CITY OF CLARENCE-ROCKLAND

BIOSOLIDS LAGOONS

2019 ANNUAL GROUNDWATER MONITORING REPORT

April 2020

April 30, 2020

City of Clarence Rockland
1560 Laurier Street
Rockland, Ontario
K4K 1P7

Attn: Nicolas Burelle, Infrastructure and Environmental Technologist

Subject: City of Clarence-Rockland Biosolid Lagoons,
2019 Annual Groundwater Monitoring Report
Certificate of Approval No. 3-0466-93-967

Dear Mr. Burelle,

WSP Canada Inc. (WSP) was retained the City of Clarence-Rockland to complete the 2019 annual groundwater monitoring of the Clarence-Rockland Biosolids Lagoons in accordance with the conditions of the site's Environmental Compliance Approval (ECA) No. 3-0466-93-967. WSP is pleased to submit herein the results of the 2019 groundwater monitoring program in this City of Clarence-Rockland Biosolids Lagoons 2019 Annual Groundwater Monitoring Report.

Should you require further information concerning this report, please do not hesitate to contact the undersigned.

Sincerely,

WSP Canada Inc.

Jennifer Brown-Hawn
Team Leader – Environment

JBH/jbh

cc. City of Clarence Rockland
Willy de Wit, WSP

1345 Rosemount Avenue
Cornwall, ON
Canada K6J 3E5

T: +1 613 933-5602
F: +1 613 936-0335
wsp.com

SIGNATURES

PREPARED BY

Angela Flipsen
Environmental Technician

REVIEWED BY

Jennifer Brown-Hawn
Team Leader - Environment

Willy de Wit, M.A.Sc., P.Eng.
Process / Environmental Engineer - Environment

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APPENDIX

1 INTRODUCTION

1.1 SCOPE

WSP was retained by the Corporation of the City of Clarence Rockland (City) to undertake the annual groundwater monitoring and reporting pursuant to satisfying the conditions prescribed by the amended Certificate of Approval (CofA) number 3-0466-93-967, Notice 3 originally issued February 8, 1996, included in **Appendix D**. This report covers the activities at the site for the period of February 2019 to January 2020. Specifically, the scope of the monitoring program included:

- Record static water levels at the 12 on-site monitoring wells quarterly;
- Collect representative groundwater samples from each of the 12 monitoring wells two (2) times per year;
- Compare groundwater sample results to the established groundwater triggers, as well as Provincial Water Quality Objectives (PWQO) where appropriate; and,
- Compile and interpret the data and prepare a report summarizing the findings.

1.2 FACILITY DESCRIPTION

The City owns and operates a municipal wastewater treatment plant on part of Lots 22 and 23, Concession 1 in the City of Clarence-Rockland at the municipal address of 600 Rue Industrielle (the site) as illustrated in **Figure 1** included in **Appendix A**. The facility includes two (2) biosolids storage lagoons located in an area that is fenced and closed to the public.

The site is located in an area designated as *Business Park* in accordance with the City of Clarence-Rockland Official Plan which permits general light industrial activities. The land surrounding the site to the south and east are developed industrial properties. The area adjacent to the west is currently zoned to accommodate low-density residential land use. The Ottawa River is located approximately 120 meters north/northeast of the biosolids lagoons. Immediately south/southeast of the lagoons is a municipal leaf and yard waste transfer station.

1.3 GEOLOGY

The geology of the site was evaluated based on review of six (6) borehole logs, and well records for the area provided by the Ministry of Environment, Conservation and Parks (MECP). **Figure 1** included in **Appendix A** illustrates the well locations and approximate site boundary. Borehole logs for some of the monitoring wells on the property were not available for review. Borehole logs which were available for review are included in **Appendix C**.

The site is generally composed of a topsoil layer overlaying a fine to medium-grain sand layer followed by a deposit of gray-brown clay. Monitoring wells MW11-6 (north) and MW11-10 (south) did not present a sand layer, instead the clay layer was evident below the topsoil. This indicates that the sand layer is localized to the area between monitors MW11-6 and MW11-10. It is also noted that a clayey, fill material was observed from boreholes in the immediate vicinity of the lagoons, namely BH03-4, MW11-8 and MW11-9, possibly associated with the construction of the lagoons.

2 MONITORING PROGRAM

The monitoring program has been developed in consultation with Ministry of the Environment, Conservation and Parks (MECP) and is documented in the Site's CofA. The monitoring wells are distributed so as to characterize the overburden groundwater upgradient, and downgradient of the lagoons. The monitoring program requires semi-annual groundwater sampling and quarterly water level measurements at 12 monitoring wells on the site. Section 2.1 of the CofA requires groundwater quality to be compared against trigger limits, and water table elevation measurement to ensure a 0.5m separation from the surface is maintained.

WSP was retained in September 2019 to complete the monitoring program. Water level measurements and groundwater sampling occurred on September 20 and November 13, 2019. In addition to these dates, water level measurements were also recorded on January 14, 2020. During each sampling event, the static groundwater levels were collected prior to purging. Each monitoring well was purged a minimum of three (3) well volumes, or purged dry and allowed to recover, prior to sampling using the dedicated Waterra™ tubing equipped with a foot valve.

Representative groundwater samples were collected in laboratory prepared sample bottles. Samples collected for dissolved metals analysis were field-filtered with disposable in-line 0.45 µm filters. All sample bottles were filled to the shoulder or neck of the bottle unless otherwise instructed by the laboratory. Samples were packed into coolers with ice under chain of custody and shipped the same day to a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory for analysis. Field water quality measurements including pH, conductivity, temperature, and oxygen-reduction potential (ORP) were recorded at the time of sampling. The groundwater samples were analyzed by the laboratory for the following parameters in accordance with the ECA and consistent with previous monitoring programs:

- Total ammonia, Nitrate, Nitrite, Sulphate, Chloride
- Total phosphorus, Total Kejdhal Nitrogen (TKN)
- Biological Oxygen Demand (BOD), Total Dissolved Solids (TDS)
- Dissolved metals

3 RESULTS

3.1 GROUNDWATER FLOW

A 0.5 m separation from the works to the water table is required by Section 2 of the CofA. Monitoring wells MW11-8 and MW11-9 are located in the immediate vicinity of the lagoons. In 2019, these wells indicated the water table was at least 3.0 m from the surface. Conservatively considering the lagoon top of slopes at a similar elevation to these wells, including the operating depth of 1.8 m and freeboard of 0.6 m, this provided for at least 0.5 m of separation from the works to the water table during each of the monitoring events.

Since 2016, monitoring wells MW-4, MW-5, and MW11-6 frequently had static water levels closer to the ground surface than 0.5 m, however these are situated the furthest downgradient from the lagoons, are in an area of low relief, and in close proximity to a watercourse.

Potentiometric groundwater contours were developed for the overburden based on the September 20, 2019 static water elevations which are summarized in **Table 1** included in **Appendix B**. The inferred groundwater flow direction in the overburden is generally north and northwest towards the Ottawa River and Clarence Creek as illustrated on **Figure 3** included in **Appendix A**. These observations are generally consistent with the findings of earlier monitoring programs.

There appears to be some groundwater mounding effects in the immediate vicinity of the lagoons based on the water levels measured at MW11-8 and MW11-9. This is particularly apparent in MW11-9 as water

levels at this monitor are consistently higher than at other locations at similar relative positions along the gradient.

3.2 GROUNDWATER QUALITY

The results of the groundwater chemical analysis were tabulated and are summarized in **Table 2** included in **Appendix B**. The results were used to undertake assessment of the site's trigger values, as well as compare against the limits prescribed by the Ontario Drinking Water Quality Standards/Guidelines (ODWQS) and MECP publication *Provincial Water Quality Objectives (PWQO)* since there are groundwater uses on adjacent properties, and groundwater discharges to nearby surface water respectively. The comparison to the ODWQS and PWQO is for information purposes only.

No samples were collected from BH03-4 in September 2019, or from MW17-2 in September and November 2019, due to the wells being dry. Monitoring well MW-5 was not sampled during the 2018 sampling year due to the well being damaged. In September 2019, WSP made temporary alterations to MW-5 to enable sample collection. The analytical results are included in **Appendix E**.

The following are specific noteworthy observations:

- Monitoring wells MW11-8 and BH03-4 had significantly elevated ammonia concentrations compared to the background well MW-3.
- Total phosphorus concentrations exceeded the PWQO limit of 0.02 mg/L at each monitoring well during the September and November 2019 sampling events including at the background well MW-3.
- Monitoring well MW-2 exceeds the limit prescribed by the ODWQS for nitrate of 10 mg/L during both sampling events. Although not exceeding, monitoring wells MW17-01 and BH03-04 had significantly higher nitrate concentrations than the background monitor MW-3.
- Monitoring wells MW11-6 and MW11-7 had concentrations of chloride above the ODWQS limit and significantly elevated compared to other monitors.
- MW11-8 and BH03-04 had significantly elevated TKN during both monitoring events compared to the background monitor MW-3.

3.3 GROUNDWATER TRIGGER ASSESSMENT

In accordance with the site's CofA, nitrate, nitrite and total phosphorus are required to be assessed as indicators of downgradient groundwater impacts associated with the activities at the site. If trigger concentrations are exceeded at the downgradient or boundary monitoring wells, then the "plan of action" described in the CofA shall be implemented. Specific details associated with the "plan of action" or otherwise contingency measures associated with trigger exceedances were not reviewed as part of this mandate. Based on earlier correspondence with the MECP by other consultants, total ammonia was recommended to be included as an additional indicator parameter and has been included in WSP's assessment.

Previous annual reports prepared by others, designated MW-3 and MW11-10 as the background comparison for the trigger evaluation; however, after a review of the location of MW11-10, groundwater flow, and proximity to the adjacent leaf and yard waste transfer station, a main road, and neighboring storage facility, it was decided that MW-3 is better suited as a background monitor for the purposes of trigger assessment as the conditions at MW11-10 may be influenced by the adjacent activities. As previously discussed in Section 3.1, the sites groundwater flow is toward the Ottawa River located north/northeast of the site.

Based on recent previous annual monitoring reports prepared by others, the trigger limit is assigned as the median value for each parameter from 2003 until the corresponding monitoring event. **Table 3** included in **Appendix B** compares the trigger value calculated at MW-3, to the values measured at the boundary monitors during each sampling event in 2019. Trigger limits were exceeded in September 2019 for ammonia at MW-4, MW-5 and MW17-01 and for nitrate at MW-5 and MW11-6.

During the November 2019 sampling event, MW-4 and MW-5 exceeded the trigger limit for ammonia however as did the background monitor MW-3. Total phosphorus at MW-3 in the November 2019 monitoring period also exceeded the trigger limit. This suggests that, under certain groundwater conditions, the water quality at MW-3 might be subject to influence from possible unknown upgradient sources of contamination as the median concentrations used in the trigger assessment for both total phosphorus and ammonia are significantly lower than their respective maxima, as well as both much closer to their respective minima.

4 CONCLUSIONS

It is evident that there are groundwater impacts associated with the operation of the biosolids storage lagoons. There is evidence of groundwater mounding in the vicinity of the lagoons, and the elevated concentrations of contaminants in the groundwater downgradient, and in the immediate vicinity of the lagoons, suggests that exfiltration from the lagoons is occurring resulting in impacts to groundwater.

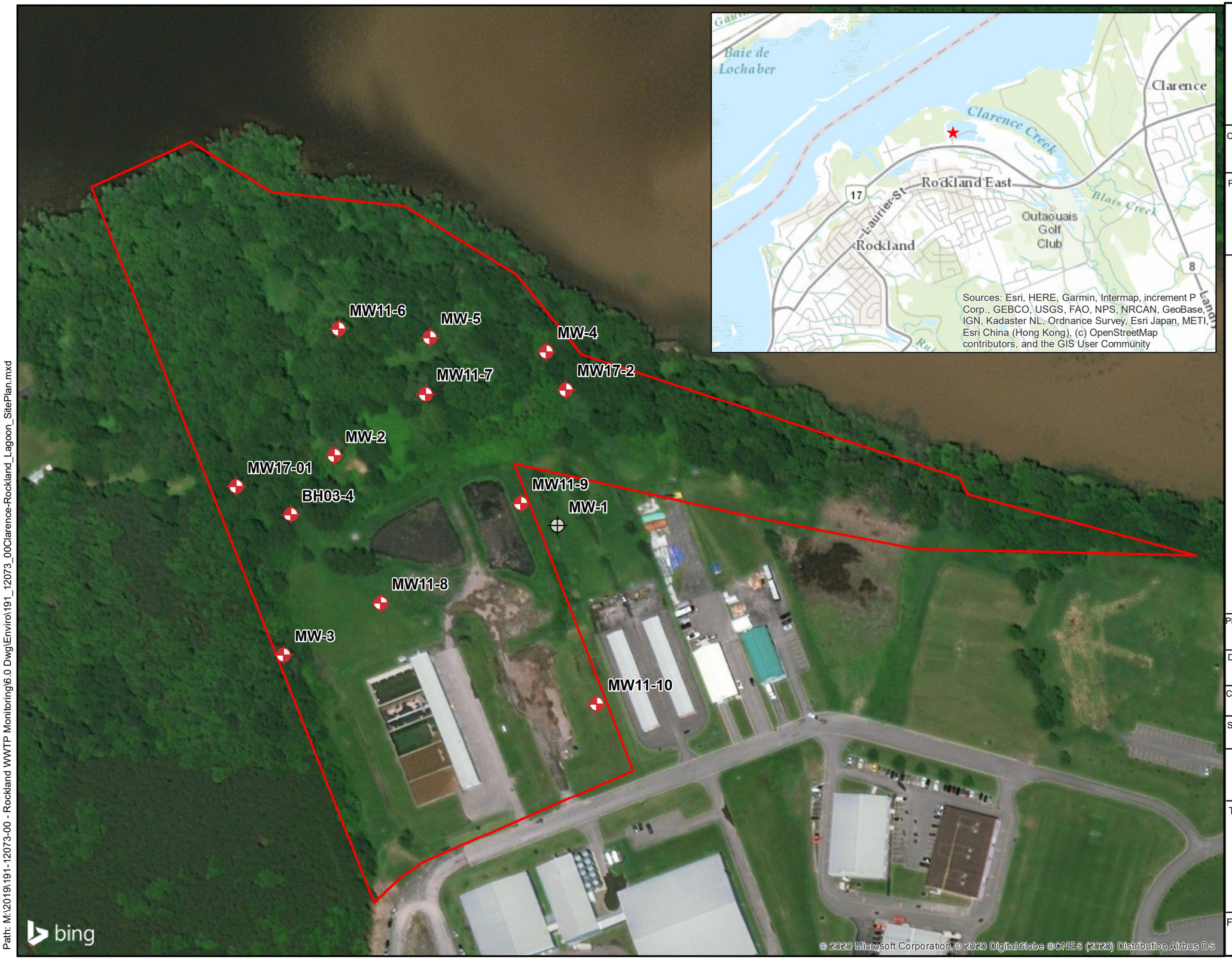
It is unclear if the groundwater impacts associated with apparent exfiltration from the biosolids lagoons is via the lagoon floor and/or embankments, or otherwise via the supporting structures including the biosolids transfer force main apparatus, or the lagoon supernatant decanting system and associated gravity sewers.

5 RECOMMENDATIONS

- A detailed inspection of the condition of the biosolids lagoon's floors and embankments, as well as the associated structures and gravity sewers should be undertaken to identify if there is evidence of exfiltration of lagoon sludge or supernatant. This should include visual inspection of the lagoon liners and surface works, as well as closed-circuit television inspection of the biosolids transfer force main and supernatant gravity sewers.
- The monitoring plan should continue in 2020. The suite of groundwater analysis at each of the monitoring wells should include the critical and key indicator parameters for groundwater impact assessment purposes identified in the MECP publication *Design Guidelines for Sewage Works*. This would include the addition of analysis of dissolved oxygen, sodium, potassium, total organic carbon, and organic nitrogen to the monitoring plan.
- Detailed chemical characterization of the sludge and supernatant water in the biosolids lagoons should be undertaken to confirm if groundwater impacts are associated with the lagoons based on chemical signatures of the lagoon contents.
- In addition to the current trigger assessment, and evidence of groundwater mounding which may be causing radial groundwater flow in the immediate vicinity of the lagoons, particularly the west lagoon which situated closed to the property boundary, evaluation of groundwater impacts should also be undertaken in accordance with the MECP publication *Guideline B-7 - Incorporation of the Reasonable Use Concepts into Ground Water Management Activities*. This framework provides a mechanism for determining acceptable off-property impacts on groundwater resources associated with the biosolids lagoons.
- Monitoring wells MW11-6 and MW11-7 had significantly elevated concentrations of chloride compared to other monitors. These elevated chloride concentrations are not evident in other monitoring wells exhibiting evidence of impact associated with the biosolids lagoons. The reason for the elevated sodium content in these monitors should be investigated, particularly since these elevated chloride concentrations are not observed at nearby monitors MW-2 and MW-5.
- A licensed well contractor should make the necessary repairs to MW-5, or otherwise decommission this well in accordance with O. Reg. 903 and install a suitable replacement well.
- A review of the suitability of MW11-10 for use as a background monitor should be undertaken given the development of upgradient activities, particularly the leaf and yard waste transfer station and adjacent self-storage business.

APPENDIX

A FIGURES



1345 ROSEMOUNT AVENUE
CORNWALL ONTARIO
CANADA K6J 3E5
PHONE: 613-933-5602 FAX: 613-936-0335
WWW.GENIVAR.COM

CLIENT
CITY OF CLARENCE -ROCKLAND

PROJECT
BIOSOLIDS STORAGE LAGOONS
2019 ANNUAL GROUNDWATER MONITORING

LEGEND

- APPROXIMATE SITE LOCATION
- APPROXIMATE SITE BOUNDARY
- MW-1 LEGACY WELLS
- MW-3 MONITORING WELLS

PROJECT NUMBER: 191-12073-00	DATE: MARCH 2020
DRAWN BY: AF	
CHECKED BY: WD	
SCALE BAR: 1:2,000	

0 25 50 100 Meters
NAD 1983 Zone 18

TITLE

SITE PLAN AND MONITORING LOCATIONS

FIGURE NUMBER
FIGURE 1

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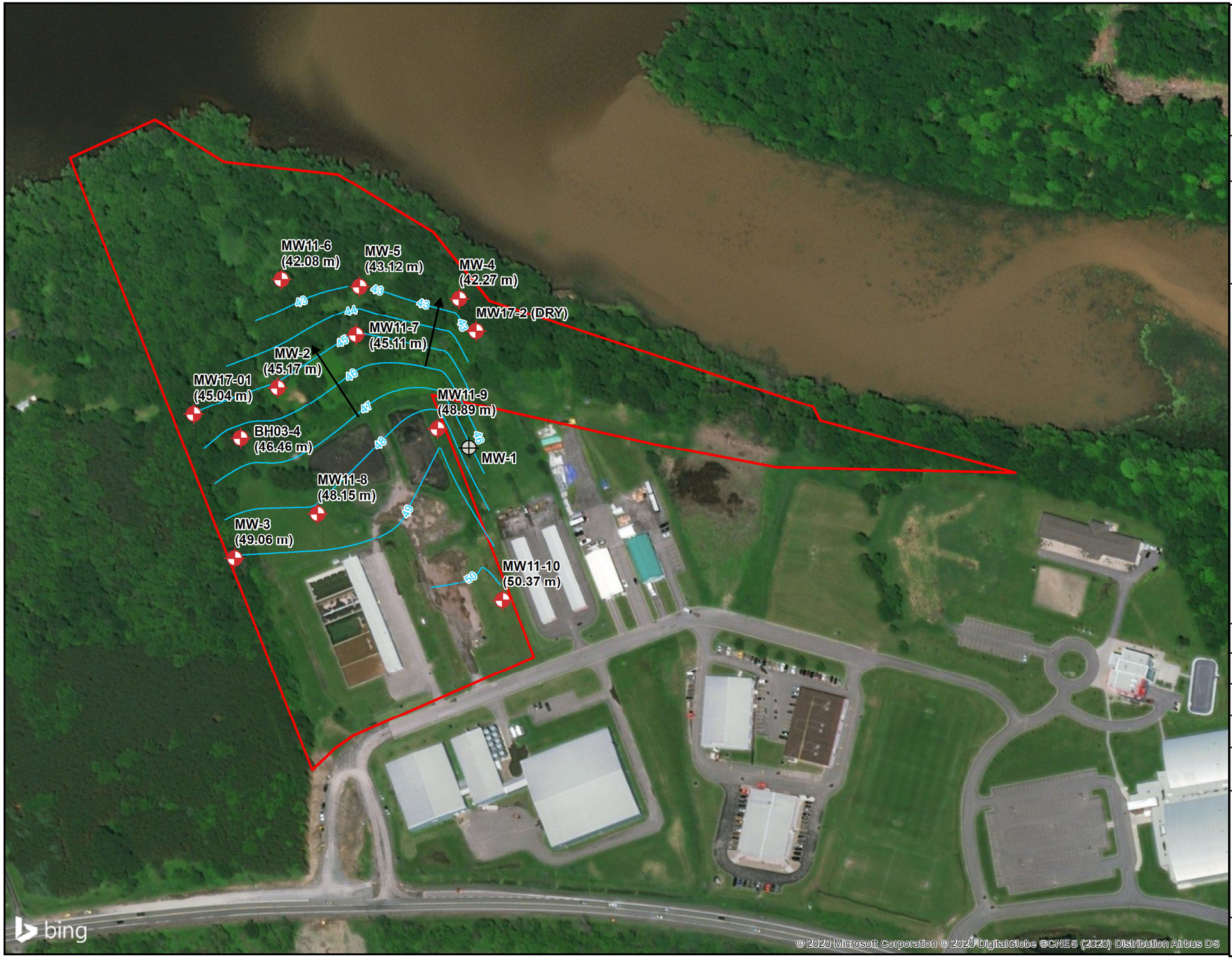

1345 ROSEMOUNT AVENUE
CORNWALL, ONTARIO
CANADA K6J 3E5
PHONE: 613-933-5602 FAX: 613-936-0335
WWW.WSP.COM

CLIENT:

CITY OF CLARENCE-ROCKLAND

PROJECT:

BIOSOLID STORAGE LAGOONS
2019 ANNUAL GROUNDWATER
MONITORING

LEGEND

- APPROXIMATE SITE BOUNDARY
- MW-2 — MONITORING WELL AND SEPTEMBER 2019 WATER LEVEL (mASL)
- MW-1 — LEGACY MONITORING WELL
- 45 — POTENTIOMETRIC ELEVATION CONTOUR (mASL)
- INFERRED GROUNDWATER FLOW DIRECTION

PROJECT NUMBER:	191-12073-00	DATE:	MARCH 2020
DRAWN BY:	GR/LSM		
CHECKED BY:	JBH		
SCALE:	1:2,500		

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NAD1983 ZONE 18

TITLE

INTERPRETED
GROUNDWATER CONTOURS
SEPTEMBER 2019

FIGURE NUMBER:

FIGURE 2

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APPENDIX

B TABLES

Rockland WWTP Monitoring
WSP Project No. 191-12073

Table 1
Potentiometric Elevations

Monitor I.D.	Top of Casing (masl)	Ground Elevation (masl)	Total Depth (m)	Static Water Levels (masl) 1-Jun-16	17-Oct-16	3-Jul-18	22-Aug-18	8-Nov-18	22-Jan-19	20-Sep-19	13-Nov-19	14-Jan-20
BH03-04	51.37	50.69	5.27	46.77	46.48	46.63	46.49	46.81	46.62	46.46	46.74	46.68
MW2	49.09	48.36	5.37	45.81	45.17	45.64	45.37	45.32	45.62	45.17	45.40	45.51
MW3	52.56	51.77	5.82	50.15	48.97	49.95	49.62	50.15	50.33	49.06	49.68	50.80
MW4	44.68	43.43	3.83	42.46	41.72	42.38	42.88	43.01	42.36	42.27	42.87	43.02
MW5	44.98	43.71	2.69	43.57	43.45	Damaged	Damaged	Damaged	Damaged	43.12	43.51	43.25
MW11-6	43.72	42.81	5.53	42.35	41.51	42.19	42.30	42.68	42.62	42.08	42.54	42.63
MW11-7	49.00	48.33	7.62	--	45.18	45.48	45.24	45.29	45.45	45.11	45.33	45.41
MW11-8	52.17	51.24	6.32	48.49	48.14	48.24	48.18	48.35	48.16	48.15	48.24	48.18
MW11-9	53.43	52.58	6.33	49.22	48.89	49.12	49.03	48.99	48.87	48.89	49.02	48.88
MW11-10	52.35	51.51	5.44	50.40	50.33	50.44	50.58	51.22	--	50.37	51.05	50.83
MW17-1	50.23	49.35	5.55	--	--	44.88	44.56	44.47	44.81	45.04	45.30	45.33
MW17-2	49.58	48.82	3.10	--	--	--	--	--	Dry	Dry	Dry	Dry

Ground elevations as per the 2016 Monitoring Program Annual Report prepared by Golder Associates

-- Indicates water level not measured.

Table 2
Groundwater Chemistry

	Field				Laboratory																										
Parameter	pH	Conductivity	Temp	ORP	TDS	Chloride	Nitrite	Nitrate	Sulphate	Aluminum	Antimony	Arsenic	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Titanium	Tungsten	Zinc	Zirconium	Total Ammonia	Total Kjeldahl Nitrogen	Total Phosphorus	BOD
ODWQ/OG	6.5-8.5				500	250	1	10	500		0.006	0.025		5	0.005	0.05				0.01			0.01										
PWQO	6.5-8.5		10							0.075	0.02	0.1	1.1	0.2	0.0002		0.0009	0.005	0.3	0.025	0.04	0.025	0.1	0.0001	0.005	0.006		0.03	0.02	0.004			0.02	
Units		µS/cm	°C	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Monitor/Date																																	
BH03-04																																	
20-Sep-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13-Nov-19	6.51	780	11.5	-21.9	476	36.4	< 0.05	4.31	32	0.06	< 0.0001	0.0004	< 0.0001	0.048	< 0.000015	< 0.001	0.0005	0.0002	9.20	0.00003	0.0003	0.0004	< 0.001	< 0.0001	0.00017	0.0013	< 0.005	< 0.01	< 0.005	< 0.003	11.9	14.3	5.68	22
MW-2																																	
20-Sep-19	6.41	862	11.5	164.6	1187	132	0.17	10.6	89	0.05	< 0.0001	0.0001	< 0.0001	0.054	0.000055	0.0006	0.0005	0.0112	< 0.005	0.00052	0.0001	0.0028	< 0.001	< 0.0001	0.00129	0.0003	< 0.005	< 0.01	0.008	< 0.003	0.63	1.2	0.26	3
13-Nov-19	6.68	823	7.5	75.7	560	101	0.25	33.4	50	0.06	< 0.0002	< 0.0002	< 0.0002	0.053	0.000086	< 0.001	0.0006	0.0024	0.007	< 0.00004	< 0.0002	0.0021	< 0.002	< 0.0001	0.00076	0.0003	< 0.005	< 0.01	< 0.005	< 0.003	0.96	1.6	0.37	5
MW3																																	
20-Sep-19	7.37	988	10.9	154.2	798	248	< 0.05	0.06	19	0.03	< 0.0001	0.0006	< 0.0001	0.098	< 0.000015	0.0003	0.0002	0.0006	< 0.005	0.00004	0.0004	0.0019	< 0.001	< 0.0001	0.00047	0.0003	< 0.005	< 0.01	0.027	< 0.003	0.16	0.4	0.1	< 3
13-Nov-19	7.29	744	7.1	36.5	513	95.1	< 0.05	< 0.05	69	0.03	< 0.0001	0.0006	< 0.0001	0.102	< 0.000015	< 0.001	0.0002	0.0005	0.020	0.00002	0.0005	0.0012	< 0.001	< 0.0001	0.00052	0.0002	< 0.005	< 0.01	< 0.005	< 0.003	0.36	1.1	2.78	4
MW-4																																	
20-Sep-19	6.82	272.9	17.2	52.9	154	7.8	< 0.05	0.63	57	0.02	< 0.0001	0.0001	< 0.0001	0.028	< 0.000015	0.0003	0.0002	0.0014	0.151	0.00006	0.0001	0.0012	< 0.001	< 0.0001	< 0.00005	0.0007	< 0.005	< 0.01	< 0.005	< 0.003	0.07	0.5	0.10	< 3
13-Nov-19	7.42	210.2	6.1	77.2	139	10.1	< 0.05	0.21	50	0.03	< 0.0001	0.0001	< 0.0001	0.019	< 0.000015	< 0.001	0.0002	0.0020	0.055	0.00008	0.0003	0.0005	< 0.001	< 0.0001	< 0.00005	0.0004	< 0.005	< 0.01	< 0.005	< 0.003	0.26	0.4	0.06	< 3
MW-5																																	
20-Sep-19	-	-	-	-	261	67.2	< 0.05	1.67	20	0.03	0.0009	< 0.0005	< 0.0005	0.078	< 0.000070	< 0.001	< 0.0005	0.0006	0.025	0.00021	< 0.0005	0.0010	< 0.005	< 0.0001	0.00114	0.0009	< 0.005	< 0.01	< 0.005	< 0.003	0.44	1.5	0.48	4
13-Nov-19	7.25	2354	3.6	5.6	506	123	< 0.05	0.73	66	0.02	0.0003	0.0006	< 0.0001	0.151	0.000029	< 0.001	0.0003	0.0010	0.016	0.00006	0.0005	0.0014	0.005	< 0.0001	0.00242	0.0006	< 0.005	< 0.01	0.007	< 0.003	0.31	1.0	0.22	< 3
MW11-6																																	
20-Sep-19	7.21	1388	14.3	179.3	4649	2580	< 0.05	< 0.05	198	0.05	< 0.0001	0.0023	< 0.0001	0.304	< 0.000015	0.0004	0.0006	0.0004	0.407	0.00004	0.0003	0.0026	< 0.02	< 0.0001	0.00033	0.0008	< 0.005	< 0.01	< 0.005	< 0.003	0.82	1.1	0.09	9
Duplicate	-	-	-	-	4443	2450	< 0.05	< 0.05	190	0.05	< 0.0001	0.0019	< 0.0001	0.284	< 0.000015	0.0003	0.0005	0.0005	0.267	0.00007	0.0003	0.0026	< 0.02	< 0.0001	0.00043	0.0008	< 0.005	< 0.01	< 0.005	< 0.003	0.82	1.1	0.09	8
13-Nov-19	7.16	10692	7.1	-47.7	4790	2540	< 3	< 3	118	0.03	< 0.002	< 0.002	< 0.002	0.113	< 0.00028	< 0.004	< 0.002	< 0.002	< 0.005	< 0.0004	< 0.002	< 0.004	< 0.02	< 0.0004	0.00126	< 0.002	< 0.005	< 0.01	< 0.005	< 0.003	1.72	2.1	0.24	< 3
MW11-7																																	
20-Sep-19	7.32	1782	9.6	81.7	1760	893	< 0.05	0.23	24	0.04	< 0.0005	< 0.0005	< 0.0005	0.098	< 0.000070	< 0.001	< 0.0005	0.0022	< 0.005	< 0.0001	0.0005	0.0017	< 0.005	< 0.0001	0.00188	0.0005	< 0.005	< 0.01	< 0.005	< 0.003	0.65	1.1	0.25	4
13-Nov-19	7.58	3966	8.1	17.3	1961	1060	< 0.05	0.17	63	0.05	< 0.0005	< 0.0005	< 0.0005	0.061	< 0.000070	< 0.001	< 0.0005	0.0025	< 0.005	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.0001	0.00186	< 0.0005	< 0.005	< 0.01	< 0.005	< 0.003	0.73	1.2	0.84	< 3
MW11-8																																	
20-Sep-19	6.56	1758	13.7	-56.8	1148	131	< 0.05	< 0.05	389	0.10	< 0.0005	< 0.0005	< 0.0005	0.107	< 0.000070	< 0.001	0.0006	< 0.0005	32.3	< 0.0001	< 0.0005	0.0027	< 0.005	< 0.0001	< 0.0003	0.0017	< 0.005	< 0.01	< 0.005	< 0.003	5.56	6.3	1.26	8
MW11-9																																	
20-Sep-19	6.05	504	9.9	138.0	350	47.3	< 0.05	0.22	66	0.05	< 0.0001	< 0.0001	< 0.0001	0.044	0.000033	0.0004	0.0005	0.0024	0.051	< 0.00002	0.0007	0.0017	< 0.001	< 0.0001	0.00017	0.0010	< 0.005	< 0.01	< 0.005	< 0.003	0.04	0.4	0.22	< 3
13-Nov-19	6.62	415	9.5	55.7	319	81.5	< 0.05	< 0.05	74	0.04	0.0001	0.0001	< 0.0001	0.052	0.000020	< 0.001	0.0005	0.0023	0.082	0.00002	0.0006	0.0003	< 0.001	< 0.0001	0.00007	0.0014	< 0.005	< 0.01	< 0.005	< 0.003	0.06	0.4	0.23	< 3
Duplicate					320	85.1	< 0.05	< 0.05	75	0.04	0.0001	0.0001	< 0.0001	0.055	0.000028	< 0.001	0.0005	0.0026	0.059	0.00002	0.0006	0.0004	< 0.001	< 0.0001	0.00006	0.0010	< 0.005	< 0.01	< 0.005	< 0.003	0.07	0.5	0.25	< 3
MW-11-10																																	
20-Sep-19	6.81	1514	14.8	177.7	978	112	< 0.05	< 0.05	204	0.06	< 0.0001	0.0002	< 0.0001	0.098	0.000016	0.0003	0.0002	0.0007	< 0.005	< 0.00002	0.0015	0.0022	0.001	< 0.0001	0.00981	0.0015	< 0.005	< 0.01	< 0.005	< 0.003	0.12	0.4	0.49	< 3
13-Nov-19	6.92	1389	10.3	81.3	973	137	< 0.05	< 0.05	212	0.06	< 0.0002	0.0002	< 0.0002	0.092	< 0.000028	< 0.001	0.0002	0.0008	< 0.005	< 0.00004	0.0018	< 0.0004	< 0.002	< 0.0001	0.0107	0.0015	< 0.005	< 0.01	< 0.005	< 0.003	0.10	0.3	0.07	< 3
MW17-01																																	
20-Sep-19	6.87	253	15.3	139.4	143	9.3	< 0.05	1.14	21	0.03	0.0002	< 0.0001	< 0.0001	0.012	< 0.000015	0.0005	0.0004	0.0007	0.180	0.00032	0.0002	0.0006	< 0.001	< 0.0001	0.00009	0.0008	< 0.005	< 0.01	< 0.005	< 0.003	0.14	1.6	0.68	3
13-Nov-19	7.13	193	6.5	39.8	127	8.5	< 0.05	1.90	18	0.02	< 0.0001	< 0.0001	< 0.0001	0.011	< 0.000015	< 0.001	0.0001	0.0009	< 0.005	< 0.00002	0.0002	< 0.0002	< 0.001	< 0.0001	< 0.00005	0.0004	< 0.005	< 0.01	< 0.005	< 0.003	0.12	1.2	1.01	< 3
MW17-02																																	
20-Sep-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13-Nov-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Indictes an exceedence of the PWQO
Indictes an exceedence of the ODWQ/OG

Table 3

Groundwater Quality Trigger Assessment

September 2019

Parameter	Historical Background Concentrations (2003-2018) MW-3			Background Well	Boundary Wells				
	Minimum	Maximum	Median						
	mg/L	mg/L	mg/L	MW-3	MW-4	MW-5	MW11-6	MW17-01	MW-17-2
Nitrate	0.06	1.10	0.10	0.06	0.63	1.67	< 0.05	1.14	Dry
Nitrite	0.01	0.10	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Total Phosphorus	0.05	9.00	1.17	0.10	0.10	0.48	0.09	0.68	
Total Ammonia	0.080	6.4	0.190	0.16	0.07	0.44	0.82	0.14	

November 2019

Parameter	Historical Background Concentrations (2003-2018) MW-3			Background Well	Boundary Wells				
	Minimum	Maximum	Median						
	mg/L	mg/L	mg/L	MW-3	MW-4	MW-5	MW11-6	MW17-01	MW-17-2
Nitrate	0.05	1.10	0.10	< 0.05	0.21	0.73	< 3	1.90	Dry
Nitrite	0.01	0.10	0.05	< 0.05	< 0.05	< 0.05	< 3	< 0.05	
Total Phosphorus	0.05	9.00	1.32	2.78	0.06	0.22	0.24	1.01	
Total Ammonia	0.080	6.4	0.190	0.36	0.26	0.31	1.72	0.12	

Notes:

7.2 Values exceeded the trigger limit

All results are in mg/L or unless noted otherwise.

When results indicate analyte concentrations below the MDL, half the MDL is assigned.

APPENDIX

C BOREHOLE LOGS

LEVAC ROBICHAUD LECLERC ASSOCIATES LTD.
Project Managers and Consulting Engineers

Stratigraphic and Instrumentation Log: MW11-10

Date: June 20, 2011

Project No.: 01201A
Client: City of Clarence-Rockland
Logged By: A.B.

Project: Groundwater Monitoring Program
Entered By: A.B.

Location: City of Clarence-Rockland Biosolids Lagoons, Industrielle Street, Rockland, Ontario
Checked By: M.H.

Driller: George Downing Estate Drilling Inc.
Drilling Equipment: CME 55 Track Mounted
Drilling Method: Hollow Stem Auger

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Symbol	Soil Description	Elev./Depth (m)
0	0		Ground Surface	51.51
			Topsoil Loam with gravel, loose, desiccated, brown.	0.00 / 51.10
			Clay With silt between 1.5 and 2.1 m, very soft, desiccated to moist in depth, grey brown.	0.41
			End of Borehole	47.16 / 4.35

SAMPLE DATA

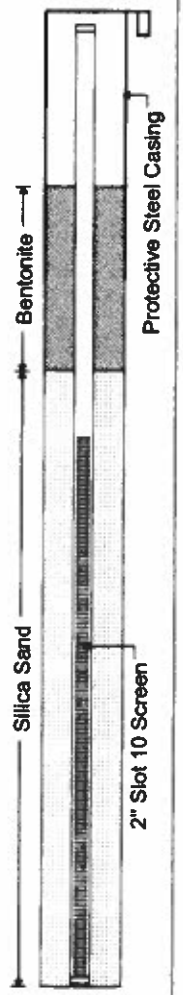
Type	N or RQD	Recovery (%)	Sample Number	Laboratory Analysis
SS1	7	22	1	
SS2	7	48	2	
SS3	9	98	3	
SS4	4	100	4	
SS5	2	8	5	
SS6	push	100	6	

Shear Strength (kPa) × 50 150 ×
SPT N Value ○ (Blows/0.3 m) ○ 20 40 60 80

	SPT N Value (Blows/0.3 m)
SS1	7
SS2	7
SS3	9
SS4	4
SS5	2
SS6	0

Water Content (%) ▽ 25 50 75 ▽
Liquid Limit (%) □ 25 50 75 □

Monitoring Well Details



Easting (X): 0478382
Northing (Y): 5045132

Site Datum: Top of reference point of monitoring well MW11-9 (53.43 m).

Groundsurface Elevation: 51.51 m
Top of Riser Elev.: 52.35 m

Hole Diameter: 203 mm
Monitoring Well Diameter: 51 mm

Riser Type: PVC
Screen Type: Slotted PVC

NOTE:
N Blow counts per 0.30 m using a conventional hammer and split spoon sampler.
RQD Rock Quality Designation. Total cumulative length of core pieces > 10 cm in length divided by total length of run.
STP Standard Penetration Test
SS Split spon sample
ST Shelby tube or thin wall tube
AUG Auger sample
RC Rock core sample
▼ Measured water level
▽ Inferred water level

PROJECT: 03-1120-7156000

RECORD OF BOREHOLE: BH03-4

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: 04/23/03

DATUM: Not surveyed

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		98.01						
0	POWER AUGER 200 mm Diam. (Hollow Stem)	Dark brown clayey silt with silty sand pockets, some organics (FILL)		0.00	1	AS				Native Backfill; Bentonite Seal
				97.25						
1		Loose grey brown to dark grey clayey silt and silty sand with pockets of medium sand and organic matter (FILL)		0.76	2	50 DO	7			
2					3	50 DO	4			Native Backfill
					4	50 DO	3			
				95.11						Bentonite Seal
3		Very loose red brown to brown fine to medium SAND		2.90	5	50 DO	2			Silica Sand
4					6	50 DO	4			50mm Diam. Well Screen
				93.29						
		End of borehole		4.72						
5										
6										Water level in piezometer @ Elev. 94.52m April 25, 2003

DEPTH SCALE
1 : 30

Golder Associates

LOGGED: P.H.

CHECKED:

MIS-BHS 001 03-1120-715.GPJ GAL-MIS.GDT 03/13/17

LEVAC ROBICHAUD LECLERC ASSOCIATES LTD.
Project Managers and Consulting Engineers

Stratigraphic and Instrumentation Log: MW11-6

Date: June 20, 2011

Project No.: 01201A
Client: City of Clarence-Rockland
Logged By: A.B.

Project: Groundwater Monitoring Program
Entered By: A.B.

Location: City of Clarence-Rockland Biosolids Lagoons, Industrielle Street, Rockland, Ontario
Checked By: M.H.

Driller: George Downing Estate Drilling Inc.
Drilling Equipment: CME 55 Track Mounted
Drilling Method: Hollow Stem Auger

Depth (ft / m)	Symbol	Soil Description	Elev./Depth (m)	Type	N or RQD	Recovery (%)	Sample Number	Laboratory Analysis
0 / 0		Ground Surface	42.81					
0 / 0		**Topsoil** Very loose, saturated, grey brown.	0.00	SS1	3	50	30	
1 / 0		**Clay** Very soft, saturated, grey brown.		SS2	push	97	31	
4 / 1				SS3	push	100	32	
7 / 2				SS4	push	100	33	
10 / 3				SS5	push	100	34	
13 / 4				SS6	push	100	35	
14 / 4		End of Borehole	38.46 4.35					

Shear Strength (kPa): 50 – 150
SPT N Value (Blows/0.3 m): 20 – 40 – 60 – 80
Water Content (%): 25 – 50 – 75
Liquid Limit (%): 25 – 50 – 75

Monitoring Well Details

Easting (X): 0478239
Northing (Y): 5045331

Site Datum: Top of reference point of monitoring well MW2 (49.09 m).

Groundsurface Elevation: 42.81 m
Top of Riser Elev.: 43.72 m

Hole Diameter: 203 mm
Monitoring Well Diameter: 51 mm

Riser Type: PVC
Screen Type: Slotted PVC

NOTE:
N Blow counts per 0.30 m using a conventional hammer and split spoon sampler.
RQD Rock Quality Designation. Total cumulative length of core pieces > 10 cm in length divided by total length of run.
STP Standard Penetration Test
SS Split spon sample
ST Shelby tube or thin wall tube
AUG Auger sample
RC Rock core sample
Measured water level
Inferred water level

LEVAC ROBICHAUD LECLERC ASSOCIATES LTD.
Project Managers and Consulting Engineers

Stratigraphic and Instrumentation Log: MW11-7

Date: June 20, 2011

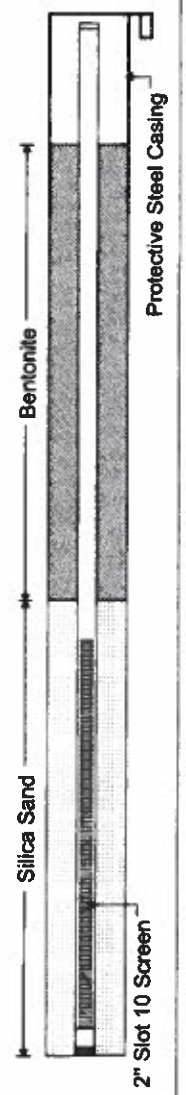
Project No.: 01201A
Client: City of Clarence-Rockland
Logged By: A.B.

Project: Groundwater Monitoring Program
Entered By: A.B.

Location: City of Clarence-Rockland Biosolids Lagoons, Industrielle Street, Rockland, Ontario
Checked By: M.H.

Driller: George Downing Estate Drilling Inc.
Drilling Equipment: CME 55 Track Mounted
Drilling Method: Hollow Stem Auger

Depth (ft / m)	Symbol	Soil Description	Elev./Depth (m)	Type	N or RQD	Recovery (%)	Sample Number	Laboratory Analysis	Shear Strength (kPa) 50–150 / SPT N Value (Blows/0.3 m) 20–80	Water Content (%) 25–50–75 / Liquid Limit (%) 25–50–75	Monitoring Well Details
0 / 0		Ground Surface	48.33								
0 – 1 / 0		**Loam** Very loose, desiccated, dark grey brown with black.	0.00	SS1	4	67	21		4		
1 – 2 / 1				SS2	3	25	22		3		
2 / 1			46.93								
2 – 3 / 2		**Sand** Fine to medium-grained, loose to compact, moist to saturated in depth, grey brown.	1.40	SS3	1	83	23		1		
3 – 4 / 2				SS4	4	38	24		4		
4 – 5 / 3				SS5	12	50	25		12		
5 / 3			44.67								
5 – 6 / 4		**Clay** Very soft, saturated, grey brown.	3.66	SS6	4	100	26		4		
6 – 7 / 5				SS7	2	100	27		2		
7 – 8 / 5				SS8	2	100	28		2		
8 – 9 / 6				SS9	2	100	29		2		
9 / 6		End of Borehole	41.73 6.60								



Easting (X): 0478288
Northing (Y): 5045296

Site Datum: Top of reference of monitoring well MW2 (49.09 m).

Groundsurface Elevation: 48.33 m
Top of Riser Elev.: 49.00 m

Hole Diameter: 203 mm
Monitoring Well Diameter: 51 mm

Riser Type: PVC
Screen Type: Slotted PVC

NOTE:
N Blow counts per 0.30 m using a conventional hammer and split spoon sampler.
RQD Rock Quality Designation. Total cumulative length of core pieces > 10 cm in length divided by total length of run.
STP Standard Penetration Test
SS Split spon sample
ST Shelby tube or thin wall tube
AUG Auger sample
RC Rock core sample
Measured water level
Inferred water level

LEVAC ROBICHAUD LECLERC ASSOCIATES LTD.
Project Managers and Consulting Engineers

Stratigraphic and Instrumentation Log: MW11-8

Date: June 20, 2011

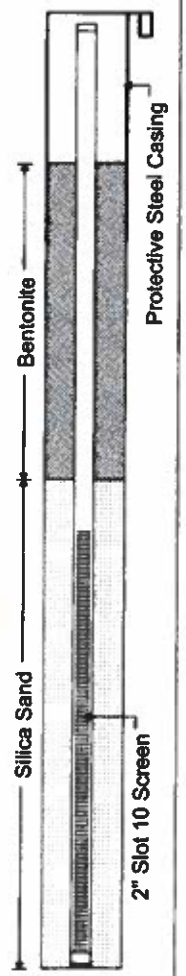
Project No.: 01201A
Client: City of Clarence-Rockland
Logged By: A.B.

Project: Groundwater Monitoring Program
Entered By: A.B.

Location: City of Clarence-Rockland Biosolids Lagoon, Industrielle Street, Rockland
Checked By: M.H.

Driller: George Downing Estate Drilling Inc.
Drilling Equipment: CME 55 Track Mounted
Drilling Method: Hollow Stem Auger

Depth (ft / m)	Symbol	Soil Description	Elev./Depth (m)	Type	N or RQD	Recovery (%)	Sample Number	Laboratory Analysis	Shear Strength (kPa) 50–150 / SPT N Value (Blows/0.3 m) 20–80	Water Content (%) 25–50–75 / Liquid Limit (%) 25–50–75	Monitoring Well Details
0 / 0		Ground Surface	51.24								
0–2 / 0–1		**Loam** Dark brown and black, dry. FILL	0.00 / 50.50	SS1	12	65	14		12		
2–8 / 1–2		**Clayey silt** Grey, moist	0.74 / 48.84	SS2	4	66	15		4		
				SS3	2	5	16		2		
8–14 / 2–4		**Sand** Grey, medium to coarse-grained, moist to wet with some silt	2.40 / 46.84	SS4	10	60	17		10		
				SS5	10	66	18		10		
				SS6	9	83	19		9		
14–16 / 4–5		**Clay** Grey and brown, very wet	4.40 / 46.14	SS7	2	100	20		2		
16 / 5		End of Borehole	5.10								
19 / 6											



Easting (X): 0478266
Northing (Y): 5045185

Site Datum: Top of reference point of monitoring well MW3 (52.56 m).

Groundsurface Elevation: 51.24 m
Top of Riser Elev.: 52.17 m

Hole Diameter: 203 mm
Monitoring Well Diameter: 51 mm

Riser Type: PVC
Screen Type: Slotted PVC

NOTE:
N Blow counts per 0.30 m using a conventional hammer and split spoon sampler.
RQD Rock Quality Designation. Total cumulative length of core pieces > 10 cm in length divided by total length of run.
STP Standard Penetration Test
SS Split spon sample
ST Shelby tube or thin wall tube
AUG Auger sample
RC Rock core sample
Measured water level
Inferred water level

LEVAC ROBICHAUD LECLERC ASSOCIATES LTD.
Project Managers and Consulting Engineers

Stratigraphic and Instrumentation Log: MW11-9

Date: June 20, 2011

Project No.: 01201A
Client: City of Clarence-Rockland
Logged By: A.B.

Project: Groundwater Monitoring Program
Entered By: A.B.

Location: City of Clarence-Rockland Biosolid Lagoons, Industrielle Street, Rockland, Ontario
Checked By: M.H.

Driller: George Downing Estate Drilling Inc.
Drilling Equipment: CME 55 Track Mounted
Drilling Method: Hollow Stem Auger

Depth (ft / m)	Symbol	Soil Description	Elev./Depth (m)	Type	N or RQD	Recovery (%)	Sample Number	Laboratory Analysis	Shear Strength (kPa) 50–150 / SPT N Value (Blows/0.3 m) 20–80	Water Content (%) 25–50–75 / Liquid Limit (%) 25–50–75	Monitoring Well Details
0 / 0		Ground Surface	52.58								
0 / 0		**Topsoil** Loam, loose, desiccated, grey brown.	0.00	SS1	6	33	7		6		
1 / 0		**Gravel Fill** Loose, desiccated, grey.		SS2	8	53	8		8		
2 / 1		**Silty and Clay** With some organic material between 1.5 and 2.2 m, loose to compact, grey brown.		SS3	20	38	9		20		
8 / 2			50.18 2.40	SS4	19	70	10		19		
10 / 3		**Sand** Fine to medium-grained, compact to loose, desiccated to moist, grey brown.		SS5	11	18	11		11		
13 / 4				SS6	6	15	12		6		
16 / 5				SS7	4	83	13		4		
17 / 5		End of Borehole	47.48 5.10								
19 / 6											

Monitoring Well Details: Protective Steel Casing; Bentonite; Silica Sand; 5.86 m (24/06/11); 2" Slot 10 Screen

Easting (X): 048339
Northing (Y): 5045239

Site Datum: Top of reference point of monitoring well MW11-8 (52.17 m).

Groundsurface Elevation: 52.58 m
Top of Riser Elev.: 53.43 m

Hole Diameter: 203 mm
Monitoring Well Diameter: 51 mm

Riser Type: PVC
Screen Type: Slotted PVC

NOTE:
N Blow counts per 0.30 m using a conventional hammer and split spoon sampler.
RQD Rock Quality Designation. Total cumulative length of core pieces > 10 cm in length divided by total length of run.
STP Standard Penetration Test
SS Split spon sample
ST Shelby tube or thin wall tube
AUG Auger sample
RC Rock core sample
Measured water level
Inferred water level

APPENDIX

D APPROVALS

Ontario

Ministry of Environment and Energy | Ministère de l'Environnement et de l'Énergie

AMENDMENT TO CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 3-0466-93-967
Notice No. 3

The Corporation of the City of Clarence-Rockland
1560 rue Laurier
Rockland, Ontario
K4K 1P7

Site Location: 600 Industrial Street
Clarence-Rockland City, United Counties of Prescott and Russell

You are hereby notified that I have amended Certificate of Approval No. 3-0466-93-967 issued on February 8, 1996 for construction of the following sewage works to satisfy Condition No. 14 on original Certificate of Approval No. 3-0466-93-967 dated February 8, 1996, as follows:

Amendments

a biosolids storage lagoon facility located on a site northeast of the existing sewage treatment plant located on the north side of County Road No. 17 (Industrial Road), in the City of Clarence-Rockland, consisting of:

- a bio-solids pumping system located adjacent to the primary clarifier in the existing sewage treatment plant, consisting of two (2) sewage pumps (one duty, one standby) each with a rated capacity of 10 L/s at a TDH of approx. 10.0 m, forcemain discharge piping and valves, to transfer the biosolids from base of the existing aerobic digester tank to a central distribution point located in an accessible chamber within the dike separating the two (2) lagoons;
- two (2) biosolids storage lagoons each with a surface area of approx. 0.184 ha and a minimum operating depth of 1.5 m and freeboard of 0.6 m;
- a gravity supernatant discharge system consisting of two (2) fixed decanting ditch inlet structures in each of the two (2) lagoons with a gravity collection piping system controlled to an allowable release rate of 340 m^3/d discharging to the inlet sanitary sewer on Industrial Street which discharges to the existing headworks at the existing Sewage Treatment Plant;
- site fencing;

all in accordance with the submitted design report dated January 2002 and enclosed plans prepared by Levac Robichaud Leclerc Associates Ltd., Consulting Engineers.

For the purpose of this Notice of Amendment and the terms and conditions specified below, the following definitions apply:

(1) "Certificate" means this entire Certificate of Approval document, issued in accordance with Section 53 of the *Ontario Water Resources Act*, and includes any schedules;

(2) "Director" means any Ministry employee appointed by the Minister pursuant to Section 5 of the *Ontario Water Resources Act*;

(3) "Ministry" means the Ontario Ministry of Environment and Energy;

(4) "Regional Director" means the Regional Director of the Eastern Region of the Ministry;

(5) "District Manager" means the District Manager of the Kingston District Office of the Ministry's Eastern Region;

(6) "Owner" means the City of Clarence-Rockland and includes its successors and assignees;

(7) "works" means the sewage works described in the Owner's application, this Certificate and in the supporting documentation referred to herein, to the extent approved by this Certificate;

You are hereby notified that this Notice of Amendment is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL CONDITION

1.(a) Except as otherwise provided by these Conditions, the Owner shall design, build, install, operate and maintain the works in accordance with the description given in this Certificate, the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this Certificate.

(b) Where there is a conflict between a provision of any submitted document referred to in this Certificate and the Conditions of this Certificate, the Conditions in this Certificate shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

2. MONITORING, RECORDING AND REPORTING

2.1 The Owner shall ensure that the following monitoring program is carried out upon

commencement of operation of the works:

(a) Within six (6) months of the commencement of the operation of the works, the Owner shall submit a program on the groundwater monitoring program for the biosolids storage lagoon facility to the satisfaction of the District Manager. The program shall include at least the following:

i. a clear statement of the groundwater monitoring program;

ii. a plan showing the sampling points location of the groundwater monitoring wells;

iii. parameters to be analyzed (NOTE: Prior to the start-up of operation of the works, groundwater samples shall be collected and analyzed to determine background concentrations of the parameters for regular monitoring);

iv. sampling frequencies;

vi. protocol for collecting and analyzing groundwater samples;

vii. a plan of action once the trigger concentrations such as Nitrates, Nitrites and Total Phosphorous, set by the District Manager, are exceeded. The plan of action shall include an investigation of the trigger concentration migration and the resulting impact on the surface water and groundwater regime off the site;

viii. monitoring the flow through the treatment system.

(b) Water levels in the ground water monitoring wells shall be measured on three (3) month basis to ensure that a 0.5 m separation from the water table is maintained.

(c) all monitoring and analytical results shall be included in the annual report.

3. Buffer Zone

3.1 The Owner shall establish a buffer zone around the biosolids lagoons and maintain a minimum separation distance of 80 m to 100 m (where possible) around the biosolids storage facility (measured from the top of the outer berm outwards) and that this area shall remain free of industrial, commercial or residential development.

3.2 In conjunction with Condition 3.1, the Owner shall submit a contingency plan for addressing potential odour complaints to the District Manager within three (3) months of the date of this Certificate of Approval.

4. REVOCATION OF EXISTING APPROVALS

4.1 The descriptions of the approved works and conditions of approval in this certificate apply in place of all existing descriptions and conditions in the certificates of approval under the Ontario Water Resources Act for sewage works which are part of the works approved by this certificate.

4.2 Notwithstanding Condition 4.1 above, the original applications for approval, including design calculations, engineering drawings and reports prepared in support of the existing certificate(s) of approval whose descriptions of the approved works and conditions are now replaced pursuant to Condition 4.1 above, shall form part of this certificate.

4.3 Where an existing certificate of approval referred to in Condition 4.1 above applies to works in addition to the works approved by this certificate, it shall continue to apply to those additional works.

The reason for the imposition of these terms and conditions are as follows:

1. Condition 1. is imposed to ensure that the works are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the Certificate and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

2. Condition 2. is included to set out a groundwater monitoring program for the biosolids storage lagoon facility.

3. Condition 3.1 and 3.2 are included to ensure that the effect of odours emanating from this sewage treatment facility on adjacent land uses is minimized.

   The separation distances are intended to mitigate the effects of offensive odours which may occur during normal daily operations or when facilities have minor overloads or upsets created by abnormal conditions or wastes.

4. Conditions 4.1 through 4.3 are included to stipulate that this certificate replaces all previous approvals for the works being the subject of this certificate, and that the existing approvals remain in force for the purpose of any works which are not subject to this certificate.

This Notice shall constitute part of the approval issued under Certificate of Approval No. 3-0466-93-967 dated February 8, 1996 and revokes and replaces Amendment to Certificate of Approval No. 3-0466-93-967 (Notice No. 1) dated November 23, 2000 and Amendment to Certificate of Approval No. 3-0466-93-967 (Notice No. 2) dated July 31, 2002.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

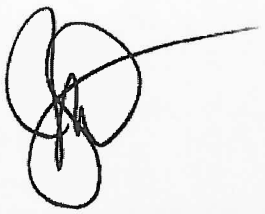
AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of Environment and Energy
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 21st day of August, 2002



Mohamed Dhalla, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

JC/

c: District Manager, MOEE Kingston - District
MOEE Cornwall Area Office
Clerk, City of Clarence-Rockland

Neil A. Levac, Levac Robichaud Leclerc Associates Ltd.

APPENDIX

E ANALYTICAL RESULTS

CADUCEON™ ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G71746 **REPORT No. B19-30169**

Report To:

WSP Canada Inc.
1345 Rosemont Ave.,
Cornwall ON K6J 3E5 Canada
Attention: Jennifer Brown-Hawn

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 20-Sep-19
DATE REPORTED: 02-Oct-19
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Rockland WWTP
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		GW Duplicate	MW08-12	MW-4	MW-5
			Sample I.D.		B19-30169-1	B19-30169-2	B19-30169-3	B19-30169-4
			Date Collected		20-Sep-19	20-Sep-19	20-Sep-19	20-Sep-19
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
TDS (Calc. from Cond.)	mg/L	1	Calc.	24-Sep-19	4443	992	154	261
Chloride	mg/L	0.5	SM4110C	24-Sep-19/O	2450	148	7.8	67.2
Nitrite (N)	mg/L	0.05	SM4110C	24-Sep-19/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	24-Sep-19/O	< 0.05	< 0.05	0.63	1.67
Sulphate	mg/L	1	SM4110C	24-Sep-19/O	190	100	57	20
Aluminum	mg/L	0.01	SM 3120	01-Oct-19/O	0.05	0.06	0.02	0.03
Antimony	mg/L	0.0001	EPA 200.8	24-Sep-19/O	< 0.0001	< 0.0001	< 0.0001	0.0009
Arsenic	mg/L	0.0001	EPA 200.8	24-Sep-19/O	0.0019	0.0004	0.0001	< 0.0005
Beryllium	mg/L	0.0001	EPA 200.8	24-Sep-19/O	< 0.0001	< 0.0001	< 0.0001	< 0.0005
Boron	mg/L	0.005	SM 3120	01-Oct-19/O	0.284	0.093	0.028	0.078
Cadmium	mg/L	0.000015	EPA 200.8	24-Sep-19/O	< 0.000015	< 0.000015	< 0.000015	< 0.000070
Chromium	mg/L	0.0002	EPA 200.8	24-Sep-19/O	0.0003	0.0004	0.0003	< 0.001
Cobalt	mg/L	0.0001	EPA 200.8	24-Sep-19/O	0.0005	0.0010	0.0002	< 0.0005
Copper	mg/L	0.0001	EPA 200.8	24-Sep-19/O	0.0005	0.0005	0.0014	0.0006
Iron	mg/L	0.005	SM 3120	01-Oct-19/O	0.267	0.027	0.151	0.025
Lead	mg/L	0.00002	EPA 200.8	24-Sep-19/O	0.00007	0.00012	0.00006	0.00021
Molybdenum	mg/L	0.0001	EPA 200.8	24-Sep-19/O	0.0003	0.0024	0.0001	< 0.0005
Nickel	mg/L	0.0002	EPA 200.8	24-Sep-19/O	0.0026	0.0061	0.0012	0.0010
Selenium	mg/L	0.001	EPA 200.8	24-Sep-19/O	< 0.02	0.001	< 0.001	< 0.005
Silver	mg/L	0.0001	EPA 200.8	24-Sep-19/O	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Uranium	mg/L	0.00005	EPA 200.8	24-Sep-19/O	0.00043	0.00301	< 0.00005	0.00114
Vanadium	mg/L	0.0001	EPA 200.8	24-Sep-19/O	0.0008	0.0002	0.0007	0.0009
Titanium	mg/L	0.005	SM 3120	01-Oct-19/O	< 0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/L	0.01	SM 3120	01-Oct-19/O	< 0.01	< 0.01	< 0.01	< 0.01
Zinc	mg/L	0.005	SM 3120	01-Oct-19/O	< 0.005	< 0.005	< 0.005	< 0.005
Zirconium	mg/L	0.003	SM 3120	01-Oct-19/O	< 0.003	< 0.003	< 0.003	< 0.003

NOTE: Elevated RL's for Se in several samples due to the elevated Chloride content.

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

CADUCEON™ ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G71746 **REPORT No. B19-30169**

Report To:

WSP Canada Inc.
1345 Rosemont Ave.,
Cornwall ON K6J 3E5 Canada
Attention: Jennifer Brown-Hawn

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 20-Sep-19
DATE REPORTED: 02-Oct-19
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Rockland WWTP
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		GW Duplicate	MW08-12	MW-4	MW-5
			Sample I.D.		B19-30169-1	B19-30169-2	B19-30169-3	B19-30169-4
			Date Collected		20-Sep-19	20-Sep-19	20-Sep-19	20-Sep-19
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	25-Sep-19/K	0.82	0.17	0.07	0.44
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	24-Sep-19/K	1.1	2.1	0.5	1.5
Phosphorus-Total	mg/L	0.01	E3199A.1	24-Sep-19/K	0.09	1.24	0.10	0.48
BOD(5 day)	mg/L	3	SM 5210B	23-Sep-19/K	8	4	< 3	4

NOTE: Elevated RL's for Se in several samples due to the elevated Chloride content.

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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DATE RECEIVED: 20-Sep-19
DATE REPORTED: 02-Oct-19
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Rockland WWTP
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		MW11-6	MW11-7	MW11-9	MW3
			Sample I.D.		B19-30169-5	B19-30169-6	B19-30169-7	B19-30169-8
			Date Collected		20-Sep-19	20-Sep-19	20-Sep-19	20-Sep-19
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
TDS (Calc. from Cond.)	mg/L	1	Calc.	24-Sep-19	4649	1760	350	798
Chloride	mg/L	0.5	SM4110C	24-Sep-19/O	2580	893	47.3	248
Nitrite (N)	mg/L	0.05	SM4110C	24-Sep-19/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	24-Sep-19/O	< 0.05	0.23	0.22	0.06
Sulphate	mg/L	1	SM4110C	24-Sep-19/O	198	24	66	19
Aluminum	mg/L	0.01	SM 3120	01-Oct-19/O	0.05	0.04	0.05	0.03
Antimony	mg/L	0.0001	EPA 200.8	24-Sep-19/O	< 0.0001	< 0.0005	< 0.0001	< 0.0001
Arsenic	mg/L	0.0001	EPA 200.8	24-Sep-19/O	0.0023	< 0.0005	< 0.0001	0.0006
Beryllium	mg/L	0.0001	EPA 200.8	24-Sep-19/O	< 0.0001	< 0.0005	< 0.0001	< 0.0001
Boron	mg/L	0.005	SM 3120	01-Oct-19/O	0.304	0.098	0.044	0.098
Cadmium	mg/L	).000015	EPA 200.8	24-Sep-19/O	< 0.000015	< 0.000070	0.000033	< 0.000015
Chromium	mg/L	0.0002	EPA 200.8	24-Sep-19/O	0.0004	< 0.001	0.0004	0.0003
Cobalt	mg/L	0.0001	EPA 200.8	24-Sep-19/O	0.0006	< 0.0005	0.0005	0.0002
Copper	mg/L	0.0001	EPA 200.8	24-Sep-19/O	0.0004	0.0022	0.0024	0.0006
Iron	mg/L	0.005	SM 3120	01-Oct-19/O	0.407	< 0.005	0.051	< 0.005
Lead	mg/L	0.00002	EPA 200.8	24-Sep-19/O	0.00004	< 0.0001	< 0.00002	0.00004
Molybdenum	mg/L	0.0001	EPA 200.8	24-Sep-19/O	0.0003	0.0005	0.0007	0.0004
Nickel	mg/L	0.0002	EPA 200.8	24-Sep-19/O	0.0026	0.0017	0.0017	0.0019
Selenium	mg/L	0.001	EPA 200.8	24-Sep-19/O	< 0.02	< 0.005	< 0.001	< 0.001
Silver	mg/L	0.0001	EPA 200.8	24-Sep-19/O	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Uranium	mg/L	0.00005	EPA 200.8	24-Sep-19/O	0.00033	0.00188	0.00017	0.00047
Vanadium	mg/L	0.0001	EPA 200.8	24-Sep-19/O	0.0008	0.0005	0.0010	0.0003
Titanium	mg/L	0.005	SM 3120	01-Oct-19/O	< 0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/L	0.01	SM 3120	01-Oct-19/O	< 0.01	< 0.01	< 0.01	< 0.01
Zinc	mg/L	0.005	SM 3120	01-Oct-19/O	< 0.005	< 0.005	< 0.005	0.027
Zirconium	mg/L	0.003	SM 3120	01-Oct-19/O	< 0.003	< 0.003	< 0.003	< 0.003
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	25-Sep-19/K	0.82	0.65	0.04	0.16

NOTE: Elevated RL's for Se in several samples due to the elevated Chloride content.

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G71746 **REPORT No. B19-30169**

Report To:

WSP Canada Inc.
1345 Rosemont Ave.,
Cornwall ON K6J 3E5 Canada
Attention: Jennifer Brown-Hawn

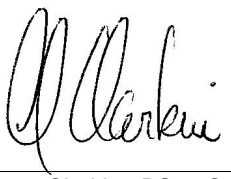
Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 20-Sep-19
DATE REPORTED: 02-Oct-19
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Rockland WWTP
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		MW11-6	MW11-7	MW11-9	MW3
			Sample I.D.		B19-30169-5	B19-30169-6	B19-30169-7	B19-30169-8
			Date Collected		20-Sep-19	20-Sep-19	20-Sep-19	20-Sep-19
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	24-Sep-19/K	1.1	1.1	0.4	0.4
Phosphorus-Total	mg/L	0.01	E3199A.1	24-Sep-19/K	0.09	0.25	0.22	0.10
BOD(5 day)	mg/L	3	SM 5210B	23-Sep-19/K	9	4	< 3	< 3

NOTE: Elevated RL's for Se in several samples due to the elevated Chloride content.



Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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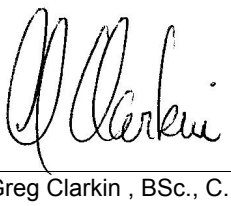
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Rockland WWTP
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		MW11-8	MW-11-10	MW17-01	MW-2
			Sample I.D.		B19-30169-9	B19-30169-10	B19-30169-11	B19-30169-12
			Date Collected		20-Sep-19	20-Sep-19	20-Sep-19	20-Sep-19
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
TDS (Calc. from Cond.)	mg/L	1	Calc.	24-Sep-19	1148	978	143	1187
Chloride	mg/L	0.5	SM4110C	24-Sep-19/O	131	112	9.3	132
Nitrite (N)	mg/L	0.05	SM4110C	24-Sep-19/O	< 0.05	< 0.05	< 0.05	0.17
Nitrate (N)	mg/L	0.05	SM4110C	24-Sep-19/O	< 0.05	< 0.05	1.14	10.6
Sulphate	mg/L	1	SM4110C	24-Sep-19/O	389	204	21	89
Aluminum	mg/L	0.01	SM 3120	01-Oct-19/O	0.10	0.06	0.03	0.05
Antimony	mg/L	0.0001	EPA 200.8	24-Sep-19/O	< 0.0005	< 0.0001	0.0002	< 0.0001
Arsenic	mg/L	0.0001	EPA 200.8	24-Sep-19/O	< 0.0005	0.0002	< 0.0001	0.0001
Beryllium	mg/L	0.0001	EPA 200.8	24-Sep-19/O	< 0.0005	< 0.0001	< 0.0001	< 0.0001
Boron	mg/L	0.005	SM 3120	01-Oct-19/O	0.107	0.098	0.012	0.054
Cadmium	mg/L	0.000015	EPA 200.8	24-Sep-19/O	< 0.000070	0.000016	< 0.000015	0.000055
Chromium	mg/L	0.0002	EPA 200.8	24-Sep-19/O	< 0.001	0.0003	0.0005	0.0006
Cobalt	mg/L	0.0001	EPA 200.8	24-Sep-19/O	0.0006	0.0002	0.0004	0.0005
Copper	mg/L	0.0001	EPA 200.8	24-Sep-19/O	< 0.0005	0.0007	0.0007	0.0112
Iron	mg/L	0.005	SM 3120	01-Oct-19/O	32.3	< 0.005	0.180	< 0.005
Lead	mg/L	0.00002	EPA 200.8	24-Sep-19/O	< 0.0001	< 0.00002	0.00032	0.00052
Molybdenum	mg/L	0.0001	EPA 200.8	24-Sep-19/O	< 0.0005	0.0015	0.0002	0.0001
Nickel	mg/L	0.0002	EPA 200.8	24-Sep-19/O	0.0027	0.0022	0.0006	0.0028
Selenium	mg/L	0.001	EPA 200.8	24-Sep-19/O	< 0.005	0.001	< 0.001	< 0.001
Silver	mg/L	0.0001	EPA 200.8	24-Sep-19/O	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Uranium	mg/L	0.00005	EPA 200.8	24-Sep-19/O	< 0.0003	0.00981	0.00009	0.00129
Vanadium	mg/L	0.0001	EPA 200.8	24-Sep-19/O	0.0017	0.0015	0.0008	0.0003
Titanium	mg/L	0.005	SM 3120	01-Oct-19/O	< 0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/L	0.01	SM 3120	01-Oct-19/O	< 0.01	< 0.01	< 0.01	< 0.01
Zinc	mg/L	0.005	SM 3120	01-Oct-19/O	< 0.005	< 0.005	< 0.005	0.008
Zirconium	mg/L	0.003	SM 3120	01-Oct-19/O	< 0.003	< 0.003	< 0.003	< 0.003

NOTE: Elevated RL's for Se in several samples due to the elevated Chloride content.



Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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Attention: Jennifer Brown-Hawn

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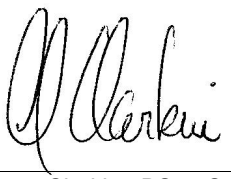
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 20-Sep-19
DATE REPORTED: 02-Oct-19
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Rockland WWTP
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		MW11-8	MW-11-10	MW17-01	MW-2
			Sample I.D.		B19-30169-9	B19-30169-10	B19-30169-11	B19-30169-12
			Date Collected		20-Sep-19	20-Sep-19	20-Sep-19	20-Sep-19
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	25-Sep-19/K	5.56	0.12	0.14	0.63
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	24-Sep-19/K	6.3	0.4	1.6	1.2
Phosphorus-Total	mg/L	0.01	E3199A.1	24-Sep-19/K	1.26	0.49	0.68	0.26
BOD(5 day)	mg/L	3	SM 5210B	23-Sep-19/K	8	< 3	3	3

NOTE: Elevated RL's for Se in several samples due to the elevated Chloride content.



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Lab Manager - Ottawa District

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G90345, 90346 **REPORT No. B19-37006**

Report To:

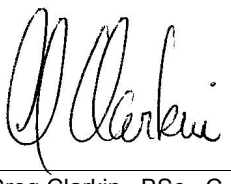
WSP Canada Inc.
1345 Rosemont Ave.,
Cornwall ON K6J 3E5 Canada
Attention: Jennifer Brown-Hawn

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 13-Nov-19
DATE REPORTED: 04-Dec-19
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Rockland WWTP
P.O. NUMBER: 191-12073
WATERWORKS NO.

			Client I.D.		MW-4	MW-5	MW11-6	MW11-7
			Sample I.D.		B19-37006-1	B19-37006-2	B19-37006-3	B19-37006-4
			Date Collected		13-Nov-19	13-Nov-19	13-Nov-19	13-Nov-19
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
TDS (Calc. from Cond.)	mg/L	1	Calc.	18-Nov-19	139	506	4790	1961
Chloride	mg/L	0.5	SM4110C	01-Dec-19/O	10.1	123	2540	1060
Nitrite (N)	mg/L	0.05	SM4110C	01-Dec-19/O	< 0.05	< 0.05	< 3	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	01-Dec-19/O	0.21	0.73	< 3	0.17
Sulphate	mg/L	1	SM4110C	01-Dec-19/O	50	66	118	63
Aluminum	mg/L	0.01	SM 3120	20-Nov-19/O	0.03	0.02	0.03	0.05
Antimony	mg/L	0.0001	EPA 200.8	19-Nov-19/O	< 0.0001	0.0003	< 0.002	< 0.0005
Arsenic	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0001	0.0006	< 0.002	< 0.0005
Beryllium	mg/L	0.0001	EPA 200.8	19-Nov-19/O	< 0.0001	< 0.0001	< 0.002	< 0.0005
Boron	mg/L	0.005	SM 3120	20-Nov-19/O	0.019	0.151	0.113	0.061
Cadmium	mg/L	0.000015	EPA 200.8	19-Nov-19/O	< 0.000015	0.000029	< 0.00028	< 0.000070
Chromium	mg/L	0.001	EPA 200.8	19-Nov-19/O	< 0.001	< 0.001	< 0.004	< 0.001
Cobalt	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0002	0.0003	< 0.002	< 0.0005
Copper	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0020	0.0010	< 0.002	0.0025
Iron	mg/L	0.005	SM 3120	20-Nov-19/O	0.055	0.016	< 0.005	< 0.005
Lead	mg/L	0.00002	EPA 200.8	19-Nov-19/O	0.00008	0.00006	< 0.0004	< 0.0001
Molybdenum	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0003	0.0005	< 0.002	< 0.0005
Nickel	mg/L	0.0002	EPA 200.8	19-Nov-19/O	0.0005	0.0014	< 0.004	< 0.001
Selenium	mg/L	0.001	EPA 200.8	19-Nov-19/O	< 0.001	0.005	< 0.02	< 0.005
Silver	mg/L	0.0001	EPA 200.8	19-Nov-19/O	< 0.0001	< 0.0001	< 0.0004	< 0.0001
Titanium	mg/L	0.005	SM 3120	20-Nov-19/O	< 0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/L	0.01	SM 3120	20-Nov-19/O	< 0.01	< 0.01	< 0.01	< 0.01
Uranium	mg/L	0.00005	EPA 200.8	19-Nov-19/O	< 0.00005	0.00242	0.00126	0.00186
Vanadium	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0004	0.0006	< 0.002	< 0.0005
Zinc	mg/L	0.005	SM 3120	20-Nov-19/O	< 0.005	0.007	< 0.005	< 0.005
Zirconium	mg/L	0.003	SM 3120	20-Nov-19/O	< 0.003	< 0.003	< 0.003	< 0.003
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	18-Nov-19/K	0.26	0.31	1.72	0.73



Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G90345, 90346 **REPORT No. B19-37006**

Report To:

WSP Canada Inc.
1345 Rosemont Ave.,
Cornwall ON K6J 3E5 Canada
Attention: Jennifer Brown-Hawn

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 13-Nov-19
DATE REPORTED: 04-Dec-19
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Rockland WWTP
P.O. NUMBER: 191-12073
WATERWORKS NO.

			Client I.D.		MW-4	MW-5	MW11-6	MW11-7
			Sample I.D.		B19-37006-1	B19-37006-2	B19-37006-3	B19-37006-4
			Date Collected		13-Nov-19	13-Nov-19	13-Nov-19	13-Nov-19
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	15-Nov-19/K	0.4	1.0	2.1	1.2
Phosphorus-Total	mg/L	0.01	E3199A.1	15-Nov-19/K	0.06	0.22	0.24	0.84
BOD(5 day)	mg/L	3	SM 5210B	14-Nov-19/K	< 3	< 3	< 3	< 3

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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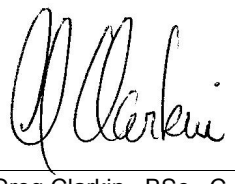
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Rockland WWTP
P.O. NUMBER: 191-12073
WATERWORKS NO.

			Client I.D.		MW-2	MW17-01	BH03-4	MW-3
			Sample I.D.		B19-37006-5	B19-37006-6	B19-37006-7	B19-37006-8
			Date Collected		13-Nov-19	13-Nov-19	13-Nov-19	13-Nov-19
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
TDS (Calc. from Cond.)	mg/L	1	Calc.	18-Nov-19	560	127	476	513
Chloride	mg/L	0.5	SM4110C	01-Dec-19/O	101	8.5	36.4	95.1
Nitrite (N)	mg/L	0.05	SM4110C	01-Dec-19/O	0.25	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	01-Dec-19/O	33.4	1.90	4.31	< 0.05
Sulphate	mg/L	1	SM4110C	01-Dec-19/O	50	18	32	69
Aluminum	mg/L	0.01	SM 3120	20-Nov-19/O	0.06	0.02	0.06	0.03
Antimony	mg/L	0.0001	EPA 200.8	19-Nov-19/O	< 0.0002	< 0.0001	< 0.0001	< 0.0001
Arsenic	mg/L	0.0001	EPA 200.8	19-Nov-19/O	< 0.0002	< 0.0001	0.0004	0.0006
Beryllium	mg/L	0.0001	EPA 200.8	19-Nov-19/O	< 0.0002	< 0.0001	< 0.0001	< 0.0001
Boron	mg/L	0.005	SM 3120	20-Nov-19/O	0.053	0.011	0.048	0.102
Cadmium	mg/L	0.000015	EPA 200.8	19-Nov-19/O	0.000086	< 0.000015	< 0.000015	< 0.000015
Chromium	mg/L	0.001	EPA 200.8	19-Nov-19/O	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0006	0.0001	0.0005	0.0002
Copper	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0024	0.0009	0.0002	0.0005
Iron	mg/L	0.005	SM 3120	20-Nov-19/O	0.007	< 0.005	9.20	0.020
Lead	mg/L	0.00002	EPA 200.8	19-Nov-19/O	< 0.00004	< 0.00002	0.00003	0.00002
Molybdenum	mg/L	0.0001	EPA 200.8	19-Nov-19/O	< 0.0002	0.0002	0.0003	0.0005
Nickel	mg/L	0.0002	EPA 200.8	19-Nov-19/O	0.0021	< 0.0002	0.0004	0.0012
Selenium	mg/L	0.001	EPA 200.8	19-Nov-19/O	< 0.002	< 0.001	< 0.001	< 0.001
Silver	mg/L	0.0001	EPA 200.8	19-Nov-19/O	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Titanium	mg/L	0.005	SM 3120	20-Nov-19/O	< 0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/L	0.01	SM 3120	20-Nov-19/O	< 0.01	< 0.01	< 0.01	< 0.01
Uranium	mg/L	0.00005	EPA 200.8	19-Nov-19/O	0.00076	< 0.00005	0.00017	0.00052
Vanadium	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0003	0.0004	0.0013	0.0002
Zinc	mg/L	0.005	SM 3120	20-Nov-19/O	< 0.005	< 0.005	< 0.005	< 0.005
Zirconium	mg/L	0.003	SM 3120	20-Nov-19/O	< 0.003	< 0.003	< 0.003	< 0.003
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	18-Nov-19/K	0.96	0.12	11.9	0.36



Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G90345, 90346 **REPORT No. B19-37006**

Report To:

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1345 Rosemont Ave.,
Cornwall ON K6J 3E5 Canada
Attention: Jennifer Brown-Hawn

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 13-Nov-19
DATE REPORTED: 04-Dec-19
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Rockland WWTP
P.O. NUMBER: 191-12073
WATERWORKS NO.

			Client I.D.		MW-2	MW17-01	BH03-4	MW-3
			Sample I.D.		B19-37006-5	B19-37006-6	B19-37006-7	B19-37006-8
			Date Collected		13-Nov-19	13-Nov-19	13-Nov-19	13-Nov-19
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	15-Nov-19/K	1.6	1.2	14.3	1.1
Phosphorus-Total	mg/L	0.01	E3199A.1	15-Nov-19/K	0.37	1.01	5.68	2.78
BOD(5 day)	mg/L	3	SM 5210B	14-Nov-19/K	5	< 3	22	4

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Lab Manager - Ottawa District

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WATERWORKS NO.

			Client I.D.		MW11-8	MW11-9	MW11-10	MW8-12
			Sample I.D.		B19-37006-9	B19-37006-10	B19-37006-11	B19-37006-12
			Date Collected		13-Nov-19	13-Nov-19	13-Nov-19	13-Nov-19
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
TDS (Calc. from Cond.)	mg/L	1	Calc.	18-Nov-19	1108	319	973	964
Chloride	mg/L	0.5	SM4110C	01-Dec-19/O	134	81.5	137	157
Nitrite (N)	mg/L	0.05	SM4110C	01-Dec-19/O	< 0.5	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	01-Dec-19/O	< 0.5	< 0.05	< 0.05	< 0.05
Sulphate	mg/L	1	SM4110C	01-Dec-19/O	307	74	212	104
Aluminum	mg/L	0.01	SM 3120	20-Nov-19/O	0.13	0.04	0.06	0.06
Antimony	mg/L	0.0001	EPA 200.8	19-Nov-19/O	< 0.0005	0.0001	< 0.0002	< 0.0002
Arsenic	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0005	0.0001	0.0002	0.0004
Beryllium	mg/L	0.0001	EPA 200.8	19-Nov-19/O	< 0.0005	< 0.0001	< 0.0002	< 0.0002
Boron	mg/L	0.005	SM 3120	20-Nov-19/O	0.104	0.052	0.092	0.096
Cadmium	mg/L	0.000015	EPA 200.8	19-Nov-19/O	< 0.000070	0.000020	< 0.000028	< 0.000028
Chromium	mg/L	0.001	EPA 200.8	19-Nov-19/O	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0008	0.0005	0.0002	0.0009
Copper	mg/L	0.0001	EPA 200.8	19-Nov-19/O	< 0.0005	0.0023	0.0008	0.0004
Iron	mg/L	0.005	SM 3120	20-Nov-19/O	29.7	0.082	< 0.005	0.017
Lead	mg/L	0.00002	EPA 200.8	19-Nov-19/O	< 0.0001	0.00002	< 0.00004	0.00010
Molybdenum	mg/L	0.0001	EPA 200.8	19-Nov-19/O	< 0.0005	0.0006	0.0018	0.0016
Nickel	mg/L	0.0002	EPA 200.8	19-Nov-19/O	< 0.001	0.0003	< 0.0004	0.0008
Selenium	mg/L	0.001	EPA 200.8	19-Nov-19/O	< 0.005	< 0.001	< 0.002	< 0.002
Silver	mg/L	0.0001	EPA 200.8	19-Nov-19/O	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Titanium	mg/L	0.005	SM 3120	20-Nov-19/O	0.006	< 0.005	< 0.005	< 0.005
Tungsten	mg/L	0.01	SM 3120	20-Nov-19/O	0.17	< 0.01	< 0.01	< 0.01
Uranium	mg/L	0.00005	EPA 200.8	19-Nov-19/O	< 0.0003	0.00007	0.0107	0.00346
Vanadium	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0025	0.0014	0.0015	< 0.0002
Zinc	mg/L	0.005	SM 3120	20-Nov-19/O	< 0.005	< 0.005	< 0.005	< 0.005
Zirconium	mg/L	0.003	SM 3120	20-Nov-19/O	< 0.003	< 0.003	< 0.003	< 0.003

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Lab Manager - Ottawa District

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Final Report

C.O.C.: G90345, 90346 **REPORT No. B19-37006**

Report To:

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1345 Rosemont Ave.,
Cornwall ON K6J 3E5 Canada
Attention: Jennifer Brown-Hawn

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 13-Nov-19
DATE REPORTED: 04-Dec-19
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Rockland WWTP
P.O. NUMBER: 191-12073
WATERWORKS NO.

			Client I.D.		MW11-8	MW11-9	MW11-10	MW8-12
			Sample I.D.		B19-37006-9	B19-37006-10	B19-37006-11	B19-37006-12
			Date Collected		13-Nov-19	13-Nov-19	13-Nov-19	13-Nov-19
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	18-Nov-19/K	5.22	0.06	0.10	0.16
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	15-Nov-19/K	6.2	0.4	0.3	1.0
Phosphorus-Total	mg/L	0.01	E3199A.1	15-Nov-19/K	1.00	0.23	0.07	0.75
BOD(5 day)	mg/L	3	SM 5210B	14-Nov-19/K	7	< 3	< 3	4

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SAMPLE MATRIX: Groundwater

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P.O. NUMBER: 191-12073
WATERWORKS NO.

			Client I.D.		Duplicate			
			Sample I.D.		B19-37006-13			
			Date Collected		13-Nov-19			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
TDS (Calc. from Cond.)	mg/L	1	Calc.	18-Nov-19	320			
Chloride	mg/L	0.5	SM4110C	01-Dec-19/O	85.1			
Nitrite (N)	mg/L	0.05	SM4110C	01-Dec-19/O	< 0.05			
Nitrate (N)	mg/L	0.05	SM4110C	01-Dec-19/O	< 0.05			
Sulphate	mg/L	1	SM4110C	01-Dec-19/O	75			
Aluminum	mg/L	0.01	SM 3120	20-Nov-19/O	0.04			
Antimony	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0001			
Arsenic	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0001			
Beryllium	mg/L	0.0001	EPA 200.8	19-Nov-19/O	< 0.0001			
Boron	mg/L	0.005	SM 3120	20-Nov-19/O	0.055			
Cadmium	mg/L	0.000015	EPA 200.8	19-Nov-19/O	0.000028			
Chromium	mg/L	0.001	EPA 200.8	19-Nov-19/O	< 0.001			
Cobalt	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0005			
Copper	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0026			
Iron	mg/L	0.005	SM 3120	20-Nov-19/O	0.059			
Lead	mg/L	0.00002	EPA 200.8	19-Nov-19/O	0.00002			
Molybdenum	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0006			
Nickel	mg/L	0.0002	EPA 200.8	19-Nov-19/O	0.0004			
Selenium	mg/L	0.001	EPA 200.8	19-Nov-19/O	< 0.001			
Silver	mg/L	0.0001	EPA 200.8	19-Nov-19/O	< 0.0001			
Titanium	mg/L	0.005	SM 3120	20-Nov-19/O	< 0.005			
Tungsten	mg/L	0.01	SM 3120	20-Nov-19/O	< 0.01			
Uranium	mg/L	0.00005	EPA 200.8	19-Nov-19/O	0.00006			
Vanadium	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0010			
Zinc	mg/L	0.005	SM 3120	20-Nov-19/O	< 0.005			
Zirconium	mg/L	0.003	SM 3120	20-Nov-19/O	< 0.003			

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Lab Manager - Ottawa District

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JOB/PROJECT NO.: Rockland WWTP
P.O. NUMBER: 191-12073
WATERWORKS NO.

			Client I.D.		Duplicate			
			Sample I.D.		B19-37006-13			
			Date Collected		13-Nov-19			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	18-Nov-19/K	0.07			
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	15-Nov-19/K	0.5			
Phosphorus-Total	mg/L	0.01	E3199A.1	15-Nov-19/K	0.25			
BOD(5 day)	mg/L	3	SM 5210B	14-Nov-19/K	< 3			

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District