



March 26, 2019
CO676.00

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

Attention: Mr. Phillipe Cormier
Interim Manager of Environment and Water, Infrastructure and Engineering

Re: Biosolids Lagoon Monitoring Program 2018
700 Industrielle Street, Clarence-Rockland, Ontario

Dear Mr. Cormier:

Terrapex Environmental Ltd. (Terrapex) is pleased to submit this letter report documenting the 2018 results of the annual biosolids lagoon monitoring program conducted at the City of Clarence-Rockland's (the City) waste water treatment plant (WWTP) located at 700 Industrielle Street, Clarence-Rockland, Ontario (the Site, Figure 1, attached). It is understood that the lagoon monitoring was completed to fulfil a requirement of the certificate of approval (C of A) No. 3-0466-93967 in order to operate the two on-site biosolids lagoons.

Terrapex based the work program on the Biosolids Lagoons Request for Quotation (RFQ) F18-QC-2018-009 and a review of *2016 Monitoring Program Annual Report City of Clarence-Land Biosolids Storage Lagoons 700 Industrielle Street Clarence Rockland* prepared by Golder Associates (Golder) dated April 2017 which was provided with the aforementioned RFQ.

SITE DESCRIPTION

The Site is located in the municipality of Clarence-Rockland in an industrial/ commercial area south of the Ottawa River and north of Highway 17. The 700 Industrielle Street property is irregular and in shape and contains the WWTP and associated biosolids lagoons in the western portion of the Site and a hockey arena and a hockey academy in the eastern portion. This report will refer to the Site as only the western portion of the 700 Industrielle Street Property that contains the WTPP and associated infrastructure.

The Site is fenced and is accessible from a driveway from Industrielle Street. The southern portion of the Site contains the WWTP building and is located at approximately 50 metres (m) above sea level (asl). Two biosolids lagoons (West Lagoon and East Lagoon) are located north of the WWTP building in the central portion of the Site. North of the lagoons the Site is heavily vegetated and slopes down towards the Ottawa River, which is located at an approximate elevation of 40 m asl.

BACKGROUND

It is Terrapex's understanding that the biosolids lagoon monitoring is required to fulfil condition 2 of the C of A No. 3-0466-93967. Terrapex was provided with the aforementioned 2016 annual report and the 2017 annual report; *2017 Monitoring Program Annual Report City of Clarence-Rockland Biosolids Storage Lagoons 700 Industrielle Street Clarence Rockland, Ontario*. Review of the aforementioned report determined the following.

Reportedly the Site's biosolid lagoons were constructed in 2002 and began receiving biosolids in 2003. Three monitoring wells (MW-1, MW-2 and MW-3) were installed to determine background groundwater conditions prior to operation of the biosolids lagoon. Reportedly the monitoring program was implemented in 2003 by LRL Associates (LRL) on behalf of the City. LRL also developed an "emergency action" plan in conjunction with the monitoring and sampling program. The emergency action plan identified specific parameters (nitrate, nitrite and total phosphorus) which would act as trigger parameters. Terrapex was not provided a copy of the emergency action plan to review.

Between 2003 and 2011, eight additional monitoring wells were added to the monitoring well network (MW-4, MW-5, BH03-4, MW11-6, MW11-7, MW11-8, MW11-9 and MW11-10).

In 2015 based on the analytical groundwater results from monitoring well MW-2, LRL recommended that the emergency action plan be implemented and that an inspection of the biosolids lagoon for leaks and cracks was to be completed. The City has reportedly indicated that the West and East Lagoon were relined with clay in 2011 and 2012 respectively.

Review of borehole logs (BH03-4, MW11-6, MW11-7, MW11-8, MW11-10, MW17-01 and MW17-02) provided in the 2016 and 2017 annual reports identified that the major geological unit present at the Site is clay or silty clay which is overlain with varying amount of silty clay or fine medium sand fill. Six of the boreholes (BH03-4, MW11-7, MW11-8, MW11-9, BH17-01, and BH17-02) in the vicinity of the biosolids lagoons were screened in the fine to medium sand layer which overlies the predominant clay layer. Boreholes logs for monitoring wells MW-2, MW-3, MW-4 and MW-5 were not available to Terrapex for review.

In the 2017 annual report, Golder concluded that impacts from the biosolids lagoons were observed at downgradient monitoring wells (MW-2 and BH03-4) and possibly at one monitoring (MW11-8) well located up gradient of the lagoons. Golder recommended that monitoring wells be installed north of MW-4 and west of monitoring wells MW-2 and BH03-4.

WORK PROGRAM

As requested by in the RFQ F18-QC-2018-009 Terrapex, completed the following as part of the biosolids lagoon monitoring program:

- Monitoring of water levels in all accessible monitoring wells on a quarterly basis (completed in July, August, November 2018 and January 2019);

- Collection of groundwater samples from 10 monitoring wells on a semi-annual basis (Completed in July and November 2018) for laboratory analysis of ammonia, nitrate, nitrite, total kjeldahl nitrogen (TKN) biological oxygen demand (BOD), total dissolved solids (TDS), total phosphorus, dissolved sulphate, dissolved chloride, and metals analysis;
- Measurement of field parameters (temperature, pH, conductivity and Turbidity) during the groundwater sampling event; and,
- Collection of biosolid samples from the each of the lagoons for analysis of ammonia, nitrate, nitrite, TKN, chloride, sulphate, total phosphorus and metals analysis during each groundwater sampling event.

The locations of the monitoring wells are shown on Figure 2, attached. The findings are discussed below. During the completion of the first monitoring and sampling event it was noted that MW-5 was in a state of disrepair and was unable to be sampled. Monitoring well MW-5 was not monitored or sampled during any of the events in 2018.

CALCULATION OF TRIGGER CONCENTRATIONS

Nitrate, nitrite, total phosphorus and ammonia have been used historically as trigger parameters to determine if groundwater is being impacted from the lagoon operations (2016, 2017 Golder Assessments).

The trigger parameters were determined by calculating the median of the historical and current groundwater data from monitoring well MW-3 (Groundwater data from 2003 to 2018) and monitoring well MW11-10 (groundwater data from 2011 to 2018). Both monitoring well MW-3 and MW11-10 are located upgradient of the biosolids lagoons and therefore are expected to represent background conditions at the Site. The historical range and the trigger concentrations for both monitoring well MW-3 and MW11-10 are provided below.

	Ammonia	Nitrate	Nitrite	Total Phosphorus
Minimum (2003 to 2018)	<0.1	<0.1	<0.01	0.05
Maximum (2003 to 2018)	6.4	<0.1	<0.05	9
Trigger Value (median)	0.14	<0.1	<0.05	0.80

Since the nitrate and nitrite trigger concentrations are at the method detection limit (MDL), (i.e. nitrate and nitrite were not detected in the background wells) any detectable concentration above the MDL is considered an exceedance of the trigger concentrations.

Review of the distribution of background groundwater analytical results for total phosphorus has revealed the total phosphorus concentrations have varied considerably (i.e. the 75th percentile is more than twice the median value) and therefore the usefulness of total phosphorus as a trigger parameter is limited.

The full set of historical groundwater data used to derive the trigger concentrations are attached.

GROUNDWATER MONITORING

Groundwater monitoring was completed at the Site on July 3, August 22, and November 8, 2018, and January 23, 2019. Groundwater levels were measured using an electronic water interface probe. The 2018 monitoring data is provided Table 1.

Based on a review of the groundwater elevations, the shallow overburden groundwater flow is north towards the Ottawa River. This is consistent with the historical interpreted groundwater flow reported in the 2016 and 2017 annual reports. An interpreted groundwater flow diagram of the November 8, 2018 monitoring event is provided in Figure 3.

GROUNDWATER SAMPLING

Ten monitoring wells (MW-2, MW-3, MW-4, MW-5, BH03-4, MW11-6, MW11-7, MW11-8, MW11-9, MW11-10, and MW17-01) were sampled during the July and November sampling events. Prior to sampling, each well was purged of a minimum of three standing well volumes or until dry using an existing dedicated inertial sampler comprising low density polyethylene (LDPE) tubing and a foot valve. Prior to sampling, field parameters were measured in the purged groundwater by using a Hanna9828 multiparameter handheld water quality meter.

Groundwater samples were collected directly into pre-cleaned laboratory supplied bottles, placed in a cooler with ice packs, and transported under signed chain of custody to Maxxam Analytics Inc. (Maxxam) for analysis of ammonia, nitrate, nitrite, TKN, BOD, TDS, Total phosphorus, dissolved sulphate, dissolved chloride, and metals analysis. At the time of the sampling, Maxxam was certified by the Canadian Association for Laboratory Accreditation (CALA) and Standards Council of Canada (SCC) for all the analyses it was requested to perform under this work program. A 45-micron field filter was used when collecting the groundwater samples for the metals parameters.

One duplicate groundwater sample was collected as a quality assurance/quality control measure during each groundwater sampling event. A duplicate groundwater sample (labelled MW11-19) was collected from monitoring well MW11-6 during the July sampling event. A duplicate groundwater sample (labelled MW11-19) was collected from monitoring well MW11-9 during the November sampling event.

GROUNDWATER ANALYTICAL RESULTS AND INTERPRETATION

Groundwater analytical results are provided in Table 2. Laboratory certificates are attached.

Monitoring well MW-5 was observed to be in a state of disrepair and therefore could not be sampled in 2018.

Comparison with Trigger Parameters

MW-2

Monitoring well MW-2, located approximately 30 m north (downgradient) of the biosolids lagoon, appears to be impacted based on the increasing concentration of ammonia and nitrate observed since approximately 2013. Concentrations of nitrate and ammonia exceeded the trigger concentrations during both sampling events in 2018. The nitrate concentrations exhibited in monitoring well MW-2 were at least two orders of magnitude greater than the trigger concentration (11.1 mg/L and 20.5 mg/L for July and November sampling event respectively) during both groundwater sampling events. The ammonia concentration exhibited in monitoring well MW-2 was one order of magnitude greater than the trigger concentration during the November groundwater event.

BH03-4

Monitoring well BH03-4, located approximately 30 m to the west (cross gradient) of the biosolids lagoons appears to be impacted based on the elevated concentrations of ammonia. Concentrations of ammonia exceeded the trigger concentration for ammonia in every sampling event since 2006 and an increasing trend is discernible. The ammonia concentration exhibited in monitoring well BH03-4 was at least one order of magnitude greater than the trigger concentration for both sampling events.

MW11-8

Monitoring well MW11-8, located approximately 30 m to the south of the lagoon, is interpreted to be impacted by the increasing concentration of ammonia observed since 2012. The monitoring well is located up gradient of the biosolids lagoons (according to Site interpreted groundwater flow) however, it may have been impacted because the large hydraulic gradient and of the short horizontal distance between the monitoring well and the western biosolids lagoon. The ammonia concentration exhibited in monitoring well MW11-18 was at least one order magnitude greater than the trigger concentration for both sampling events.

MW-4

Monitoring well MW-4, located 60 m to the northeast of the lagoons has exhibited detectable/variable concentrations of nitrate since 2004 and thus the presence of detectable concentrations of nitrate during the November sampling event is not indicative of the biosolids lagoon impact. Total phosphorus marginally exceeded the trigger concentration during the July sampling event however was well within the historical background range.

MW17-01

Monitoring well MW17-01, located 60 m northwest of the biosolids lagoons exhibited concentrations of nitrate and total phosphorus that exceeded the trigger parameters during the groundwater sampling events. Due to the marginal exceedance of the trigger parameters for Nitrate during the November groundwater sampling event (less than 1 order of magnitude greater than the trigger concentrations) and the non-detectable concentration exhibited in the July groundwater sampling event it appears that the monitoring well MW17-01 is not impacted.

Additional sampling events are needed to determine if there is an increasing trend of nitrate concentrations in monitoring well MW17-01. Based on the proximity to the impacted wells located up gradient and cross gradient (BH03-4 and MW-2 respectively) and based on the reviews of their respective borehole logs, it is suspected all the wells are screened within the fine medium sand layer. It is likely that based on the interpreted groundwater flow and stratigraphy that monitoring well MW17-01 will be impacted eventually.

MW11-6

Monitoring wells MW11-6, located approximately 90 m to the north (downgradient) of the biosolids lagoons, has exhibited concentrations of ammonia above the trigger concentrations during the both groundwater sampling events. The ammonia concentration exhibited during the July groundwater sampling event was one order of magnitude greater than the trigger concentration. Since the ammonia concentration during the November event was under one order of magnitude and review of historical analytical data does not indicate upward trend in concentrations, therefore it appears that groundwater in the vicinity of monitoring well MW11-6 is not impacted by the biosolids lagoons.

MW11-7

Monitoring well MW11-7 has exhibited concentrations of ammonia and nitrate above the trigger concentrations during both groundwater sampling events. Review of historical analytical data does not indicate upward trend in concentrations. Therefore, it appears that groundwater in the vicinity of monitoring well MW11-7 is not impacted by the biosolids lagoons.

MW11-9

Monitoring well MW11-9, located adjacent to the eastern lagoon, exhibited concentrations of ammonia, total phosphate and nitrate greater than the trigger concentrations. Review of historical analytical data has indicated that monitoring well MW11-9 has exhibited variable concentrations of ammonia total phosphorus well within the historical background range. Review of historical groundwater analytical results for monitoring well MW11-9 has indicated no discernible upward trend of increasing nitrate in groundwater and the relatively minor exceedances of the trigger parameters, monitoring well MW11-9 is interpreted not to be impacted by the biosolids lagoons.

MW-3 and MW11-10

Monitoring wells MW-3 and MW11-10 are located up gradient of the biosolids lagoon and by definition are considered non-impacted. Both of these monitoring well were used for the derivation of the trigger concentrations.

Summary

Review of the current and historical analytical results have determined the following:

- Groundwater in the vicinity of monitoring wells MW-2, BH03-4, and, MW11-8 appears to be impacted by the biosolids lagoons;
- Groundwater in the vicinity of monitoring well, MW-4, MW11-6, MW11-7, MW11-9 and MW17-01 does not appear to be impacted by biosolids lagoons.

Comparison with Provincial Water Quality Objectives

Monitoring wells MW-4 and MW11-6 located in the vicinity of Ottawa River were compared to the provincial water quality objectives (PWQO). The analytical results comparing the groundwater concentrations to the PWQO criteria is provided in Table 3. Both monitoring wells exhibited concentrations of at least one parameter that exceeded the PWQO. Monitoring well MW-4 exceeded the PWQO for total ammonia (criteria of 0.02 mg/L) and total phosphorus (criteria of 0.03 mg/L). Monitoring well MW11-6 exceeded the PWQO for total ammonia, total phosphorus and boron (criteria of 270 ug/L).

Review of the analytical data from the background monitoring wells (MW-3 and MW11-10) has indicated that the concentrations of total phosphorus and ammonia are well within the range of historical background concentrations at the Site and therefore, the exceedances of the PWQO in monitoring well MW-4 and MW11-6 are expected to be naturally occurring. The boron exceedance exhibited in monitoring well MW11-6 is not replicated in up gradient impacted monitoring wells (MW-2, boron groundwater concentration of 51 and 55 ug/L in 2018) and therefore, it appears that the boron exceedance of the PWQO exhibited in monitoring well MW11-6 is not related to the biosolids lagoon.

Quality Assurance Quality Control

The relative percent difference (RPD) between the groundwater sample and its respective duplicate pairs were below the alert criteria of 30%, with exception of groundwater sample MW11-9 and its duplicate pair (MW11-19) during the November 2018 sampling event for phosphorus analysis (calculated RPD of 181% between the groundwater sample and its duplicate pair). Since phosphorus was not used as extensively as ammonia and nitrate as a trigger parameter, this does not present a QA/QC issue for the interpretation of the groundwater analytical data.

BIOSOLIDS SAMPLING AND ANALYTICAL RESULTS

Biosolids samples from the biosolids lagoons were collected using a telescoping pole and a stainless steel beaker. The biosolids samples were then decanted into a stainless steel pail, mixed and poured into laboratory supplied jars and bottles. Biosolids samples were submitted to Maxxam for laboratory analysis of ammonia, nitrate, nitrite, TKN, chloride, sulphate, total phosphorus and metals.

Due to the lower moisture content of the biosolids samples collected in November they were analysed as a solid and thus are reported in milligram per gram (mg/g) or microgram per gram (ug/g) instead of mg/L (the November biosolids samples were reported in mg/L). Laboratory certificates with biosolids analytical results are attached.

RECOMMENDATIONS AND CONCLUSIONS

Based on the analytical results and review of previously reported data, monitoring wells MW-2, BH03-4 and MW11-8 appear to be impacted by the biosolid lagoon operations. No discernible concentration trend is apparent monitoring well MW17-01. However currently it appears that the groundwater in its vicinity is not impacted by biosolid lagoon operations. Terrapex recommends continuing the quarterly groundwater monitoring and semi-annual sampling program as required by the C of A.

Terrapex recommends that monitoring well MW-5 be abandoned by licenced Ontario well driller (as per O.Reg 903) and a new monitoring well be installed (as a replacement) and included in the 2019 monitoring and sampling program.

CLOSURE

This project and report have been prepared in accordance with the terms of reference for this project as agreed upon by the city of Clarence-Rockland and Terrapex Environmental Ltd. and generally accepted engineering or environmental consulting practices in this area. The reported information is believed to provide a reasonable representation of the general environmental conditions at the site, however, the data were collected at specific locations and conditions may vary at other locations. The assessment was also limited to a study of those chemical parameters specifically addressed in this report.

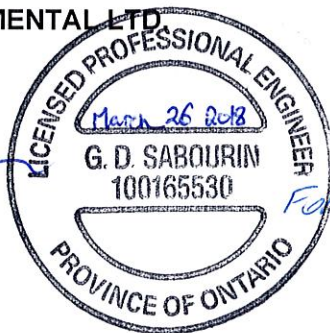
This report has been prepared for the sole use of the City of Clarence-Rockland and Terrapex Environmental Ltd. accepts no liability for claims arising from the use of this report, or from actions taken or decisions made as a result of this report, by parties other than the City of Clarence-Rockland

Terrapex appreciated the opportunity to provide our services on this project. Should you have any questions, or if there is any additional information we can provide, please call.

Sincerely,

TERRAPEX ENVIRONMENTAL LTD.


Greg Sabourin, P.Eng.,
Project Manager




Rod Rose, P.Geo. (Limited)
Senior Reviewer

Attachments

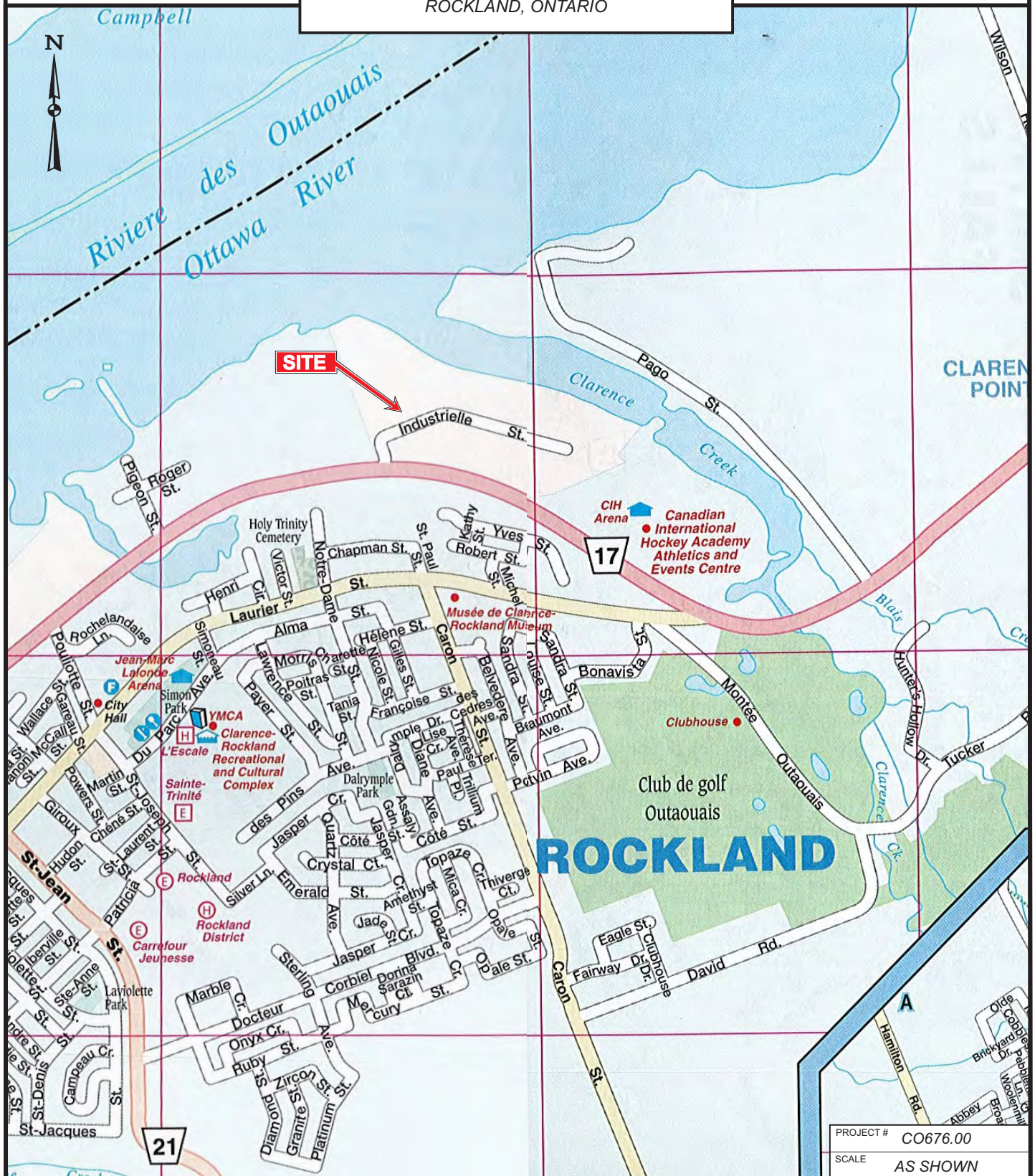
Figures 1
Figure 2
Figure 3

Tables 1, 2 & 3

Laboratory Certificates of Analyses

Certificate of approval (C of A) No. 3-0466-93967 Historical Groundwater Analytical Data

FIGURES



0 400m 800m
(APPROXIMATE)

SOURCE: CCCMAPS, THE GOLDEN HORSESHOE, 2015 EDITION, PAGES 116 AND 117.

PROJECT #	CO676.00
SCALE	AS SHOWN
DATE	JANUARY 2019
DRAWN	SK
CHECKED	GS
DRAWING #	

FIGURE 1



GENERAL SITE LAYOUT

700 INDUSTRIELLE STREET
ROCKLAND, ONTARIO

CLIENT

CITY OF CLARENCE ROCKLAND



LEGEND

 MONITORING WELL
(BY OTHERS)

0 100m 200m
(APPROXIMATE)

SOURCE: VUMAP FIRST BASE SOLUTIONS, 2018 IMAGERY.

PROJECT # CO676.00

SCALE AS SHOWN

DATE JANUARY 2019

DRAWN SK CHECKED GS

DRAWING #

FIGURE 2



TABLES

TABLE 1 GROUNDWATER MONITORING DATA
700 Industrielle Street, Clarence-Rockland, ON

WELL NUMBER	DATE	GROUND ELEVATION ¹ (m)	T.O.P. ELEVATION ² (m)	DEPTH TO WATER FROM T.O.P. (m)	DEPTH TO WATER FROM GROUND (m)	GROUNDWATER ELEVATION ⁴ (m)	Comments
MW-2	03-Jul-18	48.36	49.09	3.45	2.72	45.64	None
	22-Aug-18			3.72	2.99	45.37	None
	08-Nov-18			3.77	3.04	45.32	None
	22-Jan-19			3.47	2.74	45.62	None
MW-3	03-Jul-18	51.77	52.56	2.61	1.82	49.95	None
	22-Aug-18			2.94	2.15	49.62	None
	08-Nov-18			2.41	1.62	50.15	None
	22-Jan-19			2.23	1.44	50.33	None
MW-4	03-Jul-18	43.43	44.68	2.30	1.05	42.38	None
	22-Aug-18			1.80	0.55	42.88	None
	08-Nov-18			1.67	0.42	43.01	None
	22-Jan-19			2.32	1.07	42.36	None
MW-5	03-Jul-18	43.71	44.98	-	-	-	Damaged
	22-Aug-18			-	-	-	Damaged
	08-Nov-18			-	-	-	Damaged
	22-Jan-19			-	-	-	Damaged
BH03-4	03-Jul-18	50.69	51.37	4.74	4.06	46.63	None
	22-Aug-18			4.88	4.20	46.49	None
	08-Nov-18			4.56	3.88	46.81	None
	22-Jan-19			4.75	4.07	46.62	None
MW11-6	03-Jul-18	42.81	43.72	1.53	0.62	42.19	None
	22-Aug-18			1.42	0.51	42.30	None
	08-Nov-18			1.04	0.13	42.68	None
	22-Jan-19			1.10	0.19	42.62	None
MW11-7	03-Jul-18	48.33	49.00	3.52	2.85	45.48	None
	22-Aug-18			3.76	3.09	45.24	None
	08-Nov-18			3.71	3.04	45.29	None
	22-Jan-19			3.55	2.88	45.45	None
MW11-8	03-Jul-18	51.24	52.17	3.93	3.00	48.24	None
	22-Aug-18			3.99	3.06	48.18	None
	08-Nov-18			3.82	2.89	48.35	None
	22-Jan-19			4.01	3.08	48.16	None
MW11-9	03-Jul-18	52.58	53.43	4.31	3.46	49.12	None
	22-Aug-18			4.40	3.55	49.03	None
	08-Nov-18			4.44	3.59	48.99	None
	22-Jan-19			4.56	3.71	48.87	None
MW11-10	03-Jul-18	51.51	52.35	1.91	1.07	50.44	None
	22-Aug-18			1.77	0.93	50.58	None
	08-Nov-18			1.13	0.29	51.22	None
	22-Jan-19			-	-	-	Inaccessible

MW17-1	03-Jul-18	49.35	50.23	4.70	3.94	44.88	None
	22-Aug-18			5.02	4.26	44.56	None
	08-Nov-18			5.11	4.35	44.47	None
	22-Jan-19			4.77	4.01	44.81	None
MW17-2 ⁵	03-Jul-18	48.82	49.58	-	-	-	None
	22-Aug-18			-	-	-	None
	08-Nov-18			-	-	-	None
	22-Jan-19			3.03 - dry	-	-	Dry

¹ Elevation of ground surface at well location, relative to site benchmark

² Elevation of highest point of well pipe ("top of pipe"), relative to site benchmark

³ Elevation of bottom of well screened interval, relative to site benchmark

⁴ Static water level elevation, relative to site benchmark

⁵ Monitoring well MW17-2 was not monitored in July, August or November 2018

- Not measured

Note: Survey Data was taken from the 2017 Annual Monitoring report prepared by Golder

**TABLE 2 GROUNDWATER ANALYTICAL RESULTS COMPARED
TO THE TRIGGER PARAMETERS
700 Industrielle Street, Clarence-Rockland, ON**

Terrapex Sample Name:	Trigger Parameters ¹	units	MW-2		MW-3	
			03-Jul-18	08-Nov-18	03-Jul-18	08-Nov-18
Sampling Date			B8G6084	B8T9661	B8G6084	B8T9661
Certificate of Analysis No.						
FIELD PARAMETERS						
Temperature c°			12.99	9.90	12.11	9.80
pH			8.01	7.57	8.06	7.57
Conductivity			0.898	0.910	1.04	0.856
Turbidity			239	455	800	432
INORGANICS						
Total- Ammonia -N	0.14	mg/L	<u>0.41</u>	<u>1.8</u>	<u>0.22</u>	<u>0.16</u>
Total BOD		mg/L	3	8	<2	3
Total Dissolved Solids		mg/L	425	540	445	435
Total Kjeldahl Nitrogen (TKN)		mg/L	<1	2.1	0.26	0.21
Total Phosphorous	0.80	mg/L	0.18	0.068	<u>1.1</u>	0.08
Dissolved Sulphate		mg/L	80	46	61	64
Dissolved Chloride		mg/L	40	110	81	49
Nitrite (N)	0.05	mg/L	0.028	<u>0.182</u>	<0.010	<0.010
Nitrate (N)	0.1	mg/L	<u>11.1</u>	<u>20.5</u>	<0.10	<0.10
Nitrite + Nitrate (N)		mg/L	11.1	20.7	<0.10	<0.10
METALS						
		ug/L				
Aluminium (Al)		ug/L	6.1	<5.0	<0.50	<5.0
Antimony (Sb)		ug/L	<0.50	<0.50	<0.50	<0.50
Arsenic (As)		ug/L	<1.0	<1.0	<1.0	<1.0
Beryllium (Be)		ug/L	<0.50	<0.50	<0.50	<0.50
Boron (B)		ug/L	51	55	86	88
Cadmium (Cd)		ug/L	<0.10	<0.10	<0.10	<0.10
Chromium (Cr)		ug/L	<5.0	<5.0	<5.0	<5.0
Cobalt (Co)		ug/L	<0.50	0.58	<0.50	<0.50
Copper (Cu)		ug/L	4.4	4.8	<1.0	1.5
Iron (Fe)		ug/L	<100	<100	<100	<100
Lead (Pb)		ug/L	<0.50	0.81	<0.50	<0.50
Molybdenum (Mo)		ug/L	<0.50	<0.50	<0.50	<0.50
Nickel (N)		ug/L	1.4	3.0	1.2	1.8
Selenium (Se)		ug/L	<2.0	<2.0	<2.0	<2.0
Silver (Ag)		ug/L	<0.10	<0.10	<0.10	<0.10
Thallium (Tl)		ug/L	<0.050	<0.050	<0.050	<0.050
Tungsten (W)		ug/L	<1.0	<1.0	<1.0	<1.0
Uranium (U)		ug/L	1.1	0.76	0.46	0.52
Vanadium (V)		ug/L	<0.50	<0.50	<0.50	<0.50
Zinc (Zn)		ug/L	<5.0	16	<5.0	11
Zirconium (Zr)		ug/L	<1.0	<1.0	<1.0	<1.0

BOLD: Value exceeds the "trigger concentration".

Note ¹: Trigger concentrations were calculated by finding the median concentration from the historical analytical data from background monitoring wells (MW-3 and MW11-10).

**TABLE 2 GROUNDWATER ANALYTICAL RESULTS COMPARED
TO THE TRIGGER PARAMETERS
700 Industrielle Street, Clarence-Rockland, ON**

Terrapex Sample Name:			MW-4 ¹		BH-03-4	
	Trigger Parameters ¹	units				
Sampling Date			03-Jul-18	08-Nov-18	03-Jul-18	08-Nov-18
Certificate of Analysis No.			B8G6084	B8T9661	B8G6084	B8T9661
FIELD PARAMETERS						
Temperature c°			-	9.00	-	11.50
pH			-	6.66	-	6.94
Conductivity			-	0.352	-	0.870
Turbidity			-	178	-	433
INORGANICS						
Total- Ammonia -N	0.14	mg/L	0.088	<0.050	<u>2.4</u>	<u>9.3</u>
Total BOD		mg/L	<2	<2	<2	29
Total Dissolved Solids		mg/L	260	170	230	445
Total Kjeldahl Nitrogen (TKN)		mg/L	0.30	<0.10	2.5	9.3
Total Phosphorous	0.80	mg/L	<u>1.1</u>	0.069	1.3	1.4
Dissolved Sulphate		mg/L	52	53	21	25
Dissolved Chloride		mg/L	41	22	15	32
Nitrite (N)	0.05	mg/L	0.019	<0.010	<0.010	<u>0.142</u>
Nitrate (N)	0.1	mg/L	<0.10	<u>0.43</u>	<u>0.12</u>	<u>0.33</u>
Nitrite + Nitrate (N)		mg/L	<0.10	0.43	0.12	0.47
METALS						
		ug/L				
Aluminium (Al)		ug/L	<0.50	6.8	8.8	9.9
Antimony (Sb)		ug/L	<0.50	<0.50	<0.50	<0.50
Arsenic (As)		ug/L	<1.0	<1.0	<1.0	<1.0
Beryllium (Be)		ug/L	<0.50	<0.50	<0.50	<0.50
Boron (B)		ug/L	27	17	24	37
Cadmium (Cd)		ug/L	<0.10	<0.10	<0.10	<0.10
Chromium (Cr)		ug/L	<5.0	<5.0	<5.0	<5.0
Cobalt (Co)		ug/L	<0.50	<0.50	<0.50	<0.50
Copper (Cu)		ug/L	<1.0	1.3	1.7	1.1
Iron (Fe)		ug/L	<100	<100	4000	8700
Lead (Pb)		ug/L	<0.50	<0.50	<0.50	<0.50
Molybdenum (Mo)		ug/L	<0.50	<0.50	<0.50	<0.50
Nickel (N)		ug/L	1.0	<1.0	1.0	<1.0
Selenium (Se)		ug/L	<2.0	<2.0	<2.0	<2.0
Silver (Ag)		ug/L	<0.10	<0.10	<0.10	<0.10
Thallium (Tl)		ug/L	<0.050	<0.050	<0.050	<0.050
Tungsten (W)		ug/L	<1.0	<1.0	<1.0	<1.0
Uranium (U)		ug/L	0.14	<0.10	0.11	0.26
Vanadium (V)		ug/L	1.1	<0.50	1.7	1.4
Zinc (Zn)		ug/L	<5.0	<5.0	<5.0	<5.0
Zirconium (Zr)		ug/L	<1.0	<1.0	<1.0	<1.0

BOLD: Value exceeds the "trigger concentration".

Note ¹: Trigger concentrations were calculated by finding the median concentration from the historical analytical data from background monitoring wells (MW-3 and MW11-10).

**TABLE 2 GROUNDWATER ANALYTICAL RESULTS COMPARED
TO THE TRIGGER PARAMETERS
700 Industrielle Street, Clarence-Rockland, ON**

Terrapex Sample Name:	Trigger Parameters ¹	units	MW11-6			
			MW11-19		RPD	
			Duplicate			
Sampling Date			03-Jul-18			08-Nov-18
Certificate of Analysis No.			B8G6084			B8T9661
FIELD PARAMETERS						
Temperature c°			13.02		-	10.10
pH			7.69		-	7.70
Conductivity			6.90		-	3.999
Turbidity			173		-	2000
INORGANICS						
Total- Ammonia -N	0.14	mg/L	1.6	1.6	0.0%	0.36
Total BOD		mg/L	<2	<2	-	3
Total Dissolved Solids		mg/L	3960	4060	2.5%	3330
Total Kjeldahl Nitrogen (TKN)		mg/L	1.6	1.7	6.1%	0.45
Total Phosphorous	0.80	mg/L	0.20	0.20	-	0.07
Dissolved Sulphate		mg/L	210	200	4.9%	130
Dissolved Chloride		mg/L	2300	2200	4.4%	1200
Nitrite (N)	0.05	mg/L	0.011	0.015	-	0.046
Nitrate (N)	0.1	mg/L	<0.10	<0.10	-	<0.10
Nitrite + Nitrate (N)		mg/L	<0.10	<0.10	-	0.14
METALS						
		ug/L				
Aluminium (Al)		ug/L	<5.0	<5.0	-	<5.0
Antimony (Sb)		ug/L	<0.50	<0.50	-	<0.50
Arsenic (As)		ug/L	1.3	1.3	-	<1.0
Beryllium (Be)		ug/L	<0.50	<0.50	-	<0.50
Boron (B)		ug/L	270	270	0.0%	150
Cadmium(Cd)		ug/L	<0.10	<0.10	-	<0.10
Chromium (Cr)		ug/L	<5.0	<5.0	-	<5.0
Cobalt (Co)		ug/L	<0.50	<0.50	-	<0.50
Copper (Cu)		ug/L	<1.0	<1.0	-	3.8
Iron (Fe)		ug/L	210	210	-	130
Lead (Pb)		ug/L	<0.50	<0.50	-	1.0
Molybdenum (Mo)		ug/L	<0.50	0.57	-	0.58
Nickel (N)		ug/L	1.1	1.1	-	1.5
Selenium (Se)		ug/L	<2.0	<2.0	-	<2.0
Silver (Ag)		ug/L	<0.10	<0.10	-	<0.10
Thallium (Tl)		ug/L	<0.050	<0.050	-	<0.050
Tungsten (W)		ug/L	<1.0	<1.0	-	<1.0
Uranium (U)		ug/L	0.41	0.44	-	1.1
Vanadium (V)		ug/L	0.53	<0.50	-	0.88
Zinc (Zn)		ug/L	<5.0	<5.0	-	21
Zirconium (Zr)		ug/L	<1.0	<1.0	-	<1.0

BOLD: Value exceeds the "trigger concentration".

Note ¹: Trigger concentrations were calculated by finding the median concentration from the historical analytical data from background monitoring wells (MW-3 and MW11-10).

**TABLE 2 GROUNDWATER ANALYTICAL RESULTS COMPARED
TO THE TRIGGER PARAMETERS
700 Industrielle Street, Clarence-Rockland, ON**

Terrapex Sample Name:			MW11-7		MW11-8	
	Trigger Parameters ¹	units				
Sampling Date			03-Jul-18	08-Nov-18	03-Jul-18	08-Nov-18
Certificate of Analysis No.			B8G6084	B8T9661	B8G6084	B8T9661
FIELD PARAMETERS						
Temperature c°			13.56	8.9	12.05	11.3
pH			8.90	7.22	6.64	6.86
Conductivity			2.54	2.239	1.83	1.674
Turbidity			387	1121	798	840
INORGANICS						
Total- Ammonia -N	0.14	mg/L	0.30	0.90	6.8	7.5
Total BOD		mg/L	<2	3	<2	<2
Total Dissolved Solids		mg/L	1420	1620	935	1050
Total Kjeldahl Nitrogen (TKN)		mg/L	0.49	0.93	6.6	7.4
Total Phosphorous	0.80	mg/L	0.1	0.22	1.3	1.2
Dissolved Sulphate		mg/L	61	65	150	200
Dissolved Chloride		mg/L	600	570	98	100
Nitrite (N)	0.05	mg/L	<0.010	0.046	<0.010	<0.010
Nitrate (N)	0.1	mg/L	1.55	1.20	<0.10	<0.10
Nitrite + Nitrate (N)		mg/L	1.55	1.24	<0.10	<0.10
METALS						
		ug/L				
Aluminium (Al)		ug/L	<5.0	<5.0	<5.0	<5.0
Antimony (Sb)		ug/L	<0.50	<0.50	<0.50	<0.50
Arsenic (As)		ug/L	1.3	1.4	<1.0	<1.0
Beryllium (Be)		ug/L	<0.50	<0.50	<0.50	<0.50
Boron (B)		ug/L	98	200	73	70
Cadmium(Cd)		ug/L	<0.10	<0.10	<0.10	<0.10
Chromium (Cr)		ug/L	<5.0	<5.0	<5.0	<5.0
Cobalt (Co)		ug/L	<0.50	0.62	<0.50	<0.50
Copper (Cu)		ug/L	5.4	<1.0	5.4	1.4
Iron (Fe)		ug/L	<100	<100	23000	27000
Lead (Pb)		ug/L	<0.50	<0.50	<0.50	0.64
Molybdenum (Mo)		ug/L	0.53	0.88	0.53	<0.50
Nickel (N)		ug/L	1.6	1.3	<1.0	1.4
Selenium (Se)		ug/L	<2.0	<2.0	<2.0	<2.0
Silver (Ag)		ug/L	<0.10	<0.10	<0.10	<0.10
Thallium (Tl)		ug/L	<0.050	<0.050	<0.050	<0.050
Tungsten (W)		ug/L	<1.0	<1.0	<1.0	<1.0
Uranium (U)		ug/L	1.5	0.94	1.5	<0.10
Vanadium (V)		ug/L	<0.50	0.68	2.8	1.9
Zinc (Zn)		ug/L	<5.0	<5.0	<5.0	18
Zirconium (Zr)		ug/L	<1.0	<1.0	<1.0	<1.0

BOLD: Value exceeds the "trigger concentration".

Note ¹: Trigger concentrations were calculated by finding the median concentration from the historical analytical data from background monitoring wells (MW-3 and MW11-10).

**TABLE 2 GROUNDWATER ANALYTICAL RESULTS COMPARED
TO THE TRIGGER PARAMETERS
700 Industrielle Street, Clarence-Rockland, ON**

Terrapex Sample Name:	Trigger Parameters ¹	units	MW11-9			
			MW11-19		RPD	
			03-Jul-18	08-Nov-18		
			B8G6084	B8T9661	Field Duplicate	
Sampling Date						
Certificate of Analysis No.						
FIELD PARAMETERS						
Temperature c°			12.20	10.10		-
pH			8.27	6.57		-
Conductivity			487	0.624		-
Turbidity			270	313		-
INORGANICS						
Total- Ammonia -N	0.14	mg/L	0.11	<0.050	0.23	-
Total BOD		mg/L	<2	<2	<2	-
Total Dissolved Solids		mg/L	260	365	345	5.6%
Total Kjeldahl Nitrogen (TKN)		mg/L	0.3	0.22	0.39	-
Total Phosphorous	0.80	mg/L	1.2	0.12	2.4	181.0%
Dissolved Sulphate		mg/L	71	90	91	1.1%
Dissolved Chloride		mg/L	38	62	65	4.7%
Nitrite (N)	0.05	mg/L	<0.010	<0.010	<0.010	-
Nitrate (N)	0.1	mg/L	0.69	0.34	0.28	-
Nitrite + Nitrate (N)		mg/L	0.69	0.34	0.28	-
METALS						
		ug/L				
Aluminium (Al)		ug/L	12	8.2	9.3	-
Antimony (Sb)		ug/L	<0.50	<0.50	<0.50	-
Arsenic (As)		ug/L	<1.0	<1.0	<1.0	-
Beryllium (Be)		ug/L	<0.50	<0.50	<0.50	-
Boron (B)		ug/L	24	60	59	1.7%
Cadmium (Cd)		ug/L	<0.10	<0.10	<0.10	-
Chromium (Cr)		ug/L	<5.0	<5.0	<5.0	-
Cobalt (Co)		ug/L	<0.50	<0.50	<0.50	-
Copper (Cu)		ug/L	2.8	2.5	2.2	-
Iron (Fe)		ug/L	120	300	300	-
Lead (Pb)		ug/L	<0.50	<0.50	<0.50	-
Molybdenum (Mo)		ug/L	0.92	<0.50	0.51	-
Nickel (N)		ug/L	<1.0	1.3	1.2	-
Selenium (Se)		ug/L	<2.0	<2.0	<2.0	-
Silver (Ag)		ug/L	<0.10	<0.10	<0.10	-
Thallium (Tl)		ug/L	<0.050	<0.050	<0.050	-
Tungsten (W)		ug/L	<1.0	<1.0	<1.0	-
Uranium (U)		ug/L	0.15	<0.10	<0.10	-
Vanadium (V)		ug/L	1.0	0.70	0.73	-
Zinc (Zn)		ug/L	<5.0	<5.0	<5.0	-
Zirconium (Zr)		ug/L	<1.0	<1.0	<1.0	-

BOLD: Value exceeds the "trigger concentration".

Note ¹: Trigger concentrations were calculated by finding the median concentration from the historical analytical data from background monitoring wells (MW-3 and MW11-10).

**TABLE 2 GROUNDWATER ANALYTICAL RESULTS COMPARED
TO THE TRIGGER PARAMETERS
700 Industrielle Street, Clarence-Rockland, ON**

Terrapex Sample Name:	Trigger Parameters ¹	units	MW11-10		MW17-01	
			Labelled "EW" in lab certificates			
Sampling Date			03-Jul-18	08-Nov-18	03-Jul-18	08-Nov-18
Certificate of Analysis No.			B8G6084	B8T9661	B8G6084	B8T9661
FIELD PARAMETERS						
Temperature c°			16.93	11.70	12.61	9.20
pH			7.97	7.34	8.98	6.96
Conductivity			1.34	1.638	0.272	0.332
Turbidity			124	820	300	166
INORGANICS						
Total- Ammonia -N	0.14	mg/L	0.068	<0.050	0.053	<0.050
Total BOD		mg/L	<2	<2	<2	<2
Total Dissolved Solids		mg/L	1030	1080	170	130
Total Kjeldahl Nitrogen (TKN)		mg/L	0.18	<0.10	0.28	<0.10
Total Phosphorous	0.80	mg/L	0.18	0.31	1.7	0.06
Dissolved Sulphate		mg/L	190	220	20	24
Dissolved Chloride		mg/L	160	130	8.0	15
Nitrite (N)	0.05	mg/L	<0.010	<0.010	<0.010	<0.010
Nitrate (N)	0.1	mg/L	<0.10	<0.10	<0.10	0.93
Nitrite + Nitrate (N)		mg/L	<0.10	<0.10	<0.10	0.93
METALS						
		ug/L				
Aluminium (Al)		ug/L	<5.0	<5.0	12	6.2
Antimony (Sb)		ug/L	<0.50	<0.50	<0.50	<0.50
Arsenic (As)		ug/L	<1.0	<1.0	<1.0	<1.0
Beryllium (Be)		ug/L	<0.50	<0.50	<0.50	<0.50
Boron (B)		ug/L	100	85	13	13
Cadmium(Cd)		ug/L	<0.10	<0.10	<0.10	<0.10
Chromium (Cr)		ug/L	<5.0	<5.0	<5.0	<5.0
Cobalt (Co)		ug/L	<0.50	<0.50	<0.50	<0.50
Copper (Cu)		ug/L	<1.0	1.4	3.8	4.0
Iron (Fe)		ug/L	<100	<100	<100	<100
Lead (Pb)		ug/L	<0.50	<0.50	<0.50	0.89
Molybdenum (Mo)		ug/L	1.9	2.0	<0.50	<0.50
Nickel (N)		ug/L	<1.0	1.1	<1.0	<1.0
Selenium (Se)		ug/L	<2.0	<2.0	<2.0	<2.0
Silver (Ag)		ug/L	<0.10	<0.10	<0.10	<0.10
Thallium (Tl)		ug/L	<0.050	<0.050	<0.050	<0.050
Tungsten (W)		ug/L	<1.0	<1.0	<1.0	<1.0
Uranium (U)		ug/L	9.5	10	<0.10	<0.10
Vanadium (V)		ug/L	1.1	1.3	<0.50	<0.50
Zinc (Zn)		ug/L	<5.0	<5.0	<5.0	18
Zirconium (Zr)		ug/L	<1.0	<1.0	<1.0	<1.0

BOLD: Value exceeds the "trigger concentration".

Note ¹: Trigger concentrations were calculated by finding the median concentration from the historical analytical data from background monitoring wells (MW-3 and MW11-10).

TABLE 3 **GROUNDWATER ANALYTICAL RESULTS COMPARED TO PWQO**
700 Industrielle Street, Clarence-Rockland, ON

Terrapex Sample Name:	PWQO ²	units	MW-4		MW11-6			
			03-Jul-18 B8G6084	08-Nov-18 B8T9661	MW11-19		03-Jul-18 B8G6084	08-Nov-18 B8T9661
					Duplicate	RPD		
Sampling Date								
Certificate of Analysis No.								
FIELD PARAMETERS								
Temperature c°			-	9.00	13.02	-		10.10
pH			-	6.66	7.69	-		7.70
Conductivity			-	0.352	6.90	-		3.999
Turbidity			-	178	173	-		2000
INORGANICS								
Total- Ammonia -N	0.02	mg/L	0.088	<0.050	1.6	1.6	0.0%	0.36
Total BOD	-	mg/L	<2	<2	<2	<2	-	3
Total Dissolved Solids	-	mg/L	260	170	3960	4060	2.5%	3330
Total Kjeldahl Nitrogen (TKN)		mg/L	0.30	<0.10	1.6	1.7	6.1%	0.45
Total Phosphorous	0.03	mg/L	1.1	0.069	0.20	0.20	-	0.07
Dissolved Sulphate	-	mg/L	52	53	210	200	4.9%	130
Dissolved Chloride	-	mg/L	41	22	2300	2200	4.4%	1200
Nitrite (N)	-	mg/L	0.019	<0.010	0.011	0.015	-	0.046
Nitrate (N)	-	mg/L	<0.10	0.43	<0.10	<0.10	-	<0.10
Nitrite + Nitrate (N)		mg/L	<0.10	0.43	<0.10	<0.10	-	0.14
METALS								
		ug/L						
Aluminium (Al)	75	ug/L	<0.50	6.8	<5.0	<5.0	-	<5.0
Antimony (Sb)	20	ug/L	<0.50	<0.50	<0.50	<0.50	-	<0.50
Arsenic (As)	100	ug/L	<1.0	<1.0	1.3	1.3	-	<1.0
Beryllium (Be)	1100	ug/L	<0.50	<0.50	<0.50	<0.50	-	<0.50
Boron (B)	200	ug/L	27	17	270	270	0.0%	150
Cadmium(Cd)	0.2	ug/L	<0.10	<0.10	<0.10	<0.10	-	<0.10
Chromium (Cr)	8.9	ug/L	<5.0	<5.0	<5.0	<5.0	-	<5.0
Cobalt (Co)	0.9	ug/L	<0.50	<0.50	<0.50	<0.50	-	<0.50
Copper (Cu)	5	ug/L	<1.0	1.3	<1.0	<1.0	-	3.8
Iron (Fe)	300	ug/L	<100	<100	210	210	-	130
Lead (Pb)	3	ug/L	<0.50	<0.50	<0.50	<0.50	-	1.0
Molybdenum (Mo)	40	ug/L	<0.50	<0.50	<0.50	0.57	-	0.58
Nickel (N)	25	ug/L	1.0	<1.0	1.1	1.1	-	1.5
Selenium (Se)	100	ug/L	<2.0	<2.0	<2.0	<2.0	-	<2.0
Silver (Ag)	0.1	ug/L	<0.10	<0.10	<0.10	<0.10	-	<0.10
Thallium (Tl)	0.3	ug/L	<0.050	<0.050	<0.050	<0.050	-	<0.050
Tungsten (W)	30	ug/L	<1.0	<1.0	<1.0	<1.0	-	<1.0
Uranium (U)	5	ug/L	0.14	<0.10	0.41	0.44	-	1.1
Vanadium (V)	6	ug/L	1.1	<0.50	0.53	<0.50	-	0.88
Zinc (Zn)	30	ug/L	<5.0	<5.0	<5.0	<5.0	-	21
Zirconium (Zr)	4	ug/L	<1.0	<1.0	<1.0	<1.0	-	<1.0

Shaded Ministry of Environment, Conservation and Parks (MECP). Provincial Water Quality Objectives (PWQO)

Note²: Only monitoring MW-4 and MW11-6 were compared to PWQOs due to their proximity to the Ottawa River

LABORATORY CERTIFICATES OF ANALYSES

Your P.O. #: C067600
Site Location: CLARENCE ROCKLAND
Your C.O.C. #: 671397-01-01, 671397-02-01

Attention: Rod Rose

Terrapex Environmental Ltd
1-20 Gurdwara Rd.
Ottawa, ON
CANADA K2E 8B3

Report Date: 2018/07/11

Report #: R5290290

Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8G6084

Received: 2018/07/04, 10:25

Sample Matrix: Water
Samples Received: 13

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Biochemical Oxygen Demand (BOD) (1)	11	2018/07/06	2018/07/11	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry (1)	12	N/A	2018/07/06	CAM SOP-00463	EPA 325.2 m
Chloride by Automated Colourimetry (1)	1	N/A	2018/07/09	CAM SOP-00463	EPA 325.2 m
Lab Filtered Metals by ICPMS (1)	1	2018/07/07	2018/07/09	CAM SOP-00447	EPA 6020B m
Lab Filtered Metals by ICPMS (1)	2	2018/07/07	2018/07/10	CAM SOP-00447	EPA 6020B m
Dissolved Metals by ICPMS (1)	3	N/A	2018/07/06	CAM SOP-00447	EPA 6020B m
Dissolved Metals by ICPMS (1)	7	N/A	2018/07/09	CAM SOP-00447	EPA 6020B m
Total Ammonia-N (1)	13	N/A	2018/07/09	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (1, 2)	13	N/A	2018/07/06	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Sulphate by Automated Colourimetry (1)	12	N/A	2018/07/06	CAM SOP-00464	EPA 375.4 m
Sulphate by Automated Colourimetry (1)	1	N/A	2018/07/09	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (1)	11	2018/07/05	2018/07/05	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water (1)	13	2018/07/06	2018/07/09	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric) (1)	13	2018/07/09	2018/07/10	CAM SOP-00407	SM 23 4500 P B H m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

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

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Your P.O. #: C067600
Site Location: CLARENCE ROCKLAND
Your C.O.C. #: 671397-01-01, 671397-02-01

Attention: Rod Rose

Terrapex Environmental Ltd
1-20 Gurdwara Rd.
Ottawa, ON
CANADA K2E 8B3

Report Date: 2018/07/11
Report #: R5290290
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8G6084

Received: 2018/07/04, 10:25

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Analytics Mississauga

(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Jonathan Urben, Senior Project Manager

Email: jurben@maxxam.ca

Phone# (613) 274-0573

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

RESULTS OF ANALYSES OF WATER

Maxxam ID		HDD808			HDD808			HDD809		
Sampling Date		2018/07/03 12:30			2018/07/03 12:30			2018/07/03 02:00		
COC Number		671397-01-01			671397-01-01			671397-01-01		
	UNITS	MW11-9	RDL	QC Batch	MW11-9 Lab-Dup	RDL	QC Batch	MW11-8	RDL	QC Batch

Inorganics										
Total Ammonia-N	mg/L	0.11	0.050	5616220				6.8	0.050	5616220
Total BOD	mg/L	ND	2	5616031				ND	2	5616031
Total Dissolved Solids	mg/L	260	10	5615077				935	10	5615077
Total Kjeldahl Nitrogen (TKN)	mg/L	0.30	0.10	5616210				6.6	0.20	5616210
Total Phosphorus	mg/L	1.2	0.1	5618815				1.3	0.2	5618815
Dissolved Sulphate (SO4)	mg/L	71	1.0	5616991	70	1.0	5616991	150	1.0	5615010
Dissolved Chloride (Cl-)	mg/L	38	1.0	5616990	38	1.0	5616990	98	1.0	5615007
Nitrite (N)	mg/L	ND	0.010	5614987	ND	0.010	5614987	ND	0.010	5614987
Nitrate (N)	mg/L	0.69	0.10	5614987	0.68	0.10	5614987	ND	0.10	5614987
Nitrate + Nitrite (N)	mg/L	0.69	0.10	5614987	0.68	0.10	5614987	ND	0.10	5614987

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected

Maxxam ID		HDD809			HDD810		HDD811		HDD812		
Sampling Date		2018/07/03 02:00			2018/07/03 02:15		2018/07/03 02:45		2018/07/03 10:00		
COC Number		671397-01-01			671397-01-01		671397-01-01		671397-01-01		
	UNITS	MW11-8 Lab-Dup	RDL	QC Batch	MW-3	RDL	BH03-4	RDL	MW2	RDL	QC Batch

Inorganics											
Total Ammonia-N	mg/L				0.22	0.050	2.4	0.050	0.41	0.050	5616220
Total BOD	mg/L	ND	2	5616031	ND	2	ND	2	3	2	5616031
Total Dissolved Solids	mg/L				445	10	230	10	425	10	5615077
Total Kjeldahl Nitrogen (TKN)	mg/L				0.26	0.10	2.5	0.10	ND (1)	0.50	5616210
Total Phosphorus	mg/L				1.1	0.2	1.3	0.04	0.18	0.008	5618815
Dissolved Sulphate (SO4)	mg/L				61	1.0	21	1.0	80	1.0	5615010
Dissolved Chloride (Cl-)	mg/L				81	1.0	15	1.0	40	1.0	5615007
Nitrite (N)	mg/L				ND	0.010	ND	0.010	0.028	0.010	5614994
Nitrate (N)	mg/L				ND	0.10	0.12	0.10	11.1	0.10	5614994
Nitrate + Nitrite (N)	mg/L				ND	0.10	0.12	0.10	11.1	0.10	5614994

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected

(1) Due to a high concentration of NOx, the sample required dilution. The detection limit was adjusted accordingly.

RESULTS OF ANALYSES OF WATER

Maxxam ID		HDD813		HDD814			HDD815		
Sampling Date		2018/07/03 11:00		2018/07/03 11:30			2018/07/03 12:00		
COC Number		671397-01-01		671397-01-01			671397-01-01		
	UNITS	MW11-7	RDL	MW-4	RDL	QC Batch	MW11-6	RDL	QC Batch

Inorganics									
Total Ammonia-N	mg/L	0.30	0.050	0.088	0.050	5616220	1.6	0.050	5616220
Total BOD	mg/L	ND	2	ND	2	5616031	ND	2	5616031
Total Dissolved Solids	mg/L	1420	10	260	10	5615077	3960	20	5615077
Total Kjeldahl Nitrogen (TKN)	mg/L	0.49	0.10	0.30	0.10	5616210	1.6	0.10	5616210
Total Phosphorus	mg/L	0.10	0.02	1.1	0.1	5618815	0.20	0.04	5618815
Dissolved Sulphate (SO ₄)	mg/L	61	1.0	52	1.0	5615010	210	1.0	5615010
Dissolved Chloride (Cl ⁻)	mg/L	600	8.0	41	1.0	5615007	2300	30	5615007
Nitrite (N)	mg/L	ND	0.010	0.019	0.010	5614987	0.011	0.010	5614994
Nitrate (N)	mg/L	1.55	0.10	ND	0.10	5614987	ND	0.10	5614994
Nitrate + Nitrite (N)	mg/L	1.55	0.10	ND	0.10	5614987	ND	0.10	5614994
RDL = Reportable Detection Limit									
QC Batch = Quality Control Batch									
ND = Not detected									

Maxxam ID		HDD816			HDD817			HDD832		
Sampling Date		2018/07/03 02:30			2018/07/03 05:00			2018/07/03 03:00		
COC Number		671397-01-01			671397-01-01			671397-02-01		
	UNITS	MW11-10	RDL	QC Batch	EW	RDL	QC Batch	WEST LAGOON	RDL	QC Batch

Inorganics										
Total Ammonia-N	mg/L	0.068	0.050	5616220	0.053	0.050	5616220	160	5.0	5616220
Total BOD	mg/L	ND	2	5616031	ND	2	5616031			
Total Dissolved Solids	mg/L	1030	10	5615077	170	10	5615077			
Total Kjeldahl Nitrogen (TKN)	mg/L	0.18	0.10	5616210	0.28	0.10	5616210	990	50	5616210
Total Phosphorus	mg/L	0.18	0.04	5618815	1.7	0.2	5618815	480	10	5618815
Dissolved Sulphate (SO ₄)	mg/L	190	1.0	5615010	20	1.0	5615010	ND (1)	100	5615010
Dissolved Chloride (Cl ⁻)	mg/L	160	2.0	5615007	8.0	1.0	5615007	230	100	5615007
Nitrite (N)	mg/L	ND	0.010	5614987	ND	0.010	5614994	ND	0.010	5614994
Nitrate (N)	mg/L	ND	0.10	5614987	2.56	0.10	5614994	ND	0.10	5614994
Nitrate + Nitrite (N)	mg/L	ND	0.10	5614987	2.56	0.10	5614994	ND	0.10	5614994

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

ND = Not detected

(1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

RESULTS OF ANALYSES OF WATER

Maxxam ID		HDD833			HDD834		
Sampling Date		2018/07/03 03:15			2018/07/03 07:00		
COC Number		671397-02-01			671397-02-01		
	UNITS	EAST LAGOON	RDL	QC Batch	MW11-19	RDL	QC Batch
Inorganics							
Total Ammonia-N	mg/L	530	5.0	5616220	1.6	0.050	5616220
Total BOD	mg/L				ND	2	5616031
Total Dissolved Solids	mg/L				4060	20	5615077
Total Kjeldahl Nitrogen (TKN)	mg/L	630	20	5616210	1.7	0.10	5616210
Total Phosphorus	mg/L	120	5	5618815	0.20	0.04	5618815
Dissolved Sulphate (SO ₄)	mg/L	ND (1)	100	5615010	200	1.0	5615010
Dissolved Chloride (Cl ⁻)	mg/L	300	100	5615007	2200	30	5615007
Nitrite (N)	mg/L	ND	0.010	5614994	0.015	0.010	5614987
Nitrate (N)	mg/L	ND	0.10	5614994	ND	0.10	5614987
Nitrate + Nitrite (N)	mg/L	ND	0.10	5614994	ND	0.10	5614987
RDL = Reportable Detection Limit QC Batch = Quality Control Batch ND = Not detected (1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.							

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		HDD808	HDD809	HDD810	HDD811	HDD812	HDD813		
Sampling Date		2018/07/03 12:30	2018/07/03 02:00	2018/07/03 02:15	2018/07/03 02:45	2018/07/03 10:00	2018/07/03 11:00		
COC Number		671397-01-01	671397-01-01	671397-01-01	671397-01-01	671397-01-01	671397-01-01		
	UNITS	MW11-9	MW11-8	MW-3	BH03-4	MW2	MW11-7	RDL	QC Batch

Metals

Dissolved Aluminum (Al)	ug/L	12	ND	ND	8.8	6.1	ND	5.0	5615706
Dissolved Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	0.50	5615706
Dissolved Arsenic (As)	ug/L	ND	ND	ND	ND	ND	ND	1.0	5615706
Dissolved Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	0.50	5615706
Dissolved Boron (B)	ug/L	24	73	86	24	51	98	10	5615706
Dissolved Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	0.10	5615706
Dissolved Chromium (Cr)	ug/L	ND	ND	ND	ND	ND	ND	5.0	5615706
Dissolved Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	0.50	5615706
Dissolved Copper (Cu)	ug/L	2.8	ND	ND	1.7	4.4	5.4	1.0	5615706
Dissolved Iron (Fe)	ug/L	120	23000	ND	4000	ND	ND	100	5615706
Dissolved Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	0.50	5615706
Dissolved Molybdenum (Mo)	ug/L	0.92	ND	ND	ND	ND	0.53	0.50	5615706
Dissolved Nickel (Ni)	ug/L	ND	ND	1.2	ND	1.4	1.6	1.0	5615706
Dissolved Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	2.0	5615706
Dissolved Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	0.10	5615706
Dissolved Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	0.050	5615706
Dissolved Tungsten (W)	ug/L	ND	ND	ND	ND	ND	ND	1.0	5615706
Dissolved Uranium (U)	ug/L	0.15	ND	0.46	0.11	1.1	1.5	0.10	5615706
Dissolved Vanadium (V)	ug/L	1.0	2.8	ND	1.7	ND	ND	0.50	5615706
Dissolved Zinc (Zn)	ug/L	ND	ND	ND	ND	ND	ND	5.0	5615706
Dissolved Zirconium (Zr)	ug/L	ND	ND	ND	ND	ND	ND	1.0	5615706

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

ND = Not detected

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		HDD814	HDD814		HDD815	HDD816	HDD817		
Sampling Date		2018/07/03 11:30	2018/07/03 11:30		2018/07/03 12:00	2018/07/03 02:30	2018/07/03 05:00		
COC Number		671397-01-01	671397-01-01		671397-01-01	671397-01-01	671397-01-01		
	UNITS	MW-4	MW-4 Lab-Dup	QC Batch	MW11-6	MW11-10	EW	RDL	QC Batch

Metals

Dissolved Aluminum (Al)	ug/L	ND	5.7	5617758	ND	ND	12	5.0	5615706
Dissolved Antimony (Sb)	ug/L	ND	ND	5617758	ND	ND	ND	0.50	5615706
Dissolved Arsenic (As)	ug/L	ND	ND	5617758	1.3	ND	ND	1.0	5615706
Dissolved Beryllium (Be)	ug/L	ND	ND	5617758	ND	ND	ND	0.50	5615706
Dissolved Boron (B)	ug/L	27	27	5617758	270	100	13	10	5615706
Dissolved Cadmium (Cd)	ug/L	ND	ND	5617758	ND	ND	ND	0.10	5615706
Dissolved Chromium (Cr)	ug/L	ND	ND	5617758	ND	ND	ND	5.0	5615706
Dissolved Cobalt (Co)	ug/L	ND	ND	5617758	ND	ND	ND	0.50	5615706
Dissolved Copper (Cu)	ug/L	ND	ND	5617758	ND	ND	3.8	1.0	5615706
Dissolved Iron (Fe)	ug/L	ND	ND	5617758	210	ND	ND	100	5615706
Dissolved Lead (Pb)	ug/L	ND	ND	5617758	ND	ND	ND	0.50	5615706
Dissolved Molybdenum (Mo)	ug/L	ND	ND	5617758	ND	1.9	ND	0.50	5615706
Dissolved Nickel (Ni)	ug/L	1.0	ND	5617758	1.1	ND	ND	1.0	5615706
Dissolved Selenium (Se)	ug/L	ND	ND	5617758	ND	ND	ND	2.0	5615706
Dissolved Silver (Ag)	ug/L	ND	ND	5617758	ND	ND	ND	0.10	5615706
Dissolved Thallium (Tl)	ug/L	ND	ND	5617758	ND	ND	ND	0.050	5615706
Dissolved Tungsten (W)	ug/L	ND	ND	5617758	ND	ND	ND	1.0	5615706
Dissolved Uranium (U)	ug/L	0.14	0.13	5617758	0.41	9.5	ND	0.10	5615706
Dissolved Vanadium (V)	ug/L	1.1	1.1	5617758	0.53	1.1	ND	0.50	5615706
Dissolved Zinc (Zn)	ug/L	ND	ND	5617758	ND	ND	ND	5.0	5615706
Dissolved Zirconium (Zr)	ug/L	ND	ND	5617758	ND	ND	ND	1.0	5615706

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

ND = Not detected

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		HDD832	HDD833		HDD834		
Sampling Date		2018/07/03 03:00	2018/07/03 03:15		2018/07/03 07:00		
COC Number		671397-02-01	671397-02-01		671397-02-01		
	UNITS	WEST LAGOON	EAST LAGOON	QC Batch	MW11-19	RDL	QC Batch

Metals							
Dissolved Aluminum (Al)	ug/L	170	310	5617758	ND	5.0	5615706
Dissolved Antimony (Sb)	ug/L	ND	0.64	5617758	ND	0.50	5615706
Dissolved Arsenic (As)	ug/L	6.2	14	5617758	1.3	1.0	5615706
Dissolved Beryllium (Be)	ug/L	ND	ND	5617758	ND	0.50	5615706
Dissolved Boron (B)	ug/L	120	180	5617758	270	10	5615706
Dissolved Cadmium (Cd)	ug/L	ND	ND	5617758	ND	0.10	5615706
Dissolved Chromium (Cr)	ug/L	ND	ND	5617758	ND	5.0	5615706
Dissolved Cobalt (Co)	ug/L	0.77	2.0	5617758	ND	0.50	5615706
Dissolved Copper (Cu)	ug/L	ND	1.9	5617758	ND	1.0	5615706
Dissolved Iron (Fe)	ug/L	ND	2200	5617758	210	100	5615706
Dissolved Lead (Pb)	ug/L	ND	ND	5617758	ND	0.50	5615706
Dissolved Molybdenum (Mo)	ug/L	ND	0.68	5617758	0.57	0.50	5615706
Dissolved Nickel (Ni)	ug/L	3.6	7.1	5617758	1.1	1.0	5615706
Dissolved Selenium (Se)	ug/L	ND	2.9	5617758	ND	2.0	5615706
Dissolved Silver (Ag)	ug/L	ND	0.18	5617758	ND	0.10	5615706
Dissolved Thallium (Tl)	ug/L	ND	ND	5617758	ND	0.050	5615706
Dissolved Tungsten (W)	ug/L	ND	ND	5617758	ND	1.0	5615706
Dissolved Uranium (U)	ug/L	0.49	1.8	5617758	0.44	0.10	5615706
Dissolved Vanadium (V)	ug/L	ND	0.96	5617758	ND	0.50	5615706
Dissolved Zinc (Zn)	ug/L	ND	5.5	5617758	ND	5.0	5615706
Dissolved Zirconium (Zr)	ug/L	ND	ND	5617758	ND	1.0	5615706
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							
ND = Not detected							

TEST SUMMARY

Maxxam ID: HDD808
Sample ID: MW11-9
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5616031	2018/07/06	2018/07/11	Prakash Piya
Chloride by Automated Colourimetry	KONE	5616990	N/A	2018/07/09	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5615706	N/A	2018/07/09	Thao Nguyen
Total Ammonia-N	LACH/NH4	5616220	N/A	2018/07/09	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5614987	N/A	2018/07/06	Charles Opoku-Ware
Sulphate by Automated Colourimetry	KONE	5616991	N/A	2018/07/09	Deonarine Ramnarine
Total Dissolved Solids	BAL	5615077	2018/07/05	2018/07/05	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5616210	2018/07/06	2018/07/09	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5618815	2018/07/09	2018/07/10	Amanpreet Sappal

Maxxam ID: HDD808 Dup
Sample ID: MW11-9
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride by Automated Colourimetry	KONE	5616990	N/A	2018/07/09	Deonarine Ramnarine
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5614987	N/A	2018/07/06	Charles Opoku-Ware
Sulphate by Automated Colourimetry	KONE	5616991	N/A	2018/07/09	Deonarine Ramnarine

Maxxam ID: HDD809
Sample ID: MW11-8
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5616031	2018/07/06	2018/07/11	Prakash Piya
Chloride by Automated Colourimetry	KONE	5615007	N/A	2018/07/06	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5615706	N/A	2018/07/06	Thao Nguyen
Total Ammonia-N	LACH/NH4	5616220	N/A	2018/07/09	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5614987	N/A	2018/07/06	Charles Opoku-Ware
Sulphate by Automated Colourimetry	KONE	5615010	N/A	2018/07/06	Deonarine Ramnarine
Total Dissolved Solids	BAL	5615077	2018/07/05	2018/07/05	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5616210	2018/07/06	2018/07/09	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5618815	2018/07/09	2018/07/10	Amanpreet Sappal

Maxxam ID: HDD809 Dup
Sample ID: MW11-8
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5616031	2018/07/11	2018/07/11	Prakash Piya

Maxxam Job #: B8G6084
Report Date: 2018/07/11

Terrapex Environmental Ltd
Site Location: CLARENCE ROCKLAND
Your P.O. #: C067600
Sampler Initials: GS

TEST SUMMARY

Maxxam ID: HDD810
Sample ID: MW-3
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5616031	2018/07/06	2018/07/11	Prakash Piya
Chloride by Automated Colourimetry	KONE	5615007	N/A	2018/07/06	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5615706	N/A	2018/07/06	Thao Nguyen
Total Ammonia-N	LACH/NH4	5616220	N/A	2018/07/09	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5614994	N/A	2018/07/06	Charles Opoku-Ware
Sulphate by Automated Colourimetry	KONE	5615010	N/A	2018/07/06	Deonarine Ramnarine
Total Dissolved Solids	BAL	5615077	2018/07/05	2018/07/05	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5616210	2018/07/06	2018/07/09	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5618815	2018/07/09	2018/07/10	Amanpreet Sappal

Maxxam ID: HDD811
Sample ID: BH03-4
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5616031	2018/07/06	2018/07/11	Prakash Piya
Chloride by Automated Colourimetry	KONE	5615007	N/A	2018/07/06	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5615706	N/A	2018/07/09	Thao Nguyen
Total Ammonia-N	LACH/NH4	5616220	N/A	2018/07/09	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5614994	N/A	2018/07/06	Charles Opoku-Ware
Sulphate by Automated Colourimetry	KONE	5615010	N/A	2018/07/06	Deonarine Ramnarine
Total Dissolved Solids	BAL	5615077	2018/07/05	2018/07/05	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5616210	2018/07/06	2018/07/09	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5618815	2018/07/09	2018/07/10	Amanpreet Sappal

Maxxam ID: HDD812
Sample ID: MW2
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5616031	2018/07/06	2018/07/11	Prakash Piya
Chloride by Automated Colourimetry	KONE	5615007	N/A	2018/07/06	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5615706	N/A	2018/07/09	Thao Nguyen
Total Ammonia-N	LACH/NH4	5616220	N/A	2018/07/09	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5614994	N/A	2018/07/06	Charles Opoku-Ware
Sulphate by Automated Colourimetry	KONE	5615010	N/A	2018/07/06	Deonarine Ramnarine
Total Dissolved Solids	BAL	5615077	2018/07/05	2018/07/05	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5616210	2018/07/06	2018/07/09	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5618815	2018/07/09	2018/07/10	Amanpreet Sappal

Maxxam Job #: B8G6084
Report Date: 2018/07/11

Terrapex Environmental Ltd
Site Location: CLARENCE ROCKLAND
Your P.O. #: C067600
Sampler Initials: GS

TEST SUMMARY

Maxxam ID: HDD813
Sample ID: MW11-7
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5616031	2018/07/06	2018/07/11	Prakash Piya
Chloride by Automated Colourimetry	KONE	5615007	N/A	2018/07/06	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5615706	N/A	2018/07/09	Thao Nguyen
Total Ammonia-N	LACH/NH4	5616220	N/A	2018/07/09	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5614987	N/A	2018/07/06	Charles Opoku-Ware
Sulphate by Automated Colourimetry	KONE	5615010	N/A	2018/07/06	Deonarine Ramnarine
Total Dissolved Solids	BAL	5615077	2018/07/05	2018/07/05	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5616210	2018/07/06	2018/07/09	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5618815	2018/07/09	2018/07/10	Amanpreet Sappal

Maxxam ID: HDD814
Sample ID: MW-4
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5616031	2018/07/06	2018/07/11	Prakash Piya
Chloride by Automated Colourimetry	KONE	5615007	N/A	2018/07/06	Deonarine Ramnarine
Lab Filtered Metals by ICPMS	ICP/MS	5617758	2018/07/07	2018/07/09	Prempal Bhatti
Total Ammonia-N	LACH/NH4	5616220	N/A	2018/07/09	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5614987	N/A	2018/07/06	Charles Opoku-Ware
Sulphate by Automated Colourimetry	KONE	5615010	N/A	2018/07/06	Deonarine Ramnarine
Total Dissolved Solids	BAL	5615077	2018/07/05	2018/07/05	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5616210	2018/07/06	2018/07/09	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5618815	2018/07/09	2018/07/10	Amanpreet Sappal

Maxxam ID: HDD814 Dup
Sample ID: MW-4
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lab Filtered Metals by ICPMS	ICP/MS	5617758	2018/07/07	2018/07/09	Prempal Bhatti

Maxxam ID: HDD815
Sample ID: MW11-6
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5616031	2018/07/06	2018/07/11	Prakash Piya
Chloride by Automated Colourimetry	KONE	5615007	N/A	2018/07/06	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5615706	N/A	2018/07/09	Thao Nguyen
Total Ammonia-N	LACH/NH4	5616220	N/A	2018/07/09	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5614994	N/A	2018/07/06	Charles Opoku-Ware
Sulphate by Automated Colourimetry	KONE	5615010	N/A	2018/07/06	Deonarine Ramnarine
Total Dissolved Solids	BAL	5615077	2018/07/05	2018/07/05	Jingwei (Alvin) Shi

TEST SUMMARY

Maxxam ID: HDD815
Sample ID: MW11-6
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Kjeldahl Nitrogen in Water	SKAL	5616210	2018/07/06	2018/07/09	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5618815	2018/07/09	2018/07/10	Amanpreet Sappal

Maxxam ID: HDD816
Sample ID: MW11-10
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5616031	2018/07/06	2018/07/11	Prakash Piya
Chloride by Automated Colourimetry	KONE	5615007	N/A	2018/07/06	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5615706	N/A	2018/07/06	Thao Nguyen
Total Ammonia-N	LACH/NH4	5616220	N/A	2018/07/09	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5614987	N/A	2018/07/06	Charles Opoku-Ware
Sulphate by Automated Colourimetry	KONE	5615010	N/A	2018/07/06	Deonarine Ramnarine
Total Dissolved Solids	BAL	5615077	2018/07/05	2018/07/05	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5616210	2018/07/06	2018/07/09	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5618815	2018/07/09	2018/07/10	Amanpreet Sappal

Maxxam ID: HDD817
Sample ID: EW
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5616031	2018/07/06	2018/07/11	Prakash Piya
Chloride by Automated Colourimetry	KONE	5615007	N/A	2018/07/06	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5615706	N/A	2018/07/09	Thao Nguyen
Total Ammonia-N	LACH/NH4	5616220	N/A	2018/07/09	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5614994	N/A	2018/07/06	Charles Opoku-Ware
Sulphate by Automated Colourimetry	KONE	5615010	N/A	2018/07/06	Deonarine Ramnarine
Total Dissolved Solids	BAL	5615077	2018/07/05	2018/07/05	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5616210	2018/07/06	2018/07/09	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5618815	2018/07/09	2018/07/10	Amanpreet Sappal

Maxxam ID: HDD832
Sample ID: WEST LAGOON
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride by Automated Colourimetry	KONE	5615007	N/A	2018/07/06	Deonarine Ramnarine
Lab Filtered Metals by ICPMS	ICP/MS	5617758	2018/07/07	2018/07/10	Prempal Bhatti
Total Ammonia-N	LACH/NH4	5616220	N/A	2018/07/09	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5614994	N/A	2018/07/06	Charles Opoku-Ware
Sulphate by Automated Colourimetry	KONE	5615010	N/A	2018/07/06	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5616210	2018/07/06	2018/07/09	Rajni Tyagi

TEST SUMMARY

Maxxam ID: HDD832
Sample ID: WEST LAGOON
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Phosphorus (Colourimetric)	LACH/P	5618815	2018/07/09	2018/07/10	Amanpreet Sappal

Maxxam ID: HDD833
Sample ID: EAST LAGOON
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride by Automated Colourimetry	KONE	5615007	N/A	2018/07/06	Deonarine Ramnarine
Lab Filtered Metals by ICPMS	ICP/MS	5617758	2018/07/07	2018/07/10	Prempal Bhatti
Total Ammonia-N	LACH/NH4	5616220	N/A	2018/07/09	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5614994	N/A	2018/07/06	Charles Opoku-Ware
Sulphate by Automated Colourimetry	KONE	5615010	N/A	2018/07/06	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5616210	2018/07/06	2018/07/09	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5618815	2018/07/09	2018/07/10	Amanpreet Sappal

Maxxam ID: HDD834
Sample ID: MW11-19
Matrix: Water

Collected: 2018/07/03
Shipped:
Received: 2018/07/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5616031	2018/07/06	2018/07/11	Prakash Piya
Chloride by Automated Colourimetry	KONE	5615007	N/A	2018/07/06	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5615706	N/A	2018/07/09	Thao Nguyen
Total Ammonia-N	LACH/NH4	5616220	N/A	2018/07/09	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5614987	N/A	2018/07/06	Charles Opoku-Ware
Sulphate by Automated Colourimetry	KONE	5615010	N/A	2018/07/06	Deonarine Ramnarine
Total Dissolved Solids	BAL	5615077	2018/07/05	2018/07/05	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5616210	2018/07/06	2018/07/09	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5618815	2018/07/09	2018/07/10	Amanpreet Sappal

GENERAL COMMENTS

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

Package 1	-0.3°C
Package 2	1.7°C

Cooler custody seals were present and intact.

Sample HDD809 [MW11-8] : TKN < Ammonia: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Sample HDD814 [MW-4] : Dissolved metals by ICPMS: Sample was submitted in a non-preserved container and was lab filtered prior to analysis.

Sample HDD832 [WEST LAGOON] : Dissolved metals by ICPMS: Sample was submitted in a non-preserved container and was lab filtered prior to analysis.

Sample HDD833 [EAST LAGOON] : Dissolved metals by ICPMS: Sample was submitted in a non-preserved container and was lab filtered prior to analysis.

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5614987	COP	Matrix Spike [HDD808-01]	Nitrite (N)	2018/07/06		95	%	80 - 120
			Nitrate (N)	2018/07/06		95	%	80 - 120
5614987	COP	Spiked Blank	Nitrite (N)	2018/07/06		99	%	80 - 120
			Nitrate (N)	2018/07/06		96	%	80 - 120
5614987	COP	Method Blank	Nitrite (N)	2018/07/06	ND, RDL=0.010		mg/L	
			Nitrate (N)	2018/07/06	ND, RDL=0.10		mg/L	
5614987	COP	RPD [HDD808-01]	Nitrite (N)	2018/07/06	NC		%	20
			Nitrate (N)	2018/07/06	0.22		%	20
5614994	COP	Matrix Spike	Nitrite (N)	2018/07/06		96	%	80 - 120
			Nitrate (N)	2018/07/06		96	%	80 - 120
5614994	COP	Spiked Blank	Nitrite (N)	2018/07/06		99	%	80 - 120
			Nitrate (N)	2018/07/06		98	%	80 - 120
5614994	COP	Method Blank	Nitrite (N)	2018/07/06	ND, RDL=0.010		mg/L	
			Nitrate (N)	2018/07/06	ND, RDL=0.10		mg/L	
5614994	COP	RPD	Nitrite (N)	2018/07/06	NC		%	20
			Nitrate (N)	2018/07/06	NC		%	20
5615007	DRM	Matrix Spike	Dissolved Chloride (Cl-)	2018/07/06		303	%	80 - 120
5615007	DRM	Spiked Blank	Dissolved Chloride (Cl-)	2018/07/06		104	%	80 - 120
5615007	DRM	Method Blank	Dissolved Chloride (Cl-)	2018/07/06	ND, RDL=1.0		mg/L	
5615007	DRM	RPD	Dissolved Chloride (Cl-)	2018/07/06	2.1		%	20
5615010	DRM	Matrix Spike	Dissolved Sulphate (SO4)	2018/07/06		79	%	75 - 125
5615010	DRM	Spiked Blank	Dissolved Sulphate (SO4)	2018/07/06		103	%	80 - 120
5615010	DRM	Method Blank	Dissolved Sulphate (SO4)	2018/07/06	ND, RDL=1.0		mg/L	
5615010	DRM	RPD	Dissolved Sulphate (SO4)	2018/07/06	0.19		%	20
5615077	JS7	QC Standard	Total Dissolved Solids	2018/07/05		98	%	90 - 110
5615077	JS7	Method Blank	Total Dissolved Solids	2018/07/05	ND, RDL=10		mg/L	
5615077	JS7	RPD	Total Dissolved Solids	2018/07/05	0.35		%	25
5615706	TNG	Matrix Spike	Dissolved Aluminum (Al)	2018/07/06		100	%	80 - 120
			Dissolved Antimony (Sb)	2018/07/06		107	%	80 - 120
			Dissolved Arsenic (As)	2018/07/06		97	%	80 - 120
			Dissolved Beryllium (Be)	2018/07/06		97	%	80 - 120
			Dissolved Boron (B)	2018/07/06		100	%	80 - 120
			Dissolved Cadmium (Cd)	2018/07/06		100	%	80 - 120
			Dissolved Chromium (Cr)	2018/07/06		94	%	80 - 120
			Dissolved Cobalt (Co)	2018/07/06		93	%	80 - 120
			Dissolved Copper (Cu)	2018/07/06		94	%	80 - 120
			Dissolved Iron (Fe)	2018/07/06		97	%	80 - 120
			Dissolved Lead (Pb)	2018/07/06		97	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/07/06		103	%	80 - 120
			Dissolved Nickel (Ni)	2018/07/06		91	%	80 - 120
			Dissolved Selenium (Se)	2018/07/06		91	%	80 - 120
			Dissolved Silver (Ag)	2018/07/06		42 (1)	%	80 - 120
			Dissolved Thallium (Tl)	2018/07/06		98	%	80 - 120
			Dissolved Tungsten (W)	2018/07/06		101	%	80 - 120

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5615706	TNG	Spiked Blank	Dissolved Uranium (U)	2018/07/06		99	%	80 - 120
			Dissolved Vanadium (V)	2018/07/06		96	%	80 - 120
			Dissolved Zinc (Zn)	2018/07/06		95	%	80 - 120
			Dissolved Zirconium (Zr)	2018/07/06		104	%	80 - 120
			Dissolved Aluminum (Al)	2018/07/06		100	%	80 - 120
			Dissolved Antimony (Sb)	2018/07/06		108	%	80 - 120
			Dissolved Arsenic (As)	2018/07/06		97	%	80 - 120
			Dissolved Beryllium (Be)	2018/07/06		96	%	80 - 120
			Dissolved Boron (B)	2018/07/06		102	%	80 - 120
			Dissolved Cadmium (Cd)	2018/07/06		101	%	80 - 120
			Dissolved Chromium (Cr)	2018/07/06		96	%	80 - 120
			Dissolved Cobalt (Co)	2018/07/06		96	%	80 - 120
			Dissolved Copper (Cu)	2018/07/06		98	%	80 - 120
			Dissolved Iron (Fe)	2018/07/06		99	%	80 - 120
			Dissolved Lead (Pb)	2018/07/06		98	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/07/06		102	%	80 - 120
			Dissolved Nickel (Ni)	2018/07/06		95	%	80 - 120
			Dissolved Selenium (Se)	2018/07/06		101	%	80 - 120
			Dissolved Silver (Ag)	2018/07/06		98	%	80 - 120
			Dissolved Thallium (Tl)	2018/07/06		98	%	80 - 120
			Dissolved Tungsten (W)	2018/07/06		100	%	80 - 120
			Dissolved Uranium (U)	2018/07/06		98	%	80 - 120
			Dissolved Vanadium (V)	2018/07/06		97	%	80 - 120
			Dissolved Zinc (Zn)	2018/07/06		96	%	80 - 120
			Dissolved Zirconium (Zr)	2018/07/06		104	%	80 - 120
5615706	TNG	Method Blank	Dissolved Aluminum (Al)	2018/07/09	ND, RDL=5.0		ug/L	
			Dissolved Antimony (Sb)	2018/07/09	ND, RDL=0.50		ug/L	
			Dissolved Arsenic (As)	2018/07/09	ND, RDL=1.0		ug/L	
			Dissolved Beryllium (Be)	2018/07/09	ND, RDL=0.50		ug/L	
			Dissolved Boron (B)	2018/07/09	ND, RDL=10		ug/L	
			Dissolved Cadmium (Cd)	2018/07/09	ND, RDL=0.10		ug/L	
			Dissolved Chromium (Cr)	2018/07/09	ND, RDL=5.0		ug/L	
			Dissolved Cobalt (Co)	2018/07/09	ND, RDL=0.50		ug/L	
			Dissolved Copper (Cu)	2018/07/09	ND, RDL=1.0		ug/L	
			Dissolved Iron (Fe)	2018/07/09	ND, RDL=100		ug/L	
			Dissolved Lead (Pb)	2018/07/09	ND, RDL=0.50		ug/L	
			Dissolved Molybdenum (Mo)	2018/07/09	ND, RDL=0.50		ug/L	
			Dissolved Nickel (Ni)	2018/07/09	ND, RDL=1.0		ug/L	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Selenium (Se)	2018/07/09	ND, RDL=2.0		ug/L	
			Dissolved Silver (Ag)	2018/07/09	ND, RDL=0.10		ug/L	
			Dissolved Thallium (Tl)	2018/07/09	ND, RDL=0.050		ug/L	
			Dissolved Tungsten (W)	2018/07/09	ND, RDL=1.0		ug/L	
			Dissolved Uranium (U)	2018/07/09	ND, RDL=0.10		ug/L	
			Dissolved Vanadium (V)	2018/07/09	ND, RDL=0.50		ug/L	
			Dissolved Zinc (Zn)	2018/07/09	ND, RDL=5.0		ug/L	
			Dissolved Zirconium (Zr)	2018/07/09	ND, RDL=1.0		ug/L	
5615706	TNG	RPD	Dissolved Arsenic (As)	2018/07/06	NC		%	20
			Dissolved Uranium (U)	2018/07/06	13		%	20
5616031	PRP	QC Standard	Total BOD	2018/07/11		90	%	80 - 120
5616031	PRP	Method Blank	Total BOD	2018/07/11	ND,RDL=2		mg/L	
5616031	PRP	RPD [HDD809-04]	Total BOD	2018/07/11	NC		%	30
5616210	RTY	Matrix Spike	Total Kjeldahl Nitrogen (TKN)	2018/07/09		109	%	80 - 120
5616210	RTY	QC Standard	Total Kjeldahl Nitrogen (TKN)	2018/07/09		95	%	80 - 120
5616210	RTY	Spiked Blank	Total Kjeldahl Nitrogen (TKN)	2018/07/09		99	%	80 - 120
5616210	RTY	Method Blank	Total Kjeldahl Nitrogen (TKN)	2018/07/09	ND, RDL=0.10		mg/L	
5616210	RTY	RPD	Total Kjeldahl Nitrogen (TKN)	2018/07/09	NC		%	20
5616220	SAN	Matrix Spike	Total Ammonia-N	2018/07/09		101	%	75 - 125
5616220	SAN	Spiked Blank	Total Ammonia-N	2018/07/09		104	%	80 - 120
5616220	SAN	Method Blank	Total Ammonia-N	2018/07/09	ND, RDL=0.050		mg/L	
5616220	SAN	RPD	Total Ammonia-N	2018/07/09	NC		%	20
5616990	DRM	Matrix Spike [HDD808-01]	Dissolved Chloride (Cl-)	2018/07/09		NC	%	80 - 120
5616990	DRM	Spiked Blank	Dissolved Chloride (Cl-)	2018/07/09		102	%	80 - 120
5616990	DRM	Method Blank	Dissolved Chloride (Cl-)	2018/07/09	ND, RDL=1.0		mg/L	
5616990	DRM	RPD [HDD808-01]	Dissolved Chloride (Cl-)	2018/07/09	0.30		%	20
5616991	DRM	Matrix Spike [HDD808-01]	Dissolved Sulphate (SO4)	2018/07/09		102	%	75 - 125
5616991	DRM	Spiked Blank	Dissolved Sulphate (SO4)	2018/07/09		99	%	80 - 120
5616991	DRM	Method Blank	Dissolved Sulphate (SO4)	2018/07/09	ND, RDL=1.0		mg/L	
5616991	DRM	RPD [HDD808-01]	Dissolved Sulphate (SO4)	2018/07/09	1.7		%	20
5617758	PBA	Matrix Spike [HDD814-01]	Dissolved Aluminum (Al)	2018/07/09		93	%	80 - 120
			Dissolved Antimony (Sb)	2018/07/09		99	%	80 - 120
			Dissolved Arsenic (As)	2018/07/09		94	%	80 - 120
			Dissolved Beryllium (Be)	2018/07/09		95	%	80 - 120
			Dissolved Boron (B)	2018/07/09		91	%	80 - 120
			Dissolved Cadmium (Cd)	2018/07/09		98	%	80 - 120
			Dissolved Chromium (Cr)	2018/07/09		87	%	80 - 120

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5617758	PBA	Spiked Blank	Dissolved Cobalt (Co)	2018/07/09		95	%	80 - 120
			Dissolved Copper (Cu)	2018/07/09		96	%	80 - 120
			Dissolved Iron (Fe)	2018/07/09		97	%	80 - 120
			Dissolved Lead (Pb)	2018/07/09		93	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/07/09		97	%	80 - 120
			Dissolved Nickel (Ni)	2018/07/09		91	%	80 - 120
			Dissolved Selenium (Se)	2018/07/09		92	%	80 - 120
			Dissolved Silver (Ag)	2018/07/09		92	%	80 - 120
			Dissolved Thallium (Tl)	2018/07/09		96	%	80 - 120
			Dissolved Tungsten (W)	2018/07/09		93	%	80 - 120
			Dissolved Uranium (U)	2018/07/09		93	%	80 - 120
			Dissolved Vanadium (V)	2018/07/09		90	%	80 - 120
			Dissolved Zinc (Zn)	2018/07/09		94	%	80 - 120
			Dissolved Zirconium (Zr)	2018/07/09		96	%	80 - 120
			Dissolved Aluminum (Al)	2018/07/09		98	%	80 - 120
			Dissolved Antimony (Sb)	2018/07/09		102	%	80 - 120
			Dissolved Arsenic (As)	2018/07/09		100	%	80 - 120
			Dissolved Beryllium (Be)	2018/07/09		93	%	80 - 120
			Dissolved Boron (B)	2018/07/09		93	%	80 - 120
			Dissolved Cadmium (Cd)	2018/07/09		101	%	80 - 120
			Dissolved Chromium (Cr)	2018/07/09		93	%	80 - 120
			Dissolved Cobalt (Co)	2018/07/09		101	%	80 - 120
			Dissolved Copper (Cu)	2018/07/09		98	%	80 - 120
			Dissolved Iron (Fe)	2018/07/09		102	%	80 - 120
			Dissolved Lead (Pb)	2018/07/09		96	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/07/09		100	%	80 - 120
			Dissolved Nickel (Ni)	2018/07/09		98	%	80 - 120
			Dissolved Selenium (Se)	2018/07/09		100	%	80 - 120
			Dissolved Silver (Ag)	2018/07/09		96	%	80 - 120
			Dissolved Thallium (Tl)	2018/07/09		96	%	80 - 120
			Dissolved Tungsten (W)	2018/07/09		97	%	80 - 120
			Dissolved Uranium (U)	2018/07/09		98	%	80 - 120
			Dissolved Vanadium (V)	2018/07/09		96	%	80 - 120
			Dissolved Zinc (Zn)	2018/07/09		101	%	80 - 120
			Dissolved Zirconium (Zr)	2018/07/09		99	%	80 - 120
5617758	PBA	Method Blank	Dissolved Aluminum (Al)	2018/07/09	ND, RDL=5.0		ug/L	
			Dissolved Antimony (Sb)	2018/07/09	ND, RDL=0.50		ug/L	
			Dissolved Arsenic (As)	2018/07/09	ND, RDL=1.0		ug/L	
			Dissolved Beryllium (Be)	2018/07/09	ND, RDL=0.50		ug/L	
			Dissolved Boron (B)	2018/07/09	ND, RDL=10		ug/L	
			Dissolved Cadmium (Cd)	2018/07/09	ND, RDL=0.10		ug/L	
			Dissolved Chromium (Cr)	2018/07/09	ND, RDL=5.0		ug/L	
			Dissolved Cobalt (Co)	2018/07/09	ND, RDL=0.50		ug/L	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Copper (Cu)	2018/07/09	ND, RDL=1.0		ug/L	
			Dissolved Iron (Fe)	2018/07/09	ND, RDL=100		ug/L	
			Dissolved Lead (Pb)	2018/07/09	ND, RDL=0.50		ug/L	
			Dissolved Molybdenum (Mo)	2018/07/09	ND, RDL=0.50		ug/L	
			Dissolved Nickel (Ni)	2018/07/09	ND, RDL=1.0		ug/L	
			Dissolved Selenium (Se)	2018/07/09	ND, RDL=2.0		ug/L	
			Dissolved Silver (Ag)	2018/07/09	ND, RDL=0.10		ug/L	
			Dissolved Thallium (Tl)	2018/07/09	ND, RDL=0.050		ug/L	
			Dissolved Tungsten (W)	2018/07/09	ND, RDL=1.0		ug/L	
			Dissolved Uranium (U)	2018/07/09	ND, RDL=0.10		ug/L	
			Dissolved Vanadium (V)	2018/07/09	ND, RDL=0.50		ug/L	
			Dissolved Zinc (Zn)	2018/07/09	ND, RDL=5.0		ug/L	
			Dissolved Zirconium (Zr)	2018/07/09	ND, RDL=1.0		ug/L	
5617758	PBA	RPD [HDD814-01]	Dissolved Aluminum (Al)	2018/07/09	13		%	20
			Dissolved Antimony (Sb)	2018/07/09	NC		%	20
			Dissolved Arsenic (As)	2018/07/09	NC		%	20
			Dissolved Beryllium (Be)	2018/07/09	NC		%	20
			Dissolved Boron (B)	2018/07/09	1.3		%	20
			Dissolved Cadmium (Cd)	2018/07/09	NC		%	20
			Dissolved Chromium (Cr)	2018/07/09	NC		%	20
			Dissolved Cobalt (Co)	2018/07/09	NC		%	20
			Dissolved Copper (Cu)	2018/07/09	NC		%	20
			Dissolved Iron (Fe)	2018/07/09	NC		%	20
			Dissolved Lead (Pb)	2018/07/09	NC		%	20
			Dissolved Molybdenum (Mo)	2018/07/09	NC		%	20
			Dissolved Nickel (Ni)	2018/07/09	4.5		%	20
			Dissolved Selenium (Se)	2018/07/09	NC		%	20
			Dissolved Silver (Ag)	2018/07/09	NC		%	20
			Dissolved Thallium (Tl)	2018/07/09	NC		%	20
			Dissolved Tungsten (W)	2018/07/09	NC		%	20
			Dissolved Uranium (U)	2018/07/09	5.1		%	20
			Dissolved Vanadium (V)	2018/07/09	0.35		%	20
			Dissolved Zinc (Zn)	2018/07/09	NC		%	20
			Dissolved Zirconium (Zr)	2018/07/09	NC		%	20
5618815	ASP	Matrix Spike	Total Phosphorus	2018/07/10		93	%	80 - 120
5618815	ASP	QC Standard	Total Phosphorus	2018/07/10		97	%	80 - 120
5618815	ASP	Spiked Blank	Total Phosphorus	2018/07/10		89	%	80 - 120
5618815	ASP	Method Blank	Total Phosphorus	2018/07/10	ND, RDL=0.004		mg/L	

Maxxam Job #: B8G6084
Report Date: 2018/07/11

Terrapex Environmental Ltd
Site Location: CLARENCE ROCKLAND
Your P.O. #: C067600
Sampler Initials: GS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC								
Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5618815	ASP	RPD	Total Phosphorus	2018/07/10	12		%	20
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement. Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference. QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy. Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy. Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination. NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration) NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL). (1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.								

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Brad Newman, Scientific Service Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Your Project #: C0676.00
Site Location: ROCKLAND LAGOON
Your C.O.C. #: 691424-01-01, 691424-02-01

Attention: Greg Sabourin

Terrapex Environmental Ltd
1-20 Gurdwara Rd.
Ottawa, ON
CANADA K2E 8B3

Report Date: 2018/11/21

Report #: R5493572

Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8T9661

Received: 2018/11/08, 14:30

Sample Matrix: Solid
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Chloride (20:1 extract) (1)	1	N/A	2018/11/13	CAM SOP-00463	EPA 325.2 m
Chloride (20:1 extract) (1)	1	N/A	2018/11/14	CAM SOP-00463	EPA 325.2 m
Strong Acid Leachable Metals by ICPMS (1)	1	2018/11/12	2018/11/13	CAM SOP-00447	EPA 6020B m
Acid Extractable Metals in Sludge by ICP (1)	1	2018/11/15	2018/11/15	CAM SOP-00408	EPA 6010D m
Moisture (1)	2	N/A	2018/11/10	CAM SOP-00445	Carter 2nd ed 51.2 m
Ammonia-N in Sludge (1)	2	2018/11/15	2018/11/15	CAM SOP-00441	Carter, SS&A
Nitrogen (1, 2)	2	N/A	2018/11/19	CAM SOP-00460	EN0000:2003 TC WI
Nitrate (NO3)/Nitrite (NO2) in Sludge (1)	2	N/A	2018/11/15	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Nitrate (NO3) and Nitrite (NO2) in Soil (1)	2	N/A	2018/11/14	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Sulphate (20:1 Extract) (1)	1	N/A	2018/11/13	CAM SOP-00464	EPA 375.4 m
Sulphate (20:1 Extract) (1)	1	N/A	2018/11/15	CAM SOP-00464	EPA 375.4 m
Calculated Total Kjeldahl Nitrogen (1)	2	N/A	2018/11/19	CAM SOP-00460	EN0000:2003 Horiz.16

Sample Matrix: Water
Samples Received: 11

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Biochemical Oxygen Demand (BOD) (1)	11	2018/11/10	2018/11/15	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry (1)	11	N/A	2018/11/12	CAM SOP-00463	EPA 325.2 m
Dissolved Metals by ICPMS (1)	11	N/A	2018/11/13	CAM SOP-00447	EPA 6020B m
Total Ammonia-N (1)	11	N/A	2018/11/14	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (1, 3)	11	N/A	2018/11/13	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Sulphate by Automated Colourimetry (1)	11	N/A	2018/11/12	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (1)	11	2018/11/10	2018/11/12	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water (1)	11	2018/11/12	2018/11/13	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric) (1)	11	2018/11/13	2018/11/14	CAM SOP-00407	SM 23 4500 P B H m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

Your Project #: C0676.00
Site Location: ROCKLAND LAGOON
Your C.O.C. #: 691424-01-01, 691424-02-01

Attention: Greg Sabourin

Terrapex Environmental Ltd
1-20 Gurdwara Rd.
Ottawa, ON
CANADA K2E 8B3

Report Date: 2018/11/21

Report #: R5493572

Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8T9661

Received: 2018/11/08, 14:30

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

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

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

Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Analytics Mississauga

(2) Samples have been analyzed using methodologies that have been subjected to Maxxam's standard validation process for the submitted matrix but it is not an accredited method.

(3) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Alisha Williamson, Project Manager

Email: AWilliamson@maxxam.ca

Phone# (613) 274-0573

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

RESULTS OF ANALYSES OF SOLID

Maxxam ID		IGH218			IGH218			IGH219		
Sampling Date		2018/11/08 02:00			2018/11/08 02:00			2018/11/08 02:05		
COC Number		691424-02-01			691424-02-01			691424-02-01		
	UNITS	WEST LAGOON	RDL	QC Batch	WEST LAGOON Lab-Dup	RDL	QC Batch	EAST LAGOON	RDL	QC Batch

Inorganics										
Total Ammonia-N	ug/g	250	25	5838688				650	25	5838688
Soluble (20:1) Chloride (Cl-)	ug/g	12000	400	5836075				2600	200	5833848
Moisture	%	99	1.0	5831290				93	1.0	5831290
Nitrogen (N)	%	0.024	0.010	5837018	0.024	0.010	5837018	0.29	0.010	5837018
Soluble (20:1) Sulphate (SO4)	ug/g	7200	400	5836076				ND (1)	200	5833849
Calculated Total Kjeldahl Nitrogen	ug/g	238	100	5836202				2880	100	5836202
Nitrite (N)	ug/g	ND	0.5	5838689				ND	0.5	5838689
Nitrate (N)	ug/g	ND	5	5838689				ND	5	5838689
Nitrate + Nitrite (N)	ug/g	ND	5	5838689				ND	5	5838689

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

ND = Not detected

(1) Due to colour interferences, sample required dilution. Detection limit was adjusted accordingly.

Maxxam ID		IGH219		
Sampling Date		2018/11/08 02:05		
COC Number		691424-02-01		
	UNITS	EAST LAGOON Lab-Dup	RDL	QC Batch

Inorganics				
Total Ammonia-N	ug/g	670	25	5838688
Nitrite (N)	ug/g	ND	0.5	5838689
Nitrate (N)	ug/g	ND	5	5838689
Nitrate + Nitrite (N)	ug/g	ND	5	5838689

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

ND = Not detected

ELEMENTS BY ATOMIC SPECTROSCOPY (SOLID)

Maxxam ID		IGH218	IGH218			IGH219		
Sampling Date		2018/11/08 02:00	2018/11/08 02:00			2018/11/08 02:05		
COC Number		691424-02-01	691424-02-01			691424-02-01		
	UNITS	WEST LAGOON	WEST LAGOON Lab-Dup	RDL	QC Batch	EAST LAGOON	RDL	QC Batch

Metals								
Acid Extractable Barium (Ba)	ug/g	1	ND	1	5838557	110	0.50	5832802
Acid Extractable Beryllium (Be)	ug/g	ND	ND	0.3	5838557	ND	0.20	5832802
Acid Extractable Cadmium (Cd)	ug/g	ND	ND	0.3	5838557	0.64	0.10	5832802
Acid Extractable Calcium (Ca)	ug/g	180	160	3	5838557	29000	50	5832802
Acid Extractable Chromium (Cr)	ug/g	ND	ND	0.5	5838557	25	1.0	5832802
Acid Extractable Cobalt (Co)	ug/g	ND	ND	1	5838557	2.9	0.10	5832802
Acid Extractable Copper (Cu)	ug/g	ND	ND	1	5838557	110	0.50	5832802
Acid Extractable Iron (Fe)	ug/g	36	31	1	5838557	7800	50	5832802
Acid Extractable Lead (Pb)	ug/g	ND	ND	3	5838557	9.5	1.0	5832802
Acid Extractable Magnesium (Mg)	ug/g	30	27	3	5838557	4000	50	5832802
Acid Extractable Manganese (Mn)	ug/g	0.6	0.6	0.5	5838557	120	1.0	5832802
Acid Extractable Molybdenum (Mo)	ug/g	ND	ND	1	5838557	2.4	0.50	5832802
Acid Extractable Nickel (Ni)	ug/g	ND	ND	3	5838557	13	0.50	5832802
Acid Extractable Phosphorus (P)	ug/g	130	120	5	5838557	11000	50	5832802
Acid Extractable Potassium (K)	ug/g	ND	ND	50	5838557	1600	200	5832802
Acid Extractable Silver (Ag)	ug/g	ND	ND	0.5	5838557	5.5	0.20	5832802
Acid Extractable Sodium (Na)	ug/g	72	70	30	5838557	1500	50	5832802
Acid Extractable Strontium (Sr)	ug/g	2.6	2.3	0.5	5838557	210	1.0	5832802
Acid Extractable Tin (Sn)	ug/g	ND	ND	10	5838557	8.6	1.0	5832802
Acid Extractable Vanadium (V)	ug/g	ND	ND	0.5	5838557	13	5.0	5832802
Acid Extractable Zinc (Zn)	ug/g	1.9	1.8	0.5	5838557	250	5.0	5832802

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected

RESULTS OF ANALYSES OF WATER

Maxxam ID		IGH207	IGH208	IGH209	IGH210			IGH210		
Sampling Date		2018/11/08 10:00	2018/11/08 11:15	2018/11/08 08:30	2018/11/08 11:30			2018/11/08 11:30		
COC Number		691424-01-01	691424-01-01	691424-01-01	691424-01-01			691424-01-01		
	UNITS	MW11-9	MW11-19	MW11-10	EW	RDL	QC Batch	EW Lab-Dup	RDL	QC Batch

Inorganics

Total Ammonia-N	mg/L	ND	0.23	ND	ND	0.050	5834080			
Total BOD	mg/L	ND	ND	ND	ND	2	5831235			
Total Dissolved Solids	mg/L	365	345	1080	130	10	5831547	140	10	5831547
Total Kjeldahl Nitrogen (TKN)	mg/L	0.22	0.39	ND	ND	0.10	5832946			
Total Phosphorus	mg/L	0.12	2.4	0.31	0.06	0.02	5833879			
Dissolved Sulphate (SO4)	mg/L	90	91	220	24	1.0	5831526			
Dissolved Chloride (Cl-)	mg/L	62	65	130	15	1.0	5831524			
Nitrite (N)	mg/L	ND	ND	ND	ND	0.010	5831508			
Nitrate (N)	mg/L	0.34	0.28	ND	0.93	0.10	5831508			
Nitrate + Nitrite (N)	mg/L	0.34	0.28	ND	0.93	0.10	5831508			

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

ND = Not detected

Maxxam ID		IGH211		IGH212		IGH213		IGH214		
Sampling Date		2018/11/08 11:00		2018/11/08 12:00		2018/11/08 09:00		2018/11/08 01:00		
COC Number		691424-01-01		691424-01-01		691424-01-01		691424-01-01		
	UNITS	MW11-7	RDL	MW11-6	RDL	MW-3	RDL	MW11-4	RDL	QC Batch

Inorganics

Total Ammonia-N	mg/L	0.90	0.050	0.36	0.050	0.16	0.050	ND	0.050	5834080
Total BOD	mg/L	3	2	3	2	3	2	ND	2	5831235
Total Dissolved Solids	mg/L	1620	10	3330	20	435	10	170	10	5831547
Total Kjeldahl Nitrogen (TKN)	mg/L	0.93	0.10	0.45	0.10	0.21	0.10	ND	0.10	5832946
Total Phosphorus	mg/L	0.22	0.02	0.07	0.02	0.08	0.02	0.069	0.004	5833879
Dissolved Sulphate (SO4)	mg/L	65	1.0	130	1.0	64	1.0	53	1.0	5831526
Dissolved Chloride (Cl-)	mg/L	570	5.0	1200	10	49	1.0	22	1.0	5831524
Nitrite (N)	mg/L	0.046	0.010	0.046	0.010	ND	0.010	ND	0.010	5831508
Nitrate (N)	mg/L	1.20	0.10	ND	0.10	ND	0.10	0.43	0.10	5831508
Nitrate + Nitrite (N)	mg/L	1.24	0.10	0.14	0.10	ND	0.10	0.43	0.10	5831508

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

ND = Not detected

RESULTS OF ANALYSES OF WATER

Maxxam ID		IGH215		IGH216		IGH217		
Sampling Date		2018/11/08 09:30		2018/11/08 10:30		2018/11/08 10:45		
COC Number		691424-01-01		691424-01-01		691424-02-01		
	UNITS	MW11-8	RDL	BH03-4	RDL	MW-2	RDL	QC Batch
Inorganics								
Total Ammonia-N	mg/L	7.5 (1)	0.050	9.3 (1)	0.050	1.8	0.050	5834080
Total BOD	mg/L	ND	2	29	2	8	2	5831235
Total Dissolved Solids	mg/L	1050	10	445	10	540	10	5831547
Total Kjeldahl Nitrogen (TKN)	mg/L	7.4 (1)	0.20	9.3 (1)	0.50	2.1	1.0	5832946
Total Phosphorus	mg/L	1.2	0.1	1.4	0.02	0.068	0.004	5833879
Dissolved Sulphate (SO ₄)	mg/L	200	1.0	25	1.0	46	1.0	5831526
Dissolved Chloride (Cl ⁻)	mg/L	100	1.0	32	1.0	110	1.0	5831524
Nitrite (N)	mg/L	ND	0.010	0.142	0.010	0.182	0.010	5831508
Nitrate (N)	mg/L	ND	0.10	0.33	0.10	20.5	0.50	5831508
Nitrate + Nitrite (N)	mg/L	ND	0.10	0.47	0.10	20.7	0.50	5831508
RDL = Reportable Detection Limit QC Batch = Quality Control Batch ND = Not detected (1) TKN < NH ₄ : Both values fall within acceptable RPD limits for duplicates and are likely equivalent.								

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		IGH207	IGH208	IGH209	IGH210	IGH211	IGH212		
Sampling Date		2018/11/08 10:00	2018/11/08 11:15	2018/11/08 08:30	2018/11/08 11:30	2018/11/08 11:00	2018/11/08 12:00		
COC Number		691424-01-01	691424-01-01	691424-01-01	691424-01-01	691424-01-01	691424-01-01		
	UNITS	MW11-9	MW11-19	MW11-10	EW	MW11-7	MW11-6	RDL	QC Batch

Metals

Dissolved Aluminum (Al)	ug/L	8.2	9.3	ND	6.2	ND	ND	5.0	5832226
Dissolved Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	0.50	5832226
Dissolved Arsenic (As)	ug/L	ND	ND	ND	ND	1.4	ND	1.0	5832226
Dissolved Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	0.50	5832226
Dissolved Boron (B)	ug/L	60	59	85	13	200	150	10	5832226
Dissolved Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	0.10	5832226
Dissolved Chromium (Cr)	ug/L	ND	ND	ND	ND	ND	ND	5.0	5832226
Dissolved Cobalt (Co)	ug/L	0.50	ND	ND	ND	0.62	ND	0.50	5832226
Dissolved Copper (Cu)	ug/L	2.5	2.2	1.4	4.0	ND	3.8	1.0	5832226
Dissolved Iron (Fe)	ug/L	300	300	ND	ND	ND	130	100	5832226
Dissolved Lead (Pb)	ug/L	ND	ND	ND	0.89	ND	1.0	0.50	5832226
Dissolved Molybdenum (Mo)	ug/L	ND	0.51	2.0	ND	0.88	0.58	0.50	5832226
Dissolved Nickel (Ni)	ug/L	1.3	1.2	1.1	ND	1.3	1.5	1.0	5832226
Dissolved Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	2.0	5832226
Dissolved Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	0.10	5832226
Dissolved Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	0.050	5832226
Dissolved Tungsten (W)	ug/L	ND	ND	ND	ND	ND	ND	1.0	5832226
Dissolved Uranium (U)	ug/L	ND	ND	10	ND	0.94	1.1	0.10	5832226
Dissolved Vanadium (V)	ug/L	0.70	0.73	1.3	ND	0.68	0.88	0.50	5832226
Dissolved Zinc (Zn)	ug/L	ND	ND	ND	18	ND	21	5.0	5832226
Dissolved Zirconium (Zr)	ug/L	ND	ND	ND	ND	ND	ND	1.0	5832226

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

ND = Not detected

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		IGH213	IGH214	IGH215	IGH216	IGH217		
Sampling Date		2018/11/08 09:00	2018/11/08 01:00	2018/11/08 09:30	2018/11/08 10:30	2018/11/08 10:45		
COC Number		691424-01-01	691424-01-01	691424-01-01	691424-01-01	691424-02-01		
	UNITS	MW-3	MW11-4	MW11-8	BH03-4	MW-2	RDL	QC Batch

Metals								
Dissolved Aluminum (Al)	ug/L	ND	6.8	ND	9.9	ND	5.0	5832226
Dissolved Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	0.50	5832226
Dissolved Arsenic (As)	ug/L	ND	ND	ND	ND	ND	1.0	5832226
Dissolved Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	0.50	5832226
Dissolved Boron (B)	ug/L	88	17	70	37	55	10	5832226
Dissolved Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	0.10	5832226
Dissolved Chromium (Cr)	ug/L	ND	ND	ND	ND	ND	5.0	5832226
Dissolved Cobalt (Co)	ug/L	ND	ND	ND	ND	0.58	0.50	5832226
Dissolved Copper (Cu)	ug/L	1.5	1.3	1.4	1.1	4.8	1.0	5832226
Dissolved Iron (Fe)	ug/L	ND	ND	27000	8700	ND	100	5832226
Dissolved Lead (Pb)	ug/L	ND	ND	0.64	ND	0.81	0.50	5832226
Dissolved Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	0.50	5832226
Dissolved Nickel (Ni)	ug/L	1.8	ND	1.4	ND	3.0	1.0	5832226
Dissolved Selenium (Se)	ug/L	ND	ND	ND	ND	ND	2.0	5832226
Dissolved Silver (Ag)	ug/L	ND	ND	ND	ND	ND	0.10	5832226
Dissolved Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	0.050	5832226
Dissolved Tungsten (W)	ug/L	ND	ND	ND	ND	ND	1.0	5832226
Dissolved Uranium (U)	ug/L	0.52	ND	ND	0.26	0.76	0.10	5832226
Dissolved Vanadium (V)	ug/L	ND	ND	1.9	1.4	ND	0.50	5832226
Dissolved Zinc (Zn)	ug/L	11	ND	18	ND	16	5.0	5832226
Dissolved Zirconium (Zr)	ug/L	ND	ND	ND	ND	ND	1.0	5832226

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

ND = Not detected

Maxxam Job #: B8T9661
Report Date: 2018/11/21

Terrapex Environmental Ltd
Client Project #: C0676.00
Site Location: ROCKLAND LAGOON
Sampler Initials: GS

TEST SUMMARY

Maxxam ID: IGH207
Sample ID: MW11-9
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5831235	2018/11/10	2018/11/15	Hinal Shah
Chloride by Automated Colourimetry	KONE	5831524	N/A	2018/11/12	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5832226	N/A	2018/11/13	Prempal Bhatti
Total Ammonia-N	LACH/NH4	5834080	N/A	2018/11/14	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5831508	N/A	2018/11/13	Chandra Nandlal
Sulphate by Automated Colourimetry	KONE	5831526	N/A	2018/11/12	Deonarine Ramnarine
Total Dissolved Solids	BAL	5831547	2018/11/10	2018/11/12	Mandeep Kaur
Total Kjeldahl Nitrogen in Water	SKAL	5832946	2018/11/12	2018/11/13	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5833879	2018/11/13	2018/11/14	Amanpreet Sappal

Maxxam ID: IGH208
Sample ID: MW11-19
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5831235	2018/11/10	2018/11/15	Hinal Shah
Chloride by Automated Colourimetry	KONE	5831524	N/A	2018/11/12	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5832226	N/A	2018/11/13	Prempal Bhatti
Total Ammonia-N	LACH/NH4	5834080	N/A	2018/11/14	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5831508	N/A	2018/11/13	Chandra Nandlal
Sulphate by Automated Colourimetry	KONE	5831526	N/A	2018/11/12	Deonarine Ramnarine
Total Dissolved Solids	BAL	5831547	2018/11/10	2018/11/12	Mandeep Kaur
Total Kjeldahl Nitrogen in Water	SKAL	5832946	2018/11/12	2018/11/13	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5833879	2018/11/13	2018/11/14	Amanpreet Sappal

Maxxam ID: IGH209
Sample ID: MW11-10
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5831235	2018/11/10	2018/11/15	Hinal Shah
Chloride by Automated Colourimetry	KONE	5831524	N/A	2018/11/12	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5832226	N/A	2018/11/13	Prempal Bhatti
Total Ammonia-N	LACH/NH4	5834080	N/A	2018/11/14	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5831508	N/A	2018/11/13	Chandra Nandlal
Sulphate by Automated Colourimetry	KONE	5831526	N/A	2018/11/12	Deonarine Ramnarine
Total Dissolved Solids	BAL	5831547	2018/11/10	2018/11/12	Mandeep Kaur
Total Kjeldahl Nitrogen in Water	SKAL	5832946	2018/11/12	2018/11/13	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5833879	2018/11/13	2018/11/14	Amanpreet Sappal

TEST SUMMARY

Maxxam ID: IGH210
Sample ID: EW
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5831235	2018/11/10	2018/11/15	Hinal Shah
Chloride by Automated Colourimetry	KONE	5831524	N/A	2018/11/12	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5832226	N/A	2018/11/13	Prempal Bhatti
Total Ammonia-N	LACH/NH4	5834080	N/A	2018/11/14	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5831508	N/A	2018/11/13	Chandra Nandlal
Sulphate by Automated Colourimetry	KONE	5831526	N/A	2018/11/12	Deonarine Ramnarine
Total Dissolved Solids	BAL	5831547	2018/11/10	2018/11/12	Mandeep Kaur
Total Kjeldahl Nitrogen in Water	SKAL	5832946	2018/11/12	2018/11/13	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5833879	2018/11/13	2018/11/14	Amanpreet Sappal

Maxxam ID: IGH210 Dup
Sample ID: EW
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Dissolved Solids	BAL	5831547	2018/11/10	2018/11/12	Mandeep Kaur

Maxxam ID: IGH211
Sample ID: MW11-7
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5831235	2018/11/10	2018/11/15	Hinal Shah
Chloride by Automated Colourimetry	KONE	5831524	N/A	2018/11/12	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5832226	N/A	2018/11/13	Prempal Bhatti
Total Ammonia-N	LACH/NH4	5834080	N/A	2018/11/14	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5831508	N/A	2018/11/13	Chandra Nandlal
Sulphate by Automated Colourimetry	KONE	5831526	N/A	2018/11/12	Deonarine Ramnarine
Total Dissolved Solids	BAL	5831547	2018/11/10	2018/11/12	Mandeep Kaur
Total Kjeldahl Nitrogen in Water	SKAL	5832946	2018/11/12	2018/11/13	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5833879	2018/11/13	2018/11/14	Amanpreet Sappal

Maxxam ID: IGH212
Sample ID: MW11-6
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5831235	2018/11/10	2018/11/15	Hinal Shah
Chloride by Automated Colourimetry	KONE	5831524	N/A	2018/11/12	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5832226	N/A	2018/11/13	Prempal Bhatti
Total Ammonia-N	LACH/NH4	5834080	N/A	2018/11/14	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5831508	N/A	2018/11/13	Chandra Nandlal
Sulphate by Automated Colourimetry	KONE	5831526	N/A	2018/11/12	Deonarine Ramnarine
Total Dissolved Solids	BAL	5831547	2018/11/10	2018/11/12	Mandeep Kaur

TEST SUMMARY

Maxxam ID: IGH212
Sample ID: MW11-6
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Kjeldahl Nitrogen in Water	SKAL	5832946	2018/11/12	2018/11/13	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5833879	2018/11/13	2018/11/14	Amanpreet Sappal

Maxxam ID: IGH213
Sample ID: MW-3
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5831235	2018/11/10	2018/11/15	Hinal Shah
Chloride by Automated Colourimetry	KONE	5831524	N/A	2018/11/12	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5832226	N/A	2018/11/13	Prempal Bhatti
Total Ammonia-N	LACH/NH4	5834080	N/A	2018/11/14	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5831508	N/A	2018/11/13	Chandra Nandlal
Sulphate by Automated Colourimetry	KONE	5831526	N/A	2018/11/12	Deonarine Ramnarine
Total Dissolved Solids	BAL	5831547	2018/11/10	2018/11/12	Mandeep Kaur
Total Kjeldahl Nitrogen in Water	SKAL	5832946	2018/11/12	2018/11/13	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5833879	2018/11/13	2018/11/14	Amanpreet Sappal

Maxxam ID: IGH214
Sample ID: MW11-4
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5831235	2018/11/10	2018/11/15	Hinal Shah
Chloride by Automated Colourimetry	KONE	5831524	N/A	2018/11/12	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5832226	N/A	2018/11/13	Prempal Bhatti
Total Ammonia-N	LACH/NH4	5834080	N/A	2018/11/14	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5831508	N/A	2018/11/13	Chandra Nandlal
Sulphate by Automated Colourimetry	KONE	5831526	N/A	2018/11/12	Deonarine Ramnarine
Total Dissolved Solids	BAL	5831547	2018/11/10	2018/11/12	Mandeep Kaur
Total Kjeldahl Nitrogen in Water	SKAL	5832946	2018/11/12	2018/11/13	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5833879	2018/11/13	2018/11/14	Amanpreet Sappal

Maxxam ID: IGH215
Sample ID: MW11-8
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5831235	2018/11/10	2018/11/15	Hinal Shah
Chloride by Automated Colourimetry	KONE	5831524	N/A	2018/11/12	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5832226	N/A	2018/11/13	Prempal Bhatti
Total Ammonia-N	LACH/NH4	5834080	N/A	2018/11/14	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5831508	N/A	2018/11/13	Chandra Nandlal
Sulphate by Automated Colourimetry	KONE	5831526	N/A	2018/11/12	Deonarine Ramnarine

TEST SUMMARY

Maxxam ID: IGH215
Sample ID: MW11-8
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Dissolved Solids	BAL	5831547	2018/11/10	2018/11/12	Mandeep Kaur
Total Kjeldahl Nitrogen in Water	SKAL	5832946	2018/11/12	2018/11/13	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5833879	2018/11/13	2018/11/14	Amanpreet Sappal

Maxxam ID: IGH216
Sample ID: BH03-4
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5831235	2018/11/10	2018/11/15	Hinal Shah
Chloride by Automated Colourimetry	KONE	5831524	N/A	2018/11/12	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5832226	N/A	2018/11/13	Prempal Bhatti
Total Ammonia-N	LACH/NH4	5834080	N/A	2018/11/14	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5831508	N/A	2018/11/13	Chandra Nandlal
Sulphate by Automated Colourimetry	KONE	5831526	N/A	2018/11/12	Deonarine Ramnarine
Total Dissolved Solids	BAL	5831547	2018/11/10	2018/11/12	Mandeep Kaur
Total Kjeldahl Nitrogen in Water	SKAL	5832946	2018/11/12	2018/11/13	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5833879	2018/11/13	2018/11/14	Amanpreet Sappal

Maxxam ID: IGH217
Sample ID: MW-2
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5831235	2018/11/10	2018/11/15	Hinal Shah
Chloride by Automated Colourimetry	KONE	5831524	N/A	2018/11/12	Deonarine Ramnarine
Dissolved Metals by ICPMS	ICP/MS	5832226	N/A	2018/11/13	Prempal Bhatti
Total Ammonia-N	LACH/NH4	5834080	N/A	2018/11/14	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5831508	N/A	2018/11/13	Chandra Nandlal
Sulphate by Automated Colourimetry	KONE	5831526	N/A	2018/11/12	Deonarine Ramnarine
Total Dissolved Solids	BAL	5831547	2018/11/10	2018/11/12	Mandeep Kaur
Total Kjeldahl Nitrogen in Water	SKAL	5832946	2018/11/12	2018/11/13	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5833879	2018/11/13	2018/11/14	Amanpreet Sappal

Maxxam ID: IGH218
Sample ID: WEST LAGOON
Matrix: Solid

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	5836075	N/A	2018/11/14	Alina Dobreanu
Acid Extractable Metals in Sludge by ICP	ICP	5838557	2018/11/15	2018/11/15	Azita Fazaeli
Moisture	BAL	5831290	N/A	2018/11/10	Prgya Panchal
Ammonia-N in Sludge	LACH/NH4	5838688	2018/11/15	2018/11/15	Charles Opoku-Ware
Nitrogen	COMB	5837018	N/A	2018/11/19	Tahir Anwar

TEST SUMMARY

Maxxam ID: IGH218
Sample ID: WEST LAGOON
Matrix: Solid

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3)/Nitrite (NO2) in Sludge	LACH	5838689	N/A	2018/11/15	Chandra Nandlal
Nitrate (NO3) and Nitrite (NO2) in Soil	LACH	5836077	N/A	2018/11/14	Chandra Nandlal
Sulphate (20:1 Extract)	KONE/EC	5836076	N/A	2018/11/15	Alina Dobreanu
Calculated Total Kjeldahl Nitrogen		5836202	N/A	2018/11/19	Automated Statchk

Maxxam ID: IGH218 Dup
Sample ID: WEST LAGOON
Matrix: Solid

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Acid Extractable Metals in Sludge by ICP	ICP	5838557	2018/11/15	2018/11/15	Azita Fazaeli
Nitrogen	COMB	5837018	N/A	2018/11/19	Tahir Anwar

Maxxam ID: IGH219
Sample ID: EAST LAGOON
Matrix: Solid

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	5833848	N/A	2018/11/13	Deonarine Ramnarine
Strong Acid Leachable Metals by ICPMS	ICP/MS	5832802	2018/11/12	2018/11/13	Daniel Teclu
Moisture	BAL	5831290	N/A	2018/11/10	Prgya Panchal
Ammonia-N in Sludge	LACH/NH4	5838688	2018/11/15	2018/11/15	Charles Opoku-Ware
Nitrogen	COMB	5837018	N/A	2018/11/19	Tahir Anwar
Nitrate (NO3)/Nitrite (NO2) in Sludge	LACH	5838689	N/A	2018/11/15	Chandra Nandlal
Nitrate (NO3) and Nitrite (NO2) in Soil	LACH	5833850	N/A	2018/11/14	Chandra Nandlal
Sulphate (20:1 Extract)	KONE/EC	5833849	N/A	2018/11/13	Deonarine Ramnarine
Calculated Total Kjeldahl Nitrogen		5836202	N/A	2018/11/19	Automated Statchk

Maxxam ID: IGH219 Dup
Sample ID: EAST LAGOON
Matrix: Solid

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Ammonia-N in Sludge	LACH/NH4	5838688	2018/11/15	2018/11/15	Charles Opoku-Ware
Nitrate (NO3)/Nitrite (NO2) in Sludge	LACH	5838689	N/A	2018/11/15	Chandra Nandlal

GENERAL COMMENTS

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

Package 1	2.7°C
-----------	-------

Sample IGH215 [MW11-8] : TKN < Ammonia: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Sample IGH218 [WEST LAGOON] : Ammonia > TKN: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Results relate only to the items tested.

Maxxam Job #: B8T9661
Report Date: 2018/11/21

Terrapex Environmental Ltd
Client Project #: C0676.00
Site Location: ROCKLAND LAGOON
Sampler Initials: GS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5831235	HSH	QC Standard	Total BOD	2018/11/15		104	%	80 - 120
5831235	HSH	Method Blank	Total BOD	2018/11/15	ND,RDL=2		mg/L	
5831235	HSH	RPD	Total BOD	2018/11/15	NC		%	30
5831290	JS9	RPD	Moisture	2018/11/10	3.8		%	20
5831508	C_N	Matrix Spike	Nitrite (N)	2018/11/13		100	%	80 - 120
			Nitrate (N)	2018/11/13		95	%	80 - 120
5831508	C_N	Spiked Blank	Nitrite (N)	2018/11/13		102	%	80 - 120
			Nitrate (N)	2018/11/13		98	%	80 - 120
5831508	C_N	Method Blank	Nitrite (N)	2018/11/13	ND, RDL=0.010		mg/L	
			Nitrate (N)	2018/11/13	ND, RDL=0.10		mg/L	
5831508	C_N	RPD	Nitrite (N)	2018/11/13	NC		%	20
			Nitrate (N)	2018/11/13	NC		%	20
5831524	DRM	Matrix Spike	Dissolved Chloride (Cl-)	2018/11/12		NC	%	80 - 120
5831524	DRM	Spiked Blank	Dissolved Chloride (Cl-)	2018/11/12		103	%	80 - 120
5831524	DRM	Method Blank	Dissolved Chloride (Cl-)	2018/11/12	ND, RDL=1.0		mg/L	
5831524	DRM	RPD	Dissolved Chloride (Cl-)	2018/11/12	1.4		%	20
5831526	DRM	Matrix Spike	Dissolved Sulphate (SO4)	2018/11/12		NC	%	75 - 125
5831526	DRM	Spiked Blank	Dissolved Sulphate (SO4)	2018/11/12		103	%	80 - 120
5831526	DRM	Method Blank	Dissolved Sulphate (SO4)	2018/11/12	ND, RDL=1.0		mg/L	
5831526	DRM	RPD	Dissolved Sulphate (SO4)	2018/11/12	0.048		%	20
5831547	MKX	QC Standard	Total Dissolved Solids	2018/11/12		98	%	90 - 110
5831547	MKX	Method Blank	Total Dissolved Solids	2018/11/12	ND, RDL=10		mg/L	
5831547	MKX	RPD [IGH210-02]	Total Dissolved Solids	2018/11/12	7.4		%	25
5832226	PBA	Matrix Spike	Dissolved Aluminum (Al)	2018/11/13		107	%	80 - 120
			Dissolved Antimony (Sb)	2018/11/13		110	%	80 - 120
			Dissolved Arsenic (As)	2018/11/13		104	%	80 - 120
			Dissolved Beryllium (Be)	2018/11/13		104	%	80 - 120
			Dissolved Boron (B)	2018/11/13		101	%	80 - 120
			Dissolved Cadmium (Cd)	2018/11/13		104	%	80 - 120
			Dissolved Chromium (Cr)	2018/11/13		100	%	80 - 120
			Dissolved Cobalt (Co)	2018/11/13		104	%	80 - 120
			Dissolved Copper (Cu)	2018/11/13		106	%	80 - 120
			Dissolved Iron (Fe)	2018/11/13		105	%	80 - 120
			Dissolved Lead (Pb)	2018/11/13		99	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/11/13		106	%	80 - 120
			Dissolved Nickel (Ni)	2018/11/13		102	%	80 - 120
			Dissolved Selenium (Se)	2018/11/13		105	%	80 - 120
			Dissolved Silver (Ag)	2018/11/13		103	%	80 - 120
			Dissolved Thallium (Tl)	2018/11/13		102	%	80 - 120
			Dissolved Tungsten (W)	2018/11/13		101	%	80 - 120
			Dissolved Uranium (U)	2018/11/13		99	%	80 - 120
			Dissolved Vanadium (V)	2018/11/13		104	%	80 - 120
			Dissolved Zinc (Zn)	2018/11/13		101	%	80 - 120
			Dissolved Zirconium (Zr)	2018/11/13		109	%	80 - 120
5832226	PBA	Spiked Blank	Dissolved Aluminum (Al)	2018/11/13		104	%	80 - 120
			Dissolved Antimony (Sb)	2018/11/13		101	%	80 - 120
			Dissolved Arsenic (As)	2018/11/13		100	%	80 - 120

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5832226	PBA	Method Blank	Dissolved Beryllium (Be)	2018/11/13		99	%	80 - 120
			Dissolved Boron (B)	2018/11/13		96	%	80 - 120
			Dissolved Cadmium (Cd)	2018/11/13		99	%	80 - 120
			Dissolved Chromium (Cr)	2018/11/13		96	%	80 - 120
			Dissolved Cobalt (Co)	2018/11/13		101	%	80 - 120
			Dissolved Copper (Cu)	2018/11/13		99	%	80 - 120
			Dissolved Iron (Fe)	2018/11/13		99	%	80 - 120
			Dissolved Lead (Pb)	2018/11/13		97	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/11/13		99	%	80 - 120
			Dissolved Nickel (Ni)	2018/11/13		99	%	80 - 120
			Dissolved Selenium (Se)	2018/11/13		103	%	80 - 120
			Dissolved Silver (Ag)	2018/11/13		100	%	80 - 120
			Dissolved Thallium (Tl)	2018/11/13		99	%	80 - 120
			Dissolved Tungsten (W)	2018/11/13		95	%	80 - 120
			Dissolved Uranium (U)	2018/11/13		99	%	80 - 120
			Dissolved Vanadium (V)	2018/11/13		97	%	80 - 120
			Dissolved Zinc (Zn)	2018/11/13		97	%	80 - 120
			Dissolved Zirconium (Zr)	2018/11/13		103	%	80 - 120
			Dissolved Aluminum (Al)	2018/11/13	ND, RDL=5.0		ug/L	
			Dissolved Antimony (Sb)	2018/11/13	ND, RDL=0.50		ug/L	
			Dissolved Arsenic (As)	2018/11/13	ND, RDL=1.0		ug/L	
			Dissolved Beryllium (Be)	2018/11/13	ND, RDL=0.50		ug/L	
			Dissolved Boron (B)	2018/11/13	ND, RDL=10		ug/L	
			Dissolved Cadmium (Cd)	2018/11/13	ND, RDL=0.10		ug/L	
			Dissolved Chromium (Cr)	2018/11/13	ND, RDL=5.0		ug/L	
			Dissolved Cobalt (Co)	2018/11/13	ND, RDL=0.50		ug/L	
			Dissolved Copper (Cu)	2018/11/13	ND, RDL=1.0		ug/L	
			Dissolved Iron (Fe)	2018/11/13	ND, RDL=100		ug/L	
			Dissolved Lead (Pb)	2018/11/13	ND, RDL=0.50		ug/L	
			Dissolved Molybdenum (Mo)	2018/11/13	ND, RDL=0.50		ug/L	
			Dissolved Nickel (Ni)	2018/11/13	ND, RDL=1.0		ug/L	
			Dissolved Selenium (Se)	2018/11/13	ND, RDL=2.0		ug/L	
			Dissolved Silver (Ag)	2018/11/13	ND, RDL=0.10		ug/L	
			Dissolved Thallium (Tl)	2018/11/13	ND, RDL=0.050		ug/L	
			Dissolved Tungsten (W)	2018/11/13	ND, RDL=1.0		ug/L	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5832226	PBA	RPD	Dissolved Uranium (U)	2018/11/13	ND, RDL=0.10		ug/L	
			Dissolved Vanadium (V)	2018/11/13	ND, RDL=0.50		ug/L	
			Dissolved Zinc (Zn)	2018/11/13	ND, RDL=5.0		ug/L	
			Dissolved Zirconium (Zr)	2018/11/13	ND, RDL=1.0		ug/L	
			Dissolved Antimony (Sb)	2018/11/13	NC		%	20
			Dissolved Arsenic (As)	2018/11/13	NC		%	20
			Dissolved Beryllium (Be)	2018/11/13	NC		%	20
			Dissolved Boron (B)	2018/11/13	1.0		%	20
			Dissolved Cadmium (Cd)	2018/11/13	NC		%	20
			Dissolved Chromium (Cr)	2018/11/13	NC		%	20
			Dissolved Cobalt (Co)	2018/11/13	5.8		%	20
			Dissolved Copper (Cu)	2018/11/13	1.0		%	20
			Dissolved Lead (Pb)	2018/11/13	NC		%	20
			Dissolved Molybdenum (Mo)	2018/11/13	1.3		%	20
			Dissolved Nickel (Ni)	2018/11/13	4.8		%	20
			Dissolved Selenium (Se)	2018/11/13	NC		%	20
			Dissolved Silver (Ag)	2018/11/13	NC		%	20
			Dissolved Thallium (Tl)	2018/11/13	NC		%	20
			Dissolved Uranium (U)	2018/11/13	5.6		%	20
5832802	DT1	Matrix Spike	Dissolved Vanadium (V)	2018/11/13	NC		%	20
			Dissolved Zinc (Zn)	2018/11/13	NC		%	20
			Acid Extractable Barium (Ba)	2018/11/12		93	%	75 - 125
			Acid Extractable Beryllium (Be)	2018/11/12		102	%	75 - 125
			Acid Extractable Cadmium (Cd)	2018/11/12		102	%	75 - 125
			Acid Extractable Calcium (Ca)	2018/11/12		NC	%	75 - 125
			Acid Extractable Chromium (Cr)	2018/11/12		97	%	75 - 125
			Acid Extractable Cobalt (Co)	2018/11/12		102	%	75 - 125
			Acid Extractable Copper (Cu)	2018/11/12		97	%	75 - 125
			Acid Extractable Iron (Fe)	2018/11/12		NC	%	75 - 125
			Acid Extractable Lead (Pb)	2018/11/12		102	%	75 - 125
			Acid Extractable Magnesium (Mg)	2018/11/12		NC	%	75 - 125
			Acid Extractable Manganese (Mn)	2018/11/12		NC	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2018/11/12		101	%	75 - 125
			Acid Extractable Nickel (Ni)	2018/11/12		101	%	75 - 125
			Acid Extractable Phosphorus (P)	2018/11/12		97	%	75 - 125
			Acid Extractable Potassium (K)	2018/11/12		92	%	75 - 125
			Acid Extractable Silver (Ag)	2018/11/12		102	%	75 - 125
			Acid Extractable Sodium (Na)	2018/11/12		NC	%	75 - 125
			Acid Extractable Strontium (Sr)	2018/11/12		104	%	75 - 125
			Acid Extractable Tin (Sn)	2018/11/12		98	%	75 - 125
5832802	DT1	Spiked Blank	Acid Extractable Vanadium (V)	2018/11/12		96	%	75 - 125
			Acid Extractable Zinc (Zn)	2018/11/12		102	%	75 - 125
			Acid Extractable Barium (Ba)	2018/11/12		89	%	80 - 120
			Acid Extractable Beryllium (Be)	2018/11/12		97	%	80 - 120
			Acid Extractable Cadmium (Cd)	2018/11/12		98	%	80 - 120
			Acid Extractable Calcium (Ca)	2018/11/12		100	%	80 - 120
			Acid Extractable Chromium (Cr)	2018/11/12		100	%	80 - 120
			Acid Extractable Cobalt (Co)	2018/11/12		100	%	80 - 120

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5832802	DT1	Method Blank	Acid Extractable Copper (Cu)	2018/11/12		97	%	80 - 120
			Acid Extractable Iron (Fe)	2018/11/12		99	%	80 - 120
			Acid Extractable Lead (Pb)	2018/11/12		99	%	80 - 120
			Acid Extractable Magnesium (Mg)	2018/11/12		105	%	80 - 120
			Acid Extractable Manganese (Mn)	2018/11/12		97	%	80 - 120
			Acid Extractable Molybdenum (Mo)	2018/11/12		102	%	80 - 120
			Acid Extractable Nickel (Ni)	2018/11/12		103	%	80 - 120
			Acid Extractable Phosphorus (P)	2018/11/12		94	%	80 - 120
			Acid Extractable Potassium (K)	2018/11/12		91	%	80 - 120
			Acid Extractable Silver (Ag)	2018/11/12		102	%	80 - 120
			Acid Extractable Sodium (Na)	2018/11/12		98	%	80 - 120
			Acid Extractable Strontium (Sr)	2018/11/12		100	%	80 - 120
			Acid Extractable Tin (Sn)	2018/11/12		98	%	80 - 120
			Acid Extractable Vanadium (V)	2018/11/12		95	%	80 - 120
			Acid Extractable Zinc (Zn)	2018/11/12		103	%	80 - 120
			Acid Extractable Barium (Ba)	2018/11/12	ND, RDL=0.50		ug/g	
			Acid Extractable Beryllium (Be)	2018/11/12	ND, RDL=0.20		ug/g	
			Acid Extractable Cadmium (Cd)	2018/11/12	ND, RDL=0.10		ug/g	
			Acid Extractable Calcium (Ca)	2018/11/12	ND, RDL=50		ug/g	
			Acid Extractable Chromium (Cr)	2018/11/12	ND, RDL=1.0		ug/g	
			Acid Extractable Cobalt (Co)	2018/11/12	ND, RDL=0.10		ug/g	
			Acid Extractable Copper (Cu)	2018/11/12	ND, RDL=0.50		ug/g	
			Acid Extractable Iron (Fe)	2018/11/12	ND, RDL=50		ug/g	
			Acid Extractable Lead (Pb)	2018/11/12	ND, RDL=1.0		ug/g	
			Acid Extractable Magnesium (Mg)	2018/11/12	ND, RDL=50		ug/g	
			Acid Extractable Manganese (Mn)	2018/11/12	ND, RDL=1.0		ug/g	
			Acid Extractable Molybdenum (Mo)	2018/11/12	ND, RDL=0.50		ug/g	
			Acid Extractable Nickel (Ni)	2018/11/12	ND, RDL=0.50		ug/g	
			Acid Extractable Phosphorus (P)	2018/11/12	ND, RDL=50		ug/g	
			Acid Extractable Potassium (K)	2018/11/12	ND, RDL=200		ug/g	
			Acid Extractable Silver (Ag)	2018/11/12	ND, RDL=0.20		ug/g	
			Acid Extractable Sodium (Na)	2018/11/12	ND, RDL=50		ug/g	
			Acid Extractable Strontium (Sr)	2018/11/12	ND, RDL=1.0		ug/g	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5832802	DT1	RPD	Acid Extractable Tin (Sn)	2018/11/12	ND, RDL=1.0		ug/g	
			Acid Extractable Vanadium (V)	2018/11/12	ND, RDL=5.0		ug/g	
			Acid Extractable Zinc (Zn)	2018/11/12	ND, RDL=5.0		ug/g	
			Acid Extractable Barium (Ba)	2018/11/12	3.0		%	30
			Acid Extractable Beryllium (Be)	2018/11/12	NC		%	30
			Acid Extractable Cadmium (Cd)	2018/11/12	NC		%	30
			Acid Extractable Chromium (Cr)	2018/11/12	5.0		%	30
			Acid Extractable Cobalt (Co)	2018/11/12	3.8		%	30
			Acid Extractable Copper (Cu)	2018/11/12	0.10		%	30
			Acid Extractable Lead (Pb)	2018/11/12	1.5		%	30
			Acid Extractable Molybdenum (Mo)	2018/11/12	NC		%	30
			Acid Extractable Nickel (Ni)	2018/11/12	3.5		%	30
			Acid Extractable Silver (Ag)	2018/11/12	NC		%	30
			Acid Extractable Vanadium (V)	2018/11/12	3.0		%	30
5832946	SSV	Matrix Spike	Acid Extractable Zinc (Zn)	2018/11/12	4.6		%	30
			Total Kjeldahl Nitrogen (TKN)	2018/11/13		97	%	80 - 120
			Total Kjeldahl Nitrogen (TKN)	2018/11/13		97	%	80 - 120
			Total Kjeldahl Nitrogen (TKN)	2018/11/13		100	%	80 - 120
5832946	SSV	Method Blank	Total Kjeldahl Nitrogen (TKN)	2018/11/13	ND, RDL=0.10		mg/L	
5832946	SSV	RPD	Total Kjeldahl Nitrogen (TKN)	2018/11/13	NC		%	20
5833848	DRM	Matrix Spike	Soluble (20:1) Chloride (Cl-)	2018/11/13		NC	%	70 - 130
5833848	DRM	Spiked Blank	Soluble (20:1) Chloride (Cl-)	2018/11/13		105	%	70 - 130
5833848	DRM	Method Blank	Soluble (20:1) Chloride (Cl-)	2018/11/13	ND, RDL=20		ug/g	
5833848	DRM	RPD	Soluble (20:1) Chloride (Cl-)	2018/11/13	1.3		%	35
5833849	DRM	Matrix Spike	Soluble (20:1) Sulphate (SO4)	2018/11/13		100	%	70 - 130
5833849	DRM	Spiked Blank	Soluble (20:1) Sulphate (SO4)	2018/11/13		103	%	70 - 130
5833849	DRM	Method Blank	Soluble (20:1) Sulphate (SO4)	2018/11/13	ND, RDL=20		ug/g	
5833849	DRM	RPD	Soluble (20:1) Sulphate (SO4)	2018/11/13	NC		%	35
5833850	C_N	Matrix Spike	Nitrite (N)	2018/11/14		101	%	75 - 125
			Nitrate (N)	2018/11/14		93	%	75 - 125
			Nitrate + Nitrite (N)	2018/11/14		95	%	75 - 125
5833850	C_N	QC Standard	Nitrate + Nitrite (N)	2018/11/14		86	%	75 - 125
5833850	C_N	Method Blank	Nitrite (N)	2018/11/14	ND, RDL=0.5		ug/g	
			Nitrate (N)	2018/11/14	ND,RDL=2		ug/g	
			Nitrate + Nitrite (N)	2018/11/14	ND,RDL=3		ug/g	
5833850	C_N	RPD	Nitrite (N)	2018/11/14	NC		%	25
			Nitrate (N)	2018/11/14	NC		%	25
			Nitrate + Nitrite (N)	2018/11/14	NC		%	25
5833879	ASP	Matrix Spike	Total Phosphorus	2018/11/14		93	%	80 - 120
5833879	ASP	QC Standard	Total Phosphorus	2018/11/14		92	%	80 - 120
5833879	ASP	Spiked Blank	Total Phosphorus	2018/11/14		85	%	80 - 120
5833879	ASP	Method Blank	Total Phosphorus	2018/11/14	ND, RDL=0.004		mg/L	
5833879	ASP	RPD	Total Phosphorus	2018/11/14	5.4		%	20
5834080	COP	Matrix Spike	Total Ammonia-N	2018/11/14		97	%	75 - 125

Maxxam Job #: B8T9661
Report Date: 2018/11/21

Terrapex Environmental Ltd
Client Project #: C0676.00
Site Location: ROCKLAND LAGOON
Sampler Initials: GS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5834080	COP	Spiked Blank	Total Ammonia-N	2018/11/14		101	%	80 - 120
5834080	COP	Method Blank	Total Ammonia-N	2018/11/14	ND, RDL=0.050		mg/L	
5834080	COP	RPD	Total Ammonia-N	2018/11/14	13		%	20
5836075	ADB	Matrix Spike	Soluble (20:1) Chloride (Cl-)	2018/11/14		NC	%	70 - 130
5836075	ADB	Spiked Blank	Soluble (20:1) Chloride (Cl-)	2018/11/14		106	%	70 - 130
5836075	ADB	Method Blank	Soluble (20:1) Chloride (Cl-)	2018/11/14	ND, RDL=20		ug/g	
5836075	ADB	RPD	Soluble (20:1) Chloride (Cl-)	2018/11/14	2.8		%	35
5836076	ADB	Matrix Spike	Soluble (20:1) Sulphate (SO4)	2018/11/15		101	%	70 - 130
5836076	ADB	Spiked Blank	Soluble (20:1) Sulphate (SO4)	2018/11/15		101	%	70 - 130
5836076	ADB	Method Blank	Soluble (20:1) Sulphate (SO4)	2018/11/15	ND, RDL=20		ug/g	
5836076	ADB	RPD	Soluble (20:1) Sulphate (SO4)	2018/11/15	NC		%	35
5836077	C_N	Matrix Spike	Nitrite (N)	2018/11/14		102	%	75 - 125
			Nitrate (N)	2018/11/14		92	%	75 - 125
			Nitrate + Nitrite (N)	2018/11/14		NC	%	75 - 125
5836077	C_N	QC Standard	Nitrate + Nitrite (N)	2018/11/14		84	%	75 - 125
5836077	C_N	Method Blank	Nitrite (N)	2018/11/14	ND, RDL=0.5		ug/g	
			Nitrate (N)	2018/11/14	ND,RDL=2		ug/g	
			Nitrate + Nitrite (N)	2018/11/14	ND,RDL=3		ug/g	
5836077	C_N	RPD	Nitrite (N)	2018/11/14	NC		%	25
			Nitrate (N)	2018/11/14	9.3		%	25
			Nitrate + Nitrite (N)	2018/11/14	9.3		%	25
5837018	TA1	QC Standard	Nitrogen (N)	2018/11/19		101	%	95 - 105
5837018	TA1	Method Blank	Nitrogen (N)	2018/11/19	ND, RDL=0.010		%	
5837018	TA1	RPD [IGH218-02]	Nitrogen (N)	2018/11/19	2.5		%	35
5838557	AFZ	Matrix Spike [IGH218-04]	Acid Extractable Barium (Ba)	2018/11/15		NC	%	75 - 125
			Acid Extractable Beryllium (Be)	2018/11/15		98	%	75 - 125
			Acid Extractable Cadmium (Cd)	2018/11/15		95	%	75 - 125
			Acid Extractable Calcium (Ca)	2018/11/15		NC	%	75 - 125
			Acid Extractable Chromium (Cr)	2018/11/15		101	%	75 - 125
			Acid Extractable Cobalt (Co)	2018/11/15		98	%	75 - 125
			Acid Extractable Copper (Cu)	2018/11/15		NC	%	75 - 125
			Acid Extractable Iron (Fe)	2018/11/15		NC	%	75 - 125
			Acid Extractable Lead (Pb)	2018/11/15		99	%	75 - 125
			Acid Extractable Magnesium (Mg)	2018/11/15		NC	%	75 - 125
			Acid Extractable Manganese (Mn)	2018/11/15		NC	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2018/11/15		96	%	75 - 125
			Acid Extractable Nickel (Ni)	2018/11/15		99	%	75 - 125
			Acid Extractable Phosphorus (P)	2018/11/15		NC	%	75 - 125
			Acid Extractable Potassium (K)	2018/11/15		NC	%	75 - 125
			Acid Extractable Silver (Ag)	2018/11/15		96	%	75 - 125
			Acid Extractable Sodium (Na)	2018/11/15		NC	%	75 - 125
			Acid Extractable Strontium (Sr)	2018/11/15		NC	%	75 - 125
			Acid Extractable Tin (Sn)	2018/11/15		96	%	75 - 125
			Acid Extractable Vanadium (V)	2018/11/15		97	%	75 - 125
			Acid Extractable Zinc (Zn)	2018/11/15		NC	%	75 - 125
5838557	AFZ	Spiked Blank	Acid Extractable Barium (Ba)	2018/11/15		104	%	80 - 120
			Acid Extractable Beryllium (Be)	2018/11/15		102	%	80 - 120

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5838557	AFZ	Method Blank	Acid Extractable Cadmium (Cd)	2018/11/15		99	%	80 - 120
			Acid Extractable Calcium (Ca)	2018/11/15		104	%	80 - 120
			Acid Extractable Chromium (Cr)	2018/11/15		106	%	80 - 120
			Acid Extractable Cobalt (Co)	2018/11/15		102	%	80 - 120
			Acid Extractable Copper (Cu)	2018/11/15		104	%	80 - 120
			Acid Extractable Iron (Fe)	2018/11/15		102	%	80 - 120
			Acid Extractable Lead (Pb)	2018/11/15		103	%	80 - 120
			Acid Extractable Magnesium (Mg)	2018/11/15		98	%	80 - 120
			Acid Extractable Manganese (Mn)	2018/11/15		105	%	80 - 120
			Acid Extractable Molybdenum (Mo)	2018/11/15		100	%	80 - 120
			Acid Extractable Nickel (Ni)	2018/11/15		103	%	80 - 120
			Acid Extractable Phosphorus (P)	2018/11/15		98	%	80 - 120
			Acid Extractable Potassium (K)	2018/11/15		103	%	80 - 120
			Acid Extractable Silver (Ag)	2018/11/15		101	%	80 - 120
			Acid Extractable Sodium (Na)	2018/11/15		105	%	80 - 120
			Acid Extractable Strontium (Sr)	2018/11/15		106	%	80 - 120
			Acid Extractable Tin (Sn)	2018/11/15		102	%	80 - 120
			Acid Extractable Vanadium (V)	2018/11/15		102	%	80 - 120
			Acid Extractable Zinc (Zn)	2018/11/15		103	%	80 - 120
			Acid Extractable Barium (Ba)	2018/11/15	ND,RDL=1		ug/g	
			Acid Extractable Beryllium (Be)	2018/11/15	ND, RDL=0.3		ug/g	
			Acid Extractable Cadmium (Cd)	2018/11/15	ND, RDL=0.3		ug/g	
			Acid Extractable Calcium (Ca)	2018/11/15	ND,RDL=3		ug/g	
			Acid Extractable Chromium (Cr)	2018/11/15	ND, RDL=0.5		ug/g	
			Acid Extractable Cobalt (Co)	2018/11/15	ND,RDL=1		ug/g	
			Acid Extractable Copper (Cu)	2018/11/15	ND,RDL=1		ug/g	
			Acid Extractable Iron (Fe)	2018/11/15	ND,RDL=1		ug/g	
			Acid Extractable Lead (Pb)	2018/11/15	ND,RDL=3		ug/g	
			Acid Extractable Magnesium (Mg)	2018/11/15	ND,RDL=3		ug/g	
			Acid Extractable Manganese (Mn)	2018/11/15	ND, RDL=0.5		ug/g	
			Acid Extractable Molybdenum (Mo)	2018/11/15	ND,RDL=1		ug/g	
			Acid Extractable Nickel (Ni)	2018/11/15	ND,RDL=3		ug/g	
			Acid Extractable Phosphorus (P)	2018/11/15	ND,RDL=5		ug/g	
			Acid Extractable Potassium (K)	2018/11/15	ND, RDL=50		ug/g	
			Acid Extractable Silver (Ag)	2018/11/15	ND, RDL=0.5		ug/g	
			Acid Extractable Sodium (Na)	2018/11/15	ND, RDL=30		ug/g	
			Acid Extractable Strontium (Sr)	2018/11/15	ND, RDL=0.5		ug/g	
			Acid Extractable Tin (Sn)	2018/11/15	ND, RDL=10		ug/g	
			Acid Extractable Vanadium (V)	2018/11/15	ND, RDL=0.5		ug/g	
			Acid Extractable Zinc (Zn)	2018/11/15	ND, RDL=0.5		ug/g	
5838557	AFZ	RPD [IGH218-04]	Acid Extractable Barium (Ba)	2018/11/15	0.10		%	30

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Beryllium (Be)	2018/11/15	NC		%	30
			Acid Extractable Cadmium (Cd)	2018/11/15	NC		%	30
			Acid Extractable Calcium (Ca)	2018/11/15	14		%	30
			Acid Extractable Chromium (Cr)	2018/11/15	NC		%	30
			Acid Extractable Cobalt (Co)	2018/11/15	NC		%	30
			Acid Extractable Copper (Cu)	2018/11/15	NC		%	30
			Acid Extractable Iron (Fe)	2018/11/15	13		%	30
			Acid Extractable Lead (Pb)	2018/11/15	NC		%	30
			Acid Extractable Magnesium (Mg)	2018/11/15	9.3		%	30
			Acid Extractable Manganese (Mn)	2018/11/15	13		%	30
			Acid Extractable Molybdenum (Mo)	2018/11/15	NC		%	30
			Acid Extractable Nickel (Ni)	2018/11/15	NC		%	30
			Acid Extractable Phosphorus (P)	2018/11/15	12		%	30
			Acid Extractable Potassium (K)	2018/11/15	NC		%	30
			Acid Extractable Silver (Ag)	2018/11/15	NC		%	30
			Acid Extractable Sodium (Na)	2018/11/15	2.6		%	30
			Acid Extractable Strontium (Sr)	2018/11/15	12		%	30
			Acid Extractable Tin (Sn)	2018/11/15	NC		%	30
			Acid Extractable Vanadium (V)	2018/11/15	NC		%	30
			Acid Extractable Zinc (Zn)	2018/11/15	8.5		%	30
5838688	COP	Matrix Spike [IGH219-02]	Total Ammonia-N	2018/11/15		NC	%	80 - 120
5838688	COP	Spiked Blank	Total Ammonia-N	2018/11/15		107	%	80 - 120
5838688	COP	Method Blank	Total Ammonia-N	2018/11/15	ND, RDL=25		ug/g	
5838688	COP	RPD [IGH219-02]	Total Ammonia-N	2018/11/15	3.1		%	35
5838689	C_N	Matrix Spike [IGH219-01]	Nitrite (N)	2018/11/15		99	%	75 - 125
			Nitrate (N)	2018/11/15		99	%	75 - 125
			Nitrate + Nitrite (N)	2018/11/15		99	%	75 - 125
5838689	C_N	Spiked Blank	Nitrite (N)	2018/11/15		101	%	75 - 125
			Nitrate (N)	2018/11/15		102	%	75 - 125
			Nitrate + Nitrite (N)	2018/11/15		102	%	75 - 125
5838689	C_N	Method Blank	Nitrite (N)	2018/11/15	ND, RDL=0.5		ug/g	
			Nitrate (N)	2018/11/15	ND,RDL=5		ug/g	
			Nitrate + Nitrite (N)	2018/11/15	ND,RDL=5		ug/g	
5838689	C_N	RPD [IGH219-01]	Nitrite (N)	2018/11/15	NC		%	25
			Nitrate (N)	2018/11/15	NC		%	25
			Nitrate + Nitrite (N)	2018/11/15	NC		%	25

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

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

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

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

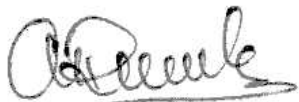
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

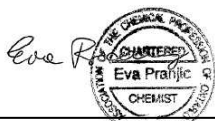
NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Anastassia Hamanov, Scientific Specialist



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

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

CERTIFICATE OF APPROVAL



Ontario

Ministry of
Environment
and Energy

Ministère de
l'Environnement
et de l'Énergie

**AMENDMENT TO CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS**

The Corporation of the City of Clarence-Rockland
1560 Laurier Street
Clarence-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 m³/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.

JUL 09 2002 08:50 FR EARB

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) 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 5.1, 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 6.1 above, shall form part of this certificate.
- 4.3 Where an existing certificate of approval referred to in Condition 6.1 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.

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;

JUL 09 2002 08:51 FR EAAE

416 314 7155 TO 916134461427

P.05/06

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

DRAFT

Signature _____

....., P.Eng.

Director

Section

JC/

c: District Manager, MOEE Kingston - District
MOEE Cornwall Area Office
Clerk, City of Clarence-Rockland
Neil A. Levac, Levac Robichaud Leclerc Associates Ltd.



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 m³/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.

REÇU

30 AOUT 2002

CITÉ CLARENCE-ROCKLAND

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

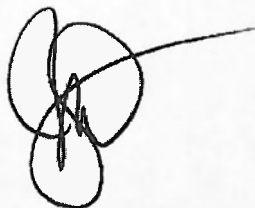
AND

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.



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. 2

REÇU

09 AOÛT 2002

CITÉ CLARENCE-ROCKLAND

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

Site Location: 2 600 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 m³/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) 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 5.1, 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 6.1 above, shall form part of this certificate.

- 4.3 Where an existing certificate of approval referred to in Condition 6.1 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.

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

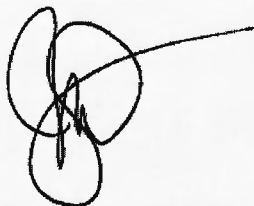
AND

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 31st day of July, 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 Clarene-Rockland
Neil A. Levac, Levac Robichaud Leclerc Associates Ltd.

HISTORICAL GROUNDWATER ANALYTICAL DATA

Summary of Field Measurements and Groundwater Analysis - MW1

Groundwater Monitoring Program 2015
City of Clarence-Rockland Biosolids Lagoons
LRL File: 01201-A

Ground Surface Elevation: 50.23 m
Top of PVC Casing Elevation: 51.11 m
Well Depth: m
Monitoring Well Destroyed in late 2005

			2005				2004				2003			
			Fall 11-Nov-05	Summer 6-Sep-05	Spring 26-May-05	Winter 21-Mar-05	Fall 3-Nov-04	Summer 18-Aug-04	Spring 9-Jun-04	Winter 5-Mar-04	Fall 23-Oct-03	Summer 21-Jul-03	Spring 17-Apr-03	Winter 19-Dec-02
Parameters	Units	MDL												
Field Parameters														
Water Level (Below PVC Casing)	m	--	1.64	1.97	1.58	2.02	--	--	--	--	--	--	NM	--
Water Level Depth	m	--	0.76	1.09	0.70	1.14	--	--	--	--	0.16	0.43	NM	1.42
Water Level Elevation	m	--	49.47	49.14	49.53	49.09	49.76	49.13	49.51	NM	50.07	49.80	NM	48.81
Conductivity	uS	--	856	1018	538	1225	1206	1487	1571	NM	NM	NM	NM	NM
Total Dissolved Solids	mg/L	--	427	512	1082	615	599	743	780	NM	NM	NM	NM	NM
Temperature	°C	--	5.5	19.7	14.0	8.4	11.6	17.3	14.1	NM	NM	NM	NM	NM
pH	unitless	--	7.10	6.72	7.03	7.34	6.99	6.45	6.92	NM	NM	NM	NM	NM
Chemical Analysis														
Total Kjeldhal Nitrogen	mg/L	0.1	7.7	NS	9.5	NS	NS	NS	13	NS	17	18	15	11
Ammonia	mg/L	0.1	<0.1	NS	0.51	NS	NS	NS	10	NS	17	18	15	9.4
Nitrate	mg/L	0.1	3.1	NS	0.1	NS	NS	NS	<0.1	NS	6.7	<0.1	<0.1	<0.1
Nitrite	mg/L	0.05	<0.05	NS	<0.05	NS	NS	NS	<0.05	NS	<0.05	<0.05	<0.05	<0.05
Chloride	mg/L	1	36	NS	21	NS	NS	NS	21	NS	32	33	48	74
Sulphate	mg/L	1	420	NS	830	NS	NS	NS	720	NS	640	730	530	1
Total Phosphorus	mg/L	0.01	0.89	NS	0.41	NS	NS	NS	0.71	NS	0.27	0.21	0.83	0.60
Conductivity	uS	5	1200	NS	1500	NS	NS	NS	1500	NS	1136	1801	1138	796
Total Dissolved Solids	mg/L	10	980	NS	1300	NS	NS	NS	1300	NS	682	1081	683	478
Total Suspended Solids	mg/L	2	--	NS	670	NS	NS	NS	22	NS	4	270	34	2000
Biological Oxygen Demand	mg/L	2	<2	NS	<2	NS	NS	NS	<2	NS	2	3	<2	8

Notes
MDL Method Detection Limit
-- Not Applicable/No Value
NA Not Analysed
NM Not Measured
NS Not Sampled

Summary of Field Measurements and Groundwater Analysis - MW2
Groundwater Monitoring Program 2015
City of Clarence-Rockland Biosolids Lagoons
LRL File: 01201-A

Ground Surface Elevation: 48.36 m
Top of PVC Casing Elevation: 49.09 m
Well Depth: 5.81 m
Type of Monitoring Well: Leakage from lagoon

Parameters			Units	MDL	2016		2014		2013		2012		2011		2010		2009		2008		2007				2006				2005				2004				2003			
					Fall 14-Sep-06	Spring 14-Jul-06	Fall 08-Sep-04	Spring 12-May-04	Fall 20-Sep-03	Spring 01-May-03	Fall 21-Sep-02	Spring 18-May-02	Fall 04-Nov-01	Spring 06-Jan-01	Fall 16-Nov-00	Spring 17-May-00	Fall 13-Nov-99	Spring 18-May-99	Fall 23-Nov-98	Spring 04-May-98	Fall 14-Nov-97	Summer 14-Aug-97	Spring 06-Jun-97	Winter 21-Feb-97	Fall 14-Nov-96	Summer 17-Aug-96	Spring 04-May-96	Winter 21-Feb-96	Fall 11-Nov-95	Summer 04-Sep-95	Spring 29-May-95	Winter 21-Dec-95	Fall 04-Nov-94	Summer 19-Aug-94	Spring 04-Jun-94	Winter 04-Mar-94	Fall 23-Oct-93	Summer 01-Feb-93	Spring 17-Apr-93	Winter 13-Dec-92
Field Parameters																																								
Water Level (Below PVC Casing)	m	--		3.445	3.42	3.51	2.80	3.58	3.24	3.505	3.30	3.71	3.046	3.39	3.29	3.48	3.04	3.09	2.56	3.92	NS	3.14	3.45	--	3.34	--	--	3.26	3.60	3.00	3.51	--	--	--	--	--	--	NM	--	
Water Level Depth	m	--		2.72	2.69	2.78	2.07	2.95	2.51	2.775	2.57	2.99	2.32	2.66	2.56	2.73	2.31	2.36	1.83	3.19	NS	2.41	2.72	2.85	2.81	2.66	3.20	2.65	2.77	2.27	2.78	--	--	--	--	2.68	2.59	NM	2.83	
Water Level Elevation	m	--		45.65	45.67	45.58	48.28	45.41	45.85	45.99	45.79	45.38	46.04	45.70	45.80	45.63	46.05	46.00	46.53	45.17	NS	45.95	45.64	46.24	45.75	45.89	45.89	45.51	45.59	46.09	45.58	45.78	46.33	45.69	45.88	45.67	45.77	NM	45.53	
Conductivity	uS	--		1060	1012	1237	1573	1305	313	1502	759	1138	1792	727	1227	893	872	1131	1248	1241	NS	1149	1213	1190	NM	956	902	807	830	965	882	1112	892	966	NM	NM	NM	NM	NM	
Total Dissolved Solids	mg/L	--		531	509	618	783	850	156	714	380	565	865	343	639	450	430	567	824	835	NS	565	625	593	NM	463	449	389	417	465	440	557	494	463	NM	NM	NM	NM	NM	
Temperature	°C	--		8.9	12.9	10.7	8.6	8.6	13.0	9.8	11.0	8.7	13.2	11.0	15.9	12.6	11.5	8.1	9.0	10.5	NS	11.8	7.1	10.1	NM	19.8	8.0	5.2	21.8	12.0	9.6	11.0	21.8	14.8	NM	NM	NM	NM	NM	
pH	unitless	--		7.17	6.82	6.69	6.70	6.87	6.60	6.69	6.56	6.51	6.68	6.55	6.27	6.45	6.06	7.62	6.13	6.41	NS	6.53	6.78	6.09	NM	6.49	6.62	6.76	6.40	6.88	7.01	6.88	6.45	6.42	NM	NM	NM	NM	NM	
Chemical Analysis																																								
Alkalinity (Total)	mg/L	5		315	237	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	
Total Kjeldahl Nitrogen	mg/L	0.1	0.3 - 1.7	8.9	8.6	8.8	8.8	8.7	1.7	3.1	1.2	1.9	1.5	1.1	1.0	0.9	0.6	0.9	1.1	2.6	NS	0.9	NS	0.9	NS	2.0	NS	3.7	NS	1.5	NS	NS	NS	0.7	<0.1	8.8	8.9	7.5	5.2	
Ammonia	mg/L	0.1	<1.31	6.13	NA	3.71	4.66	11.8	0.50	1.68	0.66	0.86	0.25	0.77	0.35	0.48	0.29	0.89	0.52	2.56	NS	0.50	NS	0.44	NS	0.57	NS	0.09	NS	0.60	NS	NS	NS	0.84	1.0	7.4	6.6	0.11	4.9	
Nitrate	mg/L	0.1	3.8 - 8.4	23.8	22.8	22.2	20.8	20.2	26.8	22.9	7.2	8.7	8.4	6	8	6.7	6.8	7.8	4.3	0.4	NS	10.4	NS	9.2	NS	12.0	NS	0.6	NS	18.0	NS	NS	NS	2.6	0.8	<0.1	<0.1	0.2	0.8	
Nitrite	mg/L	0.05	<0.10	<0.05	<0.05	<0.05	0.38	<0.05	0.88	<0.05	0.17	<0.05	<0.05	0.07	<0.05	<0.05	0.18	0.09	0.05	<0.05	NS	0.19	NS	0.20	NS	0.15	NS	<0.05	NS	<0.05	NS	NS	NS	0.20	<0.05	<0.05	<0.05	<0.05	<0.05	
Chloride	mg/L	1	42 - 56	88	79	82	88	119	79	189	87	182	88	49	51	42	41	49	38	60	NS	33	NS	46	NS	130	NS	74	NS	130	NS	NS	NS	64	96	78	97	91	79	
Sulphate	mg/L	1	223 - 433	58	58	62	56	38	83	31	34	48	74	145	207	328	350	406	443	301	NS	381	NS	270	NS	260	NS	220	NS	250	NS	NS	NS	280	220	100	85	21	4	
Total Phosphorus	mg/L	0.01	<0.81	0.30	0.62	0.18	0.05	0.47	0.06	0.26	0.21	0.24	1.29	0.27	1.43	0.08	0.14	0.15	0.14	0.02	NS	0.31	NS	0.18	NS	0.04	NS	0.43	NS	0.17	NS	NS	NS	0.02	0.07	0.89	0.02	0.03	0.81	
Conductivity	uS	5		1180	1080	1430	1400	1670	1410	1800	1010	1180	1030	834	898	892	1030	1190	1220	1150	NS	1100	NS	1200	NS	1100	NS	1100	NS	1200	NS	NS	NS	1000	1000	768	871	760	838	
Total Dissolved Solids	mg/L	10	639 - 795	690	672	888	898	1050	888	888	611	726	181	562	673	717	698	802	770	746	NS	502	NS	720	NS	680	NS	590	NS	850	NS	NS	NS	760	840	682	1091	863	478	
Total Suspended Solids	mg/L	2		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NS	210	NS	84	NS	NA	NS	450	NS	NS	NS	<2	2	4	2	4	1000	
Biological Oxygen Demand	mg/L	2		9	7	14	7	<6	2	<12	<2	<2	22	<40	<80	2	<2	<2	<2	<2	NS	<2	NS	<2	NS	<2	NS	<2	NS	4	NS	NS	NS	<2	<2	<2	<2	1	<2	
Metals																																								
Aluminum	mg/L	0.01	<0.134	0.004	0.002	0.003	0.037	0.035	<0.001	<0.01	0.019	0.084	0.01	0.215	0.012	NA	NA	NA	NA	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	
Antimony	mg/L	0.001		<0.0005	<0.0005	<0.0005	<0.0005	0.023	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0025	<0.001	NA	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	
Arsenic	mg/L	0.01		<0.001	<0.001	0.01	<0.001	<0.005	0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	NA	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	
Berium	mg/L	0.01		0.107	0.103	0.078	NA	NA	NA	0.11	NA	NA	NA	NA	NA	NA	NA	0.068	NA	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	
Beryllium	mg/L	0.001		<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.001	NA	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	
Boron	mg/L	0.05		0.077	0.079	0.312	0.097	0.079	0.036	0.07	0.052	0.078	0.099	0.1	0.0749	0.082	NA	NA	NA	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	
Cadmium	mg/L	0.001		0.0001	<0.0001	<0.0001	0.0002	0.0006	<0.0001	0.0002	0.0002	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	NA	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	
Calcium	mg/L	0.2		96.9	68.2	59	NA	NA	NA	161	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	
Chromium	mg/L	0.05		<0.01	0.005	0.023	0.007	0.059	0.013	<0.001	0.01	0.01	0.18	0.002	0.01	<0.05	NA	NA	NA	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	
Cobalt	mg/L	0.005		0.0012	0.0012	0.0008	0.0018	0.0160	0.0010	0.0017	0.0042	0.0015	0.0441	0.0005	0.0087	<0.005	NA	NA	NA	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	
Copper	mg/L	0.005		<0.0005	0.0042	0.0016	0.054	0.0339	0.0045	0.006	0.0097	0.0041	0.0794	0.0046	0.017	<0.005	NA	NA	NA	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	
Iron	mg/L	0.2	<30.70	<0.1	<0.1	0.388	<0.1	18	<0.1	<0.03	1.78	0.449	57.8	<0.1	4.9	0.367	NA	NA	NA	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	
Lead	mg/L	0.001		<0.001	<0.001	0.0001	<0.0001	0.0076	<0.0001	<0.001	0.0018	<0.0001	0.0239	<0.0001	0.0037	<0.001	NA	NA	NA	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	NA	NS	
Magnesium	mg/L	0.2		33.7	31.2	265	NA	NA	NA	54	NA	NA	NA	NA	NA	NA	NA	NA	NA</																					

Summary of Field Measurements and Groundwater Analysis - MW3
Groundwater Monitoring Program 2015
City of Clarence-Rockland Biosolids Lagoons
LRL File: 01201-A

Ground Surface Elevation: 51.77 m
Top of PVC Casing Elevation: 52.56 m
Well Depth: 5.77 m
Type of Monitoring Well: Background

Type of Monitoring Well			Background		Trigger		2016		2015		2014		2013		2012		2011		2010		2009		2008		2007		2006		2005		2004		2003		2002					
Parameters	Units	MDL	Concentration Range	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Summer	Spring	Winter	Fall	Summer	Spring	Winter	Fall	Summer	Spring	Winter			
				10-Nov-16	14-May-16	10-Nov-15	14-May-15	10-Nov-14	14-May-14	10-Nov-13	14-May-13	10-Nov-12	14-May-12	10-Nov-11	14-May-11	10-Nov-10	14-May-10	10-Nov-09	14-May-09	10-Nov-08	14-May-08	10-Nov-07	14-May-07	10-Nov-06	14-May-06	10-Nov-05	14-May-05	10-Nov-04	14-May-04	10-Nov-03	14-May-03	10-Nov-02	14-May-02	10-Nov-01	14-May-01	10-Nov-00	14-May-00	10-Nov-99	14-May-99	
Field Parameters																																								
Water Level (Below PVC Casing)	m	-		2.185	2.59	2.25	1.83	2.67	2.29	2.61	2.07	2.84	2.27	2.48	2.49	2.59	1.98	1.88	1.88	2.92	3.08	1.94	2.42	-	2.82	-	-	2.47	2.99	2.33	2.41	-	-	-	-	-	-	NM	-	
Water Level Depth	m	-		1.40	1.80	1.48	0.84	1.88	1.50	1.82	1.28	2.05	1.48	1.70	1.70	1.80	1.20	1.09	1.07	2.13	2.28	1.15	1.83	1.94	2.03	2.02	1.99	1.88	2.2	1.54	1.82	-	-	-	-	1.90	1.90	1.88	2.33	
Water Level Elevation	m	-		50.38	49.97	50.31	50.93	49.89	50.27	49.95	50.49	49.72	50.29	50.07	50.07	49.97	50.57	50.88	60.7	49.84	49.48	50.82	50.14	50.82	49.74	49.75	50.57	50.09	49.57	50.23	50.15	50.11	49.85	50.38	49.95	49.81	49.81	NM	49.44	
Conductivity	uS	-		875	1043	838	852	724	224	762	565	843	963	868	952	873	764	993	982	998	1406	1228	1320	1022	NM	981	899	759	1024	898	882	1019	1274	885	NM	NM	NM	NM	NM	NM
Total Dissolved Solids	mg/L	-		438	521	417	427	382	113	384	288	425	489	400	472	436	387	496	490	484	702	815	850	505	NM	448	450	353	512	440	432	510	639	512	NM	NM	NM	NM	NM	NM
Temperature	°C	-		9.9	9.6	10.0	8.5	7.8	11.4	8.5	9.7	8.0	12.2	11.0	14.8	10.1	9.8	7.9	7.3	9.7	10.1	10.5	8.3	9.4	NM	14.9	7.6	6.0	26.6	11.0	8.3	9.2	18.3	11.7	NM	NM	NM	NM	NM	NM
pH	unitless	-		7.46	7.65	6.95	7.10	7.24	7.65	7.16	6.99	7.15	6.78	7.37	7.58	7.69	7.52	7.85	6.98	7.52	8.55	8.70	7.85	7.30	NM	7.39	7.61	8.36	7.49	7.44	7.45	6.87	7.50	7.48	NM	NM	NM	NM	NM	NM
Chemical Analysis																																								
Alkalinity (Total)	mg/L	5		314	299	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Total Kjeldahl Nitrogen	mg/L	0.1	0.2 - 1.2	0.8	1.8	1.0	0.4	0.8	0.8	1.3	0.9	1.5	1.1	0.9	1.5	2.1	0.3	0.8	0.7	0.7	1.8	0.9	0.8	0.6	0.6	0.3	0.6	0.6	1.8	0.6	0.7	0.9	0.3	0.3	0.4	0.7	0.5	8.4	0.4	
Ammonia	mg/L	0.1	0.13 - 0.31	0.19	NA	0.28	0.20	0.24	0.99	0.19	0.16	0.23	0.17	0.24	0.20	0.32	0.16	0.26	0.27	0.30	0.31	0.24	0.10	0.08	<0.1	0.10	<0.1	0.14	<0.1	<0.1	0.13	<0.1	<0.1	0.11	0.12	0.28	0.14	6.40	0.33	
Nitrate	mg/L	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.2	<0.1	0.1	<0.1	<0.1	0.3	0.1	<0.1	0.2	0.2	<0.1	0.5	<0.1	0.2	1.1	0.1	
Nitrite	mg/L	0.05	<0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.10	
Chloride	mg/L	1	7 - 170	26	112	85	48	77	35	49	31	53	74	39	69	84	45	77	63	83	206	113	190	83	340	97	110	92	280	110	110	110	160	150	150	170	280	95	210	
Sulphate	mg/L	1	59 - 119	81	83	89	109	89	128	91	128	85	100	95	137	107	116	100	128	84	49	85	84	80	50	82	94	77	41	74	69	51	42	50	52	44	34	48	39	
Total Phosphorus	mg/L	0.01	0.52 - 3.92	0.89	9.88	2.13	0.53	2.01	1.17	2.85	2.18	2.99	1.17	2.55	3.99	2.04	1.47	8.01	3.58	3.61	3.87	1.88	2.40	0.51	0.13	0.08	1.10	0.80	1.10	0.84	4.30	0.23	0.16	0.05	0.08	0.09	0.08	0.08	0.68	
Conductivity	uS	5		972	1070	996	858	823	818	848	814	889	977	884	950	1010	930	1040	1010	955	1420	1150	1300	1100	1400	1100	980	1000	1400	1100	1100	1100	1200	1200	1200	1045	1300	950	1235	
Total Dissolved Solids	mg/L	10	444 - 722	634	646	572	584	538	455	533	532	622	249	204	628	387	526	800	558	568	684	658	720	540	730	520	810	580	730	700	810	570	630	660	620	627	798	670	741	
Total Suspended Solids	mg/L	2		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Biological Oxygen Demand	mg/L	2		4	8	3	2	3	<2	<12	4	<2	22	<40	<40	13	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	8	4	2	2	<2	<2	<2	<2	<2	5	
Metals																																								
Aluminum	mg/L	0.01	<0.297	0.002	0.008	0.005	0.082	0.154	<0.001	<0.01	0.029	0.111	0.034	0.492	0.009	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Antimony	mg/L	0.001		<0.0005	<0.0005	<0.0005	<0.0005	0.0077	<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	
Arsenic	mg/L	0.01		<0.001	0.002	0.001	<0.001	0.006	<0.001	<0.001	<0.001	0.002	<0.005	<0.001	<0.005	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	mg/L	0.01		0.019	0.02	0.02	NA	NA	NA	NA	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	mg/L	0.001		<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0005	<0.0005	0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	
Boron	mg/L	0.05		0.113	0.117	0.084	0.089	0.092	0.035	0.1	0.064	0.091	0.086	0.094	0.0802	0.104	0.0802	0.094	0.086	0.094	0.0802	0.104	0.0802	0.094	0.086	0.094	0.0802	0.104	0.0802	0.094	0.086	0.094	0.0802	0.104	0.0802	0.094	0.086	0.094	0.0802	
Cadmium	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0005	
Calcium	mg/L	0.2		48.3	59.4	38.8	NA	NA	NA	40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Chromium	mg/L	0.05		<0.01	0.005	0.005	0.003	0.120	0.007	<0.001	0.004	0.008	0.094	0.002	0.035	<0.05	0.002	0.035	0.002	0.035	0.002	0.035	0.002	0.035	0.002	0.035	0.002	0.035	0.002	0.035	0.002	0.035	0.002	0.035	0.002	0.035	0.002	0.035		
Cobalt	mg/L	0.005		<0.0005	<0.0005	<0.0005	<0.0005	0.282	<0.0005	0.0002	<0.0005	0.0075	0.023	<0.0005	0.0088	0.009	0.0075	0.023	<0.0005	0.0088	0.009	0.0075	0.023	<0.0005	0.0088	0.009	0.0075	0.023	<0.0005	0.0088	0.009	0.0075	0.023	<0.0005	0.0088	0.009	0.0075	0.023	<0.0005	0.0088
Copper	mg/L	0.005		<0.0005	0.0047	0.0018	0.0023																																	

Summary of Field Measurements and Groundwater Analysis - MW4

Groundwater Monitoring Program 2015

City of Clarence-Rockland Biosolids Lagoons

LRL File: 01201-A

Ground Surface Elevation: 43.43 m

Top of PVC Casing Elevation.

Well Depth: 3.82 m

Type of Monitoring Well: Impact to river

ParametersUnitsMDLPWDO				Trigger Concentration Range	2018		2018		2018		2012		2011		2010		2009		2008		2007			2006				2005				2004			
					Fall 18-Nov-18	Spring 14-Jun-18	Fall 05-Nov-14	Spring 18-May-14	Fall 20-Nov-13	Spring 27-May-13	Fall 21-Nov-11	Spring 19-May-11	Fall 24-Nov-11	Spring 8-Jun-11	Fall 18-Nov-10	Spring 17-May-10	Fall 12-Nov-09	Spring 12-May-09	Fall 20-Nov-08	Spring 8-May-08	Fall 14-Nov-07	Summer 14-Aug-07	Spring 8-Jun-07	Winter 28-Feb-07	Fall 14-Nov-06	Summer 17-Aug-06	Spring 8-May-06	Winter 24-Feb-06	Fall 11-Nov-05	Summer 8-Sep-05	Spring 28-May-05	Winter 21-Mar-05	Fall 8-Nov-04	Summer 18-Aug-04	
Field Parameters																																			
Water Level (Below PVC Casing)	m	--	--		1.78	2.34	2.05	1.66	1.95	1.82	1.995	1.70	2.20	1.778	1.88	1.98	1.94	1.56	1.63	1.53	2.69	2.60	1.50	2.08	--	2.13	--	--	1.75	2.73	1.76	2.18	--	--	
Water Level Depth	m	--	--		0.53	1.09	0.80	0.41	0.70	0.57	0.745	0.45	0.85	0.528	0.81	0.71	0.69	0.31	0.38	0.28	1.44	1.35	0.25	0.83	1.53	0.88	1.85	1.83	0.50	1.48	0.51	0.91	--	--	
Water Level Elevation	m	--	--		42.90	42.34	42.63	43.02	42.73	42.86	42.69	42.98	42.48	42.902	42.82	42.72	42.74	43.12	43.05	43.15	41.99	42.08	43.18	42.60	43.15	42.55	43.03	42.85	42.93	41.95	42.92	42.52	42.74	42.96	
Conductivity	uS	--	--		353	452	425	477	397	216	537	288	550	485	376	382	416	343	537	445	602	566	497	571	600	NM	434	488	523	528	435	584	555	548	
Total Dissolved Solids	mg/L	--	--		207	228	511	239	198	105	274	144	267	240	153	185	207	180	273	222	315	284	247	380	305	NM	211	244	257	272	218	290	280	274	
Temperature	°C	--	<30		7.8	13.6	10	7.9	5.8	12.4	7.0	11.7	8.1	14.6	8.8	12.0	8.3	10.0	7.8	8.0	9.0	14.2	9.4	8.5	10.5	NM	18.8	5.0	4.3	23.2	15.0	4.4	8.7	19.7	
pH	unitless	--	6.5-8.5		7.36	6.70	7.38	7.19	7.71	6.80	7.54	7.45	7.40	5.59	7.33	7.34	7.34	6.39	7.74	6.08	6.85	8.30	8.01	7.52	6.30	NM	7.14	8.16	8.21	7.46	7.26	7.80	7.55	7.05	
Chemical Analysis																																			
Alkalinity (Total)	mg/L	5	--		62	81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Total Kjeldhal Nitrogen	mg/L	0.1	--	<1.4	0.4	0.9	0.5	1.8	0.4	1.3	0.8	1.3	1.9	4.1	0.8	0.3	2.0	0.2	0.3	0.7	0.4	0.7	0.5	3.1	1.8	0.5	0.4	0.9	0.2	1.7	<0.1	0.3	0.7	1.0	
Ammonia	mg/L	0.1	--	0.02 - 0.17	0.22	NA	0.03	0.11	0.03	0.06	0.04	0.05	0.04	0.05	0.21	0.02	0.20	0.09	0.003	0.12	0.07	0.09	0.06	0.24	0.10	<0.1	0.10	<0.1	0.07	<0.1	<0.1	0.08	<0.1	0.01	
Unionized Ammonia	mg/L	--	0.02		0.00078	--	0.00013	0.00027	0.00020	0.00008	0.00020	0.00030	0.00016	0.00001	0.00076	0.00009	0.00071	0.00004	0.00003	0.00002	0.00005	0.004	0.001	0.001	0.00004	--	0.00050	--	0.00131	--	0.00059	--	0.00004		
Nitrate	mg/L	0.1	--	<1.41	0.3	<0.1	0.1	1.6	0.6	0.1	0.2	0.5	0.5	0.1	0.2	0.4	0.7	0.5	1.6	1.0	1.8	<	0.3	0.3	<	0.3	1.4	3.5	0.8	0.2	0.8	<0.1	0.1	0.3	
Nitrite	mg/L	0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Chloride	mg/L	1	--	12 - 26	26	32	42	23	61	33	72	22	21	20	16	22	23	14	16	18	19	29	14	19	18	42	24	21	20	40	28	44	30	33	
Sulphate	mg/L	1	--	68 - 153	102	76	111	81	38	58	59	49	144	49	87	83	161	54	113	91	208	103	108	120	140	160	88	160	170	58	82	130	170	20	
Total Phosphorus	mg/L	0.01	0.03	<1.65	0.13	0.68	0.26	1.09	0.47	0.87	0.38	1.34	1.29	1.71	0.8	0.24	0.88	0.40	0.11	1.43	0.72	0.58	0.89	3.8	1.1	<0.01	0.06	0.67	0.34	0.85	0.75	0.42	0.12	0.92	
Conductivity	uS	5	--		352	433	451	341	1670	358	447	292	466	330	343	380	461	333	471	420	571	579	475	510	520	560	470	520	550	550	440	580	580	540	
Total Dissolved Solids	mg/L	10	--	248 - 352	188	324	288	351	1050	207	283	480	347	208	290	276	399	208	312	282	396	322	284	310	280	330	250	340	260	280	450	330	380	260	
Total Suspended Solids	mg/L	2	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3000	930	1400	2600	NS	810	580	1100	2100	1900	
Biological Oxygen Demand	mg/L	2	--		<20	<2	<2	<2	<6	<2	<30	6	<2	20	<40	<60	7	<2	<2	<2	3	<2	<2	<2	<2	18	<2	<2	<2	2	2	6	2	6	
Metals																																			
Aluminum	mg/L	0.01	0.075	0.348 - 1.259	0.408	0.213	0.071	0.489	0.063	0.192	1.89	0.497	0.172	0.911	0.696	1.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Antimony	mg/L	0.001	0.02		<0.0005	<0.0005	<0.0005	<0.0005	0.0045	<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0025	<0.001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Arsenic	mg/L	0.01	0.005		<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.005	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Barium	mg/L	0.01	--		0.017	0.019	0.017	NA	NA	NA	0.06	NA	NA	NA	NA	NA	0.059	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Beryllium	mg/L	0.001	0.011		<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0005	0.0006	<0.0005	<0.0025	<0.0005	<0.0025	<0.001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Boron	mg/L	0.05	0.2		0.019	0.027	0.018	0.023	<0.05	0.017	0.06	0.022	0.024	<0.05	0.028	<0.05	<0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Cadmium	mg/L	0.001	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0005	<0.001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Calcium	mg/L	0.2	--		26.8	31.0	37.5	NA	NA	NA	37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Chromium	mg/L	0.05	0.001		<0.001	0.002	0.001	<0.001	0.031	<0.001	0.004	0.016	0.008	0.144	0.004	<0.005	<0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Cobalt	mg/L	0.005	0.0009		<0.0005	<0.0005	<0.0005	<0.0005	0.0053	0.0017	0.0020	0.0072	0.006	0.0318	<0.0005	<0.0025	<0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Copper	mg/L	0.005	0.005		<0.0005	0.002	0.002	0.0034	0.0149	0.0188	0.012	0.0212	0.022	0.0809	0.0043	<0.0025	0.007	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Iron	mg/L	0.2	0.3	<28.9	0.183	<0.1	<0.1	<0.1	9.18	1.27	1.71	3.78	3.44	61.3	<0.1	0.6	0.767	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Lead	mg/L	0.001	0.001		<0.0001	<0.0001	0.0005	0.0002	0.0047	0.0047	0.005	0.0126	0.0062	0.0382	<0.0001	0.0006	<0.001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Magnesium	mg/L	0.2	--		10.9	12.8	14.8	NA	NA	NA	16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Manganese	mg/L	0.05	--		0.005	0.013	0.01	NA	NA	NA	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Mercury	mg/L	0.0001	0.0005		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Molybdenum	mg/L	0.005	0.04		<0.0005	0.0007	<0.0005	<0.0005	<0.0025	<0.0005	<0.005	<0.0005	<0.0005	<0.0025	<0.001	<0.005	<0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Nickel	mg/L	0.005	0.025		<0.001	0.002	0.002	0.018	0.006	<0.005	0.012	0.009	0.094	0.001	<0.005	<0.005	<0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Potassium	mg/L	0.2	--		3.41	3.84	4.09	NA	NA	NA	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Selenium	mg/L	0.005	0.1		<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.005	<0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Silver	mg/L	0.001	0.0001		<0.																														

MDL	Method Detection Limit	NS	Not Sampled
PWQO	Provincial Water Quality Objectives	NM	Not Measured
-	Not Applicable/Not Available/No Value	NA	Not Analysed
<i>Italics</i>	Above PWQO	BOLD	Exceeds Trigger Concentration Range

Summary of Field Measurements and Groundwater Analysis - BH03-4
Groundwater Monitoring Program 2015
City of Clarence-Rockland Biosolids Lagoons
LRL File: 01201-A

Ground Surface Elevation: 50.69 m
Top of PVC Casing Elevation: 51.37 m
Well Depth: 5.3 m
Type of Monitoring Well: Leakage from lagoon

Parameters	Units	MDL	Trigger Concentration Range	2015		2014		2013		2012		2011		2010		2009		2007				2006				2005		
				Fall 18-Nov-15	Spring 14-Jul-15	Fall 8-Nov-14	Spring 19-May-14	Fall 20-Nov-13	Spring 01-May-13	Fall 01-Nov-12	Spring 15-May-12	Fall 24-Nov-11	Spring 09-Jun-11	Fall 10-Nov-10	Spring 17-May-10	Fall 20-Nov-09	Spring 04-May-09	Fall 14-Nov-07	Summer 14-Aug-07	Spring 04-Jun-07	Winter 28-Feb-07	Fall 14-Nov-06	Summer 17-Aug-06	Spring 04-May-06	Winter 24-Feb-06	Fall 11-Nov-05	Summer 06-Sep-05	Spring 25-May-05
Field Parameters																												
Water Level (Below PVC Casing)	m	—		4.585	4.64	4.67	4.33	4.61	4.80	4.59	4.43	4.77	4.532	4.54	4.61	4.42	4.19	4.95	4.73	4.24	4.63	4.35	4.48	—	4.54	4.52	4.65	4.42
Water Level Depth	m	—		3.905	3.96	3.99	3.65	3.93	3.92	3.91	3.75	4.09	3.852	3.86	3.93	3.74	3.51	4.27	4.05	3.56	3.95	3.67	3.80	4.36	3.86	3.84	3.97	3.74
Water Level Elevation	m	--		46.79	46.73	46.70	47.04	46.76	46.77	46.78	46.94	46.60	46.838	46.83	46.76	46.95	47.18	46.42	46.64	47.13	46.74	47.02	46.89	47.01	46.83	46.95	46.72	46.95
Conductivity	uS	--		851	903	851	84.4	719	639	1121	514	937	820	706	778	646	552	1318	1038	726	1160	880	NM	779	1088	668	1101	1068
Total Dissolved Solids	mg/L	—		425	450	425	429	381	322	556	258	495	300	395	434	323	272	663	517	358	580	464	NM	396	344	336	525	530
Temperature	°C	—		13.6	14.9	13.1	10.2	11.5	13.9	12.9	13.4	10.5	16.6	13.5	25.6	8.8	9.9	12.1	15.3	13.1	6.9	11.2	NM	18.1	8.5	5.1	22.6	15.0
pH	unitless	--		6.82	6.68	6.55	6.74	6.88	6.75	6.69	6.43	6.63	6.64	6.80	6.57	7.59	6.45	6.47	7.67	8.48	7.08	6.50	NM	6.60	6.71	6.97	6.41	6.40
Chemical Analysis																												
Alkalinity (Total)	mg/L	5		401	396	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NS	NA	NS	NA	NS	NS	NS	NA
Total Kjeldahl Nitrogen	mg/L	0.1	2.3 - 8.3	20.0	14.0	42.4	8.1	12.1	6.5	15.9	7.2	9.6	6.8	6.0	5.3	5.3	4.0	11.9	NS	3.7	NS	5.1	NS	5.8	NS	NS	NS	11.0
Ammonia	mg/L	0.1	0.8 - 6.3	17.6	NA	18.4	6.89	15.3	5.39	14.8	6.62	8.04	6.78	5.08	3.82	3.01	2.91	10	NS	3.67	NS	3.70	NS	0.10	NS	NS	NS	<
Nitrate	mg/L	0.1	<0.10	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.1	0.2	0.1	<0.1	<0.1	<0.1	<0.1	NS	<0.1	NS	<0.1	NS	<0.1	NS	NS	NS	<0.1
Nitrite	mg/L	0.05	0.03 - 0.07	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.09	NS	<0.05	NS	<0.05	NS	<0.05	NS	NS	NS	<0.05
Chloride	mg/L	1	6.9 - 24.1	30	37	67	25	42	33	88	28	43	12	22	15	11	8	32	NS	16	NS	14	NS	25	NS	NS	NS	46
Sulphate	mg/L	1	<83	242	19	40	27	18	29	16	21	15	18	25	33	37	32	150	NS	50	NS	87	NS	91	NS	NS	NS	170
Total Phosphorus	mg/L	0.01	0.7 - 3.2	0.82	0.85	1.37	0.71	0.86	1.17	0.76	3.47	1.67	2.88	0.09	1.7	0.12	2.36	3.08	NS	2.21	NS	7.70	NS	0.69	NS	NS	NS	2.30
Conductivity	uS	5		886	898	942	630	847	702	1200	670	951	552	748	587	622	515	1120	NS	685	NS	740	NS	880	NS	NS	NS	1100
Total Dissolved Solids	mg/L	10	242 - 522	370	450	524	341	458	379	660	401	648	162	438	365	388	276	686	NS	396	NS	370	NS	500	NS	NS	NS	670
Total Suspended Solids	mg/L	2		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NS	2500	NS	950	NS	NS	NS	160
Biological Oxygen Demand	mg/L	2		10	10	27	26	15	<2	3	<2	4	3	<20	<12	<2	<2	<2	NS	<2	NS	<2	NS	4	NS	NS	NS	8
Metals																												
Aluminum	mg/L	0.01	<0.011	0.015	0.012	0.019	0.013	<0.001	<0.001	0.020	0.009	0.011	0.01	<0.001	<0.0005	NA												
Antimony	mg/L	0.001		<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0025	<0.001												
Arsenic	mg/L	0.01		<0.001	0.002	0.002	<0.001	<0.005	0.001	<0.001	<0.001	0.002	<0.005	0.001	<0.005	<0.01												
Barium	mg/L	0.01		0.089	0.077	0.093	NA	NA	NA	0.12	NA	NA	NA	NA	NA	0.056												
Beryllium	mg/L	0.001		<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0025	<0.001												
Boron	mg/L	0.05		0.043	0.041	0.052	0.028	<0.05	0.027	0.05	0.025	0.042	<0.05	0.0384	<0.05	<0.05												
Cadmium	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0005	<0.001												
Calcium	mg/L	0.2		85.7	86.2	72.9	NA	NA	NA	118	NA	NA	NA	NA	NA	NA												
Chromium	mg/L	0.05		0.002	0.007	0.005	0.004	0.015	<0.001	0.002	0.003	0.008	0.034	0.004	0.006	<0.05												
Cobalt	mg/L	0.005		<0.0005	<0.0005	0.0005	<0.0005	0.0032	<0.0005	0.0006	<0.0005	0.0015	0.0071	<0.0005	<0.0025	<0.005												
Copper	mg/L	0.005		<0.0005	0.0009	0.001	0.0006	0.0146	<0.0005	<0.001	0.001	0.0051	0.0167	0.0025	0.0039	<0.005												
Iron	mg/L	0.2	11.5 - 24.1	13.1	14.8	10.8	5.84	22.8	13.0	18.9	7.82	19.0	27.9	11.7	17.8	13.7												
Lead	mg/L	0.001		<0.0001	<0.0001	0.0001	<0.0001	0.004	<0.0001	<0.001	<0.0001	0.0039	0.0087	<0.0001	0.004	<0.001												
Magnesium	mg/L	0.2		24.8	24.3	34.7	NA	NA	NA	39	NA	NA	NA	NA	NA	NA												
Manganese	mg/L	0.05		1.42	1.41	1.84	NA	NA	NA	2.3	NA	NA	NA	NA	NA	NA												
Mercury	mg/L	0.0001		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0001	NA	NA												
Molybdenum	mg/L	0.005		<0.0005	<0.0005	0.0009	<0.0005	<0.0025	<0.0005	<0.005	<0.0005	<0.0005	<0.0025	<0.001	<0.005	<0.005												
Nickel	mg/L	0.005		<0.001	0.003	0.003	0.001	0.01	0.002	<0.005	0.002	0.003	0.02	0.002	<0.005	<0.005												
Potassium	mg/L	0.2		7.1	5.37	7.79	NA	NA	NA	8	NA	NA	NA	NA	NA	NA												
Selenium	mg/L	0.005		<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.005	<0.005												
Silver	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0005	<0.001												
Sodium	mg/L	0.2		33.3	36.2	66.4	NA	NA	NA	61	NA	NA	NA	NA	NA	27.2												
Thallium	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0005	<0.001												
Tin	mg/L	0.01		<0.005	<0.005	<0.005	NA	NA	NA	<0.01	NA	NA	NA	NA	NA	NA												
Tungsten	mg/L	0.0001		<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	NA	<0.01	<0.01	<0.05	<0.0														

Notes
MDL Method Detection Limit
PWQO Provincial Water Quality Objectives

Summary of Field Measurements and Groundwater Analysis - MW5
Groundwater Monitoring Program 2015
City of Clarence-Rockland Biosolids Lagoons
LRL File: 01201-A

Ground Surface Elevation: 43.71 m
Top of PVC Casing Elevation: 44.98 m
Well Depth: 4.15 m
Type of Monitoring Well: Impact to river

Type of Monitoring Well:				Impact to river				Trigger		2015		2014		2013		2012		2011		2010		2009		2008		2007				2006				2005				2004	
Parameters		Units	MDL	PWQO	Concentration	Range	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Summer	Spring	Winter	Fall	Summer	Spring	Winter	Fall	Summer	Spring	Winter	Fall	Summer	
						10-Nov-16	14-Jun-16	04-Nov-14	12-May-14	20-Nov-13	01-May-13	01-Nov-12	10-May-12	24-Nov-11	04-Jun-11	19-Nov-10	17-May-10	13-Nov-09	12-May-09	20-Nov-08	04-May-08	14-Nov-07	17-Aug-07	2-Jun-07	28-Feb-07	14-Nov-06	17-Aug-06	04-May-06	24-Feb-06	11-Nov-05	04-Sep-05	25-May-05	01-Mar-05	3-Nov-04	10-Aug-04				
Field Parameters																																							
Water Level (Below PVC Casing)	m	-	-			1.637	1.76	1.665	1.62	1.645	1.63	1.69	1.61	1.75	1.657	1.64	1.62	1.64	1.66	1.64	1.61	2.04	2.07	1.40	NM	-	1.66	-	1.66	1.64	1.76	2.57	1.71	-	-				
Water Level Depth	m	-	-			0.367	0.49	0.395	0.35	0.375	0.36	0.42	0.34	0.48	0.387	0.37	0.35	0.37	0.29	0.37	0.34	0.77	0.80	0.13	NM	1.62	0.59	1.58	0.39	0.37	0.49	1.30	0.44	-	-				
Water Level Elevation	m	-	-			43.34	43.22	43.32	43.36	43.34	43.36	43.29	43.37	43.23	43.323	43.34	43.36	43.34	43.42	43.34	43.37	42.94	42.91	43.58	NM	43.36	43.12	43.40	43.32	43.34	43.22	42.41	43.27	43.25	43.12				
Conductivity	uS	-	-			>3999	3611	1437	1636	2272	NM	3179	1190	1282	3419	1412	3820	2071	2813	>3999	1975	3823	NM	3969	NM	2078	NM	1924	2346	2068	1535	1924	1993	1890	2027				
Total Dissolved Solids	mg/L	-	-			>2000	1818	719	819	1133	NM	1479	561	642	1715	705	1800	1038	1428	>2000	987	1913	NM	1945	NM	1049	NM	969	1174	1037	770	960	995	946	1020				
Temperature	°C	-	<30			6.1	12.2	9.8	7.9	5.7	NM	7.3	12.8	7.8	13.2	8.8	11.3	8.9	11.7	5.4	6.5	8.9	NM	8.4	NM	8.8	NM	18.8	5.0	4.3	21.9	12.0	4.0	6.2	21.4				
pH	unitless	-	6.5-8.5			7.65	7.35	7.85	7.28	6.73	NM	6.81	7.34	7.05	6.57	7.35	7.42	7.45	7.28	7.84	6.39	7.49	NM	7.34	NM	6.94	NM	7.23	7.31	7.19	7.37	7.36	7.51	7.16	7.49				
Chemical Analysis																																							
Alkalinity (Total)	mg/L	5	-			391	416	NA	NA	NA	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Total Kjeldahl Nitrogen	mg/L	0.1	-	0.9 - 1.9		0.8	1.0	0.9	1.8	0.9	NS	1.1	0.7	2.7	2.2	1.1	1.3	1.9	0.8	1.1	1.7	2.0	1.3	2.3	NS	1.6	1.4	1.0	2.0	2.1	2.7	1.3	2.5	1.7	0.6				
Ammonia	mg/L	0.1	-	0.2 - 0.66		0.47	NA	0.48	0.33	0.38	NS	0.12	0.52	0.32	0.49	0.45	0.66	0.19	0.41	0.40	0.89	0.20	0.52	0.47	NS	0.64	<0.1	0.10	0.23	<0.1	<0.1	<0.1	0.43	0.15	0.28				
Un-ionized Ammonia	mg/L	-	0.02			0.00284	-	0.00392	0.00099	0.00027	NS	0.00012	0.00261	0.00056	0.00043	0.0017	0.00355	0.0009	0.0016	0.0035	0.0003	0.001	NA	0.002	NS	0.001	-	0.001	0.001	-	-	-	0.002	0.0003	0.004				
Nitrate	mg/L	0.1	-	<1.0		<0.1	<0.1	<0.1	0.4	1.4	NS	0.4	<0.1	1.1	0.1	1.2	0.7	2.1	0.1	0.7	0.2	0.9	0.7	0.3	NS	0.3	0.3	0.2	0.5	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Nitrite	mg/L	0.05	-	<0.1		<0.05	<0.05	<0.05	<0.05	<0.05	NS	0.13	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.08	0.05	<0.05	0.11	0.23	NS	0.15	0.10	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Chloride	mg/L	1	-	294 - 714		33	549	235	420	391	NS	478	676	378	274	167	328	316	587	504	379	322	506	624	NS	880	42	760	640	730	900	620	650	940	890				
Sulphate	mg/L	1	-	77 - 135		18	107	127	101	111	NS	109	108	118	130	138	182	162	106	114	106	88	87	93	NS	98	140	100	120	110	110	110	110	110	98				
Total Phosphorus	mg/L	0.01	0.03	<1.0		0.09	0.16	0.11	0.34	0.12	NS	0.11	0.09	0.3	0.17	0.16	0.13	0.15	0.02	0.13	0.18	0.39	0.04	0.22	NS	0.27	<0.01	0.13	3.1	0.12	0.03	<0.01	0.08	0.06	0.14				
Conductivity	uS	5	-			2380	2830	1510	2060	1640	NS	2220	3170	NA	2310	1310	1520	1540	1720	1170	1910	3050	2420	2850	NS	3200	3500	2500	3000	3200	3500	2700	3000	3700	3700				
Total Dissolved Solids	mg/L	10	-	389 - 1325		1210	1420	846	1120	968	NS	1160	1840	1180	882	744	857	859	1280	1200	966	1650	1200	1390	NS	290	330	250	340	280	260	450	330	380	260				
Total Suspended Solids	mg/L	2	-			NA	NA	NA	NA	NA	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	1600	1700	1400	1700	1600	2000	1500	1500	2000	2100				
Biological Oxygen Demand	mg/L	2	-			3	6	3	NS	3	NS	4	<2	NA	20	<20	<12	<2	3	6	<2	10	11	10	NS	18	32	<2	<2	4	10	6	14	2	230				
Metals																																							
Aluminum	mg/L	0.01	0.076	0.027 - 0.053		0.021	0.073	0.004	NS	0.014	NS	0.42	0.01	0.026	0.023	0.035	0.04	NA	NA	0.06	NA																		
Antimony	mg/L	0	0.02			<0.0005	<0.0005	<0.0005	NS	0.0027	NS	<0.0005	<0.0005	0.0005	<0.0025	<0.0005	<0.0025	<0.001	0.018	<0.001	0.013																		
Arsenic	mg/L	0.01	0.005			<0.001	0.001	<0.001	NS	<0.005	NS	<0.001	0.002	0.002	<0.005	0.003	<0.005	<0.01	<0.01	<0.01	<0.01																		
Barium	mg/L	0.01	-			0.035	0.021	0.022	NS	NA	NS	0.02	NA	NA	NA	NA	NA	0.029	0.032	0.035	0.042																		
Beryllium	mg/L	0	0.011			<0.0005	<0.0005	<0.0005	NS	<0.0025	NS	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0025	<0.001	<0.001	<0.001	<0.001																		
Boron	mg/L	0.05	0.2			0.242	0.095	0.108	NS	0.158	NS	0.1	0.087	0.13	0.155	0.188	0.126	0.143	0.140	0.209	0.125																		
Cadmium	mg/L	0	0.0001			<0.0001	<0.0001	<0.0001	NS	<0.0005	NS	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0005	<0.001	<0.001	<0.001	<0.001																		
Calcium	mg/L	0.2	-			61.7	57.2	51.1	NS	NA	NS	54	NA	NA	NA	NA	NA	NA	NA	46.4	NA																		
Chromium	mg/L	0.05	0.001			<0.001	0.008	0.005	NS	<5	NS	<0.001	0.011	0.007	0.017	0.01	<0.005	<0.05	<0.05	<0.05	<0.05																		
Cobalt	mg/L	0.01	0.0009			<0.0005	<0.0005	0.0006	NS	<0.0025	NS	0.0007	0.0008	0.0017	0.0041	0.0005	<0.0025	<0.005	<0.005	<0.005	<0.005																		
Copper	mg/L	0.01	0.006			<0.0005	0.0042	0.0009	NS	0.0131	NS	0.012	0.0035	0.012	0.0128	0.0024	<0.0025	<0.005	<0.005	0.005	0.01																		

Summary of Field Measurements and Groundwater Analysis - MW11-6
Groundwater Monitoring Program 2015
City of Clarence-Rockland Biosolids Lagoons
LRL File: 01201-A

Ground Surface Elevation: 42.81 m
Top of PVC Casing Elevation: 43.72 m
Well Depth: 4.3 m
Type of Monitoring Well: Impact to river

Parameters	Units	MDL	PWQO	Baseline (Median 2011- 2012)	Trigger Concentration Range	2015		2014		2013		2012		2011	
						Fall 18-Nov-15	Spring 14-Jul-15	Fall 4-Nov-14	Spring 13-May-14	Fall 20-Nov-13	Spring 01-May-13	Fall 28-Nov-12	Spring 15-May-12	Fall 24-Nov-11	Spring 04-Jun-11
Field Parameters															
Water Level (Below PVC Casing)	m	--	--			1.04	1.65	1.01	1.03	1.52	1.39	1.525	1.41	2.10	2.089
Water Level Depth	m	--	--			0.13	0.74	0.10	0.12	0.61	0.48	0.62	0.50	1.19	1.159
Water Level Elevation	m	--	--			42.68	42.07	42.71	42.69	42.20	42.33	42.20	42.31	41.62	41.651
Conductivity	uS	--	--			>3999	>3999	>3999	>3999	3218	397	>3999	1852	>3999	2855
Total Dissolved Solids	mg/L	--	--			>2000	>2000	>2000	>2000	1601	200	>2000	3602	>2000	1335
Temperature	°C	--	<30			8.7	9.5	10.2	7.7	7.1	11.1	9.0	10.0	8.8	10.6
pH	unitless	--	6.5-8.5			7.58	7.58	6.67	7.28	NM	7.47	7.22	7.41	7.40	7.52
Chemical Analysis															
Alkalinity (Total)	mg/L	5	--			536	560	NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	mg/L	0.1	--	2.7	2.5 - 2.9	2.1	2.6	1.9	2.4	0.9	1.8	2.6	2.5	2.8	2.9
Ammonia	mg/L	0.1	--	1.92	1.67 - 2.17	1.69	NA	1.68	1.74	0.75	0.89	1.87	2.06	1.49	1.97
Nitrate	mg/L	--	--	0.1	0.1	4.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrite	mg/L	0.1	--	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	mg/L	0.05	--	2780	1704 - 3856	310	3730	2450	2630	<1	2780	2730	3280	2830	849
Sulphate	mg/L	1	--	251	184 - 317	88	279	270	241	165	246	259	301	242	144
Total Phosphorus	mg/L	1	0.03	0.8	0.56 - 1.02	0.22	0.63	0.48	0.43	0.13	0.35	0.39	0.74	0.84	0.89
Conductivity	mg/L	0.01				8850	10100	8570	8800	4560	9200	8960	10900	9110	3560
Total Dissolved Solids	uS	5	--	4665	2543 - 6787	5090	5790	4970	4970	2550	5310	4860	7000	4470	1830
Biological Oxygen Demand	mg/L	2	--			6	11	12	10	4	5	<2	10	2	8
Metals															
Aluminum	mg/L	0.01	0.075	0.010	<0.022	0.002	0.002	0.003	0.029	0.004	<0.001	0.01	<0.001	0.028	0.005
Antimony	mg/L	0.001	0.02			<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	mg/L	0.01	0.005			<0.001	0.010	0.009	0.012	0.007	0.007	<0.1	0.015	0.012	0.003
Barium	mg/L	0.01	--			0.034	0.062	0.076	NA	NA	NA	0.09	NA	NA	NA
Beryllium	mg/L	0.001	0.011			<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron	mg/L	0.05	0.2			0.151	0.189	0.375	0.270	0.163	0.146	0.320	0.20	0.238	0.098
Cadmium	mg/L	0.001	0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium	mg/L	0.2	--			55.3	70.2	82.3	NA	NA	NA	81	NA	NA	NA
Chromium	mg/L	0.05	0.001			<0.001	0.027	0.023	0.022	0.007	0.012	0.001	0.005	0.032	0.012
Cobalt	mg/L	0.005	0.0008			<0.0005	0.0005	0.0006	0.0006	<0.0025	<0.0005	0.0011	0.0009	0.0014	0.0011
Copper	mg/L	0.005	0.005			<0.0005	0.0206	0.004	0.0014	0.205	0.001	0.002	0.0017	0.0018	0.0089
Iron	mg/L	0.2	0.3	0.920	0.581 - 1.259	<0.1	0.322	0.490	0.704	2.880	0.154	0.82	1.43	0.788	<0.1
Lead	mg/L	0.001	0.001			<0.0001	<0.0001	0.0001	<0.0001	0.0015	<0.0001	<0.001	0.0002	<0.0001	<0.0001
Magnesium	mg/L	0.2	--			76.6	179	279	NA	NA	NA	200	NA	NA	NA
Manganese	mg/L	0.05	--			0.0073	0.139	0.199	NA	NA	NA	0.26	NA	NA	NA
Mercury	mg/L	0.0001	0.0005			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	mg/L	0.005	0.04			0.0006	0.0005	0.0011	<0.0005	<0.0025	0.0011	<0.005	0.0012	0.0032	0.0017
Nickel	mg/L	0.005	0.025			0.001	0.003	0.003	0.003	0.007	0.003	0.008	0.004	0.005	0.004
Potassium	mg/L	0.2	--			11.2	18.1	34.7	NA	NA	NA	26	NA	NA	NA
Selenium	mg/L	0.005	0.1			<0.001	0.035	0.004	0.025	0.017	0.009	<0.1	0.033	0.002	0.008
Silver	mg/L	0.001	0.0001			<0.0001	0.0002	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.2	--			533	1470	2230	NA	NA	NA	1600	NA	NA	NA
Thallium	mg/L	0.001	0.0003			<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.01	--			<0.005	<0.005	<0.005	NA	NA	NA	<0.01	NA	NA	NA
Tungsten	mg/L	0.0001	0.03			<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	NA	<0.01	<0.01	<0.01
Uranium	mg/L	0.001	0.005			0.0008	0.0005	0.0003	0.0004	0.0011	0.0006	<0.001	0.0011	0.0028	0.0027
Vanadium	mg/L	0.01	0.006			0.0009	0.0102	0.0112	0.0133	0.0057	0.0037	<0.001	<0.0005	0.014	0.0075
Zinc	mg/L	0.02	0.03			0.012	0.006	0.007	0.020	<0.25	<0.005	0.03	0.008	<0.01	<0.01
Zirconium	mg/L	0.001	0.004			NA	NA	NA	0.001	<0.005	<0.001	NA	<0.001	<0.001	<0.001

Notes
MDL Method Detection Limit
PWQO Provincial Water Quality Objectives
-- Not Applicable/Not Available/No Value
Italics Above PWQO
NS Not Sampled
NM Not Measured
NA Not Analyzed
BOLD Exceeds Trigger Concentration Range

Summary of Field Measurements and Groundwater Analysis - MW11-7

Groundwater Monitoring Program 2015
City of Clarence-Rockland Biosolids Lagoons
LRL File: 01201-A

Ground Surface Elevation: 48.33 m
Top of PVC Casing Elevation: 49.00 m
Broken spring 2014: 48.965 m
Well Depth: 5.1 m
Type of Monitoring Well: Leakage from lagoon

Parameters			Units	MDL	Trigger Concentration Range	2013		2014		2015		2012		2011	
						Fall 18-Nov-13	Spring 14-Jul-13	Fall 04-Nov-14	Spring 13-May-14	Fall 20-Nov-15	Spring 01-May-15	Fall 01-Nov-12	Spring 15-May-12	Fall 24-Nov-11	Spring 24-Jun-11
Field Parameters															
Water Level (Below PVC Casing)	m	--		3.585	3.09	3.69	2.93	3.98	3.80	3.895	3.85	4.08	3.64		
Water Level Depth	m	--		2.92	2.45	3.02	2.30	3.31	3.13	3.23	3.18	3.41	2.97		
Water Level Elevation	m	--		45.42	45.88	45.31	46.04	45.02	45.20	45.11	45.15	44.92	45.36		
Conductivity	uS	--		1084	2282	1590	1596	1408	481	1835	1592	3811	1557		
Total Dissolved Solids	mg/L	--		540	1120	796	793	717	231	961	796	1777	669		
Temperature	°C	--		7.7	10.1	8.9	8.7	5.8	6.46	7.2	10.0	7.1	10.9		
pH	unitless	--		6.91	7.68	6.95	6.76	7.21	10.9	6.94	6.84	7.41	6.97		
Chemical Analysis															
Alkalinity (Total)	mg/L	5		303	327	NA	NA	NA	NA	NA	NA	NA	NA		
Total Kjeldhal Nitrogen	mg/L	0.1	<5.5	0.7	0.9	0.9	1.5	4.4	2.3	1.4	0.9	1.5	9.3		
Ammonia	mg/L	0.1	0.06 - 0.44	0.28	NA	0.39	0.57	0.58	0.43	0.21	0.13	0.29	0.57		
Nitrate	mg/L	0.1	2.49 - 8.11	<0.1	0.8	4.4	6.7	6.0	3.9	5.0	5.6	3.6	10.1		
Nitrite	mg/L	0.05	<0.11	<0.05	<0.05	<0.05	<0.05	<0.05	0.16	0.17	<0.05	<0.05	<0.05		
Chloride	mg/L	1	236 - 504	84	895	449	217	<1	370	401	421	339	128		
Sulphate	mg/L	1	68 - 81	33	72	101	53	98	87	73	63	76	78		
Total Phosphorus	mg/L	0.01	<7	0.09	0.25	0.32	0.84	5.42	1.77	1.18	0.42	0.81	12.5		
Conductivity	uS	5		1680	2940	2110	1340	2560	1830	1900	2080	1740	1210		
Total Dissolved Solids	mg/L	10	893 - 1287	880	1830	1180	801	1420	1010	1040	1210	1150	755		
Biological Oxygen Demand	mg/L	2		<100	<2	3	5	2	2	<2	6	3	18		
Metals															
Aluminum	mg/L	0.01	<0.049	0.002	0.004	0.003	0.044	0.073	0.131	<0.01	<0.001	0.089	<0.001		
Antimony	mg/L	0.001		<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
Arsenic	mg/L	0.01		<0.001	0.002	0.002	0.001	0.016	0.001	<0.001	0.002	<0.001	<0.001		
Barium	mg/L	0.01		0.054	0.073	0.053	NA	NA	NA	0.09	NA	NA	NA		
Beryllium	mg/L	0.001		<0.0005	<0.0005	<0.0005	<0.0005	0.0027	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
Boron	mg/L	0.05		0.111	0.114	0.101	0.109	0.105	0.103	0.12	0.111	0.087	0.069		
Cadmium	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Calcium	mg/L	0.2		66.8	68.4	54.4	NA	NA	NA	86	NA	NA	NA		
Chromium	mg/L	0.05		<0.001	0.013	0.028	0.008	0.276	0.002	<0.001	0.013	0.011	0.005		
Cobalt	mg/L	0.005		<0.0005	<0.0005	0.0006	0.0006	0.0688	0.0008	0.001	0.0011	0.0067	0.0043		
Copper	mg/L	0.005		<0.0005	0.0080	0.0031	0.0048	0.199	0.0044	0.004	0.0045	0.285	0.0037		
Iron	mg/L	0.2	<2.972	<0.1	<0.1	<0.1	<0.1	105	<0.1	<0.03	<0.1	5.82	<0.1		
Lead	mg/L	0.001		<0.0001	<0.0001	0.0001	<0.0001	0.116	<0.0001	<0.001	0.0002	0.0084	<0.0001		
Magnesium	mg/L	0.2		35.4	48.5	58.2	NA	NA	NA	42	NA	NA	NA		
Manganese	mg/L	0.05		0.162	0.101	0.188	NA	NA	NA	0.21	NA	NA	NA		
Mercury	mg/L	0.0001		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Molybdenum	mg/L	0.005		<0.0005	0.0006	0.001	<0.0005	<0.0025	0.0005	<0.005	0.0007	<0.0005	0.0006		
Nickel	mg/L	0.005		0.001	0.003	0.003	0.003	0.166	0.003	<0.005	0.005	0.007	0.006		
Potassium	mg/L	0.2		7.97	8.69	8.39	NA	NA	NA	9	NA	NA	NA		
Selenium	mg/L	0.005		<0.001	0.008	0.004	0.003	0.005	0.003	<0.005	0.005	0.001	0.002		
Silver	mg/L	0.001		<0.0001	0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Sodium	mg/L	0.2		214	355	416	NA	NA	NA	249	NA	NA	NA		
Thallium	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	0.0012	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Tin	mg/L	0.01		<0.005	<0.005	<0.005	NA	NA	NA	<0.01	NA	NA	NA		
Tungsten	mg/L	0.0001		<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	NA	<0.01	<0.01	<0.01		
Uranium	mg/L	0.001		0.0017	0.0018	0.0014	0.0012	0.010	0.0011	0.002	0.0018	0.0033	0.0024		
Vanadium	mg/L	0.01		<0.0005	0.0096	0.0084	0.0088	0.233	0.0031	<0.001	0.0031	0.0247	0.0103		
Zinc	mg/L	0.02		0.012	0.010	0.006	0.033	0.185	0.009	0.01	0.011	<0.01	<0.01		
Zirconium	mg/L	0.001		NA	NA	NA	<0.001	0.014	<0.001	NA	<0.001	<0.001	<0.001		

Notes
MDL Method Detection Limit NS Not Sampled **BOLD** Exceeds Trigger Concentration Range
PWQO Provincial Water Quality Objectives NM Not Measured
- Not Applicable/Not Available/No Value NA Not Analysed

Summary of Field Measurements and Groundwater Analysis - MW11-8
Groundwater Monitoring Program 2015
City of Clarence-Rockland Biosolids Lagoons
LRL File: 01201-A

Ground Surface Elevation: 51.24 m
Top of PVC Casing Elevation: 52.17 m
Well Depth: 5.1 m
Type of Monitoring Well: Leakage from lagoon

Parameters	Units	MDL	Trigger Concentration Range	2015		2014		2013		2012		2011	
				Fall 10-Nov-15	Spring 14-Jul-15	Fall 8-Nov-14	Spring 19-May-14	Fall 20-Nov-13	Spring 31-May-13	Fall 21-Nov-12	Spring 18-May-12	Fall 24-Nov-11	Spring 24-Jun-11
Field Parameters													
Water Level (Below PVC Casing)	m	--		3.71	3.83	3.715	3.31	3.69	3.62	3.785	3.48	4.02	3.77
Water Level Depth	m	--		2.78	2.90	2.785	2.38	2.76	2.69	2.655	2.55	3.09	2.84
Water Level Elevation	m	--		48.48	48.34	48.48	48.86	48.48	48.55	48.385	48.89	48.15	48.40
Conductivity	uS	--		1497	1539	1327	1605	1177	278	1391	1056	1455	1319
Total Dissolved Solids	mg/L	--		749	766	663	806	587	137	695	522	728	812
Temperature	°C	--		9.7	10.9	11.2	11.2	10.4	12.5	12.5	10.5	10.3	11.8
pH	unitless	--		6.80	6.72	6.75	6.58	6.84	6.93	6.74	6.52	6.72	6.86
Chemical Analysis													
Alkalinity (Total)	mg/L	5		744	804	NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldhal Nitrogen	mg/L	0.1	5.5 - 8.9	8.6	11.5	8.1	7.2	5.8	4.9	6.9	5.1	6.2	6.2
Ammonia	mg/L	0.1	2.6 - 7.1	10.3	NA	6.90	5.93	8.27	4.12	5.14	4.58	0.66	5.45
Nitrate	mg/L	0.1	<0.01	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrite	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	mg/L	1	63.8 - 86.2	25	84	85	84	91	91	76	74	76	53
Sulphate	mg/L	1	82 - 145	62	21	46	42	75	76	73	99	144	128
Total Phosphorus	mg/L	0.01	0.02 - 3.31	0.87	3.38	0.12	1.03	0.85	1.16	1.28	2.05	1.02	4.82
Conductivity	uS	5		1580	1710	1500	1490	1430	1390	1450	1460	1570	1190
Total Dissolved Solids	mg/L	10	776 - 1032	808	972	694	850	832	807	844	1060	964	771
Biological Oxygen Demand	mg/L	2		<20	8	5	21	22	<2	2	6	4	11
Metals													
Aluminum	mg/L	0.01	<0.014	0.005	0.002	0.005	0.002	0.003	<0.001	<0.01	<0.001	0.018	<0.001
Antimony	mg/L	0.001		<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	mg/L	0.01		<0.001	0.002	0.001	<0.001	<0.005	0.001	<0.005	0.001	0.002	0.002
Barium	mg/L	0.01		0.114	0.112	0.11	NA	NA	NA	0.09	NA	NA	NA
Beryllium	mg/L	0.001		<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron	mg/L	0.05		0.081	0.081	0.076	0.085	0.072	0.07	0.09	0.077	0.083	0.058
Cadmium	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium	mg/L	0.2		159	145	126	NA	NA	NA	137	NA	NA	NA
Chromium	mg/L	0.05		0.001	0.014	0.009	0.011	0.070	<0.001	<0.001	0.006	0.013	0.007
Cobalt	mg/L	0.005		0.0006	0.0007	0.0007	<0.0005	0.0169	<0.0005	0.0006	0.0005	0.0065	0.001
Copper	mg/L	0.005		<0.0005	0.0020	0.0009	0.0035	0.0664	0.001	0.001	0.0009	0.0016	0.0012
Iron	mg/L	0.2	10.7 - 26.7	24.9	24.0	19.8	13.7	40.7	22.9	20.8	16.6	31.3	12.6
Lead	mg/L	0.001		<0.0001	<0.0001	0.0001	<0.0001	0.0123	<0.0001	<0.001	<0.0001	0.0014	<0.0001
Magnesium	mg/L	0.2		80.2	81.7	92.4	NA	NA	NA	64	NA	NA	NA
Manganese	mg/L	0.05		3.22	3.20	3.41	NA	NA	NA	2.4	NA	NA	NA
Mercury	mg/L	0.0001		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	mg/L	0.005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	0.005	<0.0005	<0.0005	0.0009
Nickel	mg/L	0.005		<0.001	0.005	0.004	0.003	0.052	0.003	<0.005	0.004	0.013	0.004
Potassium	mg/L	0.2		10.9	7.51	9.51	NA	NA	NA	9	NA	NA	NA
Selenium	mg/L	0.005		<0.001	0.003	0.001	0.001	<0.005	<0.001	<0.001	0.001	<0.001	0.002
Silver	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.2		87	79.9	130	NA	NA	NA	92	NA	NA	NA
Thallium	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.01		<0.005	<0.005	<0.005	NA	NA	NA	<0.01	NA	NA	NA
Tungsten	mg/L	0.0001		<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	NA	<0.01	<0.01	<0.01
Uranium	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	0.0015	<0.0001	<0.001	<0.0001	0.0002	0.0008
Vanadium	mg/L	0.01		0.0028	0.0286	0.0238	0.0242	0.0682	0.0082	0.003	0.0043	0.0376	0.0157
Zinc	mg/L	0.02		0.013	0.009	0.006	0.050	0.072	0.011	0.01	0.011	0.011	<0.01
Zirconium	mg/L	0.001		NA	NA	NA	<0.001	0.011	<0.001	NA	<0.001	0.001	<0.001

Notes

MDL Method Detection Limit
PWQO Provincial Water Quality Objectives
-- Not Applicable/Not Available/No Value
NM Not Measured
NA Not Analysed
BOLD Exceeds Trigger Concentration Range
NS Not Sampled

Summary of Field Measurements and Groundwater Analysis - MW11-9

Groundwater Monitoring Program 2015
City of Clarence-Rockland Biosolids Lagoons
LRL File: 01201-A

Ground Surface Elevation: 52.58 m
Top of PVC Casing Elevation: 53.43 m
Well Depth: 6.8 m
Type of Monitoring Well: Leakage from lagoon

Parameters	Units	MDL	Trigger Concentration Range	2018		2014		2013		2012		2011	
				Fall 18-Nov-18	Spring 14-Jul-18	Fall 8-Nov-14	Spring 13-May-14	Fall 20-Nov-13	Spring 31-May-13	Fall 21-Nov-12	Spring 16-May-12	Fall 24-Nov-11	Spring 24-Jun-11
Field Parameters													
Water Level (Below PVC Casing)	m	--		4.17	4.20	4.25	3.91	4.22	3.98	4.275	3.54	4.40	4.61
Water Level Depth	m	--		3.32	3.35	3.4	3.08	3.37	3.13	3.425	2.69	3.55	3.76
Water Level Elevation	m	--		49.28	49.23	49.18	49.52	49.21	49.45	49.16	49.89	49.03	48.83
Conductivity	uS	--		360	408	327	578	293	329	369	628	554	948
Total Dissolved Solids	mg/L	--		181	203	183	318	147	162	184	318	274	441
Temperature	°C	--		8.6	9.4	10.2	7.0	9.7	10.0	10.6	8.7	9.2	9.1
pH	unitless	--		7.37	6.93	7.57	7.15	7.16	6.97	7.08	6.42	6.69	7.05
Chemical Analysis													
Alkalinity (Total)	mg/L	5		86	87	NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	mg/L	0.1	<21.2	0.6	0.5	0.8	0.46	0.5	0.9	1.6	4.6	9.0	33.2
Ammonia	mg/L	0.1	0.31 - 0.68	0.23	NA	0.16	2.0	0.21	0.28	0.40	0.70	0.28	0.59
Nitrate	mg/L	0.1	<0.7	<0.1	1.0	0.8	3.3	0.2	1.3	0.1	1.3	<0.1	<0.1
Nitrite	mg/L	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	mg/L	1	<14	144	25	10	9	9	7	21	7	5	5
Sulphate	mg/L	1	41 - 117	176	73	49	88	58	64	70	88	53	141
Total Phosphorus	mg/L	0.01	<26	0.20	0.16	1.09	1.25	0.18	0.24	0.78	5.34	11.7	40.4
Conductivity	uS	5		392	420	388	509	370	382	408	468	534	847
Total Dissolved Solids	mg/L	10	239 - 472	186	282	208	304	246	188	254	350	381	535
Biological Oxygen Demand	mg/L	2		<2	<2	<2	8	<2	<2	<12	11	<80	120
Metals													
Aluminum	mg/L	0.01	0.023 - 0.035	0.012	0.013	0.011	0.006	0.007	<0.001	0.020	0.029	0.030	<0.001
Antimony	mg/L	0.001		<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	mg/L	0.01		<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	0.001	<0.001
Barium	mg/L	0.01		0.034	0.025	0.024	NA	NA	NA	0.03	NA	NA	NA
Beryllium	mg/L	0.001		<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron	mg/L	0.05		0.035	0.028	0.026	0.017	<0.05	0.011	0.03	0.029	0.03	0.024
Cadmium	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	<0.005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium	mg/L	0.2		38.8	54.8	44	NA	NA	NA	48	NA	NA	NA
Chromium	mg/L	0.05		<0.001	0.005	0.002	0.003	0.009	<0.001	<0.001	0.005	0.04	0.005
Cobalt	mg/L	0.005		0.0008	<0.0005	0.0006	0.0012	0.0028	0.001	0.0008	0.0012	0.0109	0.0025
Copper	mg/L	0.005		<0.0005	0.0029	0.0034	0.0036	0.0075	0.002	0.002	0.0026	0.0447	0.0018
Iron	mg/L	0.2	<11.41	0.712	0.141	0.637	0.860	7.32	2.76	1.56	2.19	20.5	0.68
Lead	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	0.0018	<0.0001	<0.001	0.0001	0.0262	<0.0001
Magnesium	mg/L	0.2		11.9	11.8	12.4	NA	NA	NA	13	NA	NA	NA
Manganese	mg/L	0.05		0.425	0.111	0.158	NA	NA	NA	0.24	NA	NA	NA
Mercury	mg/L	0.0001		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	mg/L	0.005		0.0005	<0.0005	0.0009	<0.0005	<0.0025	<0.0005	<0.005	<0.0005	<0.0005	0.0028
Nickel	mg/L	0.005		<0.001	0.002	0.002	0.002	0.007	0.001	<0.005	0.002	0.014	0.005
Potassium	mg/L	0.2		3.72	2.95	2.9	NA	NA	NA	3	NA	NA	NA
Selenium	mg/L	0.005		<0.001	0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.2		21.5	14.9	13.9	NA	NA	NA	12	NA	NA	NA
Thallium	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.01		<0.005	<0.005	<0.005	NA	NA	NA	<0.01	NA	NA	NA
Tungsten	mg/L	0.0001		<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	NA	<0.01	<0.01	<0.01
Uranium	mg/L	0.001		<0.0001	<0.0001	<0.0001	0.0001	<0.0005	<0.0001	<0.001	0.0002	0.0027	0.0006
Vanadium	mg/L	0.01		0.0014	0.0053	0.0053	0.0082	0.0141	0.0017	<0.001	0.0023	0.146	0.0107
Zinc	mg/L	0.02		0.016	0.006	0.007	0.035	<0.25	0.007	0.01	0.015	0.024	0.011
Zirconium	mg/L	0.001		NA	NA	NA	<0.001	<0.005	<0.001	NA	<0.001	0.001	<0.001

Notes

MDL Method Detection Limit
PWQO Provincial Water Quality Objectives
— Not Applicable/Not Available/No Value

BOLD
NS

Exceeds Trigger Concentration Range
Not Sampled

NM Not Measured
NA Not Analysed

Summary of Field Measurements and Groundwater Analysis - MW11-10
Groundwater Monitoring Program 2015
City of Clarence-Rockland Biosolids Lagoons
LRL File: 01201-A

Ground Surface Elevation: 51.51 m
Top of PVC Casing Elevation: 52.35 m
Well Depth: 4.3 m
Type of Monitoring Well: Background

Parameters	Units	MDL	Trigger Concentration Range	2015		2014		2013		2012		2011	
				Fall 18-Nov-15	Spring 14-Jul-15	Fall 9-Nov-14	Spring 13-May-14	Fall 20-Nov-13	Spring 21-May-13	Fall 21-Nov-12	Spring 18-May-12	Fall 24-Nov-11	Spring 24-Jun-11
Field Parameters													
Water Level (Below PVC Casing)	m	--		1.285	1.74	1.18	1.33	1.57	1.98	1.965	1.69	2.17	1.88
Water Level Depth	m	--		0.445	0.90	0.34	0.49	0.73	1.14	1.125	0.85	1.33	1.04
Water Level Elevation	m	--		51.07	50.61	51.17	51.02	50.78	50.37	50.385	50.66	50.18	50.47
Conductivity	uS	--		1664	1851	1615	1793	NM	1559	1669	1568	1677	1704
Total Dissolved Solids	mg/L	--		830	900	808	896	NM	773	832	788	840	849
Temperature	°C	--		8.4	12.3	11.5	9.4	NM	12.9	10.9	10.2	9.0	12.3
pH	unitless	--		7.37	7.10	7.01	6.84	NM	6.61	6.68	6.78	6.92	6.65
Chemical Analysis													
Alkalinity (Total)	mg/L	5		683	360	NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldhal Nitrogen	mg/L	0.1	0.6 - 0.7	0.5	0.5	0.4	0.5	0.3	0.5	0.6	0.7	0.7	0.6
Ammonia	mg/L	0.1	0.08 - 0.24	0.11	NA	0.14	0.05	0.08	0.08	0.09	0.26	0.11	0.21
Nitrate	mg/L	0.1	0.1	1.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrite	mg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	mg/L	1	173 - 262	196	243	202	223	212	268	219	298	197	216
Sulphate	mg/L	1	93 - 110	22	163	182	132	130	109	99	85	104	115
Total Phosphorus	mg/L	0.01	0.35 - 0.95	0.26	0.54	0.37	0.44	0.27	0.31	0.71	0.59	1.08	0.37
Conductivity	uS	5		1820	2030	1890	1900	1710	1930	1840	1980	1830	1580
Total Dissolved Solids	mg/L	10	950 - 1154	1030	1220	1140	1030	1030	1030	994	1150	1110	930
Biological Oxygen Demand	mg/L	2		<2	<2	3	15	4	4	<30	8	<2	6
Metals													
Aluminum	mg/L	0.01	0.006 - 0.060	0.002	0.006	0.002	0.009	0.040	<0.001	0.060	0.007	0.033	<0.001
Antimony	mg/L	0.001		<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	mg/L	0.01		<0.001	0.002	0.002	0.001	<0.005	0.001	<0.005	0.002	0.003	0.002
Barium	mg/L	0.01		0.036	0.036	0.037	NA	NA	NA	0.05	NA	NA	NA
Beryllium	mg/L	0.001		<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron	mg/L	0.05		0.103	0.134	0.127	0.095	0.100	0.108	0.12	0.113	0.102	0.069
Cadmium	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium	mg/L	0.2		110	98.6	88.2	NA	NA	NA	95	NA	NA	NA
Chromium	mg/L	0.05		<0.001	0.009	0.007	0.008	0.028	<0.001	<0.001	0.016	0.009	0.007
Cobalt	mg/L	0.005		<0.0005	0.0007	<0.0005	<0.0005	0.0062	<0.0005	0.0004	0.0006	0.0035	0.0012
Copper	mg/L	0.005		<0.0005	0.0061	0.0014	0.0018	0.0172	0.0012	0.001	0.0016	0.0102	0.0016
Iron	mg/L	0.2	<1.173	<0.1	0.184	<0.1	<0.1	9.71	<0.1	0.11	<0.1	2.24	<0.1
Lead	mg/L	0.001		<0.0001	<0.0001	<0.0001	0.0002	0.0057	<0.0001	<0.001	<0.0001	0.0038	<0.0001
Magnesium	mg/L	0.2		61.1	69.8	66.7	NA	NA	NA	58	NA	NA	NA
Manganese	mg/L	0.05		0.023	0.275	0.109	NA	NA	NA	0.08	NA	NA	NA
Mercury	mg/L	0.0001		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	mg/L	0.005		0.002	0.0016	0.0022	0.0020	0.003	0.0019	<0.005	0.0024	0.001	0.0028
Nickel	mg/L	0.005		<0.001	0.004	0.006	0.003	0.019	0.002	<0.005	0.004	0.01	0.004
Potassium	mg/L	0.2		7	7.34	7.68	NA	NA	NA	7	NA	NA	NA
Selenium	mg/L	0.005		<0.001	0.004	0.003	0.003	<0.005	0.003	<0.005	0.004	0.002	0.004
Silver	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.2		212	280	309	NA	NA	NA	231	NA	NA	NA
Thallium	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.01		<0.005	<0.005	<0.005	NA	NA	NA	<0.01	NA	NA	NA
Tungsten	mg/L	0.0001		<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	NA	<0.01	<0.01	<0.01
Uranium	mg/L	0.001		0.0100	0.0058	0.0086	0.0096	0.0093	0.0052	0.008	0.0063	0.0088	0.0086
Vanadium	mg/L	0.01		0.0011	0.0152	0.016	0.0148	0.0224	0.0053	0.001	0.0045	0.0211	0.0128
Zinc	mg/L	0.02		0.011	0.007	0.006	0.012	0.029	<0.005	0.01	0.007	0.011	<0.01
Zirconium	mg/L	0.001		NA	NA	NA	<0.001	0.006	<0.001	NA	<0.001	<0.001	<0.001

Notes

MDL Method Detection Limit
PWQO Provincial Water Quality Objectives
- Not Applicable/Not Available/No Value
[Organic Nitrogen] = [TKN] - [Ammonia]

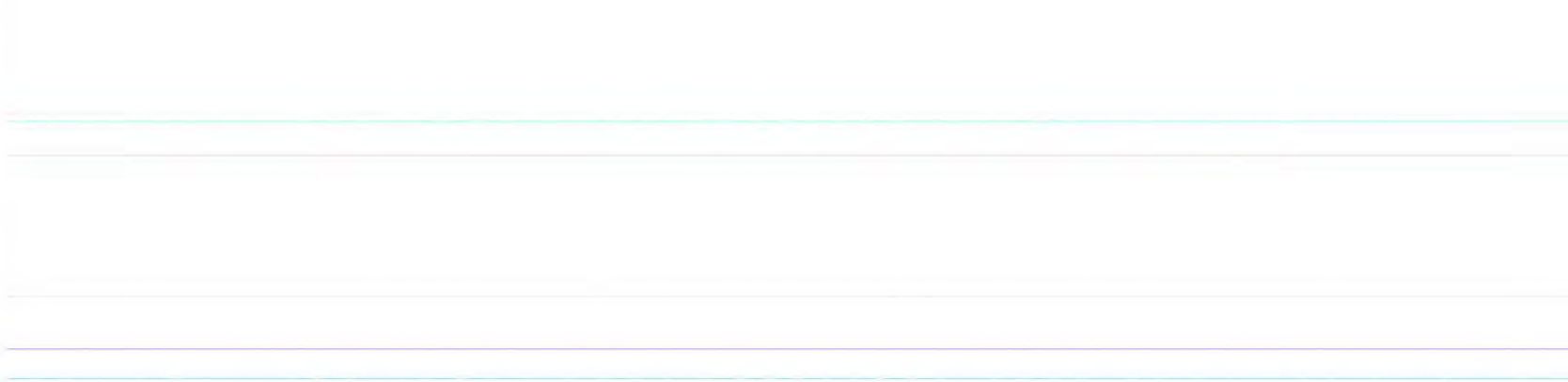
BOLD Exceeds Trigger Concentration Range
NS Not Sampled

NM Not Measured
NA Not Analysed

Parameter	Unit	MW-2	MW-2	MW-2	MW-2
		01-Jun-2016	17-Oct-2016	27-Jun-2017	28-Sep-2017
		MW-2	MW-2	MW-2	MW-2
General Chemistry					
Ammonia Nitrogen	mg/l	1.1	2.7	1.1	1.2
Biochemical Oxygen Demand, 5 Day	mg/l	<2.0	7.0	<2.0	<2.0
Chloride, dissolved	mg/l	110	110	110	140
Conductivity (Field)	uS/cm	1066	1176	934	1074
Nitrate as N	mg/l	15.4	29.9	4.83	10.5
Nitrite as N	mg/l	1.04	0.068	0.242	0.591
Nitrogen, Total Kjeldahl	mg/l	3.3	3.8	1.3	1.4
Nitrogen, Nitrate-Nitrite	mg/l	16.5	29.9	5.07	11.1
pH	-	--	--	6.77	--
pH (Field)	-	7.76	6.71	--	6.28
Phosphorus	mg/l	1.2	0.36	1.4	0.6
Sulphate, dissolved	mg/l	67	39	95	73
Temperature (Field)	deg c	14.4	11.8	10.1	11.5
Total Dissolved Solids	mg/l	614	908	608	750
Metals					
Aluminum, dissolved	ug/l	<5.0	<5.0	99	8.4
Antimony, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Arsenic, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0
Beryllium, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Boron, dissolved	ug/l	50	64	48	57
Cadmium, dissolved	ug/l	0.10	0.12	<0.10	0.10
Chromium, dissolved	ug/l	<5.0	<5.0	<5.0	<5.0
Cobalt, dissolved	ug/l	0.75	0.73	0.65	0.61
Copper, dissolved	ug/l	3.0	3.0	2.9	3.1
Iron, dissolved	ug/l	<100	<100	130	<100
Lead, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Molybdenum, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Nickel, dissolved	ug/l	2.4	3.1	2.2	2.5
Selenium, dissolved	ug/l	<2.0	<2.0	<2.0	<2.0
Silver, dissolved	ug/l	<0.10	<0.10	<0.10	<0.10
Thallium, dissolved	ug/l	<0.050	<0.050	<0.050	<0.050
Tungsten, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0
Uranium, dissolved	ug/l	1.4	1.0	1.4	1.1
Vanadium, dissolved	ug/l	<0.50	<0.50	0.51	<0.50
Zinc, dissolved	ug/l	6.6	5.6	<5.0	<5.0
Zirconium, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0

Parameter	Unit	MW-3	MW-3	MW-3	MW-3
		01-Jun-2016	17-Oct-2016	27-Jun-2017	28-Sep-2017
		MW-3	MW-3	MW-3	MW-3
General Chemistry					
Ammonia Nitrogen	mg/l	0.27	0.36	0.31	0.34
Biochemical Oxygen Demand, 5 Day	mg/l	<2.0	<2.0	<2.0	<2.0
Chloride, dissolved	mg/l	64	230	70	130
Conductivity (Field)	uS/cm	827	1418	864	1109
Nitrate as N	mg/l	<0.10	<0.10	<0.10	<0.10
Nitrite as N	mg/l	<0.010	0.017	0.022	0.015
Nitrogen, Total Kjeldahl	mg/l	0.37	0.61	0.39	0.39
Nitrogen, Nitrate-Nitrite	mg/l	<0.10	<0.10	<0.10	0.11
pH	-	--	--	7.70	--
pH (Field)	-	8.21	7.93	--	7.55
Phosphorus	mg/l	3.4	5.0	2.6	4.8
Sulphate, dissolved	mg/l	67	47	83	57
Temperature (Field)	deg c	11.2	10.5	9.8	11.5
Total Dissolved Solids	mg/l	524	812	426	690
Metals					
Aluminum, dissolved	ug/l	<5.0	<5.0	310	19
Antimony, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Arsenic, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0
Beryllium, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Boron, dissolved	ug/l	95	150	91	110
Cadmium, dissolved	ug/l	<0.10	<0.10	<0.10	<0.10
Chromium, dissolved	ug/l	<5.0	<5.0	<5.0	<5.0
Cobalt, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Copper, dissolved	ug/l	<1.0	<1.0	1.3	<1.0
Iron, dissolved	ug/l	<100	<100	450	<100
Lead, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Molybdenum, dissolved	ug/l	0.60	0.70	<0.50	<0.50
Nickel, dissolved	ug/l	1.2	1.5	1.8	1.4
Selenium, dissolved	ug/l	<2.0	<2.0	<2.0	<2.0
Silver, dissolved	ug/l	<0.10	<0.10	<0.10	<0.10
Thallium, dissolved	ug/l	<0.050	<0.050	<0.050	<0.050
Tungsten, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0
Uranium, dissolved	ug/l	0.63	0.59	0.49	0.68
Vanadium, dissolved	ug/l	1.2	0.63	1.4	0.77
Zinc, dissolved	ug/l	<5.0	<5.0	<5.0	<5.0
Zirconium, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0

Parameter	Unit	MW-4	MW-4	MW-4
		02-Jun-2016	17-Oct-2016 ⁽¹⁾	27-Jun-2017
		MW-4	MW-4	MW-4
General Chemistry				
Ammonia Nitrogen	mg/l	<0.050	--	<0.050
Biochemical Oxygen Demand, 5 Day	mg/l	<2.0	--	<2.0
Chloride, dissolved	mg/l	20	--	41
Conductivity (Field)	uS/cm	325	--	404
Nitrate as N	mg/l	0.18	--	<0.10
Nitrite as N	mg/l	<0.010	--	<0.010
Nitrogen, Total Kjeldahl	mg/l	0.15	--	0.17
Nitrogen, Nitrate-Nitrite	mg/l	0.18	--	<0.10
pH	-	--	--	6.43
pH (Field)	-	6.57	--	--
Phosphorus	mg/l	0.038	--	0.020
Sulphate, dissolved	mg/l	53	--	56
Temperature (Field)	deg c	12.0	--	13.9
Total Dissolved Solids	mg/l	212	--	198
Metals				
Aluminum, dissolved	ug/l	5.8	--	9.1
Antimony, dissolved	ug/l	<0.50	--	<0.50
Arsenic, dissolved	ug/l	<1.0	--	<1.0
Beryllium, dissolved	ug/l	<0.50	--	<0.50
Boron, dissolved	ug/l	22	--	24
Cadmium, dissolved	ug/l	<0.10	--	<0.10
Chromium, dissolved	ug/l	<5.0	--	<5.0
Cobalt, dissolved	ug/l	<0.50	--	<0.50
Copper, dissolved	ug/l	1.7	--	1.4
Iron, dissolved	ug/l	<100	--	<100
Lead, dissolved	ug/l	<0.50	--	<0.50
Molybdenum, dissolved	ug/l	<0.50	--	<0.50
Nickel, dissolved	ug/l	1.0	--	<1.0
Selenium, dissolved	ug/l	<2.0	--	<2.0
Silver, dissolved	ug/l	<0.10	--	<0.10
Thallium, dissolved	ug/l	<0.050	--	<0.050
Tungsten, dissolved	ug/l	<1.0	--	<1.0
Uranium, dissolved	ug/l	0.16	--	<0.10
Vanadium, dissolved	ug/l	0.65	--	0.58
Zinc, dissolved	ug/l	<5.0	--	<5.0
Zirconium, dissolved	ug/l	<1.0	--	<1.0



April 2018

Groundwater Sampling Results, 2016-2017
City of Clarence-Rockland Biosolids Storage Lagoons

1782863

	MW-5	MW-5	MW-5
	01-Jun-2016 ⁽¹⁾	17-Oct-2016 ⁽¹⁾	27-Jun-2017 ⁽¹⁾
Parameter	Unit		
	MW-5	MW-5	MW-5

Parameter	Unit	BH03-4	BH03-4	BH03-4	BH03-4
		01-Jun-2016	17-Oct-2016 ⁽¹⁾	27-Jun-2017	28-Sep-2017
		03-4	BH03-4	03-4	03-4
General Chemistry					
Ammonia Nitrogen	mg/l	9.1	--	2.7	6.8
Biochemical Oxygen Demand, 5 Day	mg/l	<2.0	--	3.0	<2.0
Chloride, dissolved	mg/l	46	--	14	38
Conductivity (Field)	uS/cm	967	--	604	949
Nitrate as N	mg/l	0.48	--	0.14	0.94
Nitrite as N	mg/l	0.352	--	0.068	0.321
Nitrogen, Total Kjeldahl	mg/l	10	--	3.0	7.1
Nitrogen, Nitrate-Nitrite	mg/l	0.83	--	0.20	1.26
pH	-	--	--	6.91	--
pH (Field)	-	7.30	--	--	6.38
Phosphorus	mg/l	1.0	--	1.2	1.2
Sulphate, dissolved	mg/l	27	--	26	24
Temperature (Field)	deg c	16.5	--	13.3	14.7
Total Dissolved Solids	mg/l	512	--	268	565
Metals					
Aluminum, dissolved	ug/l	11	--	17	16
Antimony, dissolved	ug/l	<0.50	--	<0.50	<0.50
Arsenic, dissolved	ug/l	<1.0	--	<1.0	<1.0
Beryllium, dissolved	ug/l	<0.50	--	<0.50	<0.50
Boron, dissolved	ug/l	32	--	26	37
Cadmium, dissolved	ug/l	<0.10	--	<0.10	<0.10
Chromium, dissolved	ug/l	<5.0	--	<5.0	<5.0
Cobalt, dissolved	ug/l	<0.50	--	<0.50	<0.50
Copper, dissolved	ug/l	<1.0	--	<1.0	<1.0
Iron, dissolved	ug/l	11000	--	6500	5800
Lead, dissolved	ug/l	<0.50	--	<0.50	<0.50
Molybdenum, dissolved	ug/l	<0.50	--	0.66	<0.50
Nickel, dissolved	ug/l	<1.0	--	<1.0	<1.0
Selenium, dissolved	ug/l	<2.0	--	<2.0	<2.0
Silver, dissolved	ug/l	<0.10	--	<0.10	<0.10
Thallium, dissolved	ug/l	<0.050	--	<0.050	<0.050
Tungsten, dissolved	ug/l	<1.0	--	<1.0	<1.0
Uranium, dissolved	ug/l	0.18	--	<0.10	0.19
Vanadium, dissolved	ug/l	1.6	--	1.1	1.8
Zinc, dissolved	ug/l	5.7	--	<5.0	<5.0
Zirconium, dissolved	ug/l	<1.0	--	<1.0	<1.0

Parameter	Unit	MW11-6	MW11-6	MW11-6	MW11-6
		01-Jun-2016	17-Oct-2016	27-Jun-2017	28-Sep-2017
		11-6	11-6	11-6	11-6
General Chemistry					
Ammonia Nitrogen	mg/l	1.6	1.2	1.6	1.6
Biochemical Oxygen Demand, 5 Day	mg/l	<2.0	9.0	<2.0	5.0
Chloride, dissolved	mg/l	2400	2600	2600	2500
Conductivity (Field)	uS/cm	>3999	>3999	>3999	3999
Nitrate as N	mg/l	0.74	0.11	<0.10	0.81
Nitrite as N	mg/l	0.458	0.141	0.069	0.441
Nitrogen, Total Kjeldahl	mg/l	2.0	1.6	1.8	1.9
Nitrogen, Nitrate-Nitrite	mg/l	1.20	0.25	0.12	1.25
pH	-	--	--	7.73	--
pH (Field)	-	7.75	7.67	--	7.66
Phosphorus	mg/l	0.38	0.45	0.30	0.35
Sulphate, dissolved	mg/l	230	240	230	230
Temperature (Field)	deg c	12.2	11.0	11.0	11.3
Total Dissolved Solids	mg/l	4860	4350	4870	5230
Metals					
Aluminum, dissolved	ug/l	7.7	44	28	<5.0
Antimony, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Arsenic, dissolved	ug/l	1.9	1.5	1.7	1.5
Beryllium, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Boron, dissolved	ug/l	270	290	310	310
Cadmium, dissolved	ug/l	<0.10	<0.10	<0.10	<0.10
Chromium, dissolved	ug/l	<5.0	<5.0	<5.0	<5.0
Cobalt, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Copper, dissolved	ug/l	<5.0	<5.0 ⁽²⁾	1.3	1.1
Iron, dissolved	ug/l	330	<100	240	170
Lead, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Molybdenum, dissolved	ug/l	0.61	0.63	0.56	<0.50
Nickel, dissolved	ug/l	1.6	1.3	1.5	1.2
Selenium, dissolved	ug/l	<2.0	<2.0	<2.0	<2.0
Silver, dissolved	ug/l	<0.10	<0.10	<0.10	<0.10
Thallium, dissolved	ug/l	<0.050	<0.050	<0.050	<0.050
Tungsten, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0
Uranium, dissolved	ug/l	0.42	0.56	0.40	0.43
Vanadium, dissolved	ug/l	<2.5	<2.5 ⁽²⁾	0.63	0.81
Zinc, dissolved	ug/l	8.4	5.8	<5.0	<5.0
Zirconium, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0

Parameter	Unit	MW11-7	MW11-7	MW11-7	MW11-7
		01-Jun-2016 ⁽³⁾	17-Oct-2016	27-Jun-2017	28-Sep-2017
		MW11-7	11-7	11-7	11-7
General Chemistry					
Ammonia Nitrogen	mg/l	--	0.26	0.30	0.44
Biochemical Oxygen Demand, 5 Day	mg/l	--	3.0	<2.0	<2.0
Chloride, dissolved	mg/l	--	400	450	710
Conductivity (Field)	uS/cm	--	2187	1420	2426
Nitrate as N	mg/l	--	1.23	1.43	0.66
Nitrite as N	mg/l	--	<0.010	0.223	0.058
Nitrogen, Total Kjeldahl	mg/l	--	0.52	0.65	0.59
Nitrogen, Nitrate-Nitrite	mg/l	--	1.23	1.65	0.72
pH	-	--	--	7.06	--
pH (Field)	-	--	7.32	--	7.58
Phosphorus	mg/l	--	0.14	0.26	0.43
Sulphate, dissolved	mg/l	--	58	57	59
Temperature (Field)	deg c	--	9.2	10.0	10.0
Total Dissolved Solids	mg/l	--	1360	660	1080
Metals					
Aluminum, dissolved	ug/l	--	<5.0	36	<5.0
Antimony, dissolved	ug/l	--	<0.50	<0.50	<0.50
Arsenic, dissolved	ug/l	--	<1.0	<1.0	<1.0
Beryllium, dissolved	ug/l	--	<0.50	<0.50	<0.50
Boron, dissolved	ug/l	--	130	79	110
Cadmium, dissolved	ug/l	--	<0.10	<0.10	<0.10
Chromium, dissolved	ug/l	--	<5.0	<5.0	<5.0
Cobalt, dissolved	ug/l	--	<0.50	<0.50	<0.50
Copper, dissolved	ug/l	--	3.2	2.8	3.1
Iron, dissolved	ug/l	--	<100	<100	<100
Lead, dissolved	ug/l	--	<0.50	<0.50	<0.50
Molybdenum, dissolved	ug/l	--	0.83	<0.50	0.64
Nickel, dissolved	ug/l	--	1.4	1.3	1.1
Selenium, dissolved	ug/l	--	<2.0	<2.0	<2.0
Silver, dissolved	ug/l	--	<0.10	<0.10	<0.10
Thallium, dissolved	ug/l	--	<0.050	<0.050	<0.050
Tungsten, dissolved	ug/l	--	<1.0	<1.0	<1.0
Uranium, dissolved	ug/l	--	2.1	1.5	1.6
Vanadium, dissolved	ug/l	--	<0.50	<0.50	<0.50
Zinc, dissolved	ug/l	--	<5.0	<5.0	<5.0
Zirconium, dissolved	ug/l	--	<1.0	<1.0	<1.0

Parameter	Unit	MW11-8	MW11-8	MW11-8	MW11-8
		01-Jun-2016	17-Oct-2016	27-Jun-2017 ⁽⁴⁾	28-Sep-2017
		11-8	11-8	11-8	11-8
General Chemistry					
Ammonia Nitrogen	mg/l	9.7	9.2	7.3 ⁽⁵⁾	6.7
Biochemical Oxygen Demand, 5 Day	mg/l	<2.0	<2.0	<2.0	<2.0
Chloride, dissolved	mg/l	86	88	100	120
Conductivity (Field)	uS/cm	1507	1502	1435	1673
Nitrate as N	mg/l	<0.10	<0.10	<0.10	<0.10
Nitrite as N	mg/l	0.020	<0.010	<0.010	0.083
Nitrogen, Total Kjeldahl	mg/l	12	10	7.1 ⁽⁵⁾	6.9
Nitrogen, Nitrate-Nitrite	mg/l	<0.10	<0.10	<0.10	0.11
pH	-	--	--	6.90	--
pH (Field)	-	7.74	6.90	--	6.66
Phosphorus	mg/l	1.8	3.5	1.2	3.4
Sulphate, dissolved	mg/l	42	66	43	140
Temperature (Field)	deg c	13.3	12.7	10.3	13.6
Total Dissolved Solids	mg/l	874	880	770	1000
Metals					
Aluminum, dissolved	ug/l	<5.0	41	18	5.2
Antimony, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Arsenic, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0
Beryllium, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Boron, dissolved	ug/l	75	84	76	75
Cadmium, dissolved	ug/l	<0.10	<0.10	<0.10	<0.10
Chromium, dissolved	ug/l	<5.0	<5.0	<5.0	<5.0
Cobalt, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Copper, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0
Iron, dissolved	ug/l	21000	15000	22000	23000
Lead, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Molybdenum, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Nickel, dissolved	ug/l	1.5	1.2	1.1	<1.0
Selenium, dissolved	ug/l	<2.0	<2.0	<2.0	<2.0
Silver, dissolved	ug/l	<0.10	<0.10	<0.10	<0.10
Thallium, dissolved	ug/l	<0.050	<0.050	<0.050	<0.050
Tungsten, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0
Uranium, dissolved	ug/l	0.11	<0.10	<0.10	<0.10
Vanadium, dissolved	ug/l	3.2	2.7	2.8	2.9
Zinc, dissolved	ug/l	6.2	<5.0	<5.0	<5.0
Zirconium, dissolved	ug/l	<1.0	1.1	<1.0	<1.0

Parameter	Unit	MW11-9	MW11-9	MW11-9	MW11-9
		01-Jun-2016	17-Oct-2016	27-Jun-2017	28-Sep-2017
		11-9	11-9	11-9	11-9
General Chemistry					
Ammonia Nitrogen	mg/l	0.20	0.19	0.17	0.11
Biochemical Oxygen Demand, 5 Day	mg/l	<2.0	<2.0	<2.0	<2.0
Chloride, dissolved	mg/l	6.7	12	59	45
Conductivity (Field)	uS/cm	369	376	565	721
Nitrate as N	mg/l	1.67	<0.10	1.26	1.84
Nitrite as N	mg/l	0.033	<0.010	0.023	0.019
Nitrogen, Total Kjeldahl	mg/l	0.50	0.42	0.46	0.35
Nitrogen, Nitrate-Nitrite	mg/l	1.71	<0.10	1.28	1.86
pH	-	--	--	6.69	--
pH (Field)	-	7.91	6.84	--	6.78
Phosphorus	mg/l	0.096	0.045	0.086	0.09
Sulphate, dissolved	mg/l	47	50	82	110
Temperature (Field)	deg c	10.3	12.1	8.6	13.1
Total Dissolved Solids	mg/l	222	286	324	500
Metals					
Aluminum, dissolved	ug/l	9.7	5.8	9.7	7.9
Antimony, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Arsenic, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0
Beryllium, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Boron, dissolved	ug/l	17	24	18	45
Cadmium, dissolved	ug/l	<0.10	<0.10	<0.10	<0.10
Chromium, dissolved	ug/l	<5.0	<5.0	<5.0	<5.0
Cobalt, dissolved	ug/l	0.61	1.0	0.57	0.52
Copper, dissolved	ug/l	3.1	1.6	2.9	3.7
Iron, dissolved	ug/l	340	990	430	260
Lead, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Molybdenum, dissolved	ug/l	1.7	0.72	1.2	1.2
Nickel, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0
Selenium, dissolved	ug/l	<2.0	<2.0	<2.0	<2.0
Silver, dissolved	ug/l	<0.10	<0.10	<0.10	<0.10
Thallium, dissolved	ug/l	<0.050	<0.050	<0.050	<0.050
Tungsten, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0
Uranium, dissolved	ug/l	0.17	<0.10	0.14	0.18
Vanadium, dissolved	ug/l	1.0	<0.50	0.81	0.82
Zinc, dissolved	ug/l	<5.0	5.4	<5.0	<5.0
Zirconium, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0

Parameter	Unit	MW11-10	MW11-10	MW11-10	MW11-10
		01-Jun-2016	17-Oct-2016	27-Jun-2017	28-Sep-2017
		11-10	11-10	11-10	11-10
General Chemistry					
Ammonia Nitrogen	mg/l	0.097	<0.050	0.076	<0.050
Biochemical Oxygen Demand, 5 Day	mg/l	<2.0	<2.0	<2.0	<2.0
Chloride, dissolved	mg/l	170	140	170	150
Conductivity (Field)	uS/cm	1790	1870	1743	1806
Nitrate as N	mg/l	<0.10	<0.10	<0.10	<0.10
Nitrite as N	mg/l	<0.010	<0.010	<0.010	<0.010
Nitrogen, Total Kjeldahl	mg/l	0.59	0.24	0.28	0.21
Nitrogen, Nitrate-Nitrite	mg/l	<0.10	<0.10	<0.10	<0.10
pH	-	--	--	7.48	--
pH (Field)	-	7.74	7.25	--	7.09
Phosphorus	mg/l	0.58	0.43	0.70	0.8
Sulphate, dissolved	mg/l	170	180	170	190
Temperature (Field)	deg c	13.4	13.6	10.5	14.5
Total Dissolved Solids	mg/l	1120	1160	1060	1120
Metals					
Aluminum, dissolved	ug/l	<5.0	<5.0	130	<5.0
Antimony, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Arsenic, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0
Beryllium, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Boron, dissolved	ug/l	99	100	100	100
Cadmium, dissolved	ug/l	<0.10	<0.10	<0.10	<0.10
Chromium, dissolved	ug/l	<5.0	<5.0	<5.0	<5.0
Cobalt, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Copper, dissolved	ug/l	1.3	<1.0	1.2	1.3
Iron, dissolved	ug/l	<100	<100	170	<100
Lead, dissolved	ug/l	<0.50	<0.50	<0.50	<0.50
Molybdenum, dissolved	ug/l	2.1	2.2	2.0	2.3
Nickel, dissolved	ug/l	1.2	<1.0	1.1	<1.0
Selenium, dissolved	ug/l	<2.0	<2.0	<2.0	<2.0
Silver, dissolved	ug/l	<0.10	<0.10	<0.10	<0.10
Thallium, dissolved	ug/l	<0.050	<0.050	<0.050	<0.050
Tungsten, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0
Uranium, dissolved	ug/l	8.7	9.4	8.7	10
Vanadium, dissolved	ug/l	0.93	1.2	1.4	1.4
Zinc, dissolved	ug/l	6.6	<5.0	<5.0	<5.0
Zirconium, dissolved	ug/l	<1.0	<1.0	<1.0	<1.0

April 2018

Groundwater Sampling Results, 2016-2017
City of Clarence-Rockland Biosolids Storage Lagoons

1782863

Parameter	Unit	MW17-1
		28-Sep-2017
		17-1
General Chemistry		
Ammonia Nitrogen	mg/l	0.097
Biochemical Oxygen Demand, 5 Day	mg/l	<2.0
Chloride, dissolved	mg/l	14
Conductivity (Field)	uS/cm	339
Nitrate as N	mg/l	0.38
Nitrite as N	mg/l	<0.010
Nitrogen, Total Kjeldahl	mg/l	0.62
Nitrogen, Nitrate-Nitrite	mg/l	0.38
pH (Field)	-	5.55
Phosphorus	mg/l	5.9
Sulphate, dissolved	mg/l	33
Temperature (Field)	deg c	10.5
Total Dissolved Solids	mg/l	275
Metals		
Aluminum, dissolved	ug/l	1300
Antimony, dissolved	ug/l	<0.50
Arsenic, dissolved	ug/l	<1.0
Beryllium, dissolved	ug/l	<0.50
Boron, dissolved	ug/l	14
Cadmium, dissolved	ug/l	<0.10
Chromium, dissolved	ug/l	<5.0
Cobalt, dissolved	ug/l	0.85
Copper, dissolved	ug/l	3.4
Iron, dissolved	ug/l	1600
Lead, dissolved	ug/l	1.1
Molybdenum, dissolved	ug/l	<0.50
Nickel, dissolved	ug/l	2.0
Selenium, dissolved	ug/l	<2.0
Silver, dissolved	ug/l	<0.10
Thallium, dissolved	ug/l	<0.050
Tungsten, dissolved	ug/l	<1.0
Uranium, dissolved	ug/l	0.25
Vanadium, dissolved	ug/l	3.4
Zinc, dissolved	ug/l	6.7
Zirconium, dissolved	ug/l	<1.0