenzene,1,4-	mg/L	0.0005	0.017, 0.0068	SAN, STORM	<0.0005
Dichloroethane,1,1-	mg/L	0.0005	0.2	SAN	<0.0005
Dichloroethane,1,2-	mg/L	0.0005	0.21	SAN	0.0007
Dichloroethylene,1,1-	mg/L	0.0005	0.04	SAN	<0.0005
Dichloroethylene,1,2-cis-	mg/L	0.0005	0.2, 0.0056	SAN, STORM	<0.0005
Dichloroethylene,1,2-trans-	mg/L	0.0005	0.2	SAN	<0.0005
Dichloropropane,1,2-	mg/L	0.0005	0.85	SAN	<0.0005
Dichloropropene,1,3-cis-	mg/L	0.0005	0.07	SAN	<0.0005



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					Client I.D.
					BH106
					Sample I.D.
					24-010898-1
					Date Collected
					2024-Apr-19
Parameter	Units	R.L.	Limits		-
Dichloropropene, 1,3-trans-	mg/L	0.0005	0.07, 0.0056	SAN, STORM	<0.0005
Ethylbenzene	mg/L	0.0005	0.057, 0.002	SAN, STORM	<0.0005
Dichloromethane (Methylene Chloride)	mg/L	0.005	0.211, 0.0052	SAN, STORM	<0.005
Styrene	mg/L	0.0005	0.04	SAN	<0.0005
Tetrachloroethane, 1,1,2,2-	mg/L	0.0005	0.04, 0.017	SAN, STORM	<0.0005
Tetrachloroethylene	mg/L	0.0005	0.05, 0.0044	SAN, STORM	<0.0005
Toluene	mg/L	0.0005	0.08, 0.002	SAN, STORM	<0.0005
Trichloroethane, 1,1,1-	mg/L	0.0005	0.054	SAN	<0.0005
Trichloroethane, 1,1,2-	mg/L	0.0005	0.8	SAN	<0.0005
Trichloroethylene	mg/L	0.0005	0.054, 0.0076	SAN, STORM	<0.0005
Trichlorofluoromethane (Freon 11)	mg/L	0.005	0.02	SAN	<0.005
Trimethylbenzene, 1,3,5-	mg/L	0.0001	0.003	SAN	<0.0001
Vinyl Chloride	mg/L	0.0002	0.4	SAN	<0.0002
Xylene, m,p-	µg/L	1			<1
Xylene, m,p,o-	mg/L	0.0011	0.32, 0.0044	SAN, STORM	<0.0011
Xylene, o-	µg/L	0.5			<0.5
Oil & Grease (Total)	mg/L	1.0			1.7
Oil and Grease (Mineral)	mg/L	1.0	15	SAN	<1.0
Oil and Grease (Anim/Veg)	mg/L	1.0	150	SAN	1.4



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					Client I.D.
					BH106
					Sample I.D.
					24-010898-1
					Date Collected
					2024-Apr-19
Parameter	Units	R.L.	Limits		-
Acenaphthene	µg/L	0.05			<0.05
Acenaphthylene	µg/L	0.05			<0.05
Anthracene	µg/L	0.05			<0.05
Benzo[a]anthracene	µg/L	0.05			<0.05
Benzo(a)pyrene	µg/L	0.01			<0.01
Benzo(b)fluoranthene	µg/L	0.05			<0.05
Benzo(b+k)fluoranthene	µg/L	0.1			<0.1
Benzo(g,h,i)perylene	µg/L	0.05			<0.05
Benzo(k)fluoranthene	µg/L	0.05			<0.05
Butyl Benzyl Phthalate	mg/L	0.001	0.017	SAN	<0.001
Bis(2-Chloroethoxy)methane	mg/L	0.002	0.036	SAN	<0.002
Bis(2-ethylhexyl) Phthalate	mg/L	0.005	0.28	SAN	<0.005
Chrysene	µg/L	0.05			<0.05
Dibenzo(a,h)anthracene	µg/L	0.05			<0.05
Di-n-Butyl Phthalate	mg/L	0.0010	0.057	SAN	<0.0010
Dichlorophenol,2,4-	mg/L	0.0002	0.044	SAN	<0.0002
Diethyl Phthalate	mg/L	0.0010	0.2	SAN	<0.0010
Di-n-Octyl Phthalate	mg/L	0.0010	0.03	SAN	<0.0010
Fluoranthene	mg/L	0.00005	0.059	SAN	<0.00005
Fluorene	µg/L	0.05			<0.05
Indeno(1,2,3,-cd)Pyrene	µg/L	0.05			<0.05

  
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CADUCEON Environmental Laboratories Certificate of Analysis

Final Report  
REPORT No: 24-010898 - Rev. 1

Client I.D.					BH106
Sample I.D.					24-010898-1
Date Collected					2024-Apr-19
Parameter	Units	R.L.	Limits		-
Indole	mg/L	0.002	0.05	SAN	<0.002
Methylnaphthalene,1-	mg/L	0.00005	0.032	SAN	<0.00005
Methylnaphthalene,2-(1-)	µg/L	1			<1
Methylnaphthalene,2-	mg/L	0.00005	0.022	SAN	<0.00005
Naphthalene	mg/L	0.00005	0.059, 0.064	SAN, STORM	<0.00005
Phenanthrene	µg/L	0.05			<0.05
Pyrene	µg/L	0.05			<0.05
Total PAH	mg/L	0.0001	0.015, 0.006	SAN, STORM	<0.0001
Client I.D.					BH106
Sample I.D.					24-010898-1
Date Collected					2024-Apr-19
Parameter	Units	R.L.	Limits		-
Hexachlorobenzene	mg/L	0.00001	0.00004	STORM	<0.00001



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<b>Subcontracted Analyses</b>					Client I.D.	BH106
					Sample I.D.	24-010898-1
					Date Collected	2024-Apr-19
						-
Parameter	Units	R.L.	Limits			
Formaldehyde	mg/L	-	0.3	SAN		<0.008
Nitrosodimethylamine (NDMA)	mg/L	-	0.4	SAN		<0.0004
Nonylphenol Monoethoxylate	mg/L	-				<0.01
Nonylphenol Diethoxylate	mg/L	-				<0.01
Nonylphenols	mg/L	-	0.0025, 0.001	SAN, STORM		<0.001
Nonylphenol Ethoxylates	mg/L	-	0.025, 0.01	SAN, STORM		<0.01

Revised to include additional dissolved metals at clients request

: City of Ottawa  
SAN: Sanitary Sewer By Law  
STORM: Storm Sewer By Law

Summary of Exceedances		
Sanitary Sewer By Law		
BH106	Found Value	Limit
Total Suspended Solids	9480	350
Storm Sewer By Law		
BH106	Found Value	Limit
Total Suspended Solids	9480	15.0
Phosphorus (Total)	8.72	0.4
Arsenic (Total)	0.0275	0.02
Chromium (Total)	0.249	0.08
Copper (Total)	0.301	0.04
Nickel (Total)	0.189	0.08



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Data Specialist



CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G 107579

REPORT No: 24-010898 - Rev. 2

Report To:  
Cambium Environmental - Kingston  
625 Fortune Crescent  
#1  
Kingston, ON K7P 0L5

CADUCEON Environmental Laboratories  
2378 Holly Lane  
Ottawa, ON K1V 7P1

Attention: Kyle Horner

DATE RECEIVED: 2024-Apr-22  
DATE REPORTED: 2024-Aug-07  
SAMPLE MATRIX: Ground Water

CUSTOMER PROJECT: 17280-002  
P.O. NUMBER:

Analyses	Qty	Site Analyzed	Authorized	Date Analyzed	Lab Method	Reference Method
Anions (Liquid)	1	OTTAWA	PCURIEL	2024-Apr-24	A-IC-01	SM 4110B
BOD5 (Liquid)	1	KINGSTON	JYEARWOOD	2024-Apr-24	BOD-001	SM 5210B
Cond/pH/Alk Auto (Liquid)	1	OTTAWA	SBOUDREAU	2024-Apr-22	COND-02/PH-02/A LK-02	SM 2510B/4500H/ 2320B
Cyanide Total (Liquid)	1	KINGSTON	JMACINNES	2024-Apr-23	CN-001	SM 4500-CN-E
Formaldehyde (Subcontracted)	1	TESTMARK	SISLAM	2024-Apr-26		Subcontracted
Ion Balance (Calc.)	1	OTTAWA	ASCHNEIDER		CP-028	MECP E3196
Chromium VI (Liquid)	1	OTTAWA	STAILLON	2024-Apr-25	D-CRVI-01	MECP E3056
ICP/MS Total (Liquid)	1	OTTAWA	AOZKAYMAK	2024-Apr-24	D-ICPMS-01	EPA 6020
ICP/OES Total (Liquid)	1	OTTAWA	APRUDYVUS	2024-Apr-29	D-ICP-01	SM 3120B
ICP/OES (Liquid)	1	OTTAWA	APRUDYVUS	2024-Apr-24	D-ICP-01	SM 3120B
Mercury (Liquid)	1	OTTAWA	TBENNETT	2024-Apr-24	D-HG-02	SM 3112B
NDMA Liquid (Subcontract)	1	SGS_LAKEFIELD	SISLAM	2024-May-30		Subcontracted
Ammonia (Liquid)	1	KINGSTON	JYEARWOOD	2024-Apr-24	NH3-001	SM 4500NH3
Nonylphenols (Subcontracted)	1	SGS_LAKEFIELD	SISLAM	2024-Apr-30		Subcontracted
OC Pesticides (Liquid)	1	KINGSTON	CSUMMERHAYS	2024-Apr-23	PESTCL-001	EPA 8081
Oil & Grease (Liquid)	1	KINGSTON	MLANE	2024-Apr-25	O&G-001	SM 5520
Phenols (Liquid)	1	KINGSTON	JMACINNES	2024-Apr-25	PHEN-01	MECP E3179
Sulphide (Liquid)	1	KINGSTON	EHINCH	2024-Apr-23	H2S-001	SM 4500-S2
SVOC - Semi-Volatiles (Liquid)	1	KINGSTON	EASIEDU	2024-Apr-24	NAB-W-001	EPA 8270D
TP & TKN (Liquid)	1	KINGSTON	KDIBBITS	2024-Apr-29	TPTKN-001	MECP E3516.2
TSS (Liquid)	1	KINGSTON	MCLOSS	2024-Apr-23	TSS-001	SM 2540D
Turbidity (Liquid)	1	OTTAWA	STAILLON	2024-Apr-23	A-TURB-01	SM 2130B
VOC-Volatiles Full (Water)	1	RICHMOND_HILL	FLENA	2024-Apr-24	C-VOC-02	EPA 8260

R.L. = Reporting Limit  
NC = Not Calculated  
Test methods may be modified from specified reference method unless indicated by an \*

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					Client I.D.
					BH106
					Sample I.D.
					24-010898-1
					Date Collected
					2024-Apr-19
Parameter	Units	R.L.	Limits		-
Alkalinity(CaCO3) to pH4.5	mg/L	5			283
pH @25°C	pH units	-	8.5	PWQO	7.85
Turbidity	NTU	0.1			7070
Fluoride	mg/L	0.1			<0.1
Sulphate	mg/L	1			84
BOD5	mg/L	3			3
Total Suspended Solids	mg/L	3			9480
Phosphorus (Total)	µg/L	10	10	INTERIM	8720
Total Kjeldahl Nitrogen	mg/L	0.1			6.3
Ammonia (N)-Total (NH3+NH4)	mg/L	0.05			0.15
Ammonia (N)-unionized	µg/L	10.0	20	PWQO	<10.0
Sulphide	mg/L	0.01			0.01
Cyanide (Total)	mg/L	0.005			<0.005
Phenolics	µg/L	1	1	PWQO	<1
Hardness (as CaCO3)	mg/L as CaCO3	0			368
Aluminum	µg/L	10	75	INTERIM	70
Barium	µg/L	1			165
Calcium	µg/L	20			105000
Iron	µg/L	5	300	PWQO	20
Magnesium	µg/L	20			25600
Tungsten	µg/L	10			<10



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					Client I.D.
					BH106
					Sample I.D.
					24-010898-1
					Date Collected
					2024-Apr-19
Parameter	Units	R.L.	Limits		-
Zinc	µg/L	5	30	PWQO	<5
Zirconium	µg/L	3			<3
Hardness (as CaCO3)	mg/L as CaCO3	-			789
Aluminum (Total)	µg/L	10			30
Bismuth (Total)	µg/L	20			<20
Boron (Total)	µg/L	5	200	INTERIM	28
Cadmium (Total)	µg/L	5	0.1, 0.2	INTERIM, PWQO	<5
Calcium (Total)	µg/L	20			97700
Chromium (Total)	µg/L	2			<2
Cobalt (Total)	µg/L	5	0.9, 0.0	INTERIM, PWQO	<5
Copper (Total)	µg/L	2	5, 0.0	INTERIM, PWQO	8
Iron (Total)	µg/L	5	300	PWQO	<5
Lead (Total)	µg/L	20	1, 0.0	INTERIM, PWQO	<20
Magnesium (Total)	µg/L	20			27300
Manganese (Total)	µg/L	1			3
Molybdenum (Total)	µg/L	10	40, 0.0	INTERIM, PWQO	<10
Nickel (Total)	µg/L	10	25	PWQO	<10
Silver (Total)	µg/L	5	0.1	PWQO	<5
Tin (Total)	µg/L	50			<50
Titanium (Total)	µg/L	5			<5
Tungsten (Total)	µg/L	10	30	INTERIM	<10



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					Client I.D.
					BH106
					Sample I.D.
					24-010898-1
					Date Collected
					2024-Apr-19
Parameter	Units	R.L.	Limits		-
Vanadium (Total)	µg/L	5			<5
Zinc (Total)	µg/L	5	20, 30	INTERIM, PWQO	<5
Zirconium (Total)	µg/L	3	4	INTERIM	<3
Antimony (Total)	µg/L	0.1	20	INTERIM	0.7
Arsenic (Total)	µg/L	0.1	5, 5	INTERIM, PWQO	27.5
Beryllium (Total)	µg/L	0.1	11	PWQO	3.2
Cadmium (Total)	µg/L	0.015	0.1, 0.2	INTERIM, PWQO	1.12
Chromium (Total)	µg/L	1			249
Cobalt (Total)	µg/L	0.1	0.9	INTERIM	103
Copper (Total)	µg/L	0.1	5	INTERIM	301
Lead (Total)	µg/L	0.02	1, 5	INTERIM, PWQO	76.8
Molybdenum (Total)	µg/L	0.1	40	INTERIM	7.6
Nickel (Total)	µg/L	0.2	25	PWQO	189
Selenium (Total)	µg/L	1	100	PWQO	<1
Silver (Total)	µg/L	0.1	0.1	PWQO	1.1
Thallium (Total)	µg/L	0.05	0.3, 0.3	INTERIM, PWQO	1.82
Uranium (Total)	µg/L	0.05	5	INTERIM	11.4
Vanadium (Total)	µg/L	0.1	6	INTERIM	327
Chromium (VI)	µg/L	10	1	PWQO	<10
Mercury	µg/L	0.02	0.2	PWQO	<0.02
Anion Sum	meq/L	-			16.6



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Client I.D.					BH106
Sample I.D.					24-010898-1
Date Collected					2024-Apr-19
Parameter	Units	R.L.	Limits		-
Cation Sum	meq/L	-			15.3
% Difference	%	-			4.03
Ion Ratio	-	-			1.08
Sodium Adsorption Ratio	-	-			4.28
TDS (Ion Sum Calc)	mg/L	1			893
TDS(calc.)/EC(actual)	-	-			0.540
Conductivity Calc	µmho/cm	-			1590
Conductivity Calc / Conductivity	-	-			0.959
Langelier Index(25°C)	-	-			0.800
Saturation pH (25°C)	-	-			7.05
pH (Client Data)	pH units	-			6.97
Temperature (Client Data)	°C	-			9.9



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					Client I.D.
					BH106
					Sample I.D.
					24-010898-1
					Date Collected
					2024-Apr-19
Parameter	Units	R.L.	Limits		-
Benzene	µg/L	0.5	100	INTERIM	<0.5
Bromodichloromethane	µg/L	2	200	INTERIM	<2
Bromoform	µg/L	5	60	INTERIM	<5
Bromomethane	µg/L	0.5	0.9	INTERIM	<0.5
Carbon Tetrachloride	µg/L	0.2			<0.2
Chlorobenzene	µg/L	0.5	15	PWQO	<0.5
Chloroethane	µg/L	3			<3
Chloroform	µg/L	1			<1
Chloromethane (Methyl Chloride)	µg/L	2	700	INTERIM	<2
Dibromochloromethane	µg/L	2	40	INTERIM	<2
Ethylene Dibromide	µg/L	0.2	5, 5	INTERIM, PWQO	<0.2
Dichlorobenzene,1,2-	µg/L	0.5	2.5	PWQO	<0.5
Dichlorobenzene,1,3-	µg/L	0.5	2.5	PWQO	<0.5
Dichlorobenzene,1,4-	µg/L	0.5	4	PWQO	<0.5
Dichloroethane,1,1-	µg/L	0.5	200	INTERIM	<0.5
Dichloroethane,1,2-	µg/L	0.5	100	INTERIM	0.7
Dichloroethylene,1,1-	µg/L	0.5	40	INTERIM	<0.5
Dichloroethylene,1,2-cis-	µg/L	0.5	200	INTERIM	<0.5
Dichloroethylene,1,2-trans-	µg/L	0.5	200	INTERIM	<0.5
Dichloropropane,1,2-	µg/L	0.5	0.7	INTERIM	<0.5
Dichloropropene,1,3-cis-	µg/L	0.5			<0.5



Michelle Dubien  
Data Specialist

					Client I.D.
					BH106
					Sample I.D.
					24-010898-1
					Date Collected
					2024-Apr-19
Parameter	Units	R.L.	Limits		-
Dichloropropene, 1,3-trans-	µg/L	0.5	7	INTERIM	<0.5
Ethylbenzene	µg/L	0.5	8	INTERIM	<0.5
Dichloromethane (Methylene Chloride)	µg/L	5	100	INTERIM	<5
Styrene	µg/L	0.5	4	INTERIM	<0.5
Tetrachloroethane, 1,1,2,2-	µg/L	0.5	70	INTERIM	<0.5
Tetrachloroethylene	µg/L	0.5	50	INTERIM	<0.5
Toluene	µg/L	0.5	0.8, 0.8	INTERIM, PWQO	<0.5
Trichloroethane, 1,1,1,-	µg/L	0.5	10	INTERIM	<0.5
Trichloroethane, 1,1,2,-	µg/L	0.5	800	INTERIM	<0.5
Trichloroethylene	µg/L	0.5	20	INTERIM	<0.5
Trichlorofluoromethane (Freon 11)	µg/L	5			<5
Trimethylbenzene, 1,3,5-	µg/L	0.1	3	INTERIM	<0.1
Vinyl Chloride	µg/L	0.2	600	INTERIM	<0.2
Xylene, m,p-	µg/L	1			<1
Xylene, m,p,o-	µg/L	1.1			<1.1
Xylene, o-	µg/L	0.5	40	INTERIM	<0.5
Oil & Grease (Total)	mg/L	1.0			1.7
Oil and Grease (Mineral)	mg/L	1.0			<1.0
Oil and Grease (Anim/Veg)	mg/L	1.0			1.4



Michelle Dubien  
Data Specialist

					Client I.D.
					BH106
					Sample I.D.
					24-010898-1
					Date Collected
					2024-Apr-19
Parameter	Units	R.L.	Limits		-
Acenaphthene	µg/L	0.05			<0.05
Acenaphthylene	µg/L	0.05			<0.05
Anthracene	µg/L	0.05	0.0008	PWQO	<0.05
Benzo[a]anthracene	µg/L	0.05	0.0004	INTERIM	<0.05
Benzo(a)pyrene	µg/L	0.01			<0.01
Benzo(b)fluoranthene	µg/L	0.05			<0.05
Benzo(b+k)fluoranthene	µg/L	0.1			<0.1
Benzo(g,h,i)perylene	µg/L	0.05	0.00002	INTERIM	<0.05
Benzo(k)fluoranthene	µg/L	0.05			<0.05
Butyl Benzyl Phthalate	µg/L	1	0.2	INTERIM	<1
Bis(2-Chloroethoxy)methane	µg/L	2			<2
Bis(2-ethylhexyl) Phthalate	µg/L	5			<5
Chrysene	µg/L	0.05	0.0001	INTERIM	<0.05
Dibenzo(a,h)anthracene	µg/L	0.05	0.002	INTERIM	<0.05
Di-n-Butyl Phthalate	µg/L	1	4	PWQO	<1
Dichlorophenol,2,4-	µg/L	0.2	0.2	PWQO	<0.2
Diethyl Phthalate	µg/L	1			<1
Di-n-Octyl Phthalate	µg/L	1	0.6	PWQO	<1
Fluoranthene	µg/L	0.05	0.0008	INTERIM	<0.05
Fluorene	µg/L	0.05	0.2	INTERIM	<0.05
Indeno(1,2,3,-cd)Pyrene	µg/L	0.05			<0.05



Michelle Dubien  
Data Specialist



					Client I.D.	BH106
					Sample I.D.	24-010898-1
					Date Collected	2024-Apr-19
Parameter	Units	R.L.	Limits			-
Indole	µg/L	2				<2
Methylnaphthalene,1-	µg/L	0.05	2	INTERIM		<0.05
Methylnaphthalene,2-(1-)	µg/L	1				<1
Methylnaphthalene,2-	µg/L	0.05	2	INTERIM		<0.05
Naphthalene	µg/L	0.05	7	INTERIM		<0.05
Phenanthrene	µg/L	0.05	0.03	INTERIM		<0.05
Pyrene	µg/L	0.05				<0.05
Total PAH	µg/L	0.1				<0.1

					Client I.D.	BH106
					Sample I.D.	24-010898-1
					Date Collected	2024-Apr-19
Parameter	Units	R.L.	Limits			-
Hexachlorobenzene	µg/L	0.01				<0.01



Michelle Dubien  
Data Specialist

<div>Subcontracted Analyses</div>					Client I.D.
					BH106
					Sample I.D.
					24-010898-1
					Date Collected
					2024-Apr-19
Parameter	Units	R.L.	Limits		-
Formaldehyde	µg/L	-	0.8	INTERIM	<8
Nitrosodimethylamine (NDMA)	µg/L	-	15	INTERIM	<0.4
Nonylphenol Monoethoxylate	µg/L	-			<10
Nonylphenol Diethoxylate	µg/L	-			<10
Nonylphenols	µg/L	-	0.04	INTERIM	<1
Nonylphenol Ethoxylates	µg/L	-			<10

Revised to change guideline to PWQO

: PWQO Limits  
INTERIM: Interim PWQO  
PWQO: PWQO



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Data Specialist

## CADUCEON Environmental Laboratories Certificate of Analysis

Final Report

REPORT No: 24-010898 - Rev. 2

Summary of Exceedances		
Interim PWQO		
BH106	Found Value	Limit
Phosphorus (Total)	8720	10
Cadmium (Total)	<5	0.1
Cobalt (Total)	<5	0.9
Copper (Total)	8	5
Lead (Total)	<20	1
Arsenic (Total)	27.5	5
Cadmium (Total)	1.12	0.1
Cobalt (Total)	103	0.9
Copper (Total)	301	5
Lead (Total)	76.8	1
Thallium (Total)	1.82	0.3
Uranium (Total)	11.4	5
Vanadium (Total)	327	6
Benzo[a]anthracene	<0.05	0.0004
Benzo(g,h,i)perylene	<0.05	0.00002
Butyl Benzyl Phthalate	<1	0.2
Chrysene	<0.05	0.0001
Dibenzo(a,h)anthracene	<0.05	0.002
Fluoranthene	<0.05	0.0008
Phenanthrene	<0.05	0.03
Formaldehyde	<8	0.8
Nonylphenols	<1	0.04
PWQO		
BH106	Found Value	Limit
Cadmium (Total)	<5	0.2
Silver (Total)	<5	0.1
Arsenic (Total)	27.5	5
Cadmium (Total)	1.12	0.2
Lead (Total)	76.8	5
Nickel (Total)	189	25
Silver (Total)	1.1	0.1
Thallium (Total)	1.82	0.3
Chromium (VI)	<10	1
Anthracene	<0.05	0.0008
Di-n-Octyl Phthalate	<1	0.6



**Michelle Dubien**  
Data Specialist

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**Michelle Dubien**  
**Data Specialist**



CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G 106721

REPORT No: 24-024417 - Rev. 0

Report To:  
Cambium Environmental - Kingston  
31 Hyperion Crt  
Suite 102  
Kingston, ON K7K 7G3

CADUCEON Environmental Laboratories  
285 Dalton Ave  
Kingston, ON K7K 6Z1

Attention: Natasha Augustine

DATE RECEIVED: 2024-Aug-10  
DATE REPORTED: 2024-Aug-16  
SAMPLE MATRIX: Ground Water

CUSTOMER PROJECT: 17281-002  
P.O. NUMBER:

Analyses	Qty	Site Analyzed	Authorized	Date Analyzed	Lab Method	Reference Method
ICP/MS (Liquid)	1	OTTAWA	AOZKAYMAK	2024-Aug-13	D-ICPMS-01	EPA 200.8
ICP/OES (Liquid)	1	OTTAWA	APRUDYVUS	2024-Aug-14	D-ICP-01	SM 3120B
TSS (Liquid)	1	KINGSTON	DCASSIDY	2024-Aug-15	TSS-001	SM 2540D

R.L. = Reporting Limit  
NC = Not Calculated  
Test methods may be modified from specified reference method unless indicated by an \*

				Client I.D.	BH106
				Sample I.D.	24-024417-1
				Date Collected	2024-Aug-08
Parameter	Units	R.L.	Limits		-
Total Suspended Solids	mg/L	3			<3
Hardness (as CaCO3)	mg/L as CaCO3	0			380
Aluminum	µg/L	10	75	INTERIM	20
Boron	µg/L	5	200	INTERIM	62
Calcium	µg/L	20			107000
Iron	µg/L	5	300	PWQO	334
Magnesium	µg/L	20			27400
Tungsten	µg/L	10			<10
Zinc	µg/L	5	30	PWQO	<5
Zirconium	µg/L	3			<3

Michelle Dubien  
Data Specialist

The analytical results reported herein refer to the samples as received and relate only to the items tested. Reproduction of this analytical report in full or in part is prohibited without prior consent from Caduceon Environmental Laboratories.

Client I.D.					BH106
Sample I.D.					24-024417-1
Date Collected					2024-Aug-08
Parameter	Units	R.L.	Limits		-
Antimony	µg/L	0.1	20, 5	INTERIM, PWQO	0.3
Arsenic	µg/L	0.1	5, 0.0	INTERIM, PWQO	1.0
Beryllium	µg/L	0.1	0.0, 11	INTERIM, PWQO	<0.1
Cadmium	µg/L	0.015	0.1, 0.2	INTERIM, PWQO	0.211
Chromium	µg/L	1.0			<1.0
Cobalt	µg/L	0.1			1.1
Copper	µg/L	0.1	5	INTERIM	5.4
Lead	µg/L	0.02	1, 5	INTERIM, PWQO	0.08
Molybdenum	µg/L	0.1	40	INTERIM	5.0
Nickel	µg/L	0.2	25	PWQO	3.8
Selenium	µg/L	1.00	100	PWQO	<1.00
Silver	µg/L	0.1	0.1	PWQO	<0.1
Thallium	µg/L	0.05	0.3, 0.3	INTERIM, PWQO	<0.05
Uranium	µg/L	0.05	5	INTERIM	4.68
Vanadium	µg/L	0.1	6	INTERIM	0.3

: PWQO Limits  
INTERIM: Interim PWQO  
PWQO: PWQO



Michelle Dubien  
Data Specialist

## CADUCEON Environmental Laboratories Certificate of Analysis

Final Report

REPORT No: 24-024417 - Rev. 0

Summary of Exceedances		
Interim PWQO		
BH106	Found Value	Limit
Cadmium	0.211	0.1
Copper	5.4	5
PWQO		
BH106	Found Value	Limit
Iron	334	300
Cadmium	0.211	0.2



Michelle Dubien  
Data Specialist

The analytical results reported herein refer to the samples as received and relate only to the items tested. Reproduction of this analytical report in full or in part is prohibited without prior consent from Caduceon Environmental Laboratories.



CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G 106721

REPORT No: 24-024417 - Rev. 2

Report To:  
Cambium Environmental - Kingston  
31 Hyperion Crt  
Suite 102  
Kingston, ON K7K 7G3

CADUCEON Environmental Laboratories  
285 Dalton Ave  
Kingston, ON K7K 6Z1

Attention: Natasha Augustine


DATE RECEIVED: 2024-Aug-10  
DATE REPORTED: 2024-Sep-05  
SAMPLE MATRIX: Ground Water

CUSTOMER PROJECT: 17281-002  
P.O. NUMBER:

Analyses	Qty	Site Analyzed	Authorized	Date Analyzed	Lab Method	Reference Method
ICP/MS (Liquid)	1	OTTAWA	AOZKAYMAK	2024-Aug-13	D-ICPMS-01	EPA 200.8
ICP/OES (Liquid)	1	OTTAWA	APRUDYVUS	2024-Aug-14	D-ICP-01	SM 3120B
TSS (Liquid)	1	KINGSTON	DCASSIDY	2024-Aug-15	TSS-001	SM 2540D

R.L. = Reporting Limit  
NC = Not Calculated  
Test methods may be modified from specified reference method unless indicated by an \*

					Client I.D.
					BH106
					Sample I.D.
					24-024417-1
					Date Collected
					2024-Aug-08
Parameter	Units	R.L.	Limits		-
Total Suspended Solids	mg/L	3	350, 15.0	SAN, STORM	<3
Hardness (as CaCO3)	mg/L as CaCO3	0.02			380
Aluminum	mg/L	0.01	50	SAN	0.02
Boron	mg/L	0.005	25	SAN	0.062
Calcium	mg/L	0.02			107
Iron	mg/L	0.005			0.334
Magnesium	mg/L	0.02			27.4
Phosphorus	mg/L	0.1			<0.1
Tungsten	mg/L	0.01			<0.01
Zinc	mg/L	0.005	3, 0.04	SAN, STORM	<0.005

  
Steve Garrett  
Director of Laboratory Services

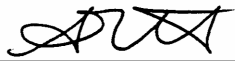
The analytical results reported herein refer to the samples as received and relate only to the items tested. Reproduction of this analytical report in full or in part is prohibited without prior consent from Caduceon Environmental Laboratories.



					Client I.D.
					BH106
					Sample I.D.
					24-024417-1
					Date Collected
					2024-Aug-08
Parameter	Units	R.L.	Limits		-
Zirconium	mg/L	0.003			<0.003
Antimony	mg/L	0.0001	5	SAN	0.0003
Arsenic	mg/L	0.0001	1, 0.02	SAN, STORM	0.0010
Beryllium	mg/L	0.0001			<0.0001
Cadmium	mg/L	0.000015	0.02, 0.008	SAN, STORM	0.000211
Chromium	mg/L	0.001	5, 0.08	SAN, STORM	<0.001
Cobalt	mg/L	0.0001	5	SAN	0.0011
Copper	mg/L	0.0001	3, 0.04	SAN, STORM	0.0054
Lead	mg/L	0.00002	5, 0.12	SAN, STORM	0.00008
Molybdenum	mg/L	0.0001	5	SAN	0.0050
Nickel	mg/L	0.0002	3, 0.08	SAN, STORM	0.0038
Selenium	mg/L	0.001	5, 0.02	SAN, STORM	<0.001
Silver	mg/L	0.0001	5, 0.12	SAN, STORM	<0.0001
Thallium	mg/L	0.00005			<0.00005
Uranium	mg/L	0.00005			0.00468
Vanadium	mg/L	0.0001	5	SAN	0.0003

Revised to add Phosphorous result by ICP

: City of Ottawa  
SAN: Sanitary Sewer By Law  
STORM: Storm Sewer By Law



Steve Garrett

Director of Laboratory Services



CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G 112298

REPORT No: 24-027621 - Rev. 0

Report To:  
Cambium Environmental - Kingston  
31 Hyperion Crt  
Suite 102  
Kingston, ON K7K 7G3

CADUCEON Environmental Laboratories  
285 Dalton Ave  
Kingston, ON K7K 6Z1


Attention: Natasha Augustine

DATE RECEIVED:	2024-Sep-06	CUSTOMER PROJECT:	17281-002
DATE REPORTED:	2024-Sep-10	P.O. NUMBER:	
SAMPLE MATRIX:	Ground Water		

Analyses	Qty	Site Analyzed	Authorized	Date Analyzed	Lab Method	Reference Method
TP & TKN (Liquid)	1	KINGSTON	YLIEN	2024-Sep-10	TPTKN-001	MECP E3516.2

R.L. = Reporting Limit  
NC = Not Calculated  
Test methods may be modified from specified reference method unless indicated by an \*

			Parameter
			Phosphorus (Total)
			Units
			mg/L
			R.L.
			0.01
Client I.D.	Sample I.D.	Date Collected	
BH106	24-027621-1	2024-Sep-05	<0.01

  
Steve Garrett  
Director of Laboratory Services



# CERTIFICATE OF ANALYSIS

## Final Report

**C.O.C.: G 132184**
**REPORT No: 25-015207 - Rev. 0**
**Report To:**

Cambium Environmental - Kingston  
31 Hyperion Crt  
Suite 102  
Kingston, ON K7K 7G3

**CADUCEON Environmental Laboratories**

2378 Holly Lane  
Ottawa, ON K1V 7P1

**Attention: Kyle Horner**

DATE RECEIVED: 2025-May-30  
DATE REPORTED: 2025-Jun-06  
SAMPLE MATRIX: Ground Water

CUSTOMER PROJECT: 17281-001  
P.O. NUMBER: 17281-001

Analyses	Qty	Site Analyzed	Authorized	Date Analyzed	Lab Method	Reference Method
Anions (Liquid)	2	OTTAWA	STAILLON	2025-Jun-02	A-IC-01	SM 4110B
Colour (Liquid)	2	OTTAWA	MMIRELLA	2025-Jun-04	A-COL-01	SM 2120C
Cond/pH/Alk Auto (Liquid)	2	OTTAWA	SBOUDREAU	2025-May-30	COND-02/PH-02/A LK-02	SM 2510B/4500H/ 2320B
Coliforms - DC Media (Liquid)	2	OTTAWA	AHIRSI	2025-May-30	ECTC-001	MECP E3407
DOC (Liquid)	2	OTTAWA	SLOZO	2025-Jun-02	C-OC-01	EPA 415.2
HPC Spread Plate (Liquid)	2	OTTAWA	SLOZO	2025-May-30	HPC-001	SM 9215D
Ion Balance (Calc)	2	OTTAWA	ASCHNEIDER		CP-028	MECP E3196
ICP/MS (Liquid)	2	OTTAWA	TPRICE	2025-Jun-03	D-ICPMS-01	EPA 200.8
ICP/OES (Liquid)	2	OTTAWA	GFENTON	2025-Jun-02	D-ICP-01	SM 3120B
Ammonia (Liquid)	2	KINGSTON	DCASSIDY	2025-Jun-06	NH3-001	SM 4500NH3
Phenols (Liquid)	2	KINGSTON	MCLOSS	2025-Jun-03	PHEN-01	MECP E3179
Sulphide (Liquid)	2	KINGSTON	MWILSON	2025-Jun-02	H2S-001	SM 4500-S2
Tannins (Liquid)	2	KINGSTON	MWILSON	2025-Jun-03	TAN-001	SM 5550
TP & TKN (Liquid)	2	KINGSTON	YLIEN	2025-Jun-06	TPTKN-001	MECP E3516.2
Turbidity (Liquid)	2	OTTAWA	MMIRELLA	2025-May-30	A-TURB-01	SM 2130B
VOC-Volatiles Full (Water)	2	RICHMOND_HILL	FLENA	2025-Jun-04	C-VOC-02	EPA 8260

R.L. = Reporting Limit

NC = Not Calculated

Test methods may be modified from specified reference method unless indicated by an \*

**Michelle Dubien**  
**Data Specialist**

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## CADUCEON Environmental Laboratories Certificate of Analysis

Final Report

REPORT No: 25-015207 - Rev. 0

Parameter	Units	R.L.	Limits	Client I.D.	TW1-1	TW1-2
				Sample I.D.	25-015207-1	25-015207-2
				Date Collected	2025-May-29	2025-May-29
				DWG	-	-
Total Coliform (DC Media)	CFU/100mL	1	0	MAC	0	0
E coli (DC Media)	CFU/100mL	1	0	MAC	0	0
Background (DC Media)	CFU/100mL	1			55	37
Heterotrophic Plate Count	CFU/1mL	2			<2	<2
Alkalinity(CaCO <sub>3</sub> ) to pH4.5	mg/L	5	500	OG	241	244
TDS (Calc. from Cond.)	mg/L	3	500	AO	495	503
Conductivity @25°C	uS/cm	1			932	946
pH @25°C	pH units	-	8.5	OG	7.98	7.95
Colour	TCU	2	5	AO	3	2
Turbidity	NTU	0.1	5	AO	8.4	3.4
Fluoride	mg/L	0.1	1.5	MAC	<0.1	<0.1
Chloride	mg/L	0.5	250	AO	125	132
Nitrate (N)	mg/L	0.05	10.0	MAC	<0.05	<0.05
Nitrite (N)	mg/L	0.05	1.0	MAC	<0.05	<0.05
Sulphate	mg/L	1	500	AO	64	65
Total Kjeldahl Nitrogen	mg/L	0.1			0.2	0.2
Ammonia (N)-Total (NH <sub>3</sub> +NH <sub>4</sub> )	mg/L	0.05			0.08	0.08
Dissolved Organic Carbon	mg/L	0.8	5	AO	1.3	1.2
Tannin & Lignin	mg/L	0.5			<0.5	<0.5
Sulphide	mg/L	0.01	0.05	AO	<0.01	<0.01
Phenolics	mg/L	0.001			<0.001	<0.001



**Michelle Dubien**  
Data Specialist

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## CADUCEON Environmental Laboratories Certificate of Analysis

Final Report

REPORT No: 25-015207 - Rev. 0

Parameter	Units	R.L.	Limits	Client I.D.	TW1-1	TW1-2
				Sample I.D.	25-015207-1	25-015207-2
				Date Collected	2025-May-29	2025-May-29
				DWG	-	-
Hardness (as CaCO <sub>3</sub> )	mg/L as CaCO <sub>3</sub>	0.02	100	OG	389	394
Aluminum	mg/L	0.01	0.1	OG	0.02	0.03
Barium	mg/L	0.001	1	MAC	0.825	0.839
Boron	mg/L	0.005	5	MAC	0.025	0.025
Calcium	mg/L	0.02			100	101
Iron	mg/L	0.005	0.3	AO	0.205	0.326
Magnesium	mg/L	0.02			33.8	34.2
Manganese	mg/L	0.001	0.05	AO	0.030	0.025
Potassium	mg/L	0.1			2.7	2.7
Sodium	mg/L	0.2	200, 20, 20	AO, WL, MAC	38.9	40.0
Strontium	mg/L	0.001			0.393	0.399
Zinc	mg/L	0.005	5	AO	<0.005	<0.005
Antimony	mg/L	0.0001	0.006	MAC	<0.0001	<0.0001
Arsenic	mg/L	0.0001	0.01	MAC	<0.0001	<0.0001
Beryllium	mg/L	0.0001			<0.0001	<0.0001
Cadmium	mg/L	0.000015	0.005	MAC	<0.000015	<0.000015
Chromium	mg/L	0.001	0.05	MAC	<0.001	<0.001
Cobalt	mg/L	0.0001			0.0001	0.0001
Copper	mg/L	0.0001	1	AO	0.0005	0.0008
Lead	mg/L	0.00002	0.010	MAC	0.00002	0.00002
Molybdenum	mg/L	0.0001			0.0008	0.0008



**Michelle Dubien**  
Data Specialist

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Final Report

REPORT No: 25-015207 - Rev. 0

Parameter	Units	R.L.	Limits	Client I.D.	TW1-1	TW1-2
				Sample I.D.	25-015207-1	25-015207-2
				Date Collected	2025-May-29	2025-May-29
				DWG	-	-
Nickel	mg/L	0.0002			0.0007	0.0007
Selenium	mg/L	0.001	0.05	MAC	<0.001	<0.001
Silver	mg/L	0.0001			<0.0001	<0.0001
Thallium	mg/L	0.00005			<0.00005	<0.00005
Uranium	mg/L	0.00005	0.02	MAC	0.00035	0.00036
Vanadium	mg/L	0.0001			<0.0001	<0.0001
Anion Sum	meq/L	-			9.70	9.96
Cation Sum	meq/L	-			9.56	9.71
% Difference	%	-			0.707	1.28
TDS (Ion Sum Calc)	mg/L	1	500	AO	510	522
Conductivity Calc	µmho/cm	-			944	964
pH (Client Data)	pH units	-			7.33	7.42
Temperature (Client Data)	°C	-			11.6	11.8



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Final Report

REPORT No: 25-015207 - Rev. 0

Parameter	Units	R.L.	Limits	Client I.D.	TW1-1	TW1-2
				Sample I.D.	25-015207-1	25-015207-2
				Date Collected	2025-May-29	2025-May-29
				DWG	-	-
Acetone	µg/L	30			<30	<30
Benzene	µg/L	0.5	1	MAC	<0.5	<0.5
Bromodichloromethane	µg/L	2			<2	<2
Bromoform	µg/L	5			<5	<5
Bromomethane	µg/L	0.5			<0.5	<0.5
Carbon Tetrachloride	µg/L	0.2	2	MAC	<0.2	<0.2
Chlorobenzene	µg/L	0.5	80, 30	MAC, AO	<0.5	<0.5
Chloroform	µg/L	1			<1	<1
Dibromochloromethane	µg/L	2			<2	<2
Ethylene Dibromide	µg/L	0.2			<0.2	<0.2
Dichlorobenzene,1,2-	µg/L	0.5	200, 3	MAC, AO	<0.5	<0.5
Dichlorobenzene,1,3-	µg/L	0.5			<0.5	<0.5
Dichlorobenzene,1,4-	µg/L	0.5	5, 1	MAC, AO	<0.5	<0.5
Dichlorodifluoromethane (Freon 12)	µg/L	2			<2	<2
Dichloroethane, 1,1-	µg/L	0.5			<0.5	<0.5
Dichloroethane, 1,2-	µg/L	0.5	5	MAC	<0.5	<0.5
Dichloroethylene, 1,1-	µg/L	0.5	14	MAC	<0.5	<0.5
Dichloroethylene, 1,2-cis-	µg/L	0.5			<0.5	<0.5
Dichloroethylene, 1,2-cis+trans-	µg/L	0.7			<0.7	<0.7
Dichloroethylene, 1,2-trans-	µg/L	0.5			<0.5	<0.5
Dichloropropane, 1,2-	µg/L	0.5			<0.5	<0.5



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Final Report

REPORT No: 25-015207 - Rev. 0

Parameter	Units	R.L.	Limits	Client I.D.	TW1-1	TW1-2
					25-015207-1	25-015207-2
					2025-May-29	2025-May-29
					-	-
Dichloropropene, 1,3-cis-	µg/L	0.5			<0.5	<0.5
Dichloropropene, 1,3-cis+trans- (Calculated)	µg/L	0.5			<0.5	<0.5
Dichloropropene, 1,3-trans-	µg/L	0.5			<0.5	<0.5
Ethylbenzene	µg/L	0.5	140, 1.6	MAC, AO	<0.5	<0.5
Hexane	µg/L	5			<5	<5
Dichloromethane (Methylene Chloride)	µg/L	5	50	MAC	<5	<5
Methyl Ethyl Ketone	µg/L	2			<2	<2
Methyl Isobutyl Ketone	µg/L	20			<20	<20
Methyl tert-Butyl Ether (MTBE)	µg/L	2			<2	<2
Styrene	µg/L	0.5			<0.5	<0.5
Tetrachloroethane, 1,1,1,2-	µg/L	0.5			<0.5	<0.5
Tetrachloroethane, 1,1,2,2-	µg/L	0.5			<0.5	<0.5
Tetrachloroethylene	µg/L	0.5	10	MAC	<0.5	<0.5
Toluene	µg/L	0.5	60	MAC	<0.5	<0.5
Trichloroethane, 1,1,1,-	µg/L	0.5			<0.5	<0.5
Trichloroethane, 1,1,2,-	µg/L	0.5			<0.5	<0.5
Trichloroethylene	µg/L	0.5	5	MAC	<0.5	<0.5
Trichlorofluoromethane (Freon 11)	µg/L	5			<5	<5
Vinyl Chloride	µg/L	0.2	1	MAC	<0.2	<0.2
Xylene, m,p-	µg/L	1			<1	<1
Xylene, m,p,o-	µg/L	1.1	90, 20	MAC, AO	<1.1	<1.1



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Final Report

REPORT No: 25-015207 - Rev. 0

Parameter	Units	R.L.	Limits	DWG	Client I.D.	
					Sample I.D.	
					Date Collected	
Xylene, o-	µg/L	0.5				

**DWG - Drinking Water Guidelines**

ODWS - Ontario Drinking Water Standards

AO - Aesthetic Objectives

IMAC - Interim Maximum Acceptable Concentration

MAC - Maximum Acceptable Concentration

ODWO - D-5-5 Objective

OG - Operational Guidelines

WL - Warning Level - Sodium Restricted Diets

Summary of Exceedances			
Aesthetic Objectives			
TW1-1	Found Value	Limit	
Turbidity	8.4	5	
TDS (Ion Sum Calc)	510	500	
TW1-2	Found Value	Limit	
TDS (Calc. from Cond.)	503	500	
Iron	0.326	0.3	
TDS (Ion Sum Calc)	522	500	
Maximum Acceptable Concentration			
TW1-1	Found Value	Limit	
Sodium	38.9	20	
TW1-2	Found Value	Limit	
Sodium	40.0	20	
Operational Guidelines			
TW1-1	Found Value	Limit	
Hardness (as CaCO3)	389	100	
TW1-2	Found Value	Limit	
Hardness (as CaCO3)	394	100	
Warning Level - Sodium Restricted Diets			
TW1-1	Found Value	Limit	
Sodium	38.9	20	
TW1-2	Found Value	Limit	
Sodium	40.0	20	



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Data Specialist

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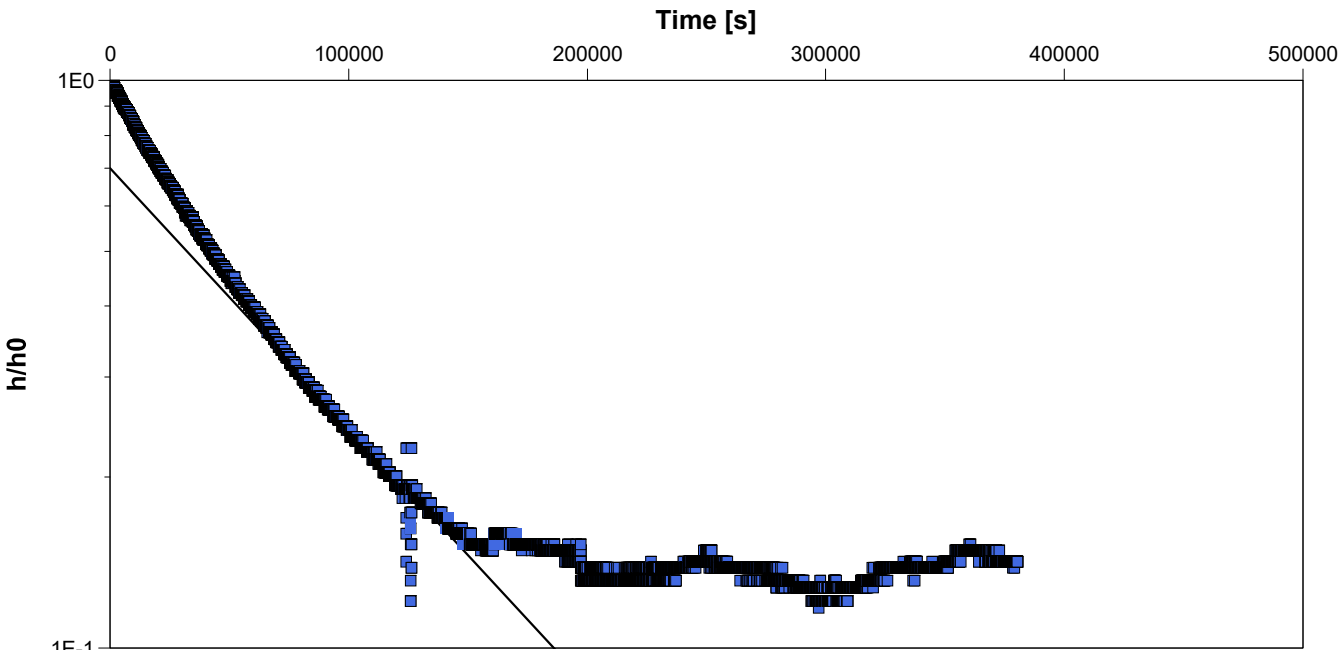



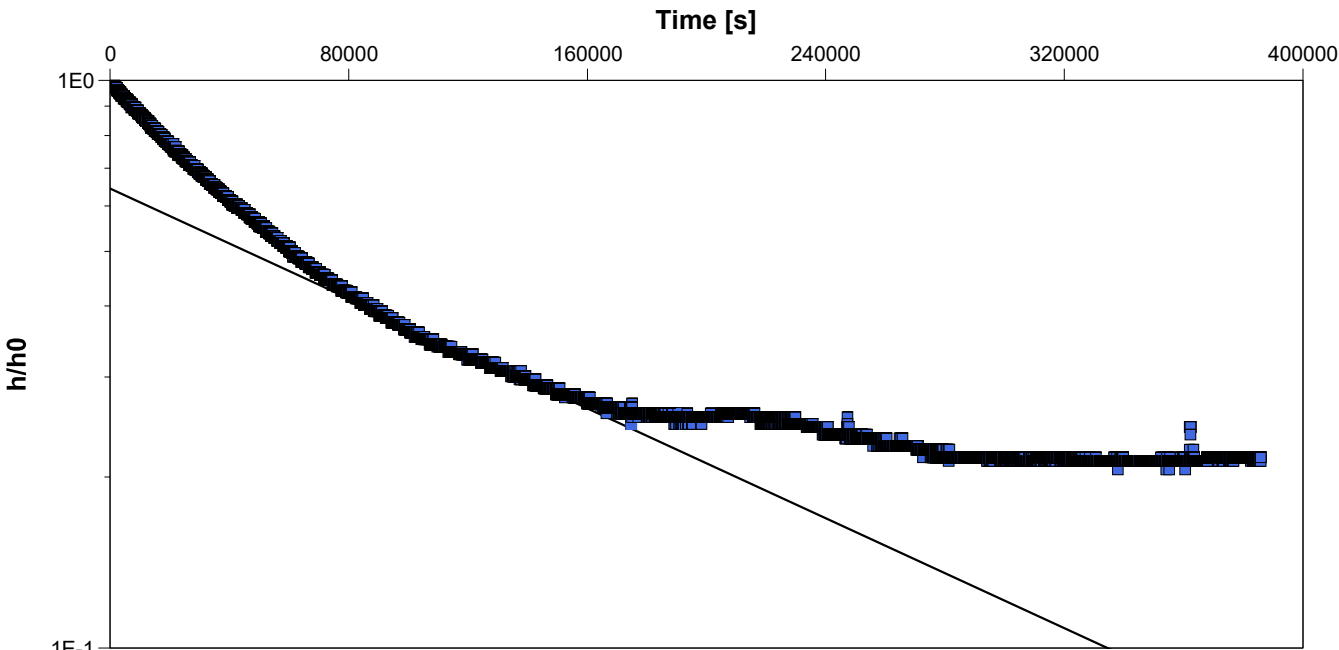
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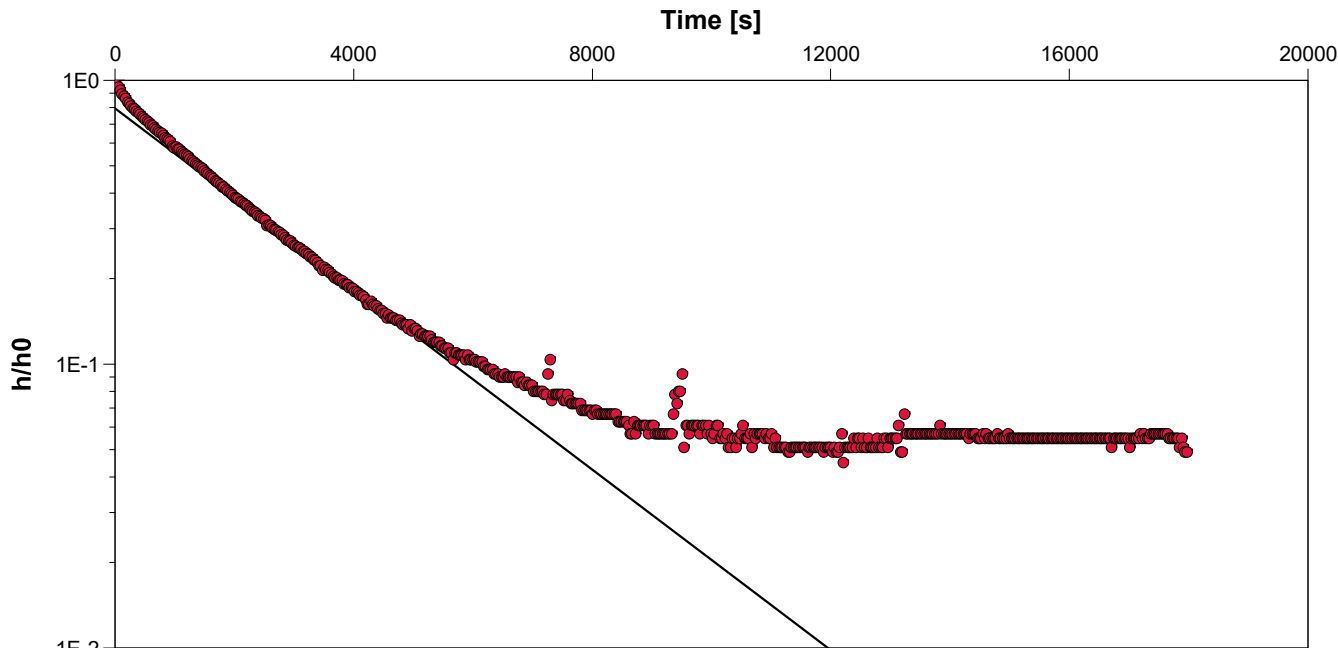
## **Appendix F**


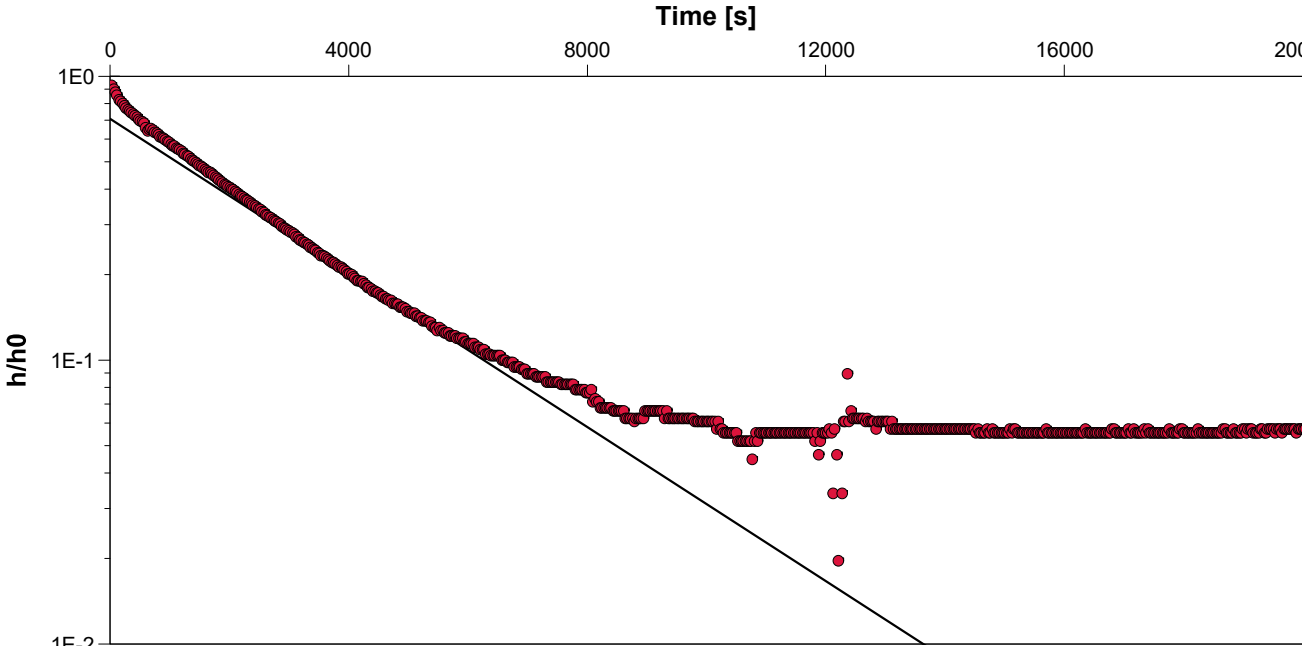
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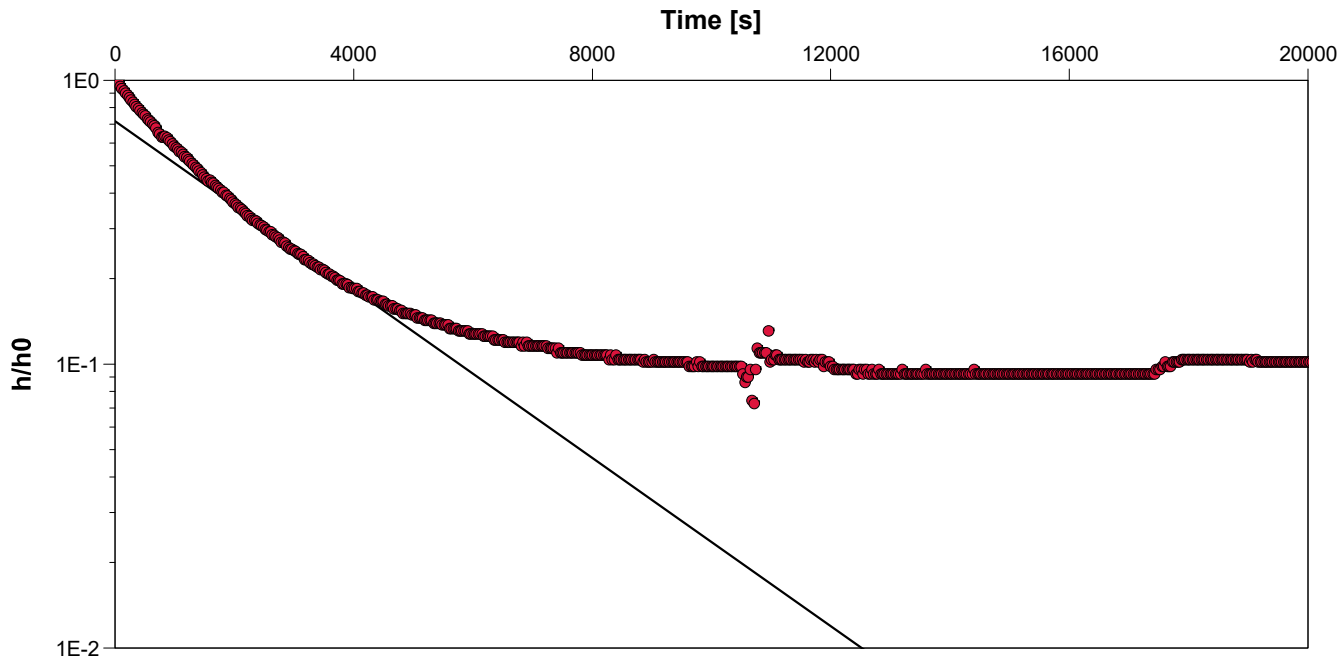
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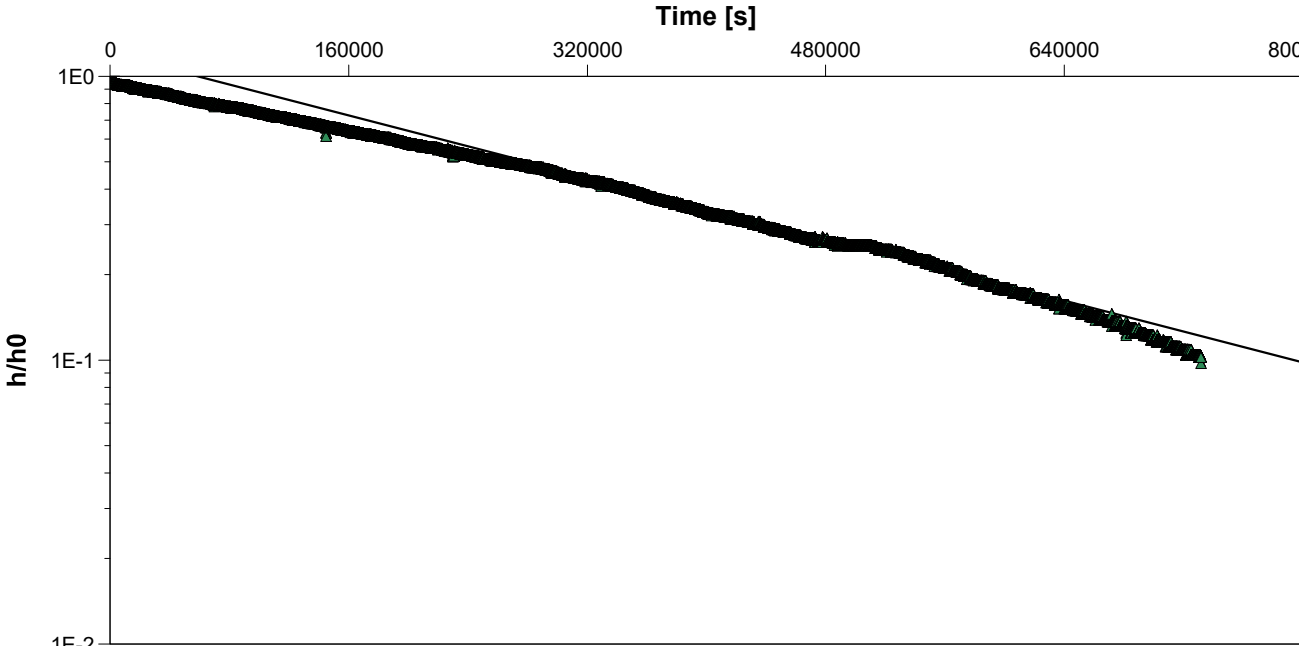
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		Project: Hydrogeological Assessment	
		Number: 17281-002	
		Client: Cassidy EW Construction Consultant Ltd.	
Location: 1386 & 1394 Greely Lane		Slug Test: BH105 - Slug Test 1	Test Well: BH105-23
Test Conducted by: MC		Test Date: 4/19/2024	
Analysis Performed by: NA		Hvorslev	Analysis Date: 7/11/2024
Aquifer Thickness: 2.62 m			
<div><p>Time [s]</p></div>			
Calculation using Hvorslev			
Observation Well	Hydraulic Conductivity [m/s]		
BH105-23	$6.35 \times 10^{-9}$		

		Slug Test Analysis Report	
		Project: Hydrogeological Assessment	
		Number: 17281-002	
		Client: Cassidy EW Construction Consultant Ltd.	
Location: 1386 & 1394 Greely Lane		Slug Test: BH105 - Slug Test 2	Test Well: BH105-23
Test Conducted by: MC		Test Date: 4/19/2024	
Analysis Performed by: NA		Hvorslev	Analysis Date: 7/11/2024
Aquifer Thickness: 2.62 m			
<div><p>Time [s]</p></div>			
Calculation using Hvorslev			
Observation Well	Hydraulic Conductivity [m/s]		
BH105-23	$3.38 \times 10^{-9}$		

		Slug Test Analysis Report	
		Project: Hydrogeological Assessment	
		Number: 17281-002	
		Client: Cassidy EW Construction Consultant Ltd.	
Location: 1386 & 1394 Greely Lane		Slug Test: BH106 - Slug Test 1	Test Well: BH106-23
Test Conducted by: MC		Test Date: 4/19/2024	
Analysis Performed by: NA		Hvorslev	Analysis Date: 7/11/2024
Aquifer Thickness: 2.46 m			
<div><p>Time [s]</p></div>			
Calculation using Hvorslev			
Observation Well	Hydraulic Conductivity [m/s]		
BH106-23	$2.22 \times 10^{-7}$		

		Slug Test Analysis Report	
		Project: Hydrogeological Assessment	
		Number: 17281-002	
		Client: Cassidy EW Construction Consultant Ltd.	
Location: 1386 & 1394 Greely Lane		Slug Test: BH106 - Slug Test 2	Test Well: BH106-23
Test Conducted by: MC		Test Date: 4/19/2024	
Analysis Performed by: NA		Hvorslev	Analysis Date: 7/11/2024
Aquifer Thickness: 2.46 m			
<div><p>Time [s]</p></div>			
Calculation using Hvorslev			
Observation Well	Hydraulic Conductivity [m/s]		
BH106-23	$1.90 \times 10^{-7}$		

		Slug Test Analysis Report	
		Project: Hydrogeological Assessment	
		Number: 17281-002	
		Client: Cassidy EW Construction Consultant Ltd.	
Location: 1386 & 1394 Greely Lane		Slug Test: BH106 - Slug Test 3	Test Well: BH106-23
Test Conducted by: MC		Test Date: 4/19/2024	
Analysis Performed by: NA		Hvorslev	Analysis Date: 7/11/2024
Aquifer Thickness: 2.46 m			
<div><p>Time [s]</p></div>			
Calculation using Hvorslev			
Observation Well	Hydraulic Conductivity [m/s]		
BH106-23	$2.07 \times 10^{-7}$		

		Slug Test Analysis Report	
		Project: Hydrogeological Assessment	
		Number: 17281-002	
		Client: Cassidy EW Construction Consultant Ltd.	
Location: 1386 & 1394 Greely Lane		Slug Test: BH107 - Slug Test 1	Test Well: BH107-23
Test Conducted by: MC		Test Date: 4/19/2024	
Analysis Performed by: NA		Hvorslev	Analysis Date: 7/11/2024
Aquifer Thickness: 2.89 m			
<div><p>Time [s]</p></div>			
Calculation using Hvorslev			
Observation Well	Hydraulic Conductivity [m/s]		
BH107-23	$1.90 \times 10^{-9}$		





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## **Appendix G**

### **Dewatering Calculations**

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DEWATERING CALCULATIONS - CONSTRUCTION PHASE

Modified Dupuit-Forchheimer Equation: unconfined flow into a linear excavation.  
Calculations assume no flow boundary at aquifer base

Excavation Area		Initial Depth to Groundwater	Target Depth to Groundwater	Depth to Base of Aquifer*	Unit Length of Trench (a)	Width of Trench (b)	Hydraulic Conductivity (K)	Drawdown (s)	R	r <sub>w</sub> = b/2	R <sub>o</sub>	ln(R <sub>o</sub> /r <sub>w</sub> )	L = R <sub>o</sub> /2	H	h = H-s	Q <sub>ends</sub>	Q <sub>trench</sub>	Q <sub>total</sub>		
		mbgs	mbgs	mbgs	m	m	m/s	m	m	m	m	-	m	m	m	m <sup>3</sup> /s	m <sup>3</sup> /s	m <sup>3</sup> /s	L/s	L/d
Elongated Trench @ 50 m Increments	Minimum K	0.30	2.50	3.60	50	2	1.90E-09	2.20	0.29	1.00	1.29	0.25	0.64	3.30	1.10	0.000000	0.000001	0.000002	0.002	143
	Maximum K	0.30	2.50	3.60	50	2	2.06E-07	2.20	2.99	1.00	3.99	1.39	2.00	3.30	1.10	0.000005	0.000050	0.000054	0.05	4,702
	Geometric mean K	0.30	2.50	3.60	50	2	1.22E-08	2.20	0.73	1.00	1.73	0.55	0.86	3.30	1.10	0.000001	0.000007	0.000008	0.01	648

s = target drawdown (initial - target depth to groundwater) (m)  
R<sub>o</sub> = radius of influence of construction dewatering/pumping, from center of excavation (m)  
L = distance to line source (m)  
r<sub>s</sub> = equivalent single well radius (m)  
H = Initial hydraulic head in aquifer (m)  
h = hydraulic head at radius of well (m)  
Q = construction dewatering rate (m<sup>3</sup>/s)  
\*For base of aquifer, use target depth to groundwater plus 50% of target drawdown (s), unless specific geological conditions dictate otherwise.  
For practical use, R is presented as zone of influence for reporting purposes, with the distance defined from edge of excavation.

Figure 6.8 Approximate analysis of long, narrow systems.

$$Q = \frac{\pi K(H^2 - h_s^2)}{\ln R_o/r_s} + 2 \left[ \frac{xK(H^2 - h_s^2)}{2L} \right] \quad (6.10b)$$

x = unit length of trench

R = 3000\*s\*sqrt(K)  
Source: Kyrieleis, W. and Sichardt, W. "Grundwasserabsenkung bei Fundierungsarbeiten" Springer, Berlin, 1930

R<sub>o</sub> = R, if R >> r<sub>s</sub>      (R >> rs when R/r<sub>s</sub> > 100)  
else, R<sub>o</sub> = R + r<sub>s</sub>

Source: Cashman and Preene. "Groundwater Lowering in Construction." (2013)

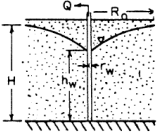
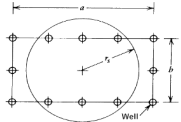
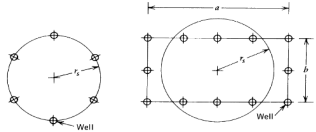


DEWATERING CALCULATIONS - OPERATIONAL PHASE

Modified Dupuit-Forchheimer Equation: unconfined flow into a rectangular excavation.  
Calculations assume no flow boundary at aquifer base

Excavation Area		Initial Depth to Groundwater	Target Depth to Groundwater	Depth to Base of Aquifer*	Excavation Length (a)	Excavation Width (b)	Hydraulic Conductivity (K)	Drawdown (s)	R	$r_w = \sqrt{(ab/\pi)}$	R <sub>o</sub>	ln(R <sub>o</sub> /r <sub>w</sub> )	H	h <sub>w</sub> = H-s	Q <sub>total</sub>		
		mbgs	mbgs	mbgs	m	m	m/s	m	m	m	m	-	m	m	m <sup>3</sup> /s	L/s	L/d
Rectangular excavation with dimensions axb	Minimum K	0.30	1.50	3.60	23	55	1.9E-09	1.20	0.16	20.07	20.22	0.01	3.30	2.10	0.000005	0.005	429
	Maximum K	0.30	1.50	3.60	23	55	2.1E-07	1.20	1.63	20.07	21.70	0.08	3.30	2.10	0.000054	0.05	4,628
Geometric mean K		0.30	1.50	3.60	23	55	1.2E-08	1.20	0.40	20.07	20.46	0.02	3.30	2.10	0.000013	0.01	1,093

s = target drawdown (initial - target depth to groundwater) (m)  
R<sub>o</sub> = radius of influence of construction dewatering/pumping, from center of excavation (m)  
r<sub>s</sub> = equivalent single well radius (m)  
H = Initial hydraulic head in aquifer (m)  
h = hydraulic head at radius of well (m)  
Q = construction dewatering rate (m<sup>3</sup>/s)  
\*For base of aquifer, use target depth to groundwater plus 50% of target drawdown (s), unless specific geological conditions dictate otherwise.  
For practical use, R is presented as zone of influence for reporting purposes, with the distance defined from edge of excavation.



Radial flow, water table aquifier

$$Q_w = \frac{\pi K (H^2 - h_w^2)}{\ln R_o / r_w}$$

(from Table 6.1, pg 67)

\*Use  $r_w = r_s$  for rectangular excavations

R = 3000\*s\*sqrt(K)

Source: Kyrieleis, W. and Sichardt, W.  
"Grundwasserabsenkung bei Fundierungsarbeiten"  
Springer, Berlin, 1930

R<sub>o</sub> = R, if R >> r<sub>s</sub> (R >> r<sub>s</sub> when R/r<sub>s</sub> > 100)  
else, R<sub>o</sub> = R + r<sub>s</sub>

Source: Cashman and Preene. "Groundwater Lowering in Construction." (2013)



---

## **Appendix H**

### **Hydraulic Pumping Test Results**

---



# PUMPING TEST DATA SHEET

Page 1 of   

## CAMBIUM

Project Name: Greedy Lane  
 Project Number: 17  
 Date: May 29, 2025

Staff: Marbatt  
 Contractor: Air Rock Drilling  
 Weather: Raining - 15°C

Well Name: TW1  
 Depth of Pump: -165-170ft  
 Distance to Pump Well: -  
 Static Level: 2.34 mblp  
 Start Time: 8:03

Diameter: 6"  
 Stick up: -  
 MP Elevation: -  
 Geological Unit: -  
 End Time: 16:03

Time	Elapsed Time	Water Level	Draw Down	Recovery	Discharge Volume	Rate Change	Comments & Observations
	0:30	2.50				-5 gal/min	
	1:00	2.48					
	1:30	2.48					* talking to driller
	3:30	2.505					
	4:00	2.50					
	4:30	2.50					
	5:00	2.50					
	6:00	2.50					
	7:00	2.50					
	8:00	2.50					
	9:00	2.50					
	10:00	2.50					
	12:00	2.50					
	14:00	2.50					
	15:00	Rate change				10 g/min	
	16:00	2.54					
	16:30	2.55					
	17:00	2.56					
	17:30	2.55					
	18:00	2.54					
	19:00	2.535					
	19:30	2.53					
	20:00	2.53					
	26:00	2.56					
	31:00	2.54					
	35:00	2.52					
	40:00	2.52					
	45:00	2.52					
	50:00	2.51					
	55:00	2.51					
	1:00:00	2.51					
	1:30:00	2.51					
	2:00:00	2.50					
	2:30:00	2.49					
	3:00:00	2.48					
	3:30:00	2.48					
	4:00:00	2.48					
	4:30:00	2.49					
	5:00:00	2.45					

## Page \_\_\_\_ of \_\_\_\_

Time	Elapsed Time	Water Level	Draw Down	Recovery	Discharge Volume	Rate Change	Comments & Observations
	5:30:00	2.41					
	6:00:00	2.39					
	6:30:00	2.31					
	7:00:00	2.36					
	7:30:00	2.35					
	8:00:00	2.34					
	<del>8:30:00</del>	no check value so attempted to create air lock but do not believe I succeeded					
	1:00	2.17					
	1:30						
	2:00						
	2:30						
	3:00						
	3:30						
	4:00						
	4:30						
	5:00						
	6:00						
	7:00						
	8:00						
	9:00						
	10:00						
	15:00	2.14					



# CAMBIUM

Guiding Good Decisions

Project: 17281-001

Date: May 29, 2025

Subject: Greely Lane P-Test - MWI and gen chem

Staff: M. Latt

Contact:

## MWI W's

test hr	wt mbao
Pre	2.28
1	2.28
2	2.28
3	2.28
4	2.21
5	2.19
6	2.16
7	2.12
Post	2.09

## TWI gen. Chem

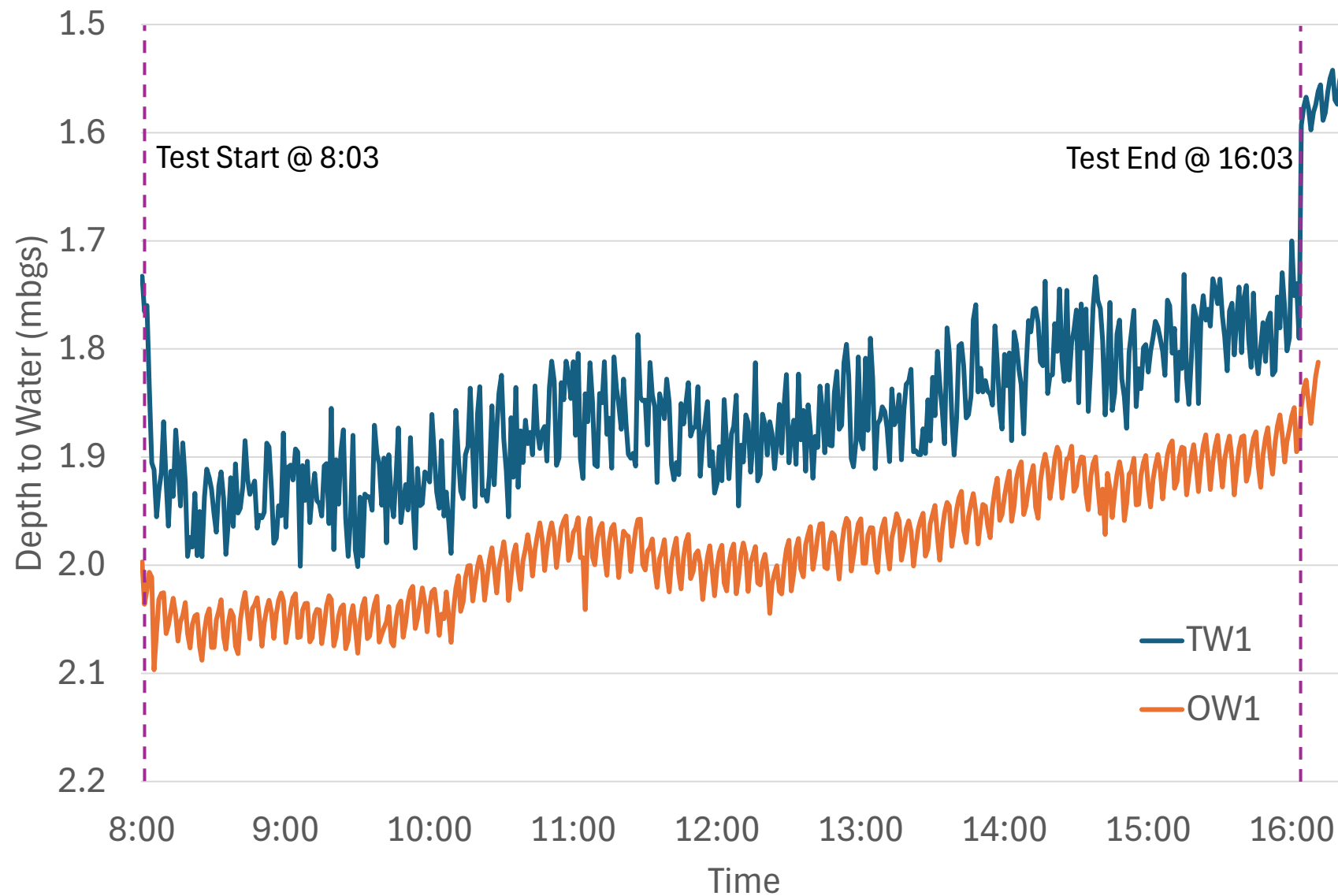
test hr	temp (C)	DO (mg/L)	Cond (µS/cm)	pH	ORP (mV)	Turb (NTU)	chl a (µg/L)	Comments
1	11.2	1.69	663	7.37	-9.4	4.44	0.00	
2	11.5	1.82	669	7.34	-9.4	5.89	0.00	
3	11.6	1.99	682	7.33	-9.3	7.05	0.00	Sampled TWI-1
4	11.4	1.94	684	7.31	-9.6	5.21	0.00	
5	11.3	1.92	688	7.32	-12.8	3.95	0.00	
6	11.7	1.92	640	7.36	-29.2	2.83	0.00	
7	11.8	1.91	691	7.42	-46.1	2.62	0.00	Sampled TWI-2

test hr	Colour	Odour	Clarity	Sheen
1	none	None	Clear	None
2	↓	↓	↓	↓
3	↓	↓	↓	↓
4	↓	↓	↓	↓
5	↓	↓	↓	↓
6	↓	↓	↓	↓
7	↓	↓	↓	↓





## Measured Water Levels for TW1 Pumping Test





# TW1 Pumping Test

Prepared By:

Cambium Inc

Prepared For:

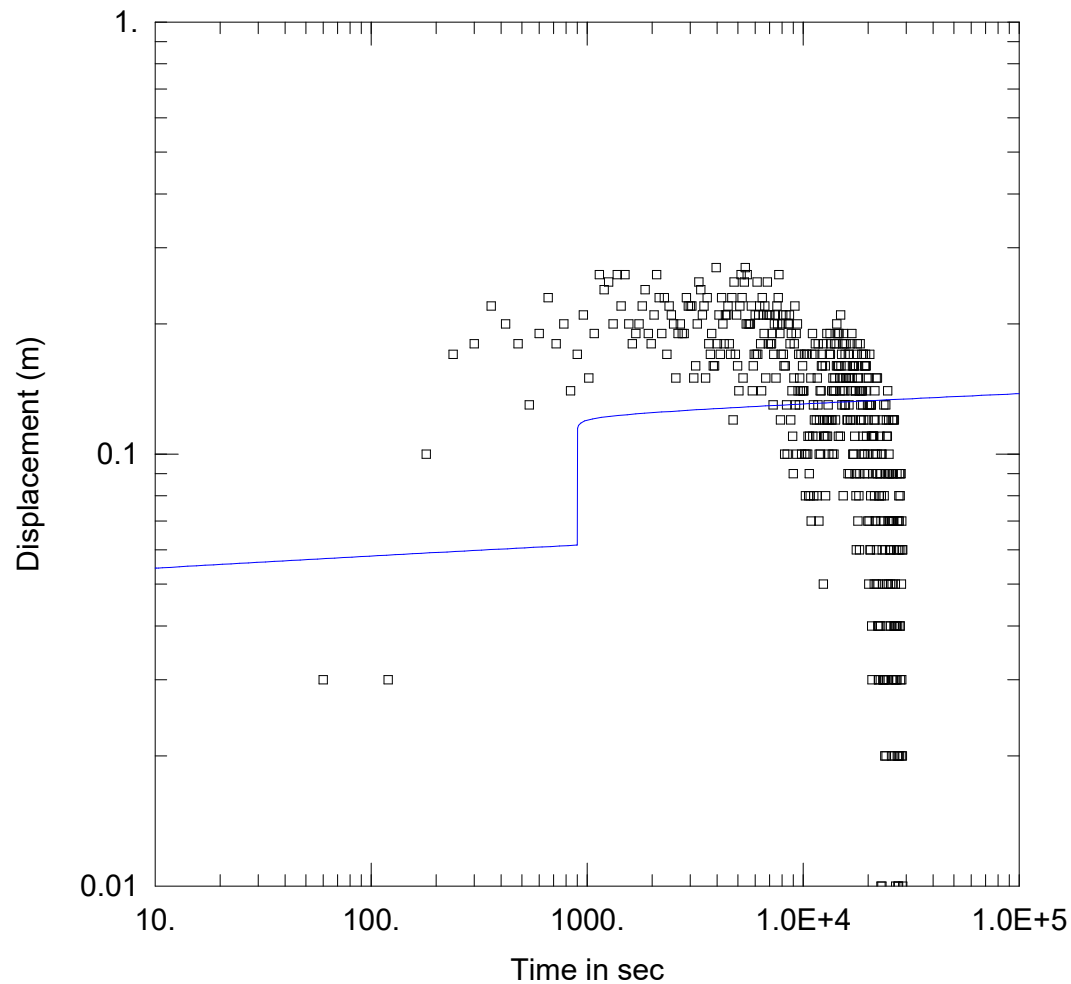
Cassidy E.W. Construction

Project:

17281-002

Location:

Greely Lane, Ottawa



Data Set:

Date: 06/17/25

Time: 11:22:56

## SOLUTION

Aquifer Model: ConfinedSolution Method: TheisT = 0.9563 m<sup>2</sup>/secS = 1.0E-10Kz/Kr = 1.b = 10. m

## WELL DATA

### Pumping Wells

Well Name	X (m)	Y (m)
TW1	0	0

### Observation Wells

Well Name	X (m)	Y (m)
□ TW1	0	0



---

## **Appendix I**

# **Water Balance Calculations and Nitrate Assessment**

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THORNTHWAIT-YPE MONTHLY WATER-BALANCE MODEL													
modified from Dingman 2015: Box 6-8 (pg 299) using ET model of Hamon (1963)													
	Input Data				Computed Values								
										Surplus 397 mm/yr			
Weather Station Location:	Greely, ON				Latitude:		45.3 degree						
Solar Declination (degree)	-20.6	-12.6	-1.5	10.0	19.0	23.1	21.0	13.4	2.6	-9.0	-18.5	-23.0	
DayLength (hr)*	9.0	10.3	11.8	13.4	14.7	15.4	15.0	13.9	12.4	10.8	9.4	8.6	
Available Water Storage Capacity	0.21 m/m			Root Depth		460 mm		SOILmax		96.6 mm			
MONTHLY WATER BALANCE DATA													
Temperatures in C, water-balance terms in mm.													
Month:	J	F	M	A	M	J	J	A	S	O	N	D	Year
=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
TEMPERATURE (T)	-10.3	-8.1	-2.3	6.3	13.3	18.5	21.0	19.8	15.0	8.0	1.5	-6.2	944
PRECIPITATION (P)	65.4	54.3	64.4	74.5	80.3	92.8	91.9	85.5	90.1	86.1	81.9	76.4	
RAIN	25.0	18.7	31.1	63.0	80.1	92.8	91.9	85.5	90.1	82.2	64.5	33.5	
SNOW	40	36	33	12	0	0	0	0	0	4	17	43	
MELT FACTOR (F)	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.25	0.00	
PACK	96	132	165	0	0	0	0	0	0	0	13	56	
MELT	0	0	0	177	0	0	0	0	0	4	4	0	
INPUT (W)	25	19	31	240	80	93	92	86	90	86	69	34	
POTENTIAL ET (PET)	0	0	0	41	73	101	118	101	65	38	21	0	
NET INPUT (ΔW)	25	19	31	199	8	-8	-26	-16	25	48	48	34	
SOIL MOISTURE (SOIL)	97	97	97	97	97	89	68	58	82	97	97	97	
ΔSOIL	0	0	0	0	0	-8	-21	-10	25	14	0	0	
ET	0	0	0	41	73	100	113	96	65	38	21	0	
SURPLUS=W-ET-DSOIL	25	19	31	199	8	0	0	0	0	34	48	34	
Notes:													
Precipitation, Rain, Temperature, and Latitude are inputted parameters													
SOILmax = available water storage capacity * root depth													
m = month													
D = Day length (hrs) =2*cos <sup>-1</sup> (-tan(Latitude)*tan(Declination))/0.2618 [calculation is in radians]													
SNOW <sub>m</sub> = P <sub>m</sub> -RAIN <sub>m</sub>													
F <sub>m</sub> = 0 if T <sub>m</sub> <= 0°C; F <sub>m</sub> = 0.167*T <sub>m</sub> if 0°C<T <sub>m</sub> <6°C; F <sub>m</sub> = 1 if T <sub>m</sub> >=6°C													
PACK <sub>m</sub> = (1-F <sub>m</sub> )*(SNOW <sub>m</sub> +PACK <sub>m-1</sub> )													
MELT = F <sub>m</sub> *(SNOW <sub>m</sub> +PACK <sub>m-1</sub> )													
W <sub>m</sub> = RAIN <sub>m</sub> +MELT <sub>m</sub>													
PET = 0 if T <sub>m</sub> <0; otherwise PET = 2.98*0.611*exp(17.3*T <sub>m</sub> /(T <sub>m</sub> +237)))/(T <sub>m</sub> +237.2)*Number of days in month [Hamon ET model (1963)]													
ΔW <sub>m</sub> = W <sub>m</sub> -PET <sub>m</sub>													
SOIL = min{[ΔW <sub>m</sub> +SOIL <sub>m-1</sub> ], SOILmax}, if ΔW <sub>m</sub> >0; otherwise SOIL = SOIL <sub>m-1</sub> * exp(ΔW/SOILmax)													
ΔSOIL = SOIL <sub>m-1</sub> -SOIL <sub>m</sub>													
ET = PET if W <sub>m</sub> > PET; otherwise, ET=W <sub>m</sub> -ΔSOIL													



Nitrate Attenuation

Calculations for Rural Developments

Input Data		Computed Values			
<u>Areas</u>	LOT #1	Total			
LOT AREA (m <sup>2</sup> )	1171	1171			
<u>Surplus water</u>		<u>Infiltration Factor</u>			
0.397 m/yr	Flat	0.3			
1.09E-03 m/day	Loam	0.3			
1.273338 m <sup>3</sup> /day	Cultivated land	0.1			
	Total	0.7			
<u>Infiltrated water</u>		<u>Captured Runoff</u>			
0.000761 m/day		WB deficit	555 m <sup>3</sup> /yr	1.52054795 m <sup>3</sup> /day	
0.891337 m <sup>3</sup> /day	<u>Runoff</u> 0.382 m <sup>3</sup> /day	Min infiltration	240 m <sup>3</sup> /yr	0.65753425 m <sup>3</sup> /day	

PREDICTED NITRATE CONCENTRATIONS

Waterloo Biofilter System (80.3% Nitrate Reduction)				
Qe	1800			
Ce	7.88			
Qi	891.34			
Ci	0.1			
Qt	2691.34			
mg/L	5.3			



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## **Appendix J**

# **Waterloo Biofilter Supporting Documentation**

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## WaterNOx-LS Third Party Testing Summary

In the fall of 2016, Waterloo Biofilter Systems Inc. installed their WaterNOx-LS™ denitrification unit at the Bureau de Normalisation du Quebec (BNQ) test site located in Quebec City. The system underwent BNQ 3680-600 test protocol which includes two parts - Period A and Period B. Period A is based on the methodology of NSF/ANSI Standards 40 and 245, containing the same flow patterns and stress tests. Period B provides for a further 6 months of seasonal reliability testing to ensure that the test includes cold weather results.

The WaterNOx-LS is a passive autotrophic denitrification process using sulphur-limestone minerals in a submerged, up-flow configuration. The WaterNOx-LS, which was sized for 1,600 L/day (350 gpd) followed a Waterloo Biofilter nitrifying treatment unit.

### **Period A Test Results**

During Period A wastewater is dosed according to the hydraulic loading specified in NSF-40. Period A includes the wash-day, working-parent, power failure, and vacation period stress tests. All sample results taken during stress tests are included in the analysis. Influent wastewater temperature values ranged from 10.0 °C (50 °F) to 16.5 °C (62 °F) with an average value of 13.3 °C (56 °F). Influent pH averaged 7.9 and effluent pH averaged 7.2.

**Table 1 – Period A Results for the WaterNOx-LS**

Parameters	Influent	Effluent	Removal
(c)BOD <sub>5</sub>	260	6	97.6%
TSS	312	3	99.2%
Fecal Coliforms	2,403,000	4,900	99.8%
NO <sub>2,3</sub>	0.08	0.20	
TKN	57.1	4.6	92.0%
TN	57.1	4.8	91.6%

n = 123; n = 357 for fecals

All parameters in mg/L except Fecal Coliforms in cfu/100mL

All values arithmetic averages except Fecal Coliforms in geometric average

Weekly influent total nitrogen concentrations ranged from 43.0 mg/L to 68.8 mg/L with a six-month average concentration of 57.1 mg/L.

Weekly effluent NO<sub>2,3</sub> concentrations ranged from < 0.02 mg/L to 3.33 mg/L with a six-month average of 0.20 mg/L. Weekly effluent TKN concentrations ranged from 1.5 mg/L to 16.9 mg/L with a six-month average of 4.6 mg/L. Weekly effluent total nitrogen concentrations ranged from 1.7 mg/L to 17.1 mg/L with a six-month average of 4.8 mg/L. The total nitrogen reduction over the six-month period was 91.6%.



## Period B Test Results

Weekday hydraulic loading is modified during Period B to a strenuous 'working parent' schedule where 40% of the flow is delivered over three hours in the morning, and 60% is delivered over three hours in the evening. All samples taken during Period B are included in the analysis. Influent wastewater temperature values ranged from 10.1 °C (50 °F) to 15.8 °C (60 °F) with an average value of 12.3 °C (54 °F). Influent pH averaged 8.0 and effluent pH averaged 7.1.

**Table 2 – Period B Results for the WaterNOx-LS**

Parameters	Influent	Effluent	Removal
(c)BOD <sub>5</sub>	248	4	98.2%
TSS	304	3	99.1%
Fecal Coliforms	2,142,000	2,800	99.9%
NO <sub>2,3</sub>	0.17	3.38	
TKN	60.3	8.5	85.9%
TN	60.4	11.9	80.3%

n = 59 except Fecal Coliforms n = 118

All parameters in mg/L except Fecal Coliforms in cfu/100mL

All values arithmetic averages except Fecal Coliforms in geometric average

Weekly influent total nitrogen concentrations ranged from 21.2 mg/L to 85.6 mg/L with a six-month average concentration of 60.4 mg/L.

Weekly effluent NO<sub>2,3</sub> concentrations ranged from < 0.04 mg/L to 15.2 mg/L with a six-month average of 3.38 mg/L. Weekly effluent TKN concentrations ranged from 1.2 mg/L to 21.2 mg/L with a weekly average of 8.5 mg/L. Weekly effluent total nitrogen concentrations ranged from 3.7 mg/L to 22.2 mg/L with a six-month average of 11.9 mg/L. The total nitrogen reduction over the six-month period was 80.3%.

## Conclusion

In summary, the WaterNOx-LS system can successfully remove very high levels of total nitrogen passively, while buffering pH to neutral and keeping cBOD<sub>5</sub> and TSS levels below 10 mg/L.