Township of Mapleton

Mapleton Water Pollution Control Plant Expansion

Municipal Class Environmental Assessment Addendum

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T001935A

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List of Acronyms

Conventional Activated Sludge	CAS
Environmental Assessment	EA
Environmental Compliance Act	ECA
Environmental Study Report	ESR
Grand River Conservation Authority	GRCA
GSP Group	GSP
Ministry of Environment, Conservation and Parks	MECP
Moving Bed Bioreactor	MBBR
Municipal Class Environmental Assessment	MCEA
Net Present Value	NPV
Ontario Clean Water Agency	OCWA
Official Plan	OP

Submerged Aerated Growth Reactor	SAGR
Total Ammonia Nitrogen	TAN
Total Suspended Solids	TSS
Waste Pollution Control Plant	WPCP
Sewage Pumping Station	SPS

1 Introduction

1.1 Overview

The Township of Mapleton (Township) completed a Schedule C Municipal Class Environmental Assessment (MCEA) in 2017 to review wastewater management in the township and identify a preferred approach to meeting future wastewater needs. The 2017 MCEA reviewed several alternatives and short listed the following:

- Limit Community Growth
- Reduce Wastewater Flow
- Expand Existing Mapleton Waste Pollution Control Plant (WPCP) and Discharge to Conestoga River with proposed nitrogen removal technologies Submerged Aerated Growth Reactor (SAGR) system or a Moving Bed Bioreactor (MBBR) system

From the short list of alternatives, the 2017 MCEA recommended a phasing plan that included the following major elements:

- Phase 1: Re-rate the WPCP from 750 m3/day to 900 m3/day treatment capacity
- Phase 2: Upgrades to a SAGR system to provide 1,300 m3/day treatment capacity

Following the completion of the 2017 MCEA Environmental Study Report (ESR), the Township undertook and completed Phase 1 recommendations resulting in an increased treatment capacity of 900 m^3/day (from the previous capacity of 750 m^3/day). The Phase 2 Upgrades to expand the plant rated capacity to 1,300 m^3/day was approved in principle by the Ministry of Environment, Conservation and Parks (MECP) with the requirement that the Township conduct winter river water sampling to address data gaps in background river water quality with respect to ammonia and phosphorus and validate the conclusions of the Assimilative Capacity Study (ACS) completed as a component of the 2017 ESR.

The Class EA planning process (Municipal Engineers Association, October 2000, as amended in 2007, 2011, and 2015) is an approved process under the Ontario Environmental Assessment Act. The process requires that if the period of time from the filing of the Notice of Completion of the ESR to the proposed commencement of construction for the project exceeds ten (10) years, the proponent shall review the planning and design process and the current environmental setting to ensure that the project and the mitigation measures are still valid given the current planning context. The review shall be recorded in an addendum to the ESR which shall be placed on the

public record. Since the ESR was completed and filed in 2017 and a period of 7 years has elapsed since its completion, the Township is undertaking an EA Addendum to update the 2017 ACS and also update the planning and design process by modifying the nitrogen removal technology from a Submerged Attached Growth reactor (SAGR) system as recommended in the Class EA document to a Moving Bed Biofilm Reactor (MBBR).

1.2 EA Addendum Scope

The EA Addendum remains consistent with the original framework, however, as it has been over 7 years since then, the analysis required updates. The EA addendum involves the following:

- Review of the population and wastewater flow projections
- Update the ACS with winter river water quality sampling results to confirm the effluent criteria required to demonstrate conformance to the MECP's policies for maintaining river water quality,
- Provide background and justification for the change of preferred sewage treatment solution recommendation,
- Update the overall cost of project for the newly preferred alternative treatment solution,
- Develop and evaluate the design concepts for the newly preferred solution (i.e., pre-lagoon nitrification with MBBR), and recommend a preferred design concept (layout, schematics, major design criteria, etc.).
- Update the overall cost of project for the newly preferred alternative treatment solution,
- Indigenous community consultation

The EA addendum evaluates alternative nitrification technologies at the Mapleton WPCP.

1.3 EA Addendum Results

The updated evaluation recommends the preferred alternatives in Table 1-1.

Table 1-1: Preferred Alternatives

Process	Recommended Upgrades
Wastewater Management and Treatment	Upgrade and expand the Mapleton WPCP from its interim rated capacity of 900 m^3/day to a capacity of 1,300 m^3/day while conforming to MECP policy objectives for river water quality.
Nitrification Enhancement Technology	Improve WPCP effluent quality by nitrification through the installation of a MBBR system.

2 Existing Conditions

2.1 Wastewater Management Overview

Wastewater in the Township of Mapleton is serviced by the municipal wastewater system that includes a network of sanitary sewers that convey wastewater flows to the Mapleton WPCP, which discharges treated wastewater to the Conestoga River.

The Township of Mapleton owns the treatment facility and Ontario Clean Water Agency (OCWA) is responsible for the operation of the municipal wastewater system. The Township collects fees (wastewater rates) from users to finance the operation of the system.

2.2 Existing Wastewater System

2.2.1 Wastewater Treatment Plant

The Mapleton WPCP site is located at 7101 Sideroad 15 in Drayton, Ontario and is approximately 25 hectares in area. Figure 2-1 below depicts a site plan of the WPCP. The lagoon-based treatment plant has a rated capacity of 900 m^3/day and consists of two (2) treatment cells (aerated and facultative) operated in series and three (3) storage cells operated in parallel or series. In addition, the Mapleton WPCP contains two (2) gravity flow control structures, two (2) alum dosing systems for phosphorus removal, a filter feed pumping station, tertiary sand filtration, UV disinfection, an effluent cascade aerator, and a 600 mm diameter effluent pipe to the outfall structure at the Conestogo River. Operational responsibility for the Mapleton WPCP has been contracted to OCWA.

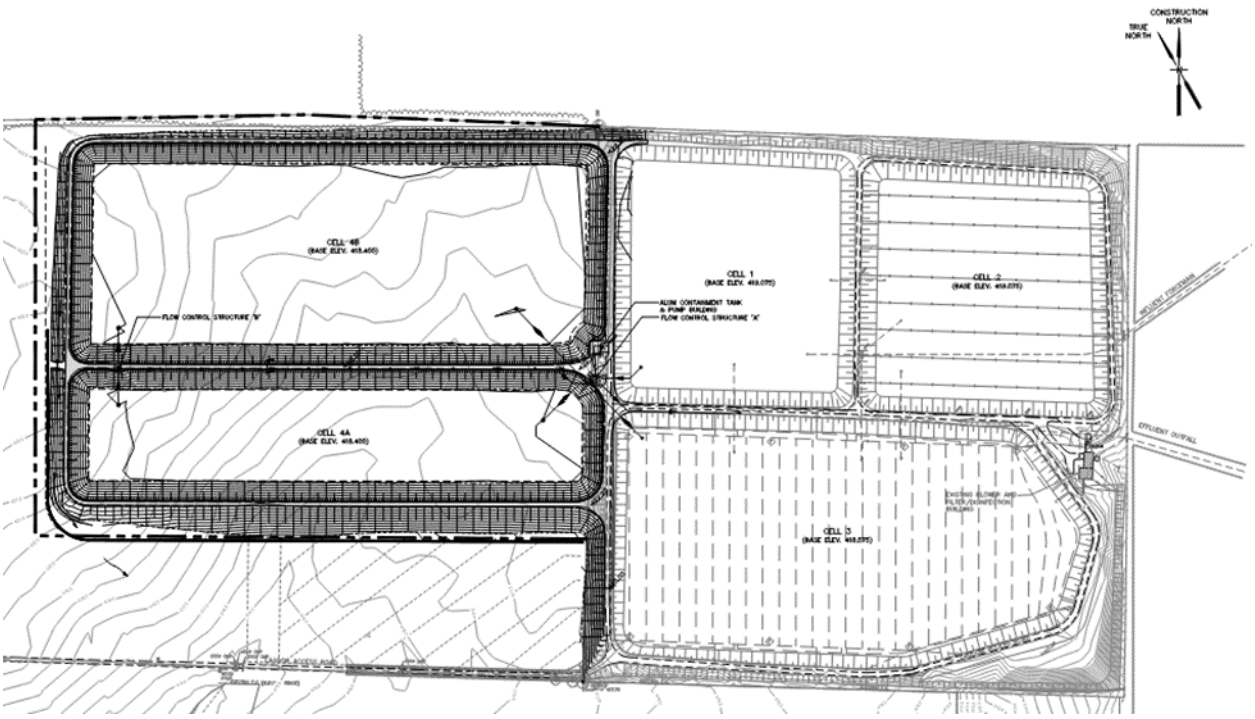

Figure 2-1: Mapleton WPCP Site Plan

An overview of the Mapleton WPCP process is presented in Figure 2-2. Wastewater pumped from Drayton Sewage Pump Station (SPS) and Moorefield SPS enters the Mapleton WPCP at the influent flow splitter manhole, where it flows to aerated treatment Cell 2. Influent wastewater to the Mapleton WPCP is typical of medium to high strength municipal sewage from primarily domestic sources.

Flow passes from Cell 2 to a facultative treatment lagoon (Cell 1). Effluent from Cell 1 flows to Flow Control Structure “A” where it is dosed with alum for phosphorus precipitation and directed by manually operated valves to any of the three storage lagoons (Cell 3, Cell 4A, or Cell 4B). During the spring or fall seasonal discharge periods, flow is directed from Cell 3, Cell 4A, and Cell 4B through Flow Control Structure “A” to the Filter Feed Pump Station. Lagoon effluent is pumped through the second alum dosing point to tertiary treatment sand filters then flows by gravity through UV disinfection before being discharged over a cascade aerator to increase the dissolved oxygen in the effluent and air strip any potential dissolved hydrogen sulphide. Following cascade aeration, the effluent is directed through a 600 mm diameter pipe and discharges to a swale, which flows overland to a wetland and then drains to the Conestogo River approximately 1km upstream of Conestogo Lake.

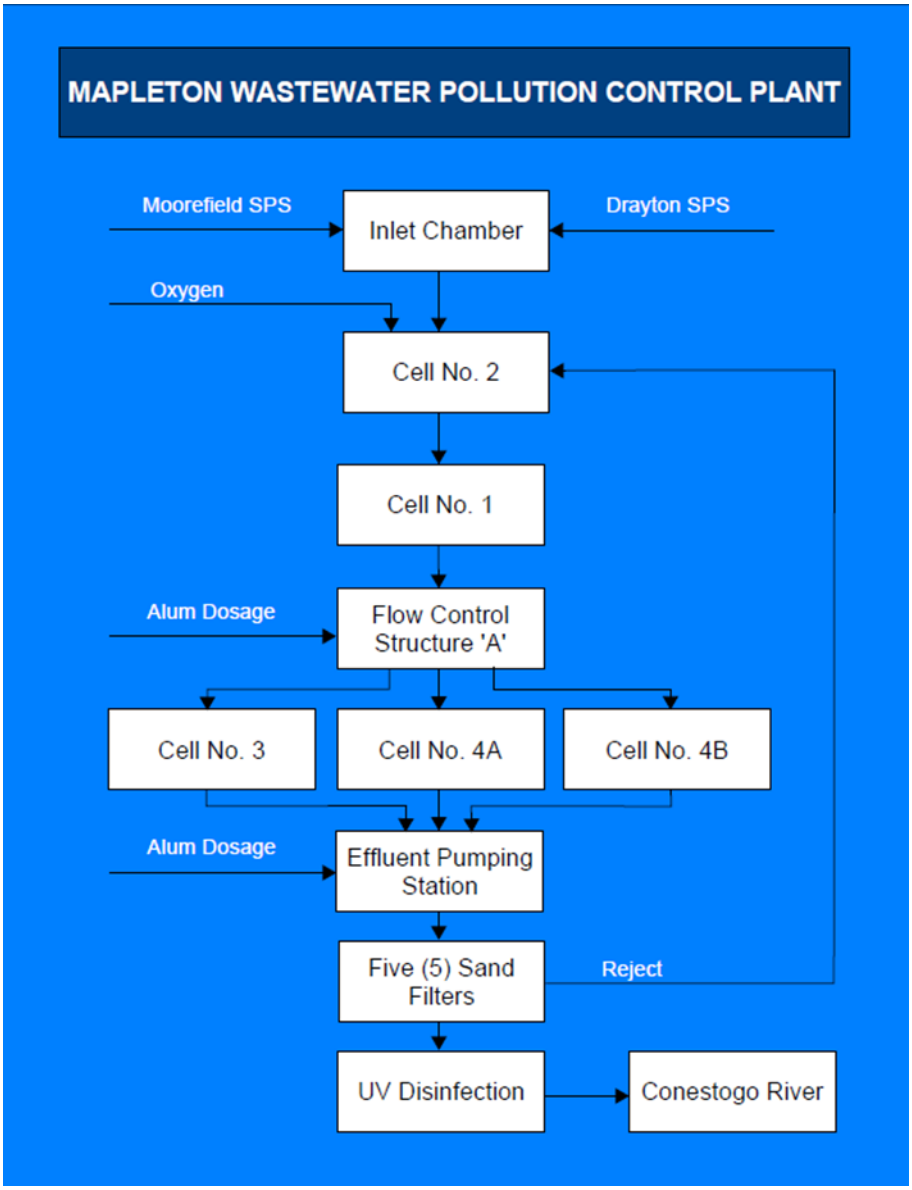

Figure 2-2: Overview of Mapleton WPCP Process System

2.2.1.1 Lagoons

The existing lagoons at the Mapleton WPCP consists of a 21.2 ha waste stabilization pond system. Two (2) treatment cells are operated in series, the primary cell, Cell 2, is aerated and has an operating volume of 60,500 m^3, and the secondary cell, Cell 1, is facultative and has an operating volume of 62,100 m^3. The three (3) effluent treatment / storage cells can be operated in parallel or series. The operating volumes of Cell 3, Cell 4A and Cell 4B are 131,700 m^3, 77,600 m^3 and 140,700 m^3, respectively. The total operating volume of the lagoons is 472,600 m^3.

2.2.1.2 Tertiary Sand Filters

The existing tertiary sand filters were installed in 2000 (2 filters) and 2002 (3 filters). Each filter is 2.0 m deep with a surface area of 4.65 m^2 and a design capacity of 800 m^3/day according to the current ECA (1391-B38PLA, August 2, 2018). The filters have a total capacity of 4,000 m^3/day or Peak Hourly Flow (PHF) of 167 m^3/hour.

2.2.1.3 Chemical Storage and Chemical Feed System

An alum dosing system housed in a 4.3 x 6.1 m Alum Building, consisting of one (1) 15,500 L storage tank and two (2) 7.1L/hour capacity metering pumps to dose alum in Flow Structure A located upstream of the storage lagoons.

2.2.1.4 UV Disinfection

The Mapleton WPCP disinfects effluent with two Trojan UV 3000-B radiation units installed in series in the effluent channel of the filtration building, with a Peak Flow Rate of 4,000 m^3/day (167 m^3/hour).

2.3 Historic WPCP Flows and Performance

The Township of Mapleton contains two urban centers, Drayton and Moorefield, which are identified as areas for sustainable growth to support the surrounding agricultural lands. The historic wastewater flows for Drayton and Moorefield that were used in the 2017 ESR are shown in Table 2-1 and

Table 2-2 respectively.

Table 2-1: Historical Wastewater Flows for the Drayton SPS used in the 2017 ESR

Year	Average Daily Flow (m^3/d)	Maximum Daily Flow (m^3/d)
2012	506	1,300
2013	624	2,622
2014	601	2,335
Average	577	2,086

Table 2-2: Historical Wastewater Flows for the Moorefield SPS used in the 2017 ESR

Year	Average Daily Flow (m^3/d)	Maximum Daily Flow (m^3/d)
2012	81.7	300
2013	90.2	211
2014	85.7	222
Average	85.9	244

Table 2-3 and Table 2-4 below show updated flow data from 2016 to 2022 for the Drayton SPS and Moorefield SPS, respectively.

Table 2-3: Historical Wastewater Flows for Drayton SPS

Year	Average Daily Flow (m^3/d)	Maximum Daily Flow (m^3/d)
2016	525	2,160
2017	598	2,675
2018	563	2,835
2019	574	1,977
2020	571	4,083
2021	564	1,872
2022	566	2,680
Average	566	2,612

Table 2-4: Historical Wastewater Flows for Moorefield SPS

Year	Average Daily Flow (m^3/d)	Maximum Daily Flow (m^3/d)
2016	75	138
2017	79	237
2018	77	182
2019	74	170
2020	76	289

Year	Average Daily Flow (m^3/d)	Maximum Daily Flow (m^3/d)
2021	75	152
2022	70	168
Average	75	191

3 Future Projections

3.1 Study Area

The Township of Mapleton (Township) is a rural municipality located within the County of Wellington in the heart of southwestern Ontario. The Township covers a land area of approximately 535.6 km^2 and has a population of 10,839 according to the 2021 Census. The Township has two (2) designated urban centres, namely Drayton and Moorefield, as well as rural hamlets, including Alma, Glen Allan, Hollen, Lebanon, Rothsay, Wallenstein, and Yatton.

The Drayton and Moorefield Urban Area's are the only areas in the Township that is serviced by municipal water supply/distribution and wastewater collection/treatment infrastructure. The boundary of the Drayton and Moorefield Urban Area's is illustrated below in Figure 3-1 along with other key planning boundaries discussed in this section.

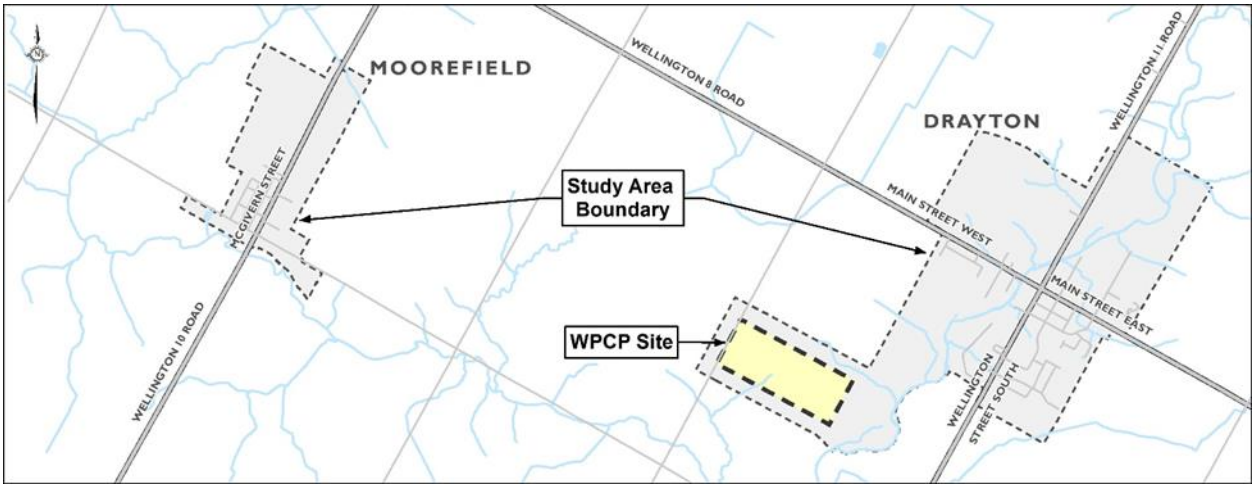

Figure 3-1: Study Area Map

Based on the Wellington County Official Plan Update (September 2023), and the Township of Mapleton Growth Management Summary (January 2022), 82% of population growth in Wellington County will take place in the County's 14 urban centres, including Drayton and Moorefield. The remainder will largely be directed mainly to hamlets and secondary agricultural areas.

3.2 Population Forecast

The potential population growth that anticipated by Mapleton over the next 20 years is identified in the 2022 Township of Mapleton Growth Management Summary Final Report by GSP Group.

3.2.1 2017 MCEA Population Projections

The previous MCEA completed by exp in 2017 forecasted a total residential population of 5,509 people serviced by the Mapleton WPCP by 2031. This forecast was based on the following:

- The WPCP is currently servicing 160 connections in Moorefield and 714 in Drayton.
- A service population of approximately 420 and 1,880, in Moorefield and Drayton respectively (based on 2011 population data).
- The Wellington Official Plan population growth projection for Mapleton anticipates annual growth of approximately 3.33% to the year 2031 for Moorefield and Drayton.

The resulting population projections are listed in Table 3-1.

Table 3-1: 2017 MCEA by EXP Population Projections

Year	Drayton	Moorefield
2011	1,880	420
2031	3,861	1,648

3.2.2 Updated Population Projections

Population projections are developed based on a combination of both best available planning information and professional judgement. Population projections form the basis of establishing water and wastewater flow projections which, in turn, dictate the water and wastewater servicing requirements. These population projections need to be revised continuously to ensure the validity of the planning estimates according to actual development, conditions of servicing infrastructure, and growth experienced in the Township.

Several recent studies have presented figures for population projections in the Township. CIMA+ has compiled the available population projection data for the Township as a whole, Drayton, and Moorefield. Ultimately, the values shown in Table 3-2 and Table 3-3, taken from the Growth Management Summary Final Report (GSP Group, 2022), were used for the Mapleton Water and Wastewater Servicing Master Plan. These values align with the most recent County of Wellington Official Plan Update (County of Wellington, 2021).

Table 3-2: Updated Population Projects (GSP Group, 2022)

Year	Population Urban Settlement Area	Population Rural Area	Population Mapleton	Households Drayton	Households Moorefield	Households Rural	Households Mapleton
2026	-	8,300	11,800	960	270	2,240	3,540
2031	4,100	8,300	12,400	1,110	360	2,250	3,780
2036	-	8,300	12,900	1,190	470	2,260	3,960
2041	5,900	8,300	14,100	1,400	660	2,270	4,380
2046	-	8,300	14,600	1,510	740	2,280	4,600
2051	6,800	8,300	15,200	1,580	880	2,290	4,820

Table 3-3: Updated Population Projections for Drayton and Moorefield (GSP Group, 2022)

Year	Pop / House [1]	Population Drayton [2]	Population Moorefield [2]	Population Mapleton	Households Drayton	Households Moorefield	Households Mapleton
2026	3.3	3,200	900	11,800	960	270	3,540
2031	3.3	3,641	1,181	12,400	1,110	360	3,780
2036	3.3	3,779	1,531	12,900	1,160	470	3,960
2041	3.2	4,507	2,125	14,100	1,400	660	4,380
2046	3.2	4,793	2,349	14,600	1,510	740	4,600
2051	3.2	4,983	2,775	15,200	1,580	880	4,820

Notes:

1) The population per household for is based on the population of Mapleton divided over the number of households.
2) Drayton and Moorefield's populations have been estimated using the Mapleton population / household ratio.

3.3 Wastewater Flows

Wastewater flows generated by the forecasted future growth have been estimated to provide a basis for determining the required future wastewater treatment capacity in 2041.

3.3.1 Wastewater Flow Rates

The MECP recommends that a sewage generation rate of 225-450 L/cap-d be used for sizing new sewers. Since the per capita rates for Drayton and Moorefield fall on the lower end of the range of MECP recommended flowrates, a future per capita flowrate of 300 L/cap-d for Drayton and 225 L/cap-d for Moorefield to allow for factor of safety within the flow estimate while satisfying MECP guidelines is recommended. Moorefield has a low-pressure sewage system, which results in less I/I and overall lower flows than Drayton, which has a gravity collection system. To reflect the lower flows in Moorefield, sewage generation was selected to be at the lowest end of the range recommended by the MECP.

The flow rates used to estimate future wastewater flows are summarized in Table 3-4 and discussed in more detail in the following sections.

Table 3-4: Existing and Forecasted Wastewater Flow Rates Per Capita

Urban Centre	Daily Flow Rate	Units
Existing Drayton (2022)	193	L/cap/d
Existing Drayton (2017 ESR)	332	L/cap-d
Forecasted Drayton	300	L/cap/d
Existing Moorefield (2022)	116	L/cap/d
Existing Moorefield (2017 ESR)	215	L/cap-d
Forecasted Moorefield	225	L/cap/d

3.3.1.1 Prior Forecasts

The 2017 MCEA completed by exp assumed a residential per capita flow rate of 215 and 332 L/cap/d for Moorefield and Drayton respectively. These per capita flow rates were based on measured plant flows and population/projected average growth rates from the Watson and Associates Population Forecast. The ESR used Watson and Associates population figures from 2011 as “current” (2017) in calculating the historic per capita sanitary flow rates. This resulted in a slight discrepancy in the historic flow per person, which in turn was used to extrapolate the future projected flows. The design

flows outlined in the following sections were based on the 2022 Township of Mapleton Growth Management Summary Final Report by GSP Group.

3.3.2 Forecasted Flows

The Township of Mapleton has adopted design guidelines for the design of wastewater infrastructure, as follows:

- Domestic Generation Rate for Drayton – 300 L/cap-d
- Domestic Generation Rate for Moorefield – 225 L/cap-d
- Peak Factor – Harmon Formula

As noted previously, the estimated future sanitary flow rate is based on a number of assumptions, which results in a high level of uncertainty in accurately predicting the future sewage demands. Given the best information now available on population projections and assuming the higher sewage generation rate, the estimated future (2031) average daily flow is projected to be approximately 1,358 m^3/day, which is elevated but similar to the 1,300 m^3/day estimated flow in the 2017 Class EA study. The projected wastewater flows are shown in Table 3-5 and Figure 3-2.

Table 3-5: Projected Wastewater Generation for Drayton and Moorefield

Year	Drayton Average Faily Flow (m^3/d)	Moorefield Average Daily Flow (m^3/d)	Total Average Daily Flow (m^3/d)
2026	960	203	1,163
2031	1,092	266	1,358
2036	1,134	344	1,478
2041	1,52	478	1,830
2046	1,438	529	1,966
2051	1,495	624	2,119

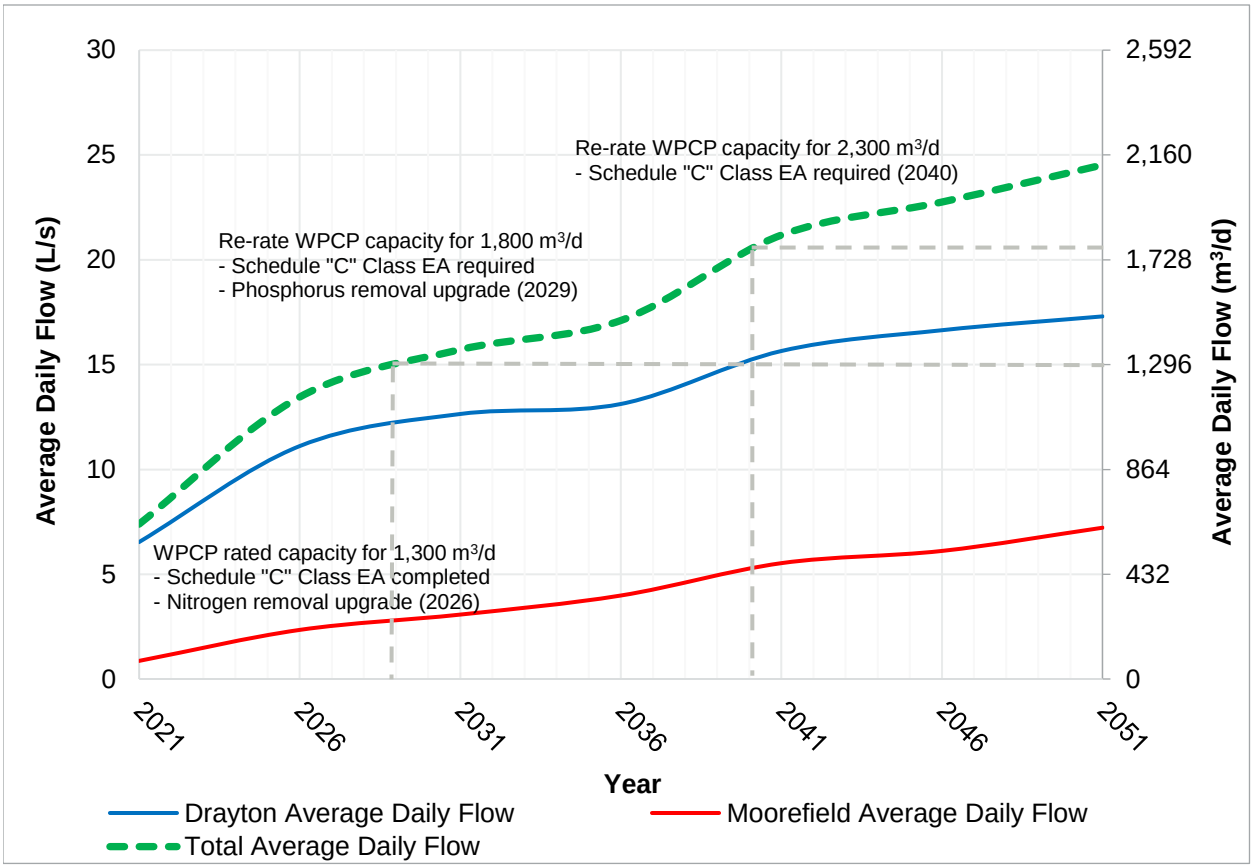

Figure 3-2: Projected Wastewater Flows for Mapleton WPCP

3.3.3 Design Wastewater Flows

Preliminary population planning estimates for Mapleton indicate that the total ultimate (2051) service population within the existing urban boundaries could potentially increase from the existing 2,868 people in 2021 to approximately 7,758 people in 2051. This will result in a total average day flow of 2,119 m^3/day at the ultimate service population. The design flows determined for the Mapleton WPCP, based on the projected population growth in the serviced area are summarized in Table 3-6.

Table 3-6: Proposed Ultimate Design Criteria – Mapleton WPCP

Parameter	2031	2041	2051
Population	4,822	6,632	7,758
Projected Average Daily Flow	1,358 m^3/d	1,830 m^3/d	2,119 m^3/d
Projected Peak Factor	3.26	3.13	3.06
Projected Maximum Daily Flow	4,678 m^3/d	6,148 m^3/d	7,020 m^3/d

Parameter	2031	2041	2051
Projected total number of households for Drayton	1,110	1,400	1,580
Additional households for Drayton from 2021	260	550	730
Projected total number of households for Moorefield	360	660	880
Additional households for Moorefield from 2021	180	480	700

3.3.4 Wastewater Characteristics

Characterization of raw wastewater is an important step in determining the preferred alternative during a wastewater treatment upgrade. By assessing influent loadings of organic material and nutrients (ammonia nitrogen and phosphorus) the design basis can be developed and used to evaluate the existing infrastructure and size new equipment. Although the 2017 ESR did not summarize the historical raw influent characteristics, the historic raw influent wastewater concentrations from OCWA Annual Reports from 2012-2022 are presented in Table 3-7. The Mapleton WPCP receives primarily domestic wastewater with medium to high strength of BOD_5, TSS, TP, and TKN as compared to the MECP Design Guidelines for Sewage Works.

Table 3-7: Historical Raw influent characteristics

Parameter	Monthly Average 2012-2022 (mg/L)	50th Percentile 2012-2022 (mg/L)	Typical Wastewater Concentration (mg/L) MECP [2]
BOD_5	255	249	150 – 200
TSS	248	244	150 – 200
TP	6.1	6.2	6.0 – 8.0
TKN	53	53	30 – 40

Notes:

1) OCWA Annual Reports (2012-2022)
2) MECP Design Guidelines for Sewage Works

3.3.5 Treatment and Compliance Requirements

The treatment plant operates under Amended Environmental Compliance Approval (ECA) No. 1391-B38PLA dated August 2, 2018. A copy of the ECA is provided in Appendix C.

Results from the pilot indicated that the total ammonia nitrogen (TAN) removed during the summer months either by means of volatilization, assimilated by algae or conventional nitrification-denitrification pathways. During the fall and winter months these means of ammonia removal are not viable primarily due to the inhibition of these pathways from cold temperatures. The TAN objective of 1.0 mg/L is proposed for the expansion to 1,300 m^3/d.

The proposed effluent Total Phosphorus (TP) objectives of 0.17 mg/L at an expanded capacity of 1,300 m^3/day, is achievable in the existing filters with the optimized alum dosing system as proposed in the 2017 ESR. Average monthly concentrations of TP typically met or were lower than the proposed objective which indicates that upgrades to the alum dosing system recommended in the ESR were appropriate. Expanding beyond 1,300 m^3/day may present a challenging to the existing sand filters and enhanced phosphorus removal at 0.1 mg/L or less can be achieved with advanced filtration technology such as Membrane Bioreactors (MBRs) (Water Environment Federation (WEF), 2012).

It was assumed that the existing lagoons will be maintained as the primary source of biochemical oxygen demand (BOD) and total suspended solids (TSS) removal as this provides significant operational benefits (e.g. low maintenance, simple operation). The Township undertook pilot testing of the MBBR technology in 2019 and the pilot confirmed that the BOD exiting the final lagoon was not significantly inhibitory to the nitrification process. The nitrification process also did not demonstrate an increase in the effluent TSS concentrations. This pilot project will be discussed further in section 8.1. The results of the pilot project demonstrated that the existing lagoon and filtration system will be capable of providing advanced removal of TAN, TSS and BOD.

The effluent limits and objectives which form part of the ESR's recommendations at Mapleton WPCP's planned capacity of 1,300 m^3/day are presented in Table 3-8.

Table 3-8: Effluent Compliance and Limit Objectives

Parameter	Previous ECA (750m³/d) Average Concentration (mg/L) Compliance Limits	Previous ECA (750m³/d) Average Concentration (mg/L) Objectives	Interim Re-rating (900m³/d) Average Concentration (mg/L) Compliance Limits	Interim Re-rating (900m³/d) Average Concentration (mg/L) Objectives	Expansion (1,300m³/d) Average Concentration (mg/L) Compliance Limits	Expansion (1,300m³/d) Average Concentration (mg/L) Objectives
$CBOD_5$	7.5 (Apr. & Oct.) 10.0 (Mar., Nov. & Dec.)	5.0	7.5 (Apr. & Oct.) 10.0 (Mar., Nov. & Dec.)	5.0	7.5 (Apr. & Oct.) 10.0 (Mar., Nov. & Dec.)	5.0
TSS	-	-	25	15	15	10
TAN (NH4+NH3)	5.0	3.0	5.0	3.0	3.0	1.0
TP	0.5	0.3	0.42	0.25	0.3	0.17
E.coli (CFU/100mL)	200	100	200	100	200	100
pH	6.0 – 9.5	6.5 – 8.5	6.0 – 9.5	6.5 – 8.5	6.0 – 9.5	6.5 – 8.5

4 Assimilative Capacity Study

An assimilative capacity study (ACS) was completed in 2017 as a component of the ESR (provide reference). The ACS concluded that if the WPCP were to extend discharge into January and February to accommodate increased flow from the expansion, un-ionized ammonia levels (UIA) in the receiver would meet the Provincial Water Quality Objectives (PWQO). Table 4-1 below shows the proposed discharge values. While the effluent quality limits and objectives proposed in the ESR at the 1300 m^3/day capacity were accepted in principle, the MECP requested additional sampling be conducted to resolve data gaps in background river water quality during the proposed winter discharge period.

Table 4-1: Proposed 2017 ESR Discharge Volumes

Month (m^3/d)	Rated Capacity – 750 m^3/d	Rated Capacity – 900 m^3/d	Rated Capacity – 1,300 m^3/d
January	-	-	3,000
February	-	-	2,660
March	1,581	2,559	2,110
April	3,154	4,000	3,773
October	233	233	300
November	1,754	1,854	1,760
December	4,000	4,000	4,000

To resolve the data gaps and to determine the impact of effluent discharge during the winter months, the GRCA implemented a monitoring program of the Conestogo River between 2016 and 2018 to collect water quality data during January and February. Results from this monitoring program were incorporated into the data set of the ACS completed by EXP and a revised The ACS was completed updated by Hutchinson Environmental Sciences Ltd. in November 2023 to include both the GRCA winter data and recent (2007–2021) water quality data collected from MECP's Provincial Water Quality Monitoring Network Station. The updated ACS concluded that the addition of water quality data from January to February did not change the conclusions of the ACS completed in 2017. Updated mass-balance modelling predicted that downstream un-ionized ammonia concentrations will remain below the PWQO, which meets MECP Policy 1 for unionized ammonia (UIA). Downstream Total Phosphorus (TP) concentrations and WPCP effluent loads were predicted to decrease, which meets MECP Policy 2 for TP. Downstream water quality is predicted to improve with the

WPCP expansion due to reduced effluent limits of Total Ammonia Nitrogen (TAN) and TP. Overall, the analysis of the additional data for January and February confirmed that downstream water quality would continue to meet MECP policies with the WPCP expansion to 1,300 m^3/day, and did not change the conclusions of the ACS completed in 2017.

5 Description of the Environment

The 2017 Class EA by EXP conducted a Natural Environment Study within the study area, including a review of the Conestogo River and subwatershed, site conditions, and a natural heritage report. Since this Addendum is focused on the WPCP capacity upgrades and selection of Nitrogen Removal Technology, the findings from the 2017 Class EA are anticipated to remain current and do not need to be amended for this section.

6 Alternative Design Concepts

6.1 Screening Criteria and Methodology

The 2017 MCEA evaluated the technology alternatives based on the following criteria.

Table 6-1: 2017 MCEA Screening Criteria

Screening Criteria	Criteria	Definition
Technical	Effluent water quality	Ability of the alternative to meet effluent limits
	Ease of implementation	Whether implementation of the solution will be relatively straight forward or will be technically complex or disruptive
	Approvals required	The number and complexity of approvals required
Natural Environment	Impact on terrestrial environment, such as woodlots, parks or habitats	The potential impact of the solution on the terrestrial environment
	Impact on aquatic environment, such as within the Conestogo River or Conestogo Lake	The potential impact of the solution on the aquatic environment
Social / Cultural	Archeological	The potential impact of the solution on archeological resources
	Nuisance to Local Community during Construction	The potential impact of dust, noise and odours from construction activity on nearby residents.
	Nuisance to Local Community during operations	The potential impact of dust, noise and odours during operations activity on nearby residents.

Screening Criteria	Criteria	Definition
Financial	Capital Costs	The estimated capital cost of the solution
	Operating Costs	The estimated annual operating cost of the solution

An updated evaluation matrix was developed to score the SAGR system, MBBR system. Within this EA addendum, the additional criteria were scored alongside the original criteria for a comprehensive technology evaluation. A score of 5 is the highest score in each category indicating an excellent ability to meet the category. A score of zero (0) indicates that the treatment system has a poor ability to meet the category requirements. These categories are summarized below in Table 6-2.

Table 6-2: Updated Screening Criteria

Screening Criteria	Description
Performance in Winter	Performance evaluation of the nitrification treatment process in cold weather, based on historic performance results. This is a key evaluation criteria of potential nitrification processes at Mapleton WPCP.
Physical Dimensions	The ability of the treatment system to fit within the constraints of the existing lagoons, structures, and access roads.
Maintenance	Evaluates the maintenance frequency and complexity of the system. Highest score would be assigned to a technology that minimizes risks, has a high system reliability, and minimizes operator involvement. Items to consider include equipment material, operating style, and susceptibility of exposure to wear and tear.
Capital and 20-year NPV	Evaluation of the capital costs for maintenance, operating and energy cost.

6.2 Overview

6.2.1 Nitrogen Removal Technologies

Historic data and reports from the OCWA Operators and the Township have confirmed that the facility has not always discharged in the early spring because the ammonia nitrogen limits could not be met due to insufficient nitrogen removal over the winter. For example, there was no discharge in March 2017 due to ice cover and high ammonia nitrogen levels in the lagoons. This indicates the WPCP requires an additional treatment process to allow nitrogen removal during colder months, particularly with the proposed discharge window extension through January and February.

Upgrades to the Mapleton WPCP secondary treatment process will include the application of some form of the activated sludge process. The activated sludge process is one of the most widely used secondary treatment process, with many variations, but all consist essentially of an aerated biological reactor followed by a solid's separation process. Nitrification can be accomplished by operating the process at a minimum required solids retention time (SRT) while supplying adequate oxygen. Additional solids and phosphorus removal can be accomplished through chemical addition and/or providing downstream tertiary treatment.

The following secondary treatment processes were reviewed as potential nitrification treatment alternatives for the Mapleton WPCP:

- Add a Submerged Aerated Growth Reactor (SAGR) process
- Add a Moving Bed Bioreactor (MBBR) process

Each of these design alternatives are described in more detail in the subsequent sections.

6.2.2 Alternative 1 – Submerged Aerated Growth Reactor (SAGR)

6.2.2.1 General Process Description

The SAGR process is a modification of the conventional activated sludge process in which primary settling tanks are omitted. Raw wastewater is introduced to the aeration tank where it is mixed and aerated to stimulate the conversion of soluble and colloidal organic matter in the wastewater to microorganisms (biomass). Longer aeration tanks of 18 to 24 hours and lower organic loadings are normally required to obtain acceptable effluent quality. The mixed liquor then flows to a secondary clarifier, where solids settle to the bottom of the tank and secondary treated effluent flows to the disinfection process.

A SAGR system was the recommended nitrification treatment process for the 2017 Class EA by EXP. SAGR is a patented process designed to provide nitrification in cold to moderate climates (Nexom, 2018). Cells in the SAGR beds contain clean gravel through which wastewater flow is evenly distributed for aerobic treatment across the width of the cell.

There are several benefits to the proposed SAGR nitrification treatment system as summarized in the ESR. Several important aspects of the SAGR beds that meet the Township's needs are noted below:

- SAGR has experience with cold climate nitrification in conjunction with lagoon treatment. There are a few installations in Ontario; the first of which was installed in Glencoe, ON in 2011.
- The SAGR system requires low operational and maintenance effort.
- SAGR systems in Ontario with similar municipal influent characteristics have consistently been able to meet the TAN limits (3.0 mg/L) proposed for the Mapleton WPCP during both summer and winter operation.
- Implementing SAGR would provide nitrification and continue to utilize the existing treatment lagoons at the Mapleton WPCP, resulting in cost effective upgrades for the Township.
- Given appropriate construction phasing, SAGR beds can be implemented during one summer construction season.

The SAGR cells would consist of a media bed, coarse bubble air diffuser system and new blower building, influent distribution piping and effluent collection piping, and a cover layer of wood chips or mulch. The media material used in the SAGR would be uniformly graded clean rock or stone. The two SAGR units would be installed in parallel, which allows for the possibility to isolate one of the reactors while keeping the other in operation (e.g., for maintenance or repair). The SAGR process is shown schematically in Figure 6-1 below.

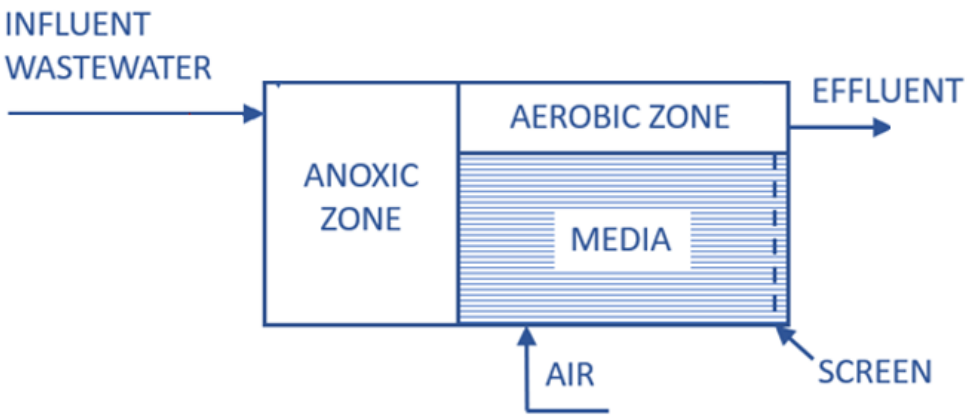

Figure 6-1: Typical SAGR Process Schematic

The SAGR process normally provides good treatment including nitrification and is well suited for small communities with primarily domestic wastewater. The process is capable of accommodating variations in hydraulic loadings that are typical for small communities and produces less sludge than a conventional activated sludge plant Figure 6-2 below shows the proposed SAGR system layout from the 2017 ESR.

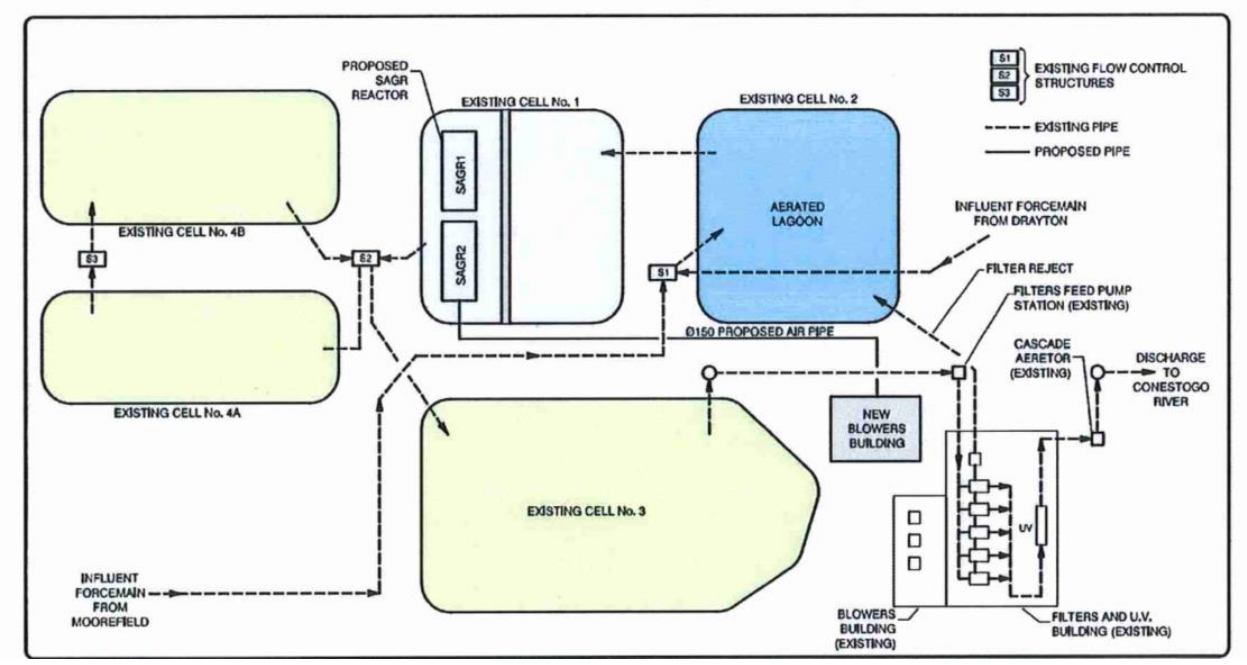

Figure 6-2: Proposed SAGR System Layout From the 2017 ESR

6.2.2.2 Performance in Winter

SAGR is a commonly used technology for smaller wastewater treatment plants. SAGR installations have shown effective nitrification year-round in cold climates.

6.2.2.3 Physical Dimensions

The SAGR has a large footprint requirement compared to newer technologies. SAGR will also require a large portion of Cell 1.

6.2.2.4 Maintenance

The SAGR is low maintenance. One (1) 50 HP blower will be in operation continuously, while the aeration system will require one operator for approximately 0.5 – 1.0 hour per day for routine maintenance and inspection.

6.2.2.5 Capital and 20-Year NPV Operating Cost

The capital cost in 2023 is estimated at $7.3M and the total 20-year NPV is estimated at $12.0M, assuming 4% interest rate and 7.7% inflation rate.

6.2.2.6 Advantages and Disadvantages

Table 6-3 provides a summary of the advantages and disadvantages of the SAGR system.

Table 6-3: Summary of Advantages and Disadvantages of SAGR Technology

Advantages	Disadvantages
• Established cold climate technology • Ammonia removal performance guarantee from the vendor	• Higher capital cost • High additional headloss – may decrease the available storage in downstream lagoons • Large space requirement

6.2.3 Alternative 2 – Moving Bed Bioreactor (MBBR)

6.2.3.1 General Process Description

The MBBR process is an attached growth aerobic process. MBBR is a variation of the conventional activated sludge (CAS) process in which inert plastic media (free floating or fixed to a grid) within the aeration tanks, provides a large surface area per unit volume for biomass to attach and grow within the bioreactor (Metcalf & Eddy, 2014). This allows a higher inventory of biomass to be maintained per unit tank volume than CAS or SAGR.

The components of a polishing MBBR treatment system include a concrete tank, stainless steel laterals and diffusers, blowers to provide oxygen for nitrification and mixing energy, and cylindrical plastic carriers (25mm diameter) which float in the tank to

provide a surface on which bacteria can grow. Figure 6-3 shows an example of these plastic carriers.

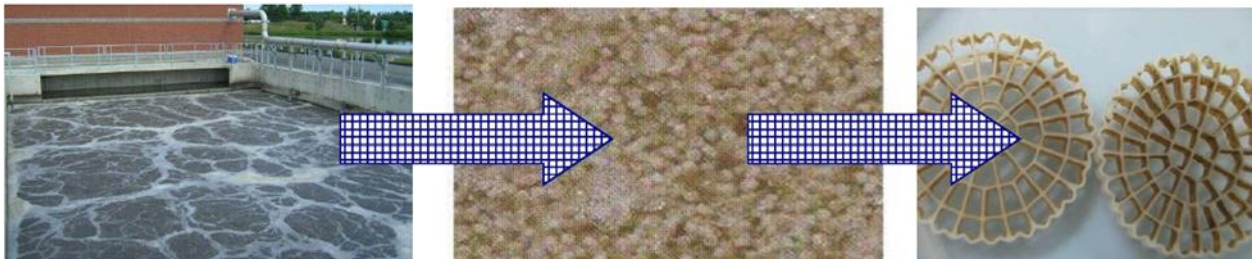

Figure 6-3: Biofilm Growth in MBBR Media

The carriers are retained in the tanks by sieves Figure 6-4 which allow the treated water to pass to downstream units for further processing. Stainless steel laterals and diffusers provided oxygen to the system for bacterial growth and mixing energy.

Figure 6-4: Aeration Grids & MBBR Sieves

One of the important features of the process is that biofilm thickness is controlled by the movement of the media so that diffusion through the biofilm is optimal. Detached biofilm is suspended within the reactor and leaves the reactor with the polished effluent. In the Mapleton lagoon setting, the slow growth rate of nitrifying bacteria means very little biomass sloughing will occur, hence no downstream TSS removal process is proposed. The MBBR is a stand-alone biological treatment system with no need for backwashing

of the media and unlike suspended growth treatment systems, the attached growth process requires no return of activated sludge thereby eliminating the need for return activated sludge pumps.

There are several benefits to implementing MBBR at Mapleton WPCP including:

- Reduced space requirements as compared to SAGR cells which would maintain the majority of the existing capacity of Cell 1, 3, 4A, and 4B.
- Reduced construction costs and
- Short construction timeframe.

Running the MBBR system only during the discharge period was reviewed for energy savings but not recommended by the vendors due to increased operational complexity and challenges in startup of nitrifier biomass on the plastic biofilm carriers. Retaining microorganisms within the MBBR year-round was recommended by the suppliers for effective nitrification during the winter.

A pilot demonstration of the MBBR system was completed in 2019 at the Mapleton WPCP to establish the design basis for the expansion to 1,300 m^3/day. The pilot testing program of the MBBR technology for ammonia removal in cold water was successfully achieved. A complete sampling campaign was effective in demonstrating that the MBBR technology is suitable for application for removing ammonia during the winter months and is a viable option to accommodate future growth. More information on this pilot program can be found in Section 8.1.

A typical MBBR process with floating biofilm carrier media is illustrated in Figure 6-5 below. Some unit processes within the figure would not be considered for the Mapleton WPCP, i.e. a secondary clarification and RAS.

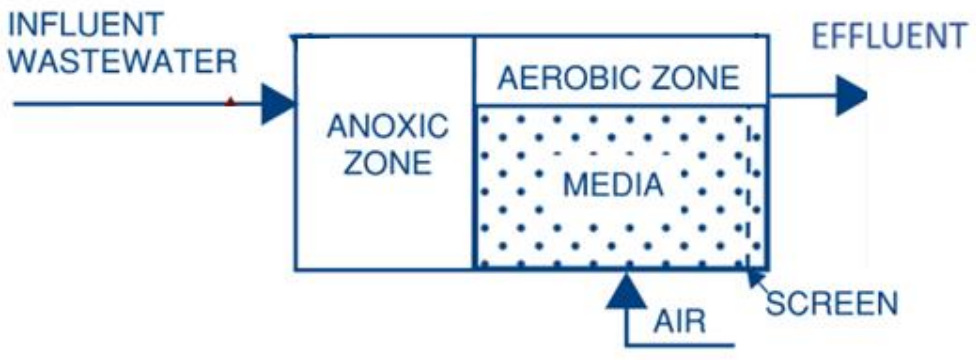

Figure 6-5: Typical MBBR Process Schematic

Figure 6-6 below shows the MBBR system layout from the 2017 ESR that considered installing the MBBR system prior to the flow entering Cell no. 2. CIMA+ has modified this layout to install the MBBR system into Cell 4B as shown in Figure 6-7.

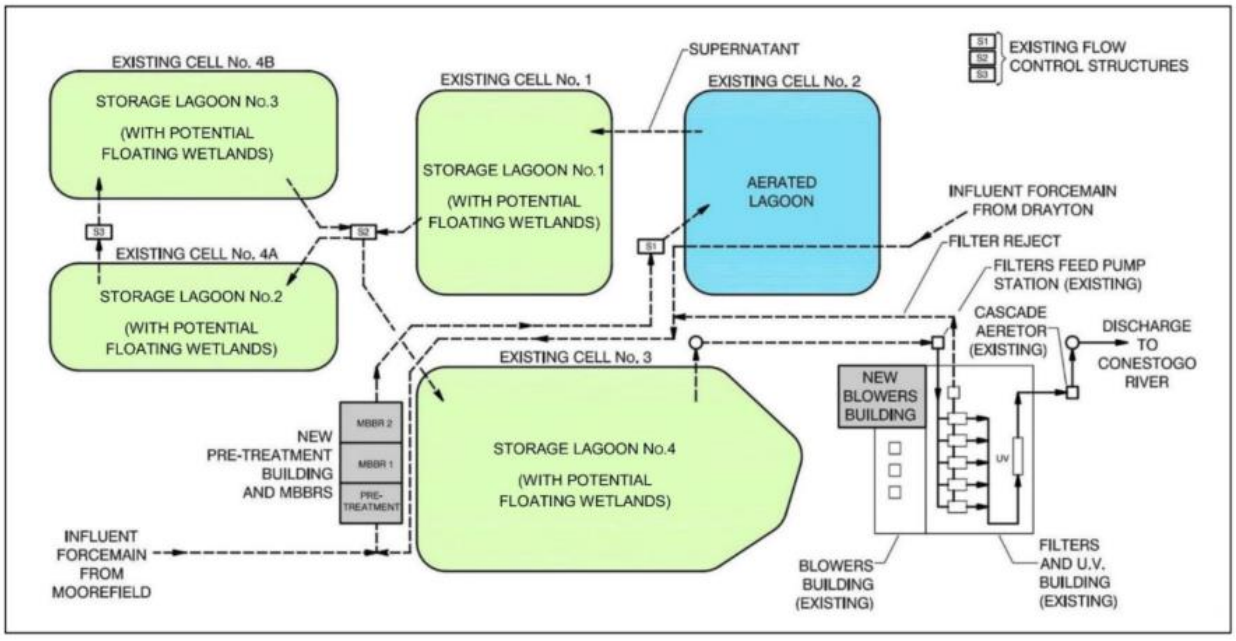

Figure 6-6: Proposed MBBR System Layout From the 2017 ESR

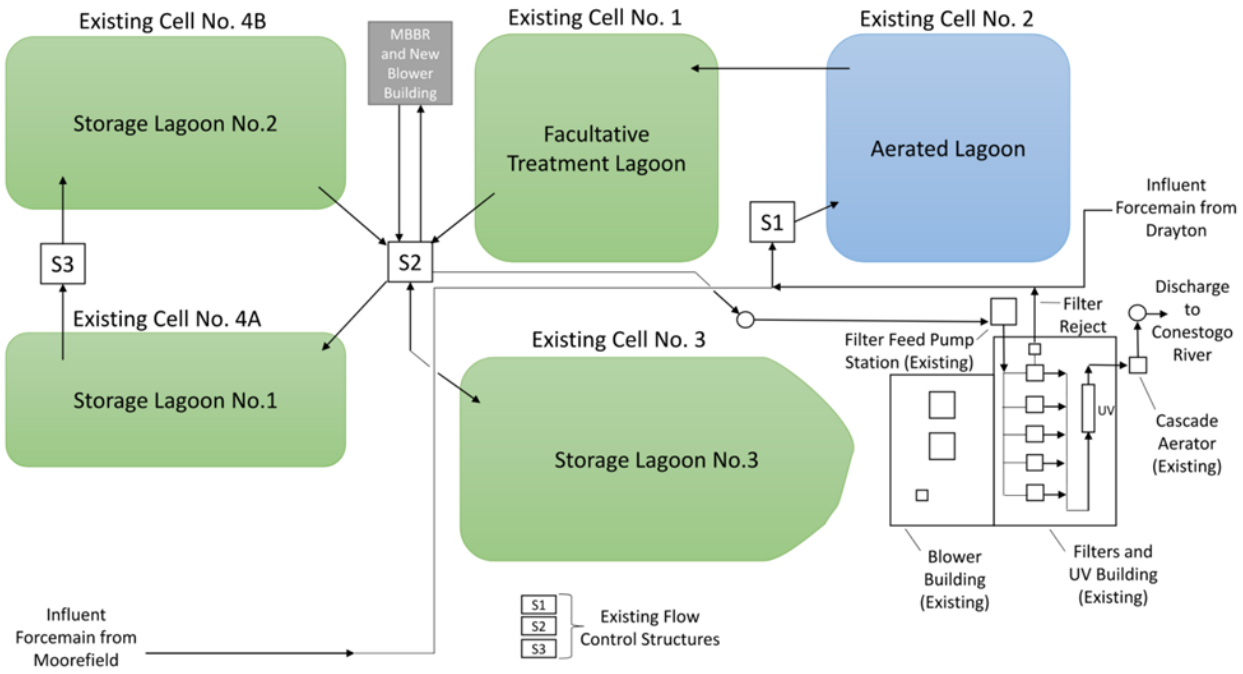

Figure 6-7: Proposed Layout for the MBBR System

6.2.3.2 Performance in Winter

There are no installations in Ontario for MBBR for post-lagoon nitrification, but this process has been demonstrated successful in Northern US and Quebec.

6.2.3.3 Physical Dimensions

The MBBR tank's footprint is much smaller than that of SAGR.

6.2.3.4 Maintenance and Operating Complexity

No significant amount of maintenance or operator intervention is required. System will require intermittent inspections to ensure the MBBR tank and aeration system is functioning properly.

6.2.3.5 Capital and 20-Year NPV Operating Cost

The capital cost in 2023 is estimated at $5.8M and the total 20-year NPV is estimated at $11.9M, assuming 4% interest rate and 4% inflation rate. Both capital costs and 20-year NPV for a MBBR system are lower than that of a SAGR system.

6.2.3.6 Advantages and Disadvantages

Table 6-4 provides a summary of the advantages and disadvantages of the MBBR technology.

Table 6-4: Summary of Advantages and Disadvantages of MBBR Technology

Advantages	Disadvantages
• Lower capital cost • Low additional headloss • Ammonia removal performance guarantee from vendor • Low space requirement • Highly modular – capabilities for future expansion	• Newer technology in Ontario • Additional operational oversight and costs will be required

6.2.4 Evaluation of Secondary Treatment Technologies

Table 6-5 summarizes the overall evaluation of the secondary treatment technologies and their application at the Mapleton WPCP. From the evaluation, it is recommended to implement MBBR for the facility expansion.

Table 6-5: Mapleton WPCP Secondary Treatment Technology Screening

Screening Criteria	Submerged Aerated Growth Reactor (SAGR)	Moving Bed Bioreactor (MBBR)
Performance	Relatively new technology. Known to show effective nitrification year-round in cold climates in Ontario and Canada.	Established technology. Limited number of installations in North America, though shown to be successful in Northern US and Quebec.
Maintenance	Low maintenance.	Medium Maintenance.
Physical Dimensions	SAGR has a larger footprint than MBBR. Cells will require large portion of Cell 1.	MBBR Tank's footprint is smaller than SAGR.
Capital Cost and 20-year NPV	Capital - $7.3M 20-year NPV - $8.07M	Capital - $5.8M 20-year NPV - $7.11M

7 Preliminary Cost Estimate

The Township requested that CIMA+ complete a peer review of the ESR's proposed design alternatives to quantify which treatment process is the most feasible for the Township to implement.

The high-level costs associated with implementing the SAGR cells for nitrification at Mapleton WPCP are summarized in Table 7-1.

Table 7-1: High-Level Costs for SAGR Implementation

Upgrade Item	Estimate Cost ($CAD, 2018)	Notes
Lagoon Sludge Inventory Investigation and Grid Analysis	$30,000	
Excavation	$100,000	1,000 m^3 at $100/$m^3$
Wall Framing and Sheathing	$528,000	440 m at $1,200/m
Backfill, Berm Construction, and Clay Lining Repair	$84,000	1,400 m^3 at $60/$m^3$
Geotextile	$600,000	12,000 m^2 at $50/$m^2$
HDPE Base Liner	$624,000	6,240 m^2 at $100/$m^2$
SAGR Gravel	$150,000	1,000 m^2 at $150/$m^2$
SAGR Wood Chips	$195,000	1,620 m3 at $120/$m^3$
Influent Flow Splitter Structure	$150,000	
Effluent Level Control Manholes	$300,000	2 at $150,000 each
Air Header Piping	$150,000	500 m at $300/m. Assuming Class EA placement of new blower building.
Inter SAGR Cell Piping	$100,000	
Chambers	$250,000	
New Blower Building	$200,000	Slab-on-grade, pre-fabricated building

Upgrade Item	Estimate Cost ($CAD, 2018)	Notes
SAGR Budgetary Quote	$1,440,000	Nexom, April 26, 2018, 1.5 safety factor
Capital Works Sub-Total	**$5,000,000**	
Contingency	$1,500,000	30% of capital works
Engineering and Construction	$750,000	15% of capital works
Capital Cost	**$7,250,000**	
20-Year NPV Life Cycle Cost	**$8,065,000**	

Table 7-2 below summarizes the high-level costs for implementation of MBBR (4m SWD tank) for nitrification at Mapleton WPCP.

Table 7-2: High-Level Costs for MBBR Implementation

Upgrade Item	Estimate Cost ($CAD, 2018)	Notes
Lagoon Sludge Inventory Investigation and Grid Analysis	$30,000	
Excavation	$120,000	1,200 m^3 at $100/$m^3$
Backfill, Berm Construction, and Clay Lining Repair	$84,000	1,400 m^3 at $60/$m^3$
Tank Walls	$756,000	210 m^3 at $3,600/$m^3$
Tank Slab	$495,000	225 m^3 at $2,200/$m^3$
Mud Slab	$216,000	135 m^3 at $1,600/$m^3$
Influent and Effluent Structures	$300,000	2 at $150,000/ea
Air Header Piping	$120,000	400 m at $300/m.
Inter MBBR Cell Piping	$150,000	
Chambers	$200,000	
New Blower Building	$500,000	Slab-on-grade, pre-fabricated building
MBBR Budgetary Quote	$936,000	Veolia, November 2022, 1.5 safety factor

Upgrade Item	Estimate Cost ($CAD, 2018)	Notes
Capital Works Sub-Total	**$4,000,000**	
Contingency	$1,200,000	30% of capital works
Engineering and Contingency	$600,000	30% of capital works
Capital Cost	**$5,800,000**	
20-Year NPV Life Cycle Cost	**$7,112,000**	

8 Preferred Alternative Conceptual Design

As noted in Section 3.3.4, expansion of the Mapleton WPCP from an average daily flow of 900 m^3/day to 1,300 m^3/day would serve the growth requirements of the Township of Mapleton to the year 2029. The 2017 MCEA by EXP recommended a SAGR treatment system, which is a proven cost-effective technology to improve cold weather nitrification performance. A MBBR was also considered as one of the ultimate servicing strategy alternatives for treatment prior to the existing lagoons but was not recommended as the preferred servicing option.

A MBBR is considered as a polishing option for nitrification after utilizing the existing lagoons for BOD removal. The peer review concluded that the significantly lower capital cost and space requirements for the MBBR system better suit the Township's needs for the Mapleton WPCP. Pilot testing of the MBBR technology during winter conditions, demonstrated that the technology is effective at reducing the TAN to the required concentration.

8.1 Pilot Testing

A pilot demonstration of the MBBR system was completed in 2019 by Veolia and the Township at the Mapleton WPCP to establish the design basis for the expansion to 1,300 m^3/day. The pilot testing program used the LagoonGuard™ technology. The LagoonGuard™ is based on the moving bed biofilm reactor (MBBR) principle where biofilm attaches and grows on submerged carriers. The LagoonGuard™ efficiency is increased through specially designed carriers. These carriers are designed to have a protected interior for biofilm growth and remain in constant movement in the reactor. The constant movement for LagoonGuard™ carriers is generated by the aeration system of the reactor, which can support fill fractions of 25 to 65% relative to the total reactor volume. The LagoonGuard™ technology has the added benefit of a flexible design and that can accommodate future increases in treatment capacity simply by increasing the fill fraction of the already installed reactor basin.

The LagoonGuard™ carriers are constantly colliding and subject to hydrodynamic shear forces. These processes act as a self-cleaning mechanism for the carriers and hence enable a consistent healthy biofilm. The self-cleaning mechanism eliminates the need for backwashing and all in basin components (aeration grid and carrier retention sieves) are designed to be maintenance free. These attributes allow the LagoonGuard™ to provide a significant increase in treatment capacity while maintaining the simplicity and operational ease associated with lagoon treatment facilities.

The LagoonGuard^{TM} pilot treatment enclosed in a trailer was supplied on site and installed besides the alum building. Figure 8-1 shows the location of the pilot unit at the Drayton WPCP.

Figure 8-1: Location of MBBR Pilot Unit

The pilot testing program of the MBBR technology for ammonia removal in cold water was successfully achieved. A complete sampling campaign was effective in demonstrating that the MBBR technology is suitable for application for removing ammonia during the winter months and is a viable option to accommodate future growth.

Some key results of the pilot testing program showed that:

- The LagoonGuardTM was effective at low water temperatures (Tmin = 1°C);
- The lagoon influent ammonia concentration increased steadily from 5 mg/L in
- December to 18 mg/L in the end of March, before decreasing slightly to 14 mg/L at the end of the pilot trial;
- The final LagoonGuardTM TAN effluent averaged 0.2 mg/L during low temperature operation;
- Nitrogen mass balance showed all ammonia was oxidized to nitrate validating the results and a sign of non-stressed bacterial growth;

- Three toxicity tests were performed on Daphnia magna and rainbow trout: The results indicated 0% mortality;
- Mortality was recorded for the final effluent (Reactor B).
- The biomass growth parameters were measured at optimum values and were not limiting factors for bacterial growth: pH, alkalinity, phosphorus, dissolved oxygen, etc.

The full pilot testing final report is included in Appendix D.

Table 8-1 below summarizes the wastewater composition of the raw wastewater pulled from Lagoon 1.

Table 8-1: Wastewater Composition for the MBBR Pilot Project

Parameter	Unit	Influent Value
BOD_5	mg/L	40
TSS	mg/L	40
TKN	mg/L	48
Influent Water Temperature	°C	0.5 - 20

8.2 MBBR Installation References

A list of MBBR references as post-lagoons configurations and at low temperatures, are provided below in Table 8-2. A full list of references is available in Appendix F.

Table 8-2: MBBR References and Contact Information

Facility	Location	Flow Rate
Ste-Julie Wastewater Facilities	Quebec, Canada	16,700 m^3/d
Noyan Wastewater Treatment Plant	Quebec, Canada	400 m^3/d
Marbleton Wastewater Treatment Plant	Wyoming, United States	3,104 m^3/d

8.3 Preliminary Design Concept

To meet the expansion needs of the Township and ensure improved year-round ammonia removal for the projected growth of residential development, it is advisable to incorporate an MBBR system. The 2019 Pilot Study confirmed that an MBBR system

can achieve satisfactory levels of ammonia removal even during low-temperature periods at the Mapleton WPCP.

Proposed dimensions of the MBBR tank include 4m or 6m in depth (depending on geotechnical requirements) while treating up to the maximum discharge flow rate at the plant. The components of a polishing MBBR treatment alternative include:

- A concrete tank
- Stainless steel laterals and diffusers
- Blowers to provide oxygen for nitrification and mixing energy
- Cylindrical plastic carriers (25mm diameter) which float in the tank to provide a surface on which bacteria can grow.

The proposed configuration of the Mapleton WPCP unit processes is depicted in Figure 8-2 below.

Table 8-3 summarizes the suggested design characteristics for the MBBR process by Veolia.

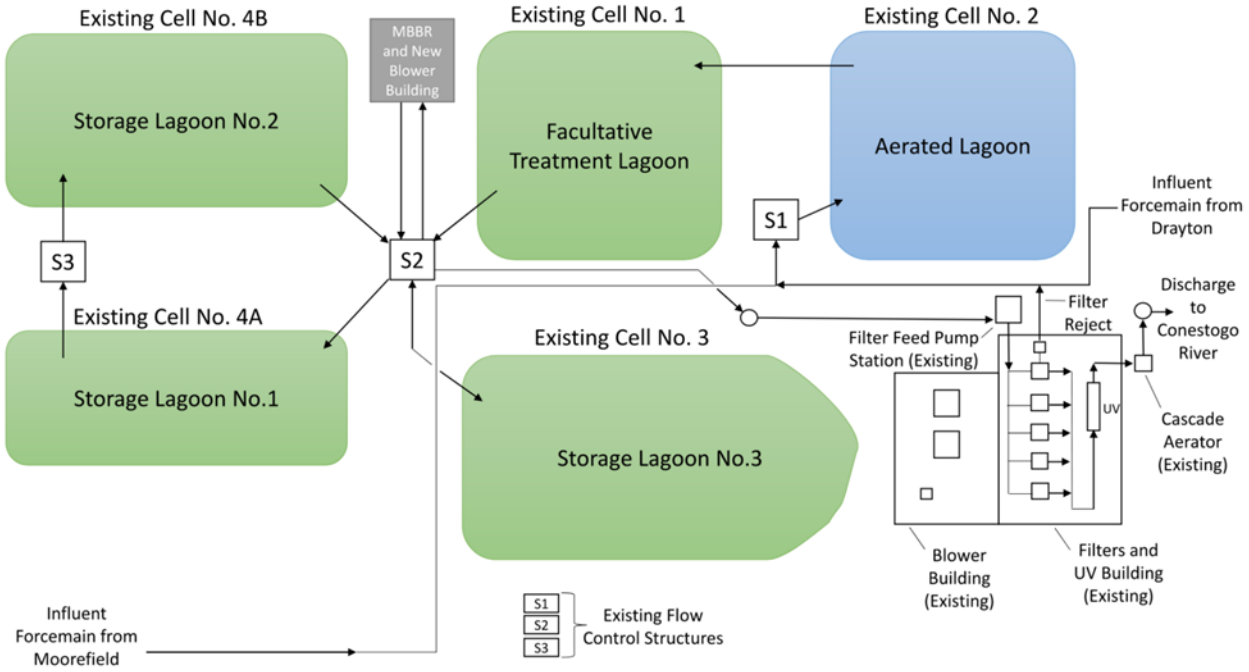

Figure 8-2: Preliminary MBBR Process Flow Diagram

Table 8-3: Design Characteristics of Recommended MBBR Process

Parameter	Unit	Values	Values
Side Water Depth	m	6	4
Average Day Design Flow	m^3/d	1,300	1,300
Hydraulic Capacity	m^3/d	4,000	4,000
Total Reactor Volume	m^3	1,440	1,440
Number of Trains	-	1	1
Number of Reactors per Train	-	2 (Nitrification)	2 (Nitrification)
Media Type	-	K5	K5
Total footprint (estimated)	m^2	240	360
Width of reactor	mm	11,000	13,400
Length of reactor	mm	11,000	13,400
Total length of train (without concrete wall thickness)	mm	22,000	26,800
Total process air requirement	Nm^3/h	1,500	2,400
Blowers Operation Pressure	Kpa	53.8	43.4

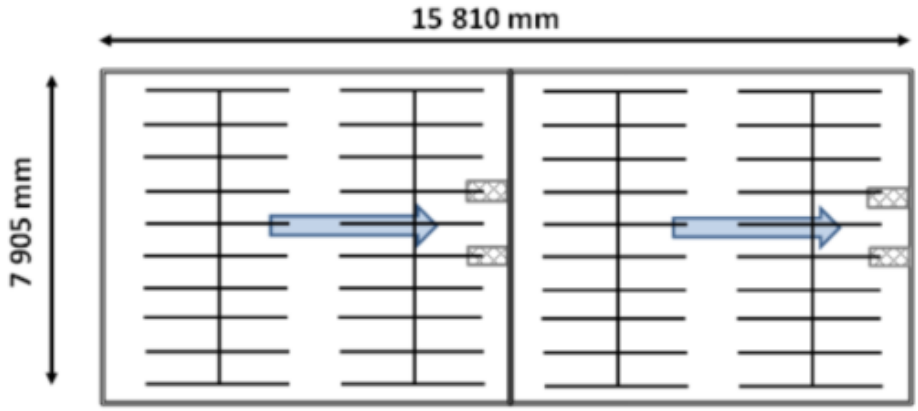

Figure 8-3: Schematic of Proposed Dimensions for a LagoonGuard at 4.0 m Side Water Depth

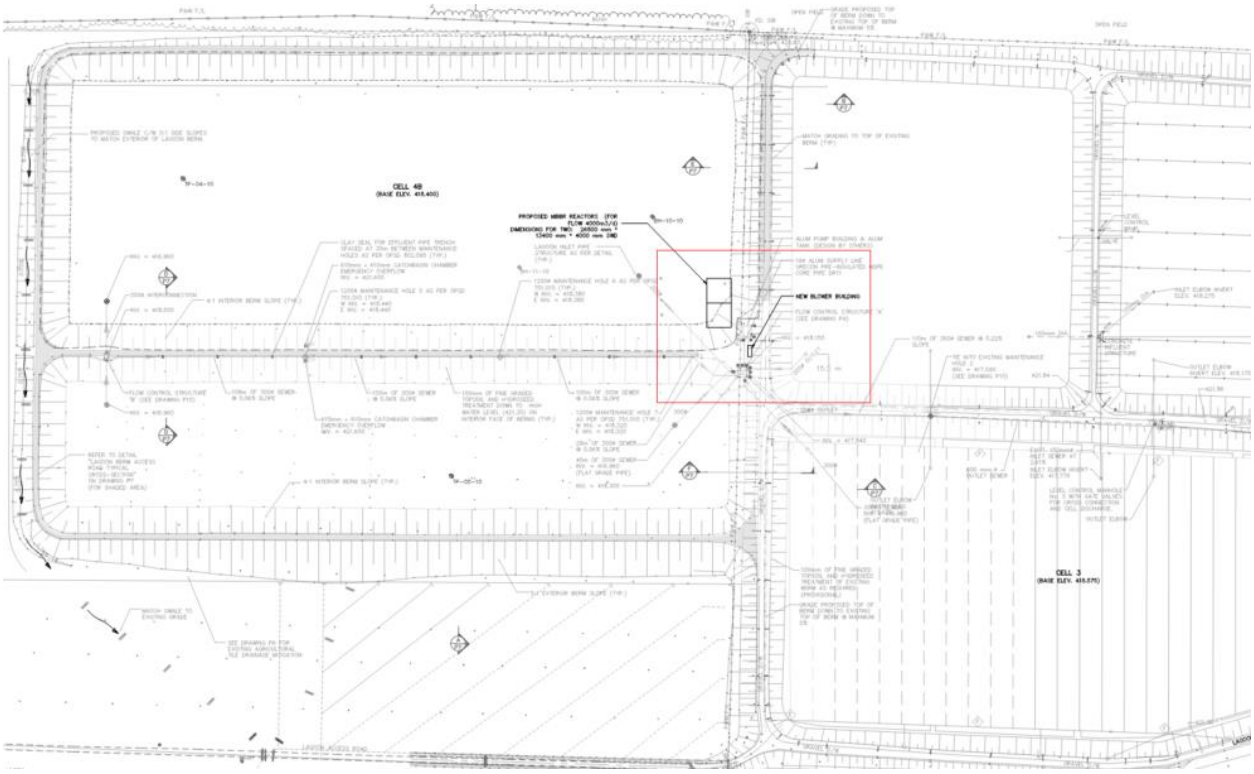

Figure 8-4: Overview of Mapleton WWTP and Location of MBBR and Control Building

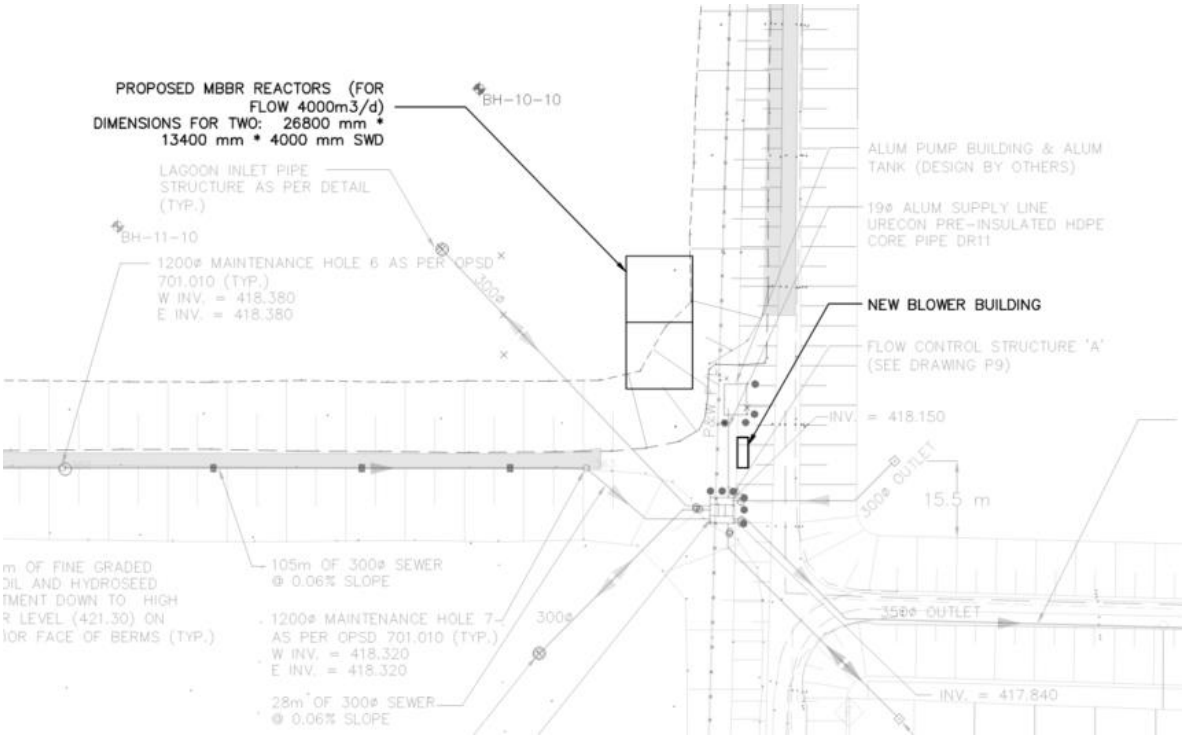

Figure 8-5: MBBR System and Control Building

9 Summary

The Township of Mapleton completed a Schedule 'C' Class Environmental Assessment (Class EA) (exp., 2017) to allow a capacity increase from the Mapleton WPCP (ECA Number 1391-B38PLA) from the current 900 m^3/day to 1,300 m^3/day. The Class EA resulted in a preferred solution requiring the additional biological treatment of ammonia through an attached growth reactor. The Class EA also required the collection of additional river water quality data to verify the conclusions of the Receiving Water Impact Assessment (RWIA) (exp., 2017) and required the subsequent filing of an Addendum to the Class EA. Since the completion of the Class EA, the Township has successfully pilot tested a Moving Bed Bioreactor (MBBR) attached growth reactor and the Grand River Conservation Authority (GRCA) has collected additional river water quality data over the 2016-2018 period. The Township retained CIMA Canada Inc. and their subconsultants, Hutchinson Environmental Sciences Ltd., to complete and file the Addendum to the 2017 Class EA to allow the required capital works for the expansion of the WPCP to the 1,300 m^3/day capacity to proceed. Additionally, due to current development pressures, CIMA+ and Hutchinson have been retained to complete a separate Class EA to accommodate growth for the next 20-year planning horizon.

The MCEA recommended a SAGR system for cold weather nitrification, but an MBBR system was later considered to have lower capital and operating costs and was determined to be the preferred alternative. The MBBR system was tested in a pilot study and found to achieve satisfactory levels of ammonia removal during critical low-temperature periods. The proposed MBBR system includes a concrete tank, stainless steel laterals and diffusers, blowers for oxygen supply and mixing energy, and cylindrical plastic carriers for bacteria growth. The estimated cost for the MBBR system is $5.8M in 2023 with a total 20-year NPV of $7.1M.

10 References

Metcalf & Eddy AECOM. (2013). *Wastewater Engineering: Treatment and Resource Recovery.* McGraw-Hill Education.

Ministry of the Environment, Conservation and Parks (MECP). (2008). *Design Guidelines for Sewage Works.* Ministry of the Environment, Conservation and Parks (MECP).

Water Environment Federation (WEF). (2012). *Membrane Bioreactors WEF Manual of Practice No. 36.* Alexandria: McGraw-Hill.

A

Appendix A: Growth and Wastewater Flow Forecast and Design Basis Calculations

CALCULATIONS COVER PAGE

Project Number:	T001935A
Project Title:	Mapleton WPCP Upgrades
Name of Client:	Mapleton Township
Calculation Title:	Historical Raw WW Characteristics

Calculations Performed By: Charlotte C

Date: 12-Feb-24

Calulations Verified By: Adam M

Date: 30-Mar-24

Hypothesis and Head Start Data:

Acceptance Criteria:

References:
OCWA annual reports (2012-2022)

Raw Data from OCWA Annual Report

Historical Raw Wastewater Characteristics

Date	BOD_5 (mg/L)	TSS (mg/L)	TP (mg/L)	TKN (mg/L)
Jan-12	389	516	11.1	42.5
Feb-12	207	194	5.4	45.2
Mar-12	128	160	3.1	19.5
Apr-12	174	180	4.0	33.4
May-12		231	3.9	46.2
Jun-12		236	5.2	39.1
Jul-12	225	229	7.2	80.0
Aug-12	168	210	4.6	37.7
Sep-12	216	198	3.9	39.4
Oct-12	195	204	6.4	63.0
Nov-12	289	184	5.3	41.2
Dec-12	141	152	2.9	23.2
Jan-13	161	124	2.3	27.7
Feb-13	238	162	3.8	31.4
Mar-13	183	210	3.6	32.6
Apr-13	195	193	4.4	34.2
May-13	134	145	1.6	24.3
Jun-13	277	242	1.7	40.3
Jul-13	257	215	1.6	42.0
Aug-13	227	280	4.5	40.5
Sep-13	247	228	8.5	63.0
Oct-13	280	139	5.3	45.0
Nov-13	170	194	5.5	27.1
Dec-13	191	200	3.6	36.0
Jan-14	218	174	5.0	42.2
Feb-14	236	208	6.2	44.0
Mar-14	268	196	7.4	65.2
Apr-14	81	124	1.8	14.8
May-14	160	174	2.8	33.7
Jun-14	305	316	6.9	50.5
Jul-14	256	176	2.1	34.7
Aug-14	197	227	6.3	47.9
Sep-14	168	185	3.5	34.5
Oct-14	218	236	6.4	53.6
Nov-14	182	180	4.3	33.7
Dec-14	280	292	9.9	81.3
Jan-15	205	236	5.0	44.7
Feb-15	76	55	4.4	33.1
Mar-15	208	187	4.1	39.2
Apr-15	180	188	3.8	25.0
May-15	263	280	7.1	61.8
Jun-15	245	291	6.4	65.0
Jul-15	303	252	7.8	75.6
Aug-15	216	260	7.3	72.5
Sep-15	216	252	7.8	38.9
Oct-15	264	192	5.5	53.4
Nov-15	202	198	3.8	31.0
Dec-15	234	249	8.9	88.4
Jan-16	179	191	4.8	31.2
Feb-16	342	250	5.4	37.6
Mar-16	286	262	9.8	79.7
Apr-16	329	235	7.5	64.5
May-16	374	284	8.1	80.0
Jun-16	246	260	8.1	56.8
Jul-16	334	391	8.1	68.3
Aug-16	246	238	8.3	48.8
Sep-16	287	263	6.4	46.6
Oct-16	243	341	9.1	80.4
Nov-16	247	247	5.2	44.2
Dec-16	188	163	4.9	45.7
Jan-17	84	97	2.3	12.4
Feb-17	168	179	2.6	22.6
Mar-17	204	197	3.7	33.6

Apr-17	269	413	7.3	59.0
May-17	285	262	7.3	63.2
Jun-17	306	283	6.8	61.2
Jul-17	381	262	8.3	76.8
Aug-17	199	153	4.6	37.4
Sep-17	338	220	6.8	54.2
Oct-17	339	262	7.9	74.1
Nov-17	232	241	6.1	46.5
Dec-17	300	170	7.1	55.9
Jan-18	190	133	2.7	21.0
Feb-18	151	150	3.7	31.7
Mar-18	258	223	2.1	53.0
Apr-18	132	143	2.8	
May-18	213	206	5.0	20.7
Jun-18	219	287	6.8	48.1
Jul-18	282	286	7.1	53.8
Aug-18	271	385	8.4	54.7
Sep-18	278	297	8.3	73.3
Oct-18	274	305	8.1	70.6
Nov-18	215	299	5.5	41.7
Dec-18	251	183	4.3	35.8
Jan-19	166	262	5.8	55.0
Feb-19	305	300	6.9	58.3
Mar-19	185	182	3.4	29.5
Apr-19	238	202	3.3	27.0
May-19	201	156	4.3	40.7
Jun-19	223	244	4.2	35.8
Jul-19	318	409	8.7	85.1
Aug-19	236	246	6.0	62.7
Sep-19	264	261	9.2	87.1
Oct-19	239	344	6.6	64.4
Nov-19	220	141	8.9	51.1
Dec-19	314	311	7.9	72.0
Jan-20	304	332	6.1	67.5
Feb-20	337	311	5.6	64.0
Mar-20	340	330	7.1	68.3
Apr-20	209	244	5.4	51.1
May-20	256	260	6.1	60.6
Jun-20	327	344	7.1	65.5
Jul-20	546	311	6.5	65.0
Aug-20	304	285	6.8	64.1
Sep-20	283	362	7.8	77.9
Oct-20	281	255	5.9	47.5
Nov-20	285	141	5.3	56.5
Dec-20	286	286	5.6	59.5
Jan-21	427	355	7.4	60.5
Feb-21	169	140	5.8	46.7
Mar-21	412	380	6.1	48.8
Apr-21	285	268	6.6	59.7
May-21	320	326	7.6	63.1
Jun-21	220	176	7.0	59.7
Jul-21	326	254	10.6	76.1
Aug-21	400	413	8.5	74.1
Sep-21	253	257	6.3	57.1
Oct-21	228	270	7.1	69.7
Nov-21	270	305	6.4	55.3
Dec-21	290	340	6.3	55.8
Jan-22	366	495	9.2	82.8
Feb-22	265	406	7.5	64.2
Mar-22	187	268	6.0	52.3
Apr-22	283	291	7.2	64.8
May-22	270	209	5.7	53.2
Jun-22	339	292	7.6	65.3
Jul-22	364	363	10.8	91.8
Aug-22	416	365	8.9	69.4
Sep-22	378	358	9.6	85.0
Oct-22	361	209	8.6	81.1
Nov-22	406	397	9.9	90.0
Dec-22	219	165	7.1	68.6

Historical Raw Wastewater Characteristics

Parameter	Site Wastewater Concentrations (mg/L) Monthly Average	Site Wastewater Concentrations (mg/L) 50th Percentile	Typical Wastewater Concentration (mg/L) MECP[2]
BOD_5	255	249	150 – 200
TSS	248	244	150 – 200
TP	6.1	6.2	6.0 – 8.0
TKN	53	53	30 – 40

Historical WW Flows

Historical WW Flows for Drayton SPS

Year	Average Daily Flow (m^3/d)	Maximum Daily Flow (m^3/d)
2016	525	2160
2017	598	2675.0
2018	563	2835
2019	574	1977
2020	Adam M	4083.0
2021	45381	1872
2022	566	2680
Average	8035	2612

Historical WW Flows for Moorefield SPS

Year	Average Daily Flow (m^3/d)	Maximum Daily Flow (m^3/d)
2016	75	138
2017	79	237
2018	77	182
2019	74	170
2020	76	289
2021	75	152
2022	70	168
Average	75	191

	Population (GSP)		Households (GSP)				Average Flow (m3/d)	
Year	Drayton	Moorefield	Drayton	Additional	Moorefield	Additional	Drayton	Moorefield
2016	2,285	440					525	75
2017	2,402	473					598	79
2018	2,518	507					563	77
2019	2,635	540					575	74
2020	2,751	574					571	76
2021	2,868	607	850		180		564	75
2022	2,928	604	866	16	175		647	104
2023	3,002	678	892	42	198	18	663	117
2024	3,076	752	917	67	222	42	679	130
2025	3,150	825	943	93	246	66	696	143
2026	3,200	900	960	110	270	90	707	155
2027	3,299	973	994	144	294	114	729	168
2028	3,373	1,047	1,020	170	318	138	745	181
2029	3,447	1,121	1,045	195	342	162	761	194
2030	3,522	1,195	1,071	221	365	185	778	206
2031	3,641	1,181	1,110	260	360	180	804	204
2032	3,670	1,343	1,122	272	413	233	811	232
2033	3,744	1,417	1,148	298	437	257	827	245
2034	3,819	1,490	1,173	323	461	281	843	257
2035	3,893	1,564	1,199	349	485	305	860	270
2036	3,779	1,531	1,160	310	470	290	835	264
2037	4,041	1,712	1,250	400	532	352	893	296
2038	4,116	1,786	1,275	425	556	376	909	308
2039	4,190	1,860	1,301	451	580	400	925	321
2040	4,264	1,934	1,327	477	604	424	942	334
2041	4,507	2,125	1,400	550	660	480	995	367
2042	4,413	2,082	1,378	528	652	472	975	360
2043	4,487	2,155	1,403	553	676	496	991	372
2044	4,561	2,229	1,429	579	699	519	1,007	385
2045	4,635	2,303	1,454	604	723	543	1,024	398
2046	4,793	2,349	1,510	660	740	560	1,058	406
2047	4,784	2,451	1,506	656	771	591	1,057	423
2048	4,858	2,525	1,531	681	795	615	1,073	436
2049	4,932	2,599	1,557	707	819	639	1,089	449
2050	5,007	2,673	1,582	732	843	663	1,106	462
2051	4,983	2,775	1,580	730	880	700	1,100	479

Average Flow (m3/d)		Average Flow (L/s)		Total Average Daily Flow (m3/d)	Total Average Daily Flow (L/s)	Maximum Daily Flow (m3/d)		Total Maximum Daily Flow (m3/d)	Maximum Daily Flow (L/s)		Harmon Peak Factor				Maximum Daily Flow using Harmon (m3/d)		Total Maximum Daily Flow (m3/d)	Maximum Daily Flow using Harmon (L/s)	
Drayton	Moorefield	Drayton	Moorefield			Drayton	Moorefield		Drayton	Moorefield	Drayton	Moorefield	Total	Combined	Drayton	Moorefield		Drayton	Moorefield
525	75	6.1	0.9	601	7.0	811	89	900	9	1.0	3.54	4.00	2725	3.48	1860	302	2161	21.5	3.5
598	79	6.9	0.9	677	7.8	885	89	975	10	1.0	3.52	3.99	2875	3.46	2106	315	2422	24.4	3.6
563	77	6.5	0.9	641	7.4	951	104	1054	11	1.2	3.51	3.97	3025	3.44	1975	307	2282	22.9	3.6
575	74	6.7	0.9	649	7.5	831	87	918	10	1.0	3.49	3.96	3175	3.42	2006	293	2300	23.2	3.4
571	76	6.6	0.9	647	7.5	870	97	967	10	1.1	3.47	3.94	3325	3.40	1984	298	2282	23.0	3.4
564	75	6.5	0.9	639	7.4	779	91	870	9	1.1	3.46	3.93	3475	3.39	1952	293	2245	22.6	3.4
878	136	10.2	1.6	1,014	11.7	2,955	435	3390	34	5.0	3.45	3.93	3532	3.38	3031	534	3565	35.1	6.2
901	152	10.4	1.8	1,053	12.2	3,030	488	3518	35	5.6	3.44	3.90	3680	3.37	3100	595	3695	35.9	6.9
923	169	10.7	2.0	1,092	12.6	3,105	541	3646	36	6.3	3.43	3.88	3828	3.35	3168	656	3824	36.7	7.6
945	186	10.9	2.1	1,131	13.1	3,180	594	3774	37	6.9	3.42	3.85	3976	3.34	3236	715	3952	37.5	8.3
960	203	11.1	2.3	1,163	13.5	3,230	648	3878	37	7.5	3.42	3.83	4100	3.32	3282	775	4057	38.0	9.0
990	219	11.5	2.5	1,209	14.0	3,329	701	4030	39	8.1	3.41	3.81	4272	3.31	3372	834	4206	39.0	9.7
1012	236	11.7	2.7	1,248	14.4	3,404	754	4158	39	8.7	3.40	3.79	4420	3.29	3439	892	4332	39.8	10.3
1034	252	12.0	2.9	1,286	14.9	3,479	807	4286	40	9.3	3.39	3.77	4569	3.28	3506	950	4457	40.6	11.0
1057	269	12.2	3.1	1,325	15.3	3,554	860	4415	41	10.0	3.38	3.75	4717	3.27	3573	1008	4581	41.4	11.7
1092	266	12.6	3.1	1,358	15.7	3,675	850	4525	43	9.8	3.37	3.75	4822	3.26	3681	997	4678	42.6	11.5
1101	302	12.7	3.5	1,403	16.2	3,704	967	4671	43	11.2	3.37	3.71	5013	3.24	3707	1122	4829	42.9	13.0
1123	319	13.0	3.7	1,442	16.7	3,779	1,020	4799	44	11.8	3.36	3.70	5161	3.23	3773	1178	4952	43.7	13.6
1146	335	13.3	3.9	1,481	17.1	3,854	1,073	4927	45	12.4	3.35	3.68	5309	3.22	3839	1235	5074	44.4	14.3
1168	352	13.5	4.1	1,520	17.6	3,929	1,126	5055	45	13.0	3.34	3.67	5457	3.21	3905	1290	5196	45.2	14.9
1134	344	13.1	4.0	1,478	17.1	3,814	1,102	4916	44	12.8	3.36	3.67	5310	3.22	3804	1265	5069	44.0	14.6
1212	385	14.0	4.5	1,598	18.5	4,079	1,233	5312	47	14.3	3.33	3.64	5754	3.19	4037	1401	5438	46.7	16.2
1235	402	14.3	4.7	1,637	18.9	4,154	1,286	5440	48	14.9	3.32	3.62	5902	3.18	4102	1456	5558	47.5	16.9
1257	418	14.5	4.8	1,675	19.4	4,229	1,339	5568	49	15.5	3.32	3.61	6050	3.17	4167	1511	5678	48.2	17.5
1279	435	14.8	5.0	1,714	19.8	4,304	1,392	5696	50	16.1	3.31	3.60	6198	3.16	4232	1565	5797	49.0	18.1
1352	478	15.6	5.5	1,830	21.2	4,548	1,530	6078	53	17.7	3.29	3.57	6632	3.13	4444	1705	6148	51.4	19.7
1324	468	15.3	5.4	1,792	20.7	4,453	1,499	5952	52	17.3	3.29	3.57	6494	3.14	4362	1673	6035	50.5	19.4
1346	485	15.6	5.6	1,831	21.2	4,528	1,552	6080	52	18.0	3.29	3.56	6642	3.13	4426	1727	6153	51.2	20.0
1368	502	15.8	5.8	1,870	21.6	4,603	1,605	6208	53	18.6	3.28	3.55	6790	3.12	4491	1780	6271	52.0	20.6
1391	518	16.1	6.0	1,909	22.1	4,678	1,658	6337	54	19.2	3.28	3.54	6939	3.11	4555	1833	6388	52.7	21.2
1438	529	16.6	6.1	1,966	22.8	4,837	1,691	6528	56	19.6	3.26	3.53	7142	3.10	4690	1866	6556	54.3	21.6
1435	551	16.6	6.4	1,987	23.0	4,828	1,765	6593	56	20.4	3.26	3.52	7235	3.09	4683	1939	6621	54.2	22.4
1457	568	16.9	6.6	2,026	23.4	4,903	1,818	6721	57	21.0	3.26	3.50	7383	3.08	4746	1991	6737	54.9	23.0
1480	585	17.1	6.8	2,064	23.9	4,978	1,871	6849	58	21.7	3.25	3.49	7531	3.08	4810	2043	6853	55.7	23.7
1502	601	17.4	7.0	2,103	24.3	5,053	1,924	6977	58	22.3	3.24	3.48	7679	3.07	4873	2095	6969	56.4	24.3
1495	624	17.3	7.2	2,119	24.5	5,029	1,998	7027	58	23.1	3.25	3.47	7758	3.06	4853	2167	7020	56.2	25.1

B

Appendix B: Environmental Compliance Approval

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 1391-B38PLA
Issue Date: August 2, 2018

The Corporation of the Township of Mapleton
7275 Sideroad 16
Post Office Box, No. 160
Mapleton, Ontario
N0G 1P0

Site Location: Mapleton Wastewater Pollution Control Plant
7101 Sideroad 15
Mapleton Township, County of Wellington
N0G 1P0

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

alteration, re-rating, usage and operation of existing municipal sewage works, for the treatment of sanitary sewage and disposal of effluent to Conestogo River via a Sewage Treatment Plant (Mapleton Wastewater Pollution Control Plant) and Final Effluent disposal facilities as follows:

Classification of Collection System: Separate Sewer System

Classification of Sewage Treatment Plant: Secondary

Design Capacity of Sewage Treatment Plant

Design Capacity with all Treatment Trains in Operation	Prior to Completion of Construction of All Proposed Works	Upon Completion of Construction of All Proposed Works
Rated Capacity	750 m^3/d	900 m^3/d

Influent

Receiving Location	Types
In Collection System	Sanitary Sewage
At Sewage Treatment Plant	None

Proposed Works

Supplementary Treatment Systems

Phosphorus Removal

a proposed secondary pre-filtration alum dosing system to facilitate additional phosphorus removal, housed in a new alum building, including:

- one (1) new 9,000 L alum storage tank;
- a new alum dosing system with a duplex pump control panel and two (2) metering pumps (duty and standby arrangement), each capable of handling 15 L/hr;
- an insulated alum dosing pipe with fittings and other appurtenances;
- installation of the alum dosing point within the filter feed pumping station wet well;
- installation of a pipe mixer (static flow mixer) in a precast chamber within the existing stainless steel filter feed pipe and necessary connections with fittings to the existing 200 mm diameter stainless steel filter feed pipe.

Existing Works

Moorefield

Low-Pressure Sanitary Sewage Collection System (Off-site)

- approximately 160 individual packaged grinder pump stations outside of the properties to be serviced including service laterals;
- low-pressure collection sewers on Robb Street, Carson Street, Adam Brown Street, Maudsley Street, Ball Avenue, McGivern Street, Hillwood Drive, Booth Street West and Eighth Concession Road;

Booth Street Sanitary Sewage Pumping Station (Off-site)

- a 2.4 m diameter by 4.5 m deep wet well equipped with two (2) submersible sewage pumps (one standby) each rated at 14.14 L/s at 47 m T.D.H., and an emergency overflow outlet;

- a 150 mm diameter forcemain along Booth Street East, Eighth Concession Road and Drayton WWTP Access Road discharging to the influent structure of the sewage treatment plant;

- a 50 kW outdoor diesel generator set;

Drayton

Sanitary Sewage Collection System (Off-site)

- sanitary sewers on Mill Street, High Street, Smith Drive, Spring Street, Main Street, Wood Street, Robin Drive, John Street, Union Street, Edward Street, Elm Street, Wellington Street, Easement West of Wellington Street, King Street, Queen Street and Wortley Street, Conestoga Drive, Hillview Drive, Pine Street, Maple Street, Green Street, Andrews Drive, Dales Drive, Parkside Street, Andrews Drive West, Faith Drive, River Run Road, Riverview Drive, Bedell Drive Pioneer Drive;

Sewage Pumping Station and Forcemain (Off-site)

- a sewage pumping station located on the north side of Mill Street approximately 110 m west of the west limit of Wellington Street with a wet well with two (2) sewage pumps (one standby) each rated at 34.0 L/s at a T.D.H. of 42.0 m;

- forcemain to the waste stabilization ponds, emergency bypass connection on the discharge forcemain;

- a 60 kW standby diesel generator and emergency station overflow;

Mapleton Wastewater Pollution Control Plant

Stabilization Ponds

- a 21.2 ha waste stabilization pond system with two (2) treatment cells operated in series and three (3) effluent treatment/storage cells operated in parallel or series with individual operating depths (exclusive of sludge storage bottom zones and freeboard), areas and volumes as listed below:

    - an aerated lagoon (Cell #2), with a surface area of 3.1 ha, operating depth of 1.825 m, and operating volume of 60,500 m^3;

    - a secondary settling lagoon (Cell #1), with a surface area of 3.2 ha, operating depth of 1.825 m, and operating volume of 62,100 m^3;

    - a storage lagoon (Cell #3), with a surface area of 5.5 ha, operating depth of 2.425 m, and operating

volume of 131,700 m^3;

- a storage lagoon (Cell #4A), with a surface area of 3.4 ha, operating depth of 2.6 m, and operating volume of 77,600 m^3;

- a storage lagoon (Cell #4B), with a surface area of 6.0 ha, operating depth of 2.6 m, and operating volume of 140,700 m^3;

- influent works to Cell #2, interconnecting structures between lagoon cells;

- a primary gravity flow control structure (flow control structure A) with adjustable weir control, receiving influent from Cell #1 and with valved inlet/outlet pipes to Cells #3, #4A and #4B, and outlet pipe to Manhole 2;

- a secondary gravity flow control structure (flow control structure B) with valved inlet/outlet pipes to Cells #4A and #4B and the primary flow control chamber;

- a fine bubble aeration system for Cell #2 comprising two high speed blowers (one standby) each rated at of 680 m^3/h at 45 kPa, air header, feeder lines and diffuser tubes at the bottom of the cell perpendicular to the direction of sewage flow;

- a compressed air distribution system in Cell #3 comprising a 25 hp compressor/blower, air header and distribution laterals for minimizing ice formation and to improve alum mixing;

- effluent works and 600 mm diameter sewer to the stabilization pond effluent pumping station;

Stabilization Pond Effluent Pumping Station

- a 3.4 m by 3.3 m by 6.0 m deep wet well, including a bypass/overflow chamber with a bottom sluice gate and an overflow weir, equipped with three (3) submersible pumps (two duty and one shelf spare) with variable speed 3 hp motors, each rated at 23.1 L/second at 4.0 m TDH, with a 150 mm diameter pipe discharging stabilization pond effluent to a common trough at the top of the wet well;

- one (1) 200 mm diameter gravity flow pipe conveying stabilization pond effluent from the trough to the filtration building;

- a 600 mm diameter emergency bypass/overflow sewer from the pumping station to the final effluent manhole;

Supplementary Treatment Systems

Phosphorus Removal

- an alum dosing system housed in a 4.3 x 6.1 m Alum Building, consisting of a 15,500 L storage tank

and two (2) 7.1L/h capacity metering pumps to dose alum in Flow Structure A located upstream of the storage lagoons.

- a new alum dosing system with a duplex pump control panel and two (2) metering pumps (duty and standby arrangement), each capable of handling 15 L/hr;

- an insulated alum dosing pipe with fittings and other appurtenances;

- installation of the alum dosing point within the filter feed pumping station wet well;

- installation of a pipe mixer (static flow mixer) within the existing stainless steel filter feed pipe and necessary connections with fittings to the existing 200 mm diameter stainless steel filter feed pipe.

Backup Alum Addition System in Cell #3

- one (1) 5 hp pump to draw water from an intake located in Cell #3 and to discharge back to Cell #3 through three (3) 100 mm dia. distribution pipe at the cell bottom weighted with saddlebag ballast system;

- two (2) 1,000 L capacity alum storage tanks and one (1) 3.9 L/min capacity chemical pump to feed liquid alum into the water pump suction pipe;

Post-Secondary Treatment System

Sand Filters

- one (1) metering chamber complete with 200 mm diameter inlet pipe from the Stabilization Pond Effluent Pumping Station, a 200 mm diameter magnetic flowmeter and a 200 mm outlet pipe discharging to the filter influent channel described below;

- one (1) filter influent channel 690 mm wide by 2.5 m deep equipped with a stainless steel screen and guide, five (5) 200 mm diameter filter inlet pipes with gate valves and one (1) 200 mm diameter overflow pipe discharging to the filter effluent channel;

- five (5) continuous backwash upflow sand filters, each having a 4.65 m^2 filtration area, 2.0 m depth coarse media, with design filtering capacity of 800 m^3/day, complete with headloss gauges, air-lift pumps for rejection/backwashing of filters to the reject wet well and effluent weirs;

- a 250 mm diameter filtered effluent pipe and a 500 mm wide by 1.6 m deep effluent channel for the disinfection system described below;

- two (2) air compressors with 7.5 hp motors, each having an output capacity of 46 m^3/h at 690 kPa pressure discharging to a common air reservoir to provide air to the air lift pumps;

- a 2.16 m by 1.7 m, 4.7 m deep reject/backwash wastewater wet well equipped with two (2) submersible

pumps with 3 hp integral motors (one standby), each having a capacity of 13.5 L/s, to pump filter reject/backwash wastewater to Cell No.2 of the stabilization pond system via an approximately 37.0 m long 100 mm diameter forcemain;

Disinfection System

UV Disinfection

- two (2) ultraviolet radiation units installed in series in the effluent channel of the filtration building, with a Peak Flow Rate of 4,000 m^3/d;

Final Effluent Flow Measurement and Sampling Point

- one (1) 200 mm dia magnetic flowmeter and associated pipework in the effluent discharge system;

Final Effluent Disposal Facilities

- a reinforced concrete cascade aerator including a 100 mm diameter drain/bypass pipe to provide adequate aeration to the filtered effluent prior to discharging to the Conestogo River;
- one (1) 300 mm diameter effluent discharge pipe from the cascade aerator to the final effluent manhole;
- one (1) 600 mm diameter final effluent pipe to the outfall structure at the Conestogo River.

including all other mechanical system, electrical system, instrumentation and control system, standby power system, piping, pumps, valves and appurtenances essential for the proper, safe and reliable operation of the Works in accordance with this Approval, in the context of process performance and general principles of wastewater engineering only;

all in accordance with the submitted supporting documents listed in Schedule A.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "Annual Average Effluent Concentration" is the mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar year, calculated and reported as per the methodology specified in Schedule F;

2. "Annual Average Daily Effluent Flow" means the cumulative total Final Effluent discharged during a calendar year divided by the number of days during which Final Effluent was discharged that year;

3. "Annual Average Daily Influent Flow" means the cumulative total sewage flow of Influent to the Sewage Treatment Plant during a calendar year divided by the number of days during which sewage was flowing to the Sewage Treatment Plant that year;

4. "Approval" means this environmental compliance approval and any schedules attached to it, and the application;

5. "BOD5" (also known as TBOD5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demands;

6. "Bypass" means diversion of sewage around one or more treatment processes, excluding Preliminary Treatment System, within the Sewage Treatment Plant with the diverted sewage flows being returned to the Sewage Treatment Plant treatment train upstream of the Final Effluent sampling point(s) and discharged via the approved effluent disposal facilities;

7. "CBOD5" means five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample;

8. "Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of the EPA;

9. "District Manager" means the District Manager of the appropriate local district office of the Ministry where the Works is geographically located;

10. "*E. coli* " refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius;

11. "EPA" means the *Environmental Protection Act* , R.S.O. 1990, c.E.19, as amended;

12. "Equivalent Equipment" means alternate piece(s) of equipment that meets the design requirements and performance specifications of the piece(s) of equipment to be substituted;

13. "Event" means an action or occurrence, at a given location within the Works that causes a Bypass or Overflow. An Event ends when there is no recurrence of Bypass or Overflow in the 12-hour period following the last Bypass or Overflow. Overflows and Bypasses are separate Events even when they occur concurrently;

14. “Existing Works” means those portions of the Works included in the Approval that have been constructed previously;

15. "Final Effluent" means effluent that is discharged to the environment through the approved effluent disposal facilities, including all Bypasses, that are required to meet the compliance limits stipulated in the Approval for the Sewage Treatment Plant at the Final Effluent sampling point(s);

16. "Influent" means flows to the Sewage Treatment Plant from the collection system;

17. "Limited Operational Flexibility” (LOF) means the conditions that the Owner shall follow in order to undertake any modification that is pre-authorized as part of this Approval;

18. "Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and

includes all officials, employees or other persons acting on its behalf;

19. "Monthly Average Effluent Concentration" is the mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar month, calculated and reported as per the methodology specified in Schedule F;

20. "Monthly Average Daily Effluent Flow" means the cumulative total Final Effluent discharged during a calendar month divided by the number of days during which Final Effluent was discharged that month;

21. "Monthly Average Daily Effluent Loading" means the value obtained by multiplying the Monthly Average Effluent Concentration of a contaminant by the Monthly Average Daily Effluent Flow over the same calendar month;

22. "Monthly Geometric Mean Density" is the mean of all Single Sample Results of *E.coli* measurement in the samples taken during a calendar month, calculated and reported as per the methodology specified in Schedule F;

23. “Normal Operating Condition” means the condition when all unit process(es), excluding Preliminary Treatment System, in a treatment train is operating within its design capacity;

24. “Operating Agency” means the Owner or the entity that is authorized by the Owner for the management, operation, maintenance, or alteration of the Works in accordance with this Approval;

25. "Overflow" means a discharge to the environment from the Works at designed location(s) other than the approved effluent disposal facilities or via the effluent disposal facilities downstream of the Final Effluent sampling point;

26. "Owner" means The Corporation of the Township of Mapleton and its successors and assignees;

27. "OWRA" means the *Ontario Water Resources Act* , R.S.O. 1990, c. O.40, as amended;

28. "Proposed Works" means those portions of the Works included in the Approval that are under construction or to be constructed;

29. "Rated Capacity" means the Annual Average Daily Influent Flow for which the Sewage Treatment Plant is designed to handle;

30. "Sanitary Sewers" means pipes that collect and convey wastewater from residential, commercial, institutional and industrial buildings, and some infiltration and inflow from extraneous sources such as groundwater and surface runoff through means other than stormwater catch basins;

31. “Secondary Treatment System” means all facilities in the Sewage Treatment Plant associated with biological treatment, secondary sedimentation and phosphorus removal unit processes;

32. “Separate Sewer Systems" means wastewater collection systems that comprised of Sanitary Sewers while

runoff from precipitation and snowmelt are separately collected in Storm Sewers;

33. “Sewage Treatment Plant" means all the facilities related to sewage treatment within the sewage treatment plant site excluding the Final Effluent disposal facilities;

34. “Single Sample Result" means the test result of a parameter in the effluent discharged on any day, as measured by a probe, analyzer or in a composite or grab sample, as required;

35. "Works" means the approved sewage works, and includes Proposed Works, Existing Works and modifications made under Limited Operational Flexibility.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

1. The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the terms and conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

2. The Owner shall design, construct, operate and maintain the Works in accordance with the conditions of this Approval.

3. Where there is a conflict between a provision of any document referred to in this Approval and the conditions of this Approval, the conditions in this Approval shall take precedence.

2. CHANGE OF OWNER AND OPERATING AGENCY

1. The Owner shall, within thirty (30) calendar days of issuance of this Approval, prepare/update and submit to the District Manager the Municipal and Local Services Board Wastewater System Profile Information Form, as amended (Schedule G) under any of the following situations:

    a. the form has not been previously submitted for the Works;

    b. this Approval is issued for extension, re-rating or process treatment upgrade of the Works;

    c. when a notification is provided to the District Manager in compliance with requirements of change of Owner or Operating Agency under this condition.

2. The Owner shall notify the District Manager and the Director, in writing, of any of the following changes within thirty (30) days of the change occurring:

a. change of address of Owner;

b. change of Owner, including address of new owner;

c. change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Business Names Act, R.S.O. 1990, c. B.17* , as amended, shall be included in the notification;

d. change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the *Corporations Information Act, R.S.O. 1990, c. C.39* , as amended, shall be included in the notification.

3. The Owner shall notify the District Manager, in writing, of any of the following changes within thirty (30) days of the change occurring:

   a. change of address of Operating Agency;

   b. change of Operating Agency, including address of new Operating Agency.

4. In the event of any change in ownership of the Works, the Owner shall notify the succeeding owner in writing, of the existence of this Approval, and forward a copy of the notice to the District Manager.

5. The Owner shall ensure that all communications made pursuant to this condition refer to the environmental compliance approval number.

3. CONSTRUCTION OF PROPOSED WORKS / RECORD DRAWINGS

1. All Proposed Works in this Approval shall be constructed and installed and must commence operation within five (5) years of issuance of this Approval, after which time the Approval ceases to apply in respect of any portions of the Works not in operation. In the event that the construction, installation and/or operation of any portion of the Proposed Works is anticipated to be delayed beyond the time period stipulated, the Owner shall submit to the Director an application to amend the Approval to extend this time period, at least six (6) months prior to the end of the period. The amendment application shall include the reason(s) for the delay and whether there is any design change(s).

2. Within thirty (30) days of commencement of construction, the Owner shall prepare and submit to the District Manager a schedule for the completion of construction and commissioning operation of the Proposed Works. The Owner shall notify the District Manager within thirty (30) days of the commissioning operation of any Proposed Works. Upon completion of construction of the Proposed Works, the Owner shall prepare and submit a statement to the District Manager, certified by a Professional Engineer, that the Proposed Works is constructed in accordance with this Approval.

3. Within one (1) year of completion of construction of the Proposed Works, a set of record drawings of the Works shall be prepared or updated. These drawings shall be kept up to date through revisions

undertaken from time to time and a copy shall be readily accessible for reference at the Works.

4. BYPASSES

1. Any Bypass is prohibited, except:

   a. an emergency Bypass when a structural, mechanical or electrical failure causes a temporary reduction in the capacity of a treatment process or when an unforeseen flow condition exceeds the design capacity of a treatment process that is likely to result in personal injury, loss of life, health hazard, basement flooding, severe property damage, equipment damage or treatment process upset, if a portion of the flow is not bypassed;

   b. a planned Bypass that is a direct and unavoidable result of a planned repair and maintenance procedure or other circumstance(s), the Owner having notified the District Manager in writing at least fifteen (15) days prior to the occurrence of Bypass, including an estimated quantity and duration of the Bypass, an assessment of the impact on the quality of the Final Effluent and the mitigation measures if necessary, and the District Manager has given written consent of the Bypass;

2. Notwithstanding the exceptions given in Paragraph 1, the Operating Agency shall undertake everything practicable to maximize the flow through the downstream treatment process(es) prior to bypassing.

3. At the beginning of a Bypass Event, the Owner shall immediately notify the Spills Action Centre (SAC) and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:

   a. the type of the Bypass as indicated in Paragraph 1 and the reason(s) for the Bypass;

   b. the date and time of the beginning of the Bypass;

   c. the treatment process(es) gone through prior to the Bypass and the treatment process(es) bypassed;

   d. the effort(s) done to maximize the flow through the downstream treatment process(es) and the reason(s) why the Bypass was not avoided.

4. Upon confirmation of the end of a Bypass Event, the Owner shall immediately notify the Spills Action Centre (SAC) and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:

   a. the date and time of the end of the Bypass;

   b. the estimated or measured volume of Bypass.

5. For any Bypass Event, the Owner shall collect daily sample(s) of the Final Effluent, inclusive of the Event and analyze for all effluent parameters outlined in Compliance Limits condition, except for *E. coli* , toxicity to Rainbow Trout and Daphnia magna, total residual chlorine / bisulphite residual,

dissolved oxygen, pH, temperature and unionized ammonia, following the same protocol specified in the Monitoring and Recording condition as for the regular samples. The sample(s) shall be in addition to the regular Final Effluent samples required under the monitoring and recording condition, except when the Event occurs on a scheduled monitoring day.

6. The Owner shall submit a summary report of the Bypass Event(s) to the District Manager on a quarterly basis, no later than each of the following dates for each calendar year: February 15, May 15, August 15, and November 15. The summary reports shall contain, at a minimum, the types of information set out in Paragraphs (3), (4) and (5) and either a statement of compliance or a summary of the non-compliance notifications submitted as required under Paragraph 1 of Condition 11. If there is no Bypass Event during a quarter, a statement of no occurrence of Bypass is deemed sufficient.

7. The Owner shall develop a notification procedure in consultation with the District Manager and SAC and notify the public and downstream water users that may be adversely impacted by any Bypass Event.

5. OVERFLOWS

1. Any Overflow is prohibited, except:

   a. an emergency Overflow in an emergency situation when a structural, mechanical or electrical failure causes a temporary reduction in the capacity of the Works or when an unforeseen flow condition exceeds the design capacity of the Works that is likely to result in personal injury, loss of life, health hazard, basement flooding, severe property damage, equipment damage or treatment process upset, if a portion of the flow is not overflowed;

   b. a planned Overflow that is a direct and unavoidable result of a planned repair and maintenance procedure or other circumstance(s), the Owner having notified the District Manager in writing at least fifteen (15) days prior to the occurrence of Overflow, including an estimated quantity and duration of the Overflow, an assessment of the impact on the environment and the mitigation measures if necessary, and the District Manager has given written consent of the Overflow;

2. Notwithstanding the exceptions given in Paragraph 1, the Operating Agency shall undertake everything practicable to maximize the flow through the downstream treatment process(es) and Bypass(es) prior to overflowing.

3. At the beginning of an Overflow Event, the Owner shall immediately notify the Spills Action Centre (SAC) and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:

   a. the type of the Overflow as indicated in Paragraph 1 and the reason(s) for the Overflow;

   b. the date and time of the beginning of the Overflow;

   c. the point of the Overflow from the Works, the treatment process(es) gone through prior to the Overflow, the disinfection status of the Overflow and whether the Overflow is discharged through

the effluent disposal facilities or an alternate location;

d. the effort(s) done to maximize the flow through the downstream treatment process(es) and Bypass(es) and the reason(s) why the Overflow was not avoided.

4. Upon confirmation of the end of an Overflow Event, the Owner shall immediately notify the Spills Action Centre (SAC) and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:

   a. the date and time of the end of the Overflow;

   b. the estimated or measured volume of the Overflow.

5. For any Overflow Event

   a. in the Sewage Treatment Plant, the Owner shall collect grab sample(s) of the Overflow, one near the beginning of the Event and one every eight (8) hours for the duration of the Event, and have them analyzed at least for CBOD5, total suspended solids, total phosphorus, total ammonia nitrogen, *E. coli.* , except that raw sewage and primary treated effluent Overflow shall be analyzed for BOD5, total suspended solids, total phosphorus and total Kjeldahl nitrogen only.

   b. at a sewage pumping station in the collection system, the Owner shall collect at least one (1) grab sample representative of the Overflow Event and have it analyzed for BOD5, total suspended solids, total phosphorus and total Kjeldahl nitrogen.

6. The Owner shall submit a summary report of the Overflow Event(s) to the District Manager on a quarterly basis, no later than each of the following dates for each calendar year: February 15, May 15, August 15, and November 15. The summary report shall contain, at a minimum, the types of information set out in Paragraphs (3), (4) and (5). If there is no Overflow Event during a quarter, a statement of no occurrence of Overflow is deemed sufficient.

7. The Owner shall develop a notification procedure in consultation with the District Manager and SAC and notify the public and downstream water users that may be adversely impacted by any Overflow Event.

6. DESIGN OBJECTIVES

1. The Owner shall design and undertake everything practicable to operate the Sewage Treatment Plant in accordance with the following objectives:

   a. Final Effluent parameters design objectives listed in the table(s) included in Schedule B.

   b. Final Effluent is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film or sheen or foam or discolouration on the

receiving waters.

c. Annual Average Daily Influent Flow is within the Rated Capacity of the Sewage Treatment Plant.

7. COMPLIANCE LIMITS

1. The Owner shall operate and maintain the Sewage Treatment Plant such that compliance limits for the Final Effluent parameters listed in the table(s) included in Schedule C are met.

2. The Owner shall operate and maintain the Sewage Treatment Plant such that the Final Effluent is disinfected continuously during the discharge period.

8. OPERATION AND MAINTENANCE

1. The Owner shall ensure that, at all times, the Works and the related equipment and appurtenances used to achieve compliance with this Approval are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate staffing and training, including training in all procedures and other requirements of this Approval and the OWRA and regulations, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances used in the Works.

2. The Owner shall update maintain the operations manual for the Works within six (6) months of completion of construction of the Proposed Works, that includes, but not necessarily limited to, the following information:

   a. operating procedures for the Works under Normal Operating Conditions;

   b. inspection programs, including frequency of inspection, for the Works and the methods or tests employed to detect when maintenance is necessary;

   c. repair and maintenance programs, including the frequency of repair and maintenance for the Works;

   d. procedures for the inspection and calibration of monitoring equipment;

   e. operating procedures for the Works to handle situations outside Normal Operating Conditions and emergency situations such as a structural, mechanical or electrical failure, or an unforeseen flow condition, including procedures to minimize Bypasses and Overflows;

   f. a spill prevention and contingency plan, consisting of procedures and contingency plans, including notification to the District Manager, to reduce the risk of spills of pollutants and prevent, eliminate or ameliorate any adverse effects that result or may result from spills of pollutants;

   g. procedures for receiving, responding and recording public complaints, including recording any followup actions taken.

3. The Owner shall maintain the operations manual up-to-date and make the manual readily accessible for reference at the Works.

4. The Owner shall ensure that the Operating Agency fulfils the requirements under O. Reg. 129/04, as amended for the Works, including the classification of facilities, licensing of operators and operating standards.

5. The Owner shall operate the Works such that discharge of Final Effluent from the Works is conducted on a seasonal discharge basis with the effluent being discharged only during the months at the rates as specified in Schedule C. However, discharges in excess of these daily discharges is allowed if the minimum 10:1 of the streamflow to daily discharge rate for the applicable period of that design streamflow occurs, based on actual measurements of flow rate in the Conestogo River.

    a. The streamflow is defined as the streamflow of the Conestogo River at the closest upstream Water Survey of Canada station, Conestogo River above Drayton (UTM coordinates 529057E 4847811N; WSC Station ID #2GA39);

    b. The Owner shall, during the discharge of Final Effluent, make reference to the streamflow data of the Conestogo River from the Grand River Conservation Authority Website. The Owner shall take responsibility for interpreting the hydrometric data for that day and make the appropriate operational changes. The streamflow provided shall be the basis of proportional discharge for that day and the next six days for the purposes of determining the final effluent discharge rate;

    c. The Maximum Final Effluent Discharge Rate shall not exceed the maximum design capacity of the sand filtration and the UV disinfection rate of 4,000 m^3/d;

    d. In the event that the streamflow is unreliable or unavailable, the Owner shall follow the specified seasonal discharge during the months at the rates stipulated in Subsection (5) of Condition 8.

9. MONITORING AND RECORDING

1. The Owner shall, upon commencement of operation of the Works, carry out a scheduled monitoring program of collecting samples at the required sampling points, at the frequency specified or higher, by means of the specified sample type and analyzed for each parameter listed in the tables under the monitoring program included in Schedule D and record all results, as follows:

    a. all samples and measurements are to be taken at a time and in a location characteristic of the quality and quantity of the sewage stream over the time period being monitored.

    b. a schedule of the day of the week/month for the scheduled sampling shall be created. The sampling schedule shall be revised and updated every year through rotation of the day of the week/month for the scheduled sampling program, except when the actual scheduled monitoring frequency is three (3) or more times per week.

    c. definitions and preparation requirements for each sample type are included in document referenced

in Paragraph 3.b.

d. definitions for frequency:

i. Weekly means once every week;

ii. Bi-weekly means once every two weeks;

2. In addition to the scheduled monitoring program required in Paragraph 1, the Owner shall collect daily sample(s) of the Final Effluent, on any day when there is any situation outside Normal Operating Conditions, by means of the specified sample type and analyzed for each parameter listed in the tables under the monitoring program included in Schedule D, except for *E. coli* , toxicity to Rainbow Trout and Daphnia magna, total residual chlorine / bisulphite residual, dissolved oxygen, pH, temperature and unionized ammonia.

3. The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following documents and all analysis shall be conducted by a laboratory accredited to the ISO/IEC:17025 standard or as directed by the District Manager:

a. the Ministry's Procedure F-10-1, “Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended;

b. the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater Version 2.0" (January 2016), PIBS 2724e02, as amended;

c. the publication "Standard Methods for the Examination of Water and Wastewater", as amended.

4. The Owner shall monitor and record the flow rate and daily quantity using flow measuring devices or other methods of measurement as approved below calibrated to an accuracy within plus or minus 15 per cent (+/- 15%) of the actual flowrate of the following:

a. Influent flow to the Sewage Treatment Plant by continuous flow measuring devices and instrumentations.

b. Final Effluent discharged from the Sewage Treatment Plant by continuous flow measuring devices and instrumentations.

5. The Owner shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this Approval.

10. LIMITED OPERATIONAL FLEXIBILITY

1. The Owner may make pre-authorized modifications to the sewage pumping stations and Sewage Treatment Plant in Works in accordance with the document “Limited Operational Flexibility - Protocol for Pre-Authorized Modifications to Municipal Sewage Works” (Schedule E), as amended, subject to the following:

a. the modifications will not involve the addition of any new treatment process or the removal of an existing treatment process, including chemical systems, from the liquid or solids treatment trains as originally designed and approved.

b. the scope and technical aspects of the modifications are in line with those delineated in Schedule E and conform with the Ministry's publication "Design Guidelines for Sewage Works 2008", as amended, Ministry's regulations, policies, guidelines, and industry engineering standards;

c. the modifications shall not negatively impact on the performance of any process or equipment in the Works or result in deterioration in the Final Effluent quality;

d. where the pre-authorized modification requires notification, a "Notice of Modifications to Sewage Works" (Schedule E), as amended shall be completed with declarations from a Professional Engineer and the Owner and retained on-site prior to the scheduled implementation date. All supporting information including technical memorandum, engineering plans and specifications, as applicable and appropriate to support the declarations that the modifications conform with LOF shall remain on-site for future inspection.

2. The following modifications are not pre-authorized under Limited Operational Flexibility:

a. Modifications that involve addition or extension of process structures, tankages or channels;

b. Modifications that involve relocation of the Final Effluent outfall or any other discharge location or that may require reassessment of the impact to the receiver or environment;

c. Modifications that involve addition of or change in technology of a treatment process or that may involve reassessment of the treatment train process design;

d. Modifications that require changes to be made to the emergency response, spill prevention and contingency plan; or

e. Modifications that are required pursuant to an order issued by the Ministry.

11. REPORTING

1. The Owner shall report to the District Manager orally as soon as possible any non-compliance with the compliance limits, and in writing within seven (7) days of non-compliance.

2. The Owner shall, within fifteen (15) days of occurrence of a spill within the meaning of Part X of the EPA, submit a full written report of the occurrence to the District Manager describing the cause and discovery of the spill, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation, in addition to fulfilling the requirements under the EPA and O. Reg. 675/98 "Classification and Exemption of Spills and Reporting of Discharges".

3. The Owner shall, upon request, make all manuals, plans, records, data, procedures and supporting

documentation available to Ministry staff.

4. The Owner shall prepare performance reports on a calendar year basis and submit to the District Manager by March 31 of the calendar year following the period being reported upon. The reports shall contain, but shall not be limited to, the following information pertaining to the reporting period:

   a. a summary and interpretation of all Influent monitoring data, and a review of the historical trend of the sewage characteristics and flow rates;

   b. a summary and interpretation of all Final Effluent monitoring data, including concentration, flow rates, loading and a comparison to the design objectives and compliance limits in this Approval, including an overview of the success and adequacy of the Works;

   c. a summary of any deviation from the monitoring schedule and reasons for the current reporting year and a schedule for the next reporting year;

   d. a summary of all operating issues encountered and corrective actions taken;

   e. a summary of all normal and emergency repairs and maintenance activities carried out on any major structure, equipment, apparatus or mechanism forming part of the Works;

   f. a summary of any effluent quality assurance or control measures undertaken;

   g. a summary of the calibration and maintenance carried out on all Influent and Final Effluent monitoring equipment to ensure that the accuracy is within the tolerance of that equipment as required in this Approval or recommended by the manufacturer;

   h. a summary of efforts made to achieve the design objectives in this Approval, including an assessment of the issues and recommendations for pro-active actions if any are required under the following situations:

      i. when any of the design objectives is not achieved more than 50% of the time in a year, or there is an increasing trend in deterioration of Final Effluent quality;

      ii. when the Annual Average Daily Influent Flow reaches 80% of the Rated Capacity;

   i. an estimate of the sludge volumes in the lagoon cells. Sludge volume is to be measured every five (5) years, but may be estimated in the interim years. A summary of disposal locations and volumes of sludge disposed of must also be provided if sludge was disposed of during the reporting period;

   j. a summary of any complaints received and any steps taken to address the complaints;

   k. a summary of all Bypasses, Overflows, other situations outside Normal Operating Conditions and spills within the meaning of Part X of EPA and abnormal discharge events;

l. a summary of all Notice of Modifications to Sewage Works completed under Paragraph 1.d. of Condition 10, including a report on status of implementation of all modification.

m. a summary of efforts made to achieve conformance with Procedure F-5-1 including but not limited to projects undertaken and completed in the sanitary sewer system that result in overall Bypass/Overflow elimination including expenditures and proposed projects to eliminate Bypass/Overflows with estimated budget forecast for the year following that for which the report is submitted.

n. any changes or updates to the schedule for the completion of construction and commissioning operation of major process(es) / equipment groups in the Proposed Works.

Schedule "A"

1. Application for Approval of Municipal and Private Sewage Works submitted by Bibek Mondal from EXP Services Inc., dated April 6, 2018.

2. Mapleton Wastewater Pollution Control Plant Design Report for Re-rating to 900 m^3/day, along with drawings and specifications, dated December 2017 and prepared by The Greer Galloway Group Inc.

Schedule B

Final Effluent Design Objectives

Concentration Objectives

Final Effluent Parameter	**Averaging Calculator**	**Objective** (milligrams per litre unless otherwise indicated)
CBOD5	Monthly Average Effluent Concentration	5.0 mg/L
Total Suspended Solids	Monthly Average Effluent Concentration	15.0 mg/L
Total Phosphorus	Monthly Average Effluent Concentration	0.25 mg/L
Total Ammonia Nitrogen	Monthly Average Effluent Concentration	3.0 mg/L
*E. coli**	Monthly Geometric Mean Density	100 CFU/100 mL
pH	Single Sample Result	6.5 – 8.5 inclusive

*If the MPN method is utilized for *E.coli* analysis the objective shall be 100 MPN/100 mL

Schedule C

Final Effluent Compliance Limits

Concentration Limits

Final Effluent Parameter	Averaging Calculator	Limit (maximum unless otherwise indicated)
CBOD5	Monthly Average Effluent Concentration	7.5 mg/L (Apr., Oct.) 10.0 mg/L (Mar., Nov., Dec.)
Total Suspended Solids	Monthly Average Effluent Concentration	25.0 mg/L
Total Phosphorus	Monthly Average Effluent Concentration	0.42 mg/L
Total Ammonia Nitrogen	Monthly Average Effluent Concentration	5.0 mg/L
*E. coli**	Monthly Geometric Mean Density	200 CFU/100 mL
pH	Single Sample Result	6.0 – 9.5 inclusive

*If the MPN method is utilized for *E.coli* analysis the limit shall be 200 MPN/100 mL

Maximum Final Effluent Discharge Rates

Month	Monthly Average Daily Effluent Flow (maximum unless otherwise indicated)
March	2,559 m^3/d
April	4,000 m^3/d
October	233 m^3/d
November	1,854 m^3/d
December	4,000 m^3/d

Schedule D

Monitoring Program

Influent - Influent sampling point

Parameters	Sample Type	Minimum Frequency
BOD5	Grab	Bi-weekly
Total Suspended Solids	Grab	Bi-weekly
Total Phosphorus	Grab	Bi-weekly
Total Kjeldahl Nitrogen	Grab	Bi-weekly

Lagoon Content Monitoring - One sample from each cell

Parameters	Sample Type	Minimum Frequency
CBOD5	Grab	Once at least seven (7) days prior to scheduled seasonal discharge
Total Suspended Solids	Grab	Once at least seven (7) days prior to scheduled seasonal discharge
Total Phosphorus	Grab	Once at least seven (7) days prior to scheduled seasonal discharge
Total Ammonia Nitrogen	Grab	Once at least seven (7) days prior to scheduled seasonal discharge
E. coli	Grab	Once at least seven (7) days prior to scheduled seasonal discharge
pH	Grab	Once at least seven (7) days prior to scheduled seasonal discharge

Final Effluent - Final Effluent sampling point

Parameters	Sample Type	Minimum Frequency
CBOD5	24 hour composite	Weekly
Total Suspended Solids	24 hour composite	Weekly
Total Phosphorus	24 hour composite	Weekly
Total Ammonia Nitrogen	24 hour composite	Weekly
E. coli	Grab	Weekly
pH*	Grab/Probe	Weekly
Temperature	Grab/Probe	Weekly
Unionized Ammonia**	Calculated	Weekly

*pH and temperature of the Final Effluent shall be determined in the field at the time of sampling for Total Ammonia Nitrogen.

**The concentration of un-ionized ammonia shall be calculated using the total ammonia concentration, pH and temperature using the methodology stipulated in "Ontario's Provincial Water Quality Objectives" dated July 1994, as amended.

Conestogo River Monitoring*

Parameters	Sample Type	Minimum Frequency**
BOD5	Grab	Weekly
Total Suspended Solids	Grab	Weekly
Total Phosphorus	Grab	Weekly
Total Ammonia Nitrogen	Grab	Weekly
E. coli	Grab	Weekly
pH	Grab/Probe	Weekly
Temperature	Grab/Probe	Weekly

*The Owner shall collect from the Conestogo River at the north side of the bridge crossing in Drayton. The sample shall be collected mid-channel only for open flowing water according to protocols acceptable to the Grand River Conservation Authority. Sampling is only required if there is open water in the middle of the river.
**The river sample shall be taken on the same day as the discharge sample from the Final Effluent specified in Condition 7.

Schedule E

Limited Operational Flexibility

Protocol for Pre-Authorized Modifications to Municipal Sewage Works

1. General

    1. Pre-authorized modifications are permitted only where Limited Operational Flexibility has already been granted in the Approval and only permitted to be made at the pumping stations and sewage treatment plant in the Works, subject to the conditions of the Approval.

    2. Where there is a conflict between the types and scope of pre-authorized modifications listed in this document, and the Approval where Limited Operational Flexibility has been granted, the Approval shall take precedence.

    3. The Owner shall consult the District Manager on any proposed modifications that may fall within the scope and intention of the Limited Operational Flexibility but is not listed explicitly or included as an example in this document.

    4. The Owner shall ensure that any pre-authorized modifications will not:

        a. adversely affect the hydraulic profile of the Sewage Treatment Plant or the performance of any upstream or downstream processes, both in terms of hydraulics and treatment performance;

        b. result in new Overflow or Bypass locations, or any potential increase in frequency or quantity of Overflow(s) or Bypass(es).

        c. result in a reduction in the required Peak Flow Rate of the treatment process or equipment as originally designed.

2. Modifications that do not require pre-authorization:

    1. Sewage works that are exempt from Ministry approval requirements;

    2. Modifications to the electrical system, instrumentation and control system.

3. Pre-authorized modifications that do not require preparation of “Notice of Modification to Sewage Works”

    1. Normal or emergency maintenance activities, such as repairs, renovations, refurbishments and replacements with Equivalent Equipment, or other improvements to an existing approved piece of equipment of a treatment process do not require pre-authorization. Examples of these activities are:

        a. Repairing a piece of equipment and putting it back into operation, including replacement of minor

components such as belts, gear boxes, seals, bearings;

b. Repairing a piece of equipment by replacing a major component of the equipment such as motor, with the same make and model or another with the same or very close power rating but the capacity of the pump or blower will still be essentially the same as originally designed and approved;

c. Replacing the entire piece of equipment with Equivalent Equipment.

2. Improvements to equipment efficiency or treatment process control do not require pre-authorization. Examples of these activities are:

a. Adding variable frequency drive to pumps;

b. Adding on-line analyzer, dissolved oxygen probe, ORP probe, flow measurement or other process control device.

4. Pre-Authorized Modifications that require preparation of "Notice of Modification to Sewage Works"

1. Pumping Stations

a. Replacement, realignment of existing sewers including manholes, valves, gates, weirs and associated appurtenances provided that the modifications will not add new influent source(s) or result in an increase in flow from existing sources as originally approved.

b. Extension or partition of wetwell to increase retention time for emergency response and improve station maintenance and pump operation;

c. Replacement or installation of inlet screens to the wetwell;

d. Replacement or installation of flowmeters, construction of station bypass;

e. Replacement, reconfiguration or addition of pumps and modifications to pump suctions and discharge pipings including valve, gates, motors, variable frequency drives and associated appurtenances to maintain firm pumping capacity or modulate the pump rate provided that the modifications will not result in a reduction in the firm pumping capacity or discharge head or an increase in the peak pumping rate of the pumping station as originally designed;

f. Replacement, realignment of existing forcemain(s) valves, gates, and associated appurtenances provided that the modifications will not reduce the flow capacity or increase the total dynamic head and transient in the forcemain.

2. Sewage Treatment Plant

1. Sewers and appurtenances

a. Replacement, realignment of existing sewers (including pipes and channels) or construction of new sewers, including manholes, valves, gates, weirs and associated appurtenances within the a sewage treatment plant, provided that the modifications will not add new influent source(s) or result in an increase in flow from existing sources as originally approved and that the modifications will remove hydraulic bottlenecks or improve the conveyance of sewage into and through the Works.

2. Flow Distribution Chambers/Splitters

   a. Replacement or modification of existing flow distribution chamber/splitters or construction of new flow distribution chamber/splitters, including replacements or installation of sluice gates, weirs, valves for distribution of flows to the downstream process trains, provided that the modifications will not result in a change in flow distribution ratio to the downstream process trains as originally designed.

3. Imported Sewage Receiving Facility

   1. Replacement, relocation or installation of loading bays, connect/disconnect hook-up systems and unloading/transferring systems;

   2. Replacement, relocation or installation of screens, grit removal units and compactors;

   3. Replacement, relocation or installation of pumps, such as dosing pumps and transfer pumps, valves, piping and appurtenances;

   4. Replacement, relocation or installation of storage tanks/chambers and spill containment systems;

   5. Replacement, relocation or installation of flow measurement and sampling equipment;

   6. Changes to the source(s) or quantity from each source, provided that changes will not result in an increase in the total quantity and waste loading of each type of Imported Sewage already approved for co-treatment.

4. Preliminary Treatment System

   a. Replacement of existing screens and grit removal units with equipment of the same or higher process performance technology, including where necessary replacement or upgrading of existing screenings dewatering washing compactors, hydrocyclones, grit classifiers, grit pumps, air blowers conveyor system, disposal bins and other ancillary equipment to the screening and grit removal processes.

   b. Replacement or installation of channel aeration systems, including air blowers, air supply main, air headers, air laterals, air distribution grids and diffusers.

5. Primary Treatment System

   a. Replacement of existing sludge removal mechanism, including sludge chamber;

b. Replacement or installation of scum removal mechanism, including scum chamber;

c. Replacement or installation of primary sludge pumps, scum pumps, provided that:the modifications will not result in a reduction in the firm pumping capacity or discharge head that the primary sludge pump(s) and scum pump(s) are originally designed to handle.

6. Secondary Treatment System

1. Biological Treatment

a. Conversion of complete mix aeration tank to plug-flow multi-pass aeration tank, including modifications to internal structural configuration;

b. Addition of inlet gates in multi-pass aeration tank for step-feed operation mode;

c. Partitioning of an anoxic/flip zone in the inlet of the aeration tank, including installation of submersible mixer(s);

d. Replacement of aeration system including air blowers, air supply main, air headers, air laterals, air distribution grids and diffusers, provided that the modifications will not result in a reduction in the firm capacity or discharge pressure that the blowers are originally designed to supply or in the net oxygen transferred to the wastewater required for biological treatment as originally required.

2. Secondary Sedimentation

a. Replacement of sludge removal mechanism, including sludge chamber;

b. Replacement or installation of scum removal mechanism, including scum chamber;

c. Replacement or installation of return activated sludge pump(s), waste activated sludge pump(s), scum pump(s), provided that the modifications will not result in a reduction in the firm pumping capacity or discharge head that the activated sludge pump(s) and scum pump(s) are originally designed to handle.

7. Tertiary Treatment System

a. Replacement of filtration system with equipment of the same filtration technology, including feed pumps, backwash pumps, filter reject pumps, filtrate extract pumps, holding tanks associated with the pumping system, provided that the modifications will not result in a reduction in the capacity of the filtration system as originally designed.

8. Disinfection System

1. UV Irridation

a. Replacement of UV irridation system, provided that the modifications will not result in a reduction in the design capacity of the disinfection system or the radiation level as originally designed.

2. Chlorination/Dechlorination and Ozonation Systems

a. Extension and reconfiguration of contact tank to increase retention time for effective disinfection and reduce dead zones and minimize short-circuiting;

b. Replacement or installation of chemical storage tanks, provided that the tanks are provided with effective spill containment.

9. Supplementary Treatment Systems

1. Chemical systems

a. Replacement, relocation or installation of chemical storage tanks for existing chemical systems only, provided that the tanks are sited with effective spill containment;

b. Replacement or installation of chemical dosing pumps provided that the modifications will not result in a reduction in the firm capacity that the dosing pumps are originally designed to handle.

c. Relocation and addition of chemical dosing point(s) including chemical feed pipes and valves and controls, to improve phosphorus removal efficiency;

d. Use of an alternate chemical provided that it is a non-proprietary product and is a commonly used alternative to the chemical approved in the Works, provided that the chemical storage tanks, chemical dosing pumps, feed pipes and controls are also upgraded, as necessary..

10. Sludge Management System

1. Sludge Holding and Thickening

a. Replacement or installation of sludge holding tanks, sludge handling pumps, such as transfer pumps, feed pumps, recirculation pumps, provided that modifications will not result in reduction in the solids storage or handling capacities;

2. Sludge Digestion

a. Replacement or installation of digesters, sludge handling pumps, such as transfer pumps, feed pumps, recirculation pumps, provided that modifications will not result in reduction in the solids storage or handling capacities;

b. replacement of sludge digester covers.

3. Sludge Dewatering and Disposal

    a. Replacement of sludge dewatering equipment, sludge handling pumps, such as transfer pumps, feed pumps, cake pumps, loading pumps, provided that modifications will not result in reduction in solids storage or handling capacities.

4. Processed Organic Waste

    a. Changes to the source(s) or quantity from each source, provided that changes will not result in an increase in the total quantity already approved for co-processing.

11. Standby Power System

    1. Replacement or installation of standby power system, including feed from alternate power grid, emergency power generator, fuel supply and storage systems, provided that the existing standby power generation capacity is not reduced.

12. Pilot Study

    1. Small side-stream pilot study for existing or new technologies, alternative treatment process or chemical, provided:

        i. all effluent from the pilot system is hauled off-site for proper disposal or returned back to the sewage treatment plant for at a point no further than immediately downstream of the location from where the side-stream is drawn;

        ii. no proprietary treatment process or propriety chemical is involved in the pilot study;

        iii. the effluent from the pilot system returned to the sewage treatment plant does not significantly alter the composition/concentration of or add any new contaminant/inhibiting substances to the sewage to be treated in the downstream process;

        iv. the pilot study will not have any negative impacts on the operation of the sewage treatment plant or cause a deterioration of effluent quality;

        v. the pilot study does not exceed a maximum of two years and a notification of completion shall be submitted to the District Manager within one month of completion of the pilot project.

13. Lagoons

    a. installing baffles in lagoon provided that the operating capacity of the lagoon system is not reduced;

    b. raise top elevation of lagoon berms to increase free-board;

    c. replace or install interconnecting pipes and chambers between cells, provided that the process design

operating sequence is not changed;

d. replace or install mechanical aerators, or replace mechanical aerators with diffused aeration system provided that the mixing and aeration capacity are not reduced;

e. removal of accumulated sludge and disposal to an approved location offsite.

3. Final Effluent Disposal Facilities

1. Replacement or realignment of the Final Effluent channel, sewer or forcemain, including manholes, valves and appurtenances from the end of the treatment train to the discharge outfall section, provided that the sewer conveys only effluent discharged from the Sewage Treatment Plant and that the replacement or re-aligned sewer has similar dimensions and performance criteria and is in the same or approximately the same location and that the hydraulic capacity will not be reduced.

This page contains an image of the form entitled "Notice of Modification to Sewage Works". A digital copy can be obtained from the District Manager.

Ontario
Ministry of
the Environment

Notice of Modification to Sewage Works

RETAIN COPY OF COMPLETED FORM AS PART OF THE ECA AND SEND A COPY TO THE WATER SUPERVISOR (FOR MUNICIPAL) OR DISTRICT MANAGER (FOR NON-MUNICIPAL SYSTEMS)

Part 1 – Environmental Compliance Approval (ECA) with Limited Operational Flexibility

(Insert the ECA's owner, number and issuance date and notice number, which should start with "01" and consecutive numbers thereafter)

ECA Number	Issuance Date (mm/dd/yy)	Notice number (if applicable)

ECA Owner	Municipality

Part 2: Description of the modifications as part of the Limited Operational Flexibility

(Attach a detailed description of the sewage works)

Description shall include:
1. A detail description of the modifications and/or operations to the sewage works (e.g. sewage work component, location, size, equipment type/model, material, process name, etc.)
2. Confirmation that the anticipated environmental effects are negligible.
3. List of updated versions of, or amendments to, all relevant technical documents that are affected by the modifications as applicable, i.e. submission of documentation is not required, but the listing of updated documents is (design brief, drawings, emergency plan, etc.)

Part 3 – Declaration by Professional Engineer

I hereby declare that I have verified the scope and technical aspects of this modification and confirm that the design:
1. Has been prepared or reviewed by a Professional Engineer who is licensed to practice in the Province of Ontario;
2. Has been designed in accordance with the Limited Operational Flexibility as described in the ECA;
3. Has been designed consistent with Ministry's Design Guidelines, adhering to engineering standards, industry's best management practices, and demonstrating ongoing compliance with s.53 of the Ontario Water Resources Act; and other appropriate regulations.

I hereby declare that to the best of my knowledge, information and belief the information contained in this form is complete and accurate

Name (Print)	PEO License Number

Signature	Date (mm/dd/yy)

Name of Employer

Part 4 – Declaration by Owner

I hereby declare that:
1. I am authorized by the Owner to complete this Declaration;
2. The Owner consents to the modification; and
3. This modifications to the sewage works are proposed in accordance with the Limited Operational Flexibility as described in the ECA.
4. The Owner has fulfilled all applicable requirements of the *Environmental Assessment Act*.

I hereby declare that to the best of my knowledge, information and belief the information contained in this form is complete and accurate

Name of Owner Representative (Print)	Owner representative's title (Print)

Owner Representative's Signature	Date (mm/dd/yy)

EAB Form December 2, 2013

Schedule F

Methodology for Calculating and Reporting Monthly Average Effluent Concentration, Annual Average Effluent Concentration and Monthly Geometric Mean Density

1. Monthly Average Effluent Concentration

Step 1: Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar month and proceed as follows depending on the result of the calculation:

a. If the arithmetic mean does not exceed the compliance limit for the contaminant, then report and use this arithmetic mean as the Monthly Average Effluent Concentration for this parameter where applicable in this Approval;

b. If the arithmetic mean exceeds the compliance limit for the contaminant and there was no Bypass Event during the calendar month, then report and use this arithmetic mean as the Monthly Average Effluent Concentration for this parameter where applicable in this Approval;

c. If the arithmetic mean exceeds the compliance limit for the contaminant and there was Bypass Event(s) during the calendar month, then proceed to Step 2;

d. If the arithmetic mean does not exceed the compliance limit for the contaminant and there was Bypass Event(s) during the calendar month, the Owner may still elect to proceed to Step 2 calculation of the flow-weighted arithmetic mean.

Step 2: Calculate the flow-weighted arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar month and proceed depending on the result of the calculation:

a. Group No Bypass Days (**NBPD**) data and Bypass Days (**BPD**) data during a calendar month separately;

b. Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured on all NBPD during a calendar month and record it as **Monthly Average NBPD Effluent Concentration**;

c. Obtain the "**Total Monthly NBPD Flow**" which is the total amount of Final Effluent discharged on all NBPD during the calendar month;

d. Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured on all BPD during a calendar month

and record it as **Monthly Average BPD Effluent Concentration**;

e. Obtain the "**Total Monthly BPD Flow**" which is the total amount of Final Effluent discharged on all BPD during the calendar month;

f. Calculate the flow-weighted arithmetic mean using the following formula:

[(Monthly Average NBPD Effluent Concentration × Total Monthly NBPD Flow) + (Monthly Average BPD Effluent Concentration × Total Monthly BPD Flow)] ÷ (Total Monthly NBPD Flow + Total Monthly BPD Flow)

It should be noted that in this method, if there are no Bypass Event for the month, the calculated result would be the same as the non-flow-weighted arithmetic mean method;

g. Report and use the lesser of the flow-weighted arithmetic mean obtained in Step 2 and the arithmetic mean obtained in Step 1 as the Monthly Average Effluent Concentration for this parameter where applicable in this Approval.

2. Annual Average Effluent Concentration

Step 1: Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar year and proceed as follows depending on the result of the calculation:

a. If the arithmetic mean does not exceed the compliance limit for the contaminant, then report and use this arithmetic mean as the Annual Average Effluent Concentration for this parameter where applicable in this Approval;

b. If the arithmetic mean exceeds the compliance limit for the contaminant and there was no Bypass Event during the calendar year, then report and use this arithmetic mean as the Annual Average Effluent Concentration for this parameter where applicable in this Approval;

c. If the arithmetic mean exceeds the compliance limit for the contaminant and there was Bypass Event(s) during the calendar year, then proceed to Step 2;

d. If the arithmetic mean does not exceed the compliance limit for the contaminant and there was Bypass Event(s) during the calendar year, the Owner may still elect to proceed to Step 2 calculation of the flow-weighted arithmetic mean.

Step 2: Calculate the flow-weighted arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar year and proceed depending on the result of the calculation:

a. Group No Bypass Days (**NBPD**) data and Bypass Days (**BPD**) data during a calendar year

separately;

b. Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured on all NBPD during a calendar year and record it as **Annual Average NBPD Effluent Concentration**;

c. Obtain the "**Total Annual NBPD Flow**" which is the total amount of Final Effluent discharged on all NBPD during the calendar year;

d. Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured on all BPD during a calendar year and record it as **Annual Average BPD Effluent Concentration**;

e. Obtain the "**Total Annual BPD Flow**" which is the total amount of Final Effluent discharged on all BPD during the calendar year;

f. Calculate the flow-weighted arithmetic mean using the following formula:

[(Annual Average NBPD Effluent Concentration × Total Annual NBPD Flow) + (Annual Average BPD Effluent Concentration × Total Annual BPD Flow)] ÷ (Total Annual NBPD Flow + Total Annual BPD Flow)

It should be noted that in this method, if there are no Bypass Event for the calendar year, the calculated result would be the same as the non-flow-weighted arithmetic mean method;

g. Report and use the lesser of the flow-weighted arithmetic mean obtained in Step 2 and the arithmetic mean obtained in Step 1 as the Annual Average Effluent Concentration for this parameter where applicable in this Approval.

3. Monthly Geometric Mean Density

Geometric mean is defined as the n^{th} root of the product of n numbers. In the context of calculating Monthly Geometric Mean Density for *E.coli*, the following formula shall be used:

$$\sqrt[n]{x_1 x_2 x_3 \cdots x_n}$$

in which,

"n" is the number of samples collected during the calendar month; and

"x" is the value of each Single Sample Result.

For example, four weekly grab samples were collected and tested for *E.coli* during the calendar month. The *E.coli* densities in the Final Effluent were found below:

Sample Number	*E.coli* Densities* (CFU/100 mL)
1	10
2	100
3	300
4	50

The Geometric Mean Density for these data:

$$\sqrt[4]{10 \times 100 \times 300 \times 50} = 62$$

*If a particular result is zero (0), then a value of one (1) will be substituted into the calculation of the Monthly Geometric Mean Density. If the MPN method is utilized for E.coli analysis, values in the table shall be MPN/100 mL.

Schedule G

Municipal and Local Services Board Wastewater System
Profile Information Form

(For reference only, images of the form are attached on the next four pages. A digital copy can be obtained from the District Manger.)

Ontario

Ministry of the Environment and Climate Change

Municipal and Local Services Board Wastewater System Profile Information Form

The information in this form is necessary to administer the Ministry's approvals, compliance and enforcement programs with respect to wastewater treatment and collection systems owned by municipalities and local services boards. These programs are authorized under the *Ontario Water Resources Act*, the *Environmental Protection Act*, the *Nutrient Management Act* and their respective regulations.

Email the completed form to: waterforms@ontario.ca
For any questions call 1-866-793-2588.

[A] SYSTEM PROFILE INFORMATION

Wastewater System Number *(if assigned)*

☐ New Profile
☐ Update Existing Profile

Name of System

Name of Municipality or Local Services Board

Level of Treatment (select one*)
☐ Primary
☐ Secondary
☐ Tertiary
☐ Secondary Equivalent
☐ Other (specify):
**See Terms and Concepts on page 4*

Population Served | Population (Design)

Type of System
☐ Treatment & Collection System ☐ Collection System Only

Design Rated Capacity (m^3/day)	Peak Flow Rate (m^3/day)	Current Environmental Compliance Approval (ECA) Number	Current ECA Issue Date (yyyy/mm/dd):

The treatment plant receives sewage from: (Check all that applies.* If you have checked more than one option below, indicate the approximate %)

☐ Sanitary Sewer ☐ Combined Sewer
☐ Nominally Separated Sewer ☐ Partially Separated Sewer **See Terms and Concepts on page 4*

[B] OWNER INFORMATION

Legal Name of Municipality or Local Services Board

Unit No	Street No.	Street Name.	Street Type (St, Rd, etc)	Street Direction (N,S,E,W)

PO Box	City/Town	Postal Code

☐ Dr ☐ Miss ☐ Mr ☐ Mrs ☐ Ms	Owner Contact First Name	Owner Contact Last Name	Owner Contact Job Title

Tel. No.	Fax Number	Email address
( ) - ext.	( ) -	

[C] OPERATING AUTHORITY ☐ Check if same as owner

Legal Name of Operator

Unit No	Street No.	Street Name.	Street Type (St, Rd, etc)	Street Direction (N,S,E,W)

PO Box	City/Town	Postal Code

☐ Dr ☐ Miss ☐ Mr ☐ Mrs ☐ Ms	Operator Contact First Name	Operator Contact Last Name	Operator Contact Job Title

Tel. No.	Fax Number	Email address
( ) - ext.	( ) -	

[D] 24/7 CONTACT

☐ Dr ☐ Miss ☒ Mr ☐ Mrs ☐ Ms	First Name	Last Name	Job Title

Tel. No.	Fax Number	Email address
( ) - ext.	( ) -	

[E] SYSTEM CIVIC LOCATION ADDRESS (I.E. ADDRESS OF TREATMENT PLANT)

Unit No	Street No.	Street Name.	Street Type (St, Rd, etc)	Street Direction (N,S,E,W)

PO Box	City/Town	Postal Code

If the Wastewater System has no street address

Geographical Township	Lot	Concession

Geographical Referencing (if known, enter the Geographical Reference Information for this Wastewater System)

Map Datum	Geo-Referencing Method	Accuracy Estimate	Location Reference	
Latitude	**Longitude**	**Zone**	**Easting**	**Northing**

[F] TREATMENT PROCESS

Preliminary	Primary	Secondary	Secondary Equivalent	Post-Secondary	Additional Treatment
☐ Screening ☐ Shredding/ grinding ☐ Grit Removal ☐ Other(specify):	☐ Settling/sedimentation/ clarification ☐ Scum Removal ☐ Polymer Addition ☐ Other(specify):	☐ Conventional Activated Sludge (CAS) ☐ Extended Aeration ☐ Membrane Bioreactor (MBR) ☐ Sequencing Batch Reactor (SBR) ☐ Rotating Biological Contactor (RBC) ☐ Trickling Filter (TF) ☐ Biological Aerated Filter (BAF) ☐ Other(specify):	☐ Aerated Lagoon ☐ Facultative Lagoon ☐ Anaerobic Lagoon ☐ Aerobic Lagoon ☐ Other(specify):	☐ Filtration ☐ Clarification ☐ Intermittent Sand Filter (after lagoons) ☐ Polishing Wetlands ☐ Polishing Lagoons ☐ Other(specify):	☐ Phosphorous Removal ☐ Biological ☐ Chemical If chemical is used, specify: ☐ Nitrification ☐ Denitrification ☐ Other(specify):

[G] DISINFECTION

Method of Disinfection	Disinfection Period
☐ Chlorination If you chlorinate, do you practice de-chlorination? ☐ Yes ☐ No	☐ Continuous ☐ Seasonal
☐ Ultraviolet Irradiation	☐ Continuous ☐ Seasonal
☐ Other (specify):	☐ Continuous ☐ Seasonal

[H] SLUDGE	
Sludge Stabilization Process	Method of Sludge Disposal/Utilization
☐ Aerobic Digestion	☐ Agricultural
☐ Anaerobic Digestion	☐ Landfill
☐ Drying & Pelletization	☐ Incineration
☐ Lime Treatment	☐ Other (specify):
☐ Composting	
☐ Other (specify):	
Available Sludge Storage Capacity (m^3):	

[I] EFFLUENT	
Effluent Disposal Method	Effluent Discharge Frequency
☐ Surface Water Receiving Water Body Name:	☐ Continuous ☐ Seasonal
☐ Subsurface	☐ Continuous ☐ Seasonal
☐ Other (specify):	☐ Continuous ☐ Seasonal

Is the effluent discharged in a vulnerable area identified in the local source protection assessment report approved under the Clean Water Act, 2006?
☐ Yes ☐ No

[J] INFLUENT

Does the plant receive sewage from another municipality or local services board either through an interconnected collection system or hauled sewage?
☐ Yes ☐ No
(if yes, name(s) of other municipality or local services board):

Plant receives:
☐ Leachate (approximate annual volume in m^3):
☐ Septage (approximate annual volume in m^3):
☐ Industrial input (approximate annual volume in m^3):
or (approximate volume in %):

Terms and Concepts

The following Terms and Concepts are provided to assist you when completing Wastewater System Profile Information Form.

In order to determine the level of treatment that applies to the wastewater system, the effluent quality objectives that the wastewater treatment plant was designed to meet must be considered. The process based approach often used in the past has led to confusion and is open to interpretation due to recent developments and practices in the wastewater treatment industry. For example, a plant with a high rate filter (often referred to as a tertiary filter) after its secondary treatment was considered a tertiary treatment in the past since the filter was designed and operated to produce a tertiary quality effluent. However, secondary plants are now being constructed with these filters as a safeguard against any potential secondary clarifier performance degradation and not for the purpose of ensuring tertiary treatment performance. Also, new technologies have evolved that can produce tertiary quality effluent without having these high rate filters (e.g., membrane bioreactors). Lagoons were considered in the past as being capable of providing only secondary equivalent treatment. However, with add-on treatment after the lagoons (e.g. intermittent sand filters), many lagoon treatment systems are capable of producing secondary or tertiary quality effluent.

During the establishment of sewage works, site-specific effluent limits (including averaging periods) are provided by the Ministry's Regional Technical Support Section, considering the assimilative capacity of the receivers and the minimum treatment requirements provided in Procedure F-5-1. The designer of the sewage works then selects objective values that are acceptable to the Ministry and are less (i.e. more stringent) than the effluent limits, in order to provide an adequate safety factor based on the designer's confidence/experience with the technology chosen and other site-specific conditions. The sewage works are then designed (and operated) to meet these design objectives in a reliable and consistent manner. Therefore, the values that are to be used in the determination of the level of treatment that applies to the sewage works must be based on the design objectives, and not the effluent limits.

Two common parameters used in almost all sewage works performance evaluations are $CBOD_5$ (carbonaceous biochemical oxygen demand) (BOD_5 – biochemical oxygen demand - for primary sewage works) and total suspended solids (TSS). Therefore, it is logical that the **objective values** of these two parameters are used to determine the level of treatment at the sewage works.

Level of Treatment:

Primary:
Wastewater treatment plants that have only settling/sedimentation (with or without chemical addition) and designed, approved and operated to reliably and consistently produce 30% and 50% or better reduction of BOD_5 and TSS respectively are considered primary plants (MOE Procedures F-5-1 and F-5-5).

Secondary:
Wastewater treatment plants that have biological processes (e.g. activated sludge process and its variations, fixed film processes) or physical-chemical processes designed, approved and operated to reliably and consistently produce an effluent quality of $CBOD_5$ and TSS of 15 mg/L or better are considered secondary plants (Section 8.2, MOE Design Guidelines for Sewage Works, 2008).

Secondary Equivalent:
Wastewater treatment plants designed, approved and operated to reliably and consistently produce an effluent quality of $CBOD_5$ of 25 mg/L and TSS of 30 mg/L or better are considered as secondary equivalent plants (Section 8.2, MOE Design Guidelines for Sewage Works, 2008).

Note: Wastewater treatment plants that provide only primary settling of solids and the addition of chemicals to improve the removal of TSS (and phosphorus) are not considered as secondary treatment plants or secondary equivalent plants (Section 8.2, MOE Design Guidelines for Sewage Works, 2008) even if they produce secondary or secondary equivalent effluent quality.

Tertiary:
Wastewater treatment plants that have biological processes (e.g. activated sludge process and its variations, fixed film processes) and/or physical-chemical processes designed, approved and operated to reliably and consistently produce an effluent quality of $CBOD_5$ and TSS of 5 mg/L or better are considered tertiary plants (adapted from Section 15.2.1, MOE Design Guidelines for Sewage Works, 2008).

Note: Biological processes such as nitrification, denitrification and enhanced biological phosphorus removal can be part of either a secondary or tertiary treatment plant. They may be described as secondary treatment plant with nitrification, secondary treatment plant with enhanced biological phosphorus removal, tertiary treatment plant with nitrification etc.

Sewer System Type:

Sanitary Sewers:
Pipes that convey sanitary sewage flows made up of wastewater discharges from residential, commercial, institutional and industrial establishments plus extraneous flow components from such sources as groundwater and surface run off.

Combined Sewers:
Pipes that convey both sanitary sewage and stormwater runoff through a single-pipe system.

Partially Separated Sewers:
Exist when either a portion of the combined sewer area was retrofitted to separate (sanitary and storm) sewers and/or a service area with combined sewers has had a new development area with separate sewers added to the service area; whatever the case may be, the final flows will be combined sewage.

Nominally Separated Sewers:
These sewers are constructed as separate sewers, but the sanitary sewers accept stormwater from roof and foundation drains (i.e., these are separated sewers in name only).

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

1. Condition #1 regarding general provisions is imposed to ensure that the Works are constructed and operated in the manner in which they were described and upon which approval was granted.

2. Condition #2 regarding change of Owner and Operating Agency is included to ensure that the Ministry records are kept accurate and current with respect to ownership and Operating Agency of the Works and to ensure that subsequent owners of the Works are made aware of the Approval and continue to operate the Works in compliance with it.

3. Condition #3 regarding construction of proposed works/record drawings is included to ensure that the Works are constructed in a timely manner so that standards applicable at the time of Approval of the Works are still applicable at the time of construction to ensure the ongoing protection of the environment, and that prior to the commencement of construction of the portion of the Works that are approved in principle only, the Director will have the opportunity to review detailed design drawings, specifications and an engineer's report containing detailed design calculations for that portion of the Works, to determine capability to comply with the Ministry's requirements stipulated in the terms and conditions of the Approval, and also ensure that the Works are constructed in accordance with the Approval and that record drawings of the Works "as constructed" are updated and maintained for future references.

4. Condition #4 regarding Bypasses is included to indicate that Bypass is prohibited, except in circumstances where the failure to Bypass could result in greater damage to the environment than the Bypass itself. The notification and documentation requirements allow the Ministry to take action in an informed manner and will ensure the Owner is aware of the extent and frequency of Bypass Events.

5. Condition #5 regarding Overflows is included to indicate that Overflow of untreated or partially treated sewage to the receiver is prohibited, except in circumstances where the failure to Overflow could result in greater damage to the environment than the Overflow itself. The notification and documentation requirements allow the Ministry to take action in an informed manner and will ensure the Owner is aware of the extent and frequency of Overflow Events.

6. Condition #6 regarding design objectives is imposed to establish non-enforceable design objectives to be used as a mechanism to trigger corrective action proactively and voluntarily before environmental impairment occurs.

7. Condition #7 regarding compliance limits is imposed to ensure that the Final Effluent discharged from the Works to the environment meets the Ministry's effluent quality requirements.

8. Condition #8 regarding operation and maintenance is included to require that the Works be properly operated, maintained, funded, staffed and equipped such that the environment is protected and deterioration, loss, injury or damage to any person or property is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the Owner. Such a manual is an integral part of the operation of the

Works. Its compilation and use should assist the Owner in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for Ministry staff when reviewing the Owner's operation of the Works.

9. Condition #9 regarding monitoring and recording is included to enable the Owner to evaluate and demonstrate the performance of the Works, on a continual basis, so that the Works are properly operated and maintained at a level which is consistent with the design objectives and compliance limits.

10. Condition #10 regarding Limited Operational Flexibility is included to ensure that the Works are constructed, maintained and operated in accordance with the Approval, and that any pre-approved modification will not negatively impact on the performance of the Works.

11. Condition #11 regarding reporting is included to provide a performance record for future references, to ensure that the Ministry is made aware of problems as they arise, and to provide a compliance record for this Approval.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 0963-A4ZMVA issued on January 22, 2016

In accordance with Section 139 of the Environmental Protection Act, 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 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

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

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 2nd day of August, 2018

Fariha Pannu, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

YZ/

c: District Manager, DWECD, MECP Guelph District Office
Bibek Mondal, EXP Services Inc.

C

Appendix C: Pilot Testing Final Report

TOWNSHIP OF MAPLETON

LagoonGuard™ MBBR TECHNOLOGY FOR BOD AND AMMONIA NITROGEN REMOVAL IN COLD TEMPERATURES

PILOT TESTING FINAL REPORT

JUNE 2019
PROJECT # 5000196029

PREPARED BY:
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TABLE OF CONTENTS

1. INTRODUCTION

The Township of Mapleton, ON is required to increase the treatment capacity of its Drayton WPCP lagoons to allow for residential expansion. Maintaining lagoons as the primary source of biochemical oxygen demand (BOD) and total suspended solids (TSS) removal provides significant operational benefits (e.g. low maintenance, simple operation), however, the lagoons ability to remove ammonia will be severely inhibited during the winter months. Hence, to accommodate future growth, the lagoon will require additional treatment with respect to ammonia.

Veolia Water Technologies Inc. (Veolia) performed a pilot study to test the LagoonGuard™ technology as a means of ammonia removal at low temperatures.

The pilot testing program was held from December 11th, 2018 to April 23rd, 2019. Table 1-1 presents the treatment objectives.

Table 1-1 Pilot testing effluent objectives

Parameters	Units	Target objectives
Soluble BOD_5	mg/L	< 5*
Total Ammonia Nitrogen	mg N/L	< 1
Acute lethality on rainbow trout	--	< 50% mortality after 96 hours in 100% effluent

* Not a regulatory value rather a typical process value

This final report presents a summary of the activities performed on site for the entire pilot test period.

2. PROCESS DESCRIPTION AND PILOT UNIT CONFIGURATION

The LagoonGuard™ is based on the moving bed biofilm reactor (MBBR) principle where biofilm attaches and grows on submerged carriers. The LagoonGuard™ efficiency is increased through specially designed carriers. These carriers are designed to have a protected interior for biofilm growth and remain in constant movement in the reactor. The constant movement for LagoonGuard™ carriers is generated by the aeration system of the reactor, which can support fill fractions of 25 to 65% relative to the total reactor volume. Thus, the LagoonGuard™ technology has a flexible design and can accommodate future increases in treatment capacity simply by increasing the fill fraction of the already installed reactor basin.

The LagoonGuard™ carriers are constantly colliding and subject to hydrodynamic shear forces. These processes act as a self-cleaning mechanism for the carriers and hence enable a consistent healthy biofilm. The self-cleaning mechanism eliminates the need for backwashing and all in basin components (aeration grid and carrier retention sieves) are designed to be maintenance free. These attributes allow the LagoonGuard™ to provide a significant increase in treatment capacity while maintaining the simplicity and operational ease associated with lagoon treatment facilities.

3. METHODOLOGY

3.1 PILOT EQUIPMENT DESCRIPTION

The LagoonGuard™ pilot treatment enclosed in a trailer was supplied on site. Figure 3-1 presents the location of the MBBR pilot unit at the Drayton WPCP. The trailer was installed besides the alum building.

Figure 3-1 Location of the MBBR pilot unit

Figure 3-2 shows a view of the MBBR pilot trailer after completion of installation, with straw bales used for insulation.

Figure 3-2 Exterior view of the LagoonGuard™ pilot unit with insulation

The pilot was equipped with all necessary equipment and instrumentation for a successful trial. Figure 3-3 presents a screen shot of the LagoonGuard™ MBBR pilot unit SCADA that illustrates the process flow diagram.

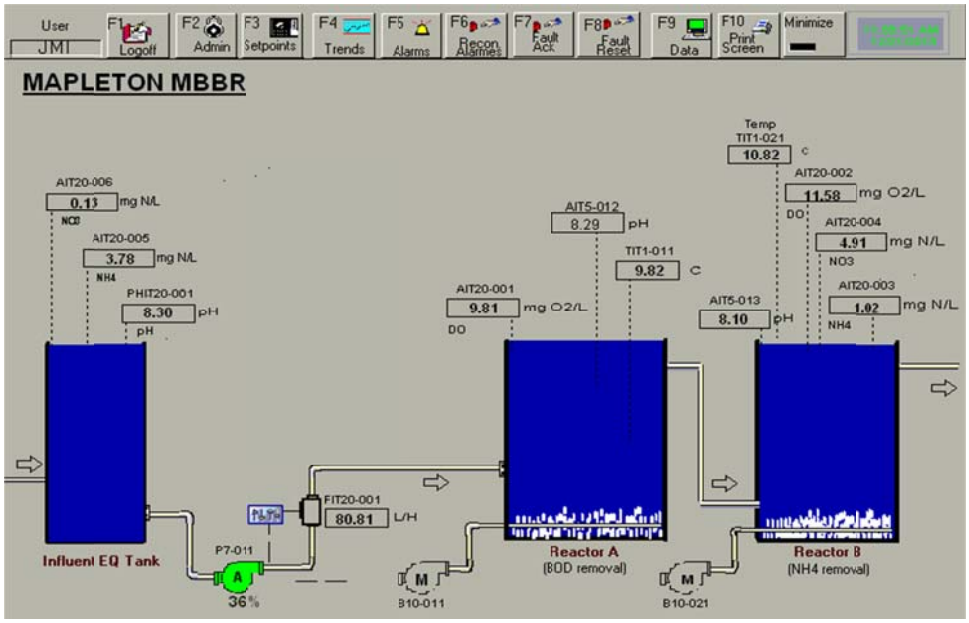

Figure 3-3 Process flow diagram

The Influent EQ tank was fed from a submersible pump located in the Cell 1 pipe cleanout standpipe. The EQ tank was equipped with an overflow pipe to allow excess pumped water to be diverted to the common drain. The EQ tank was operated in constant overflow mode to minimize the HRT in the tank to ensure the water integrity was maintained from the pump to the MBBR reactors (e.g. temperature and ammonia).This mode of operation also ensured a high flow to the common drain pipe and reduced the potential for freezing.

The following parameters were monitored online in the EQ tank:

- pH (pHIT20-001);
- Temperature (locally from the pH-meter transmitter);
- Ammonia nitrogen (AIT20-005);
- Nitrates (AIT20-006).

The influent was then pumped into the process using a variable speed centrifugal pump (P7-011), controlled by a flow control loop linked to the influent flowmeter (FIT20-001).

Reactor A was a 400 L aerated reactor designed for BOD polishing and nitrification. The following parameters were monitored online in Reactor A:

- pH (AIT5-012);
- Temperature (TIT1-011);
- Dissolved oxygen (AIT20-001).

Reactor B was a 400 L aerated reactor designed to complete nitrification and achieve the objective effluent ammonia nitrogen concentration. The following parameters were monitored online in Reactor B:

- pH (AIT5-013);
- Temperature (TIT1-021);
- Ammonia nitrogen (AIT20-003);
- Nitrates (AIT20-004);
- Dissolved oxygen (AIT20-002).

Both LagoonGuard™ reactors were supplied with “semi-seeded” MBBR carriers. The pilot was previously used at an industrial site to treat cyanide containing compounds and remove ammonia. As such, the microbiome was partially suited for municipal nitrification. This approach was used to reduce the start-up time where the pilot was being installed in December. It is important to note, this approach was only used for the pilot and would not be required in a full-scale system.

Two blowers (B10-011 and B10-021) were connected on a common manifold to feed both reactors, with one running and the second one used as a backup.

The MBBR pilot trailer was equipped with a common drain which was receiving the overflow from the Influent EQ tank and also the Reactor B (and final) effluent. The common drain effluent was discharged back to the lagoon treatment process ahead of the alum dosage for phosphorus removal.

3.2 ANALYTICAL MONITORING

The process performance was monitored for several parameters for both direct compliance objectives (ammonia and lethality) as well as indirect measurements for process optimization and system knowledge. The proposed external lab analysis plan (Table 3-1) was executed by the operational staff at OCWA. The samples for the EQ tank and RA were collected as grab samples, while RB (final LagoonGuard™ effluent) was collected as 24 hour composite samples. The samples were analyzed by the external lab.

Table 3-1 Analytical monitoring plan

Parameters	Units	Influent	Reactor A effluent	Reactor B effluent
Total Ammonia Nitrogen (TAN)	mg N/L	2-3x/week	2-3x/week	2-3x/week
Nitrites	mg N/L	2-3x/week	2-3x/week	2-3x/week
Nitrates	mg N/L	2-3x/week	2-3x/week	2-3x/week
pH	-	2-3x/week	2-3x/week	2-3x/week
Temperature	^{o}C	Online	Online	Online
DO	mg/L	-	Online	Online
Soluble chemical oxygen demand (COD)	mg/L	2-3x/week	2-3x / week	-
Total chemical oxygen demand (COD)	mg/L	1x/week	1x/week	-
Soluble biochemical oxygen demand (BOD_5)	mg/L	1x/week	1x/week	-
TSS*	mg/L	1-2x/week	-	1-2x/week
Total Phosphorus	mg P/L	1x/week	-	1x/week
Orthophosphates	mg P/L	1x/week	-	1x/week
Alkalinity	mg $CaCO_3$/L	2-3x/week	2-3x/week	2-3x/week

4. RESULTS AND DISCUSSION

This section presents the results and discusses the findings of the pilot testing program. Except for temperature and pH, the data presented in the subsections is the laboratory analysis, as measured by the external laboratory and by Veolia when on site. The complete data is presented in Appendix B while the certificates from the external laboratory are presented in Appendix C.

4.1 INFLUENT FLOW

The MBBR process is a biofilm process and modelled as a continuously stirred-tank reactor (CSTR). This allows the process performance to be load based and decoupled from the HRT (provided there is sufficient mixing). The HRT was set at 2.25 h per reactor (4.5 h total) for the low temperature operation. At this flowrate, the data collected was sufficient to confirm Veolia's design curves at low temperatures (Figure 4-1). The DO concentrations in the reactors averaged 11.2 mg/L for RA and RB throughout the low temperature operation.

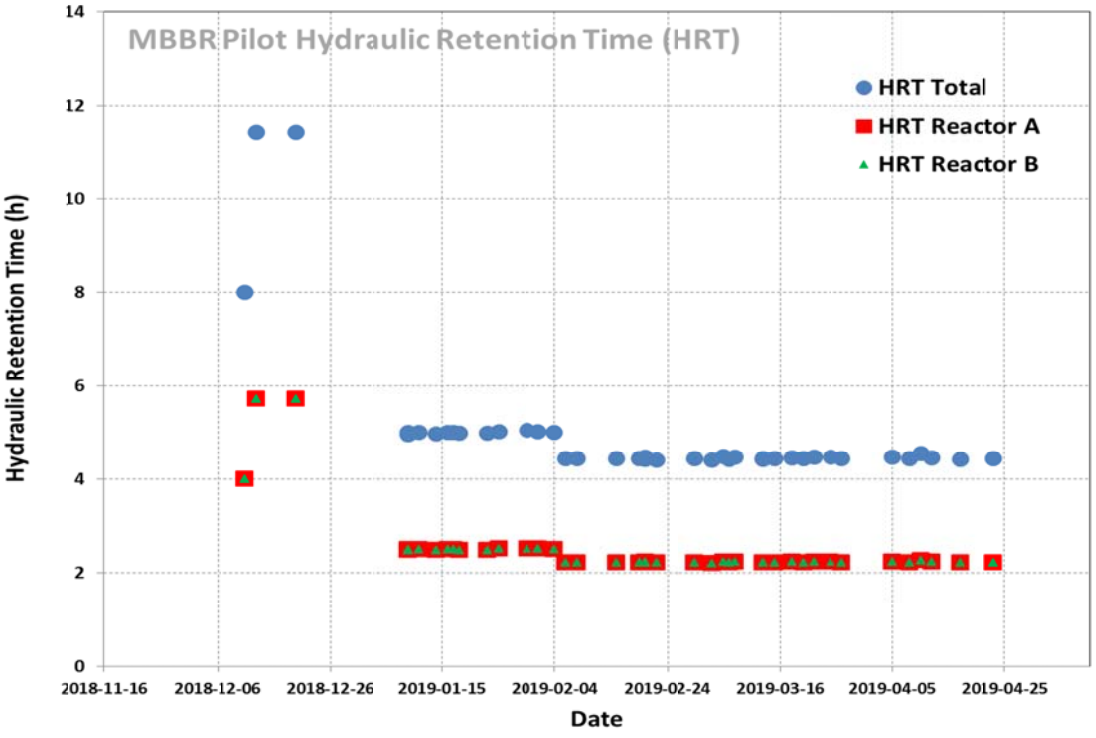

Figure 4-1 MBBR pilot unit Hydraulic Retention Time (HRT)

4.2 TEMPERATURE

The nitrification process is temperature sensitive. The lagoon effluent was pumped directly from the pipe and measured in the EQ tank to ensure the measurements were most representative. During the coldest period of the test (February 20th to March 20th) the lagoon effluent averaged 3.8°C (Figure 4-2). This is consistent with Veolia's previous studies on lagoon effluents which consist of a large facultative settling pond. Similar to a pond, the ice cover provides a cover for the lagoon and the water becomes stratified with water temperatures near freezing closest to the ice surface and 4°C near the sludge layer.

The temperature in Reactor B was correlated to the ambient temperature inside the trailer. If the temperature inside the trailer was higher than the Influent temperature, Reactor B temperature increased. Due to power outages and GFCI trips at the main building (described in Appendix A: Chronology of the pilot testing program) the pump and pipes within the pilot froze. Following the repairs and checks, all sources of heat were removed from the pilot.

The reactors inside the tank were fully exposed to the ambient air with large surfaces for heat transfer. This facilitated a decrease in water temperature through the process train from February 20th to March 22nd (Figure 4-2). The average water temperature during this period was 2.7°C with a minimum temperature of 1.1°C. The final month of the trial corresponded to increased temperatures in both the influent and RB effluent confirming the pilot demonstration was successful in capturing the most critical period of operation.

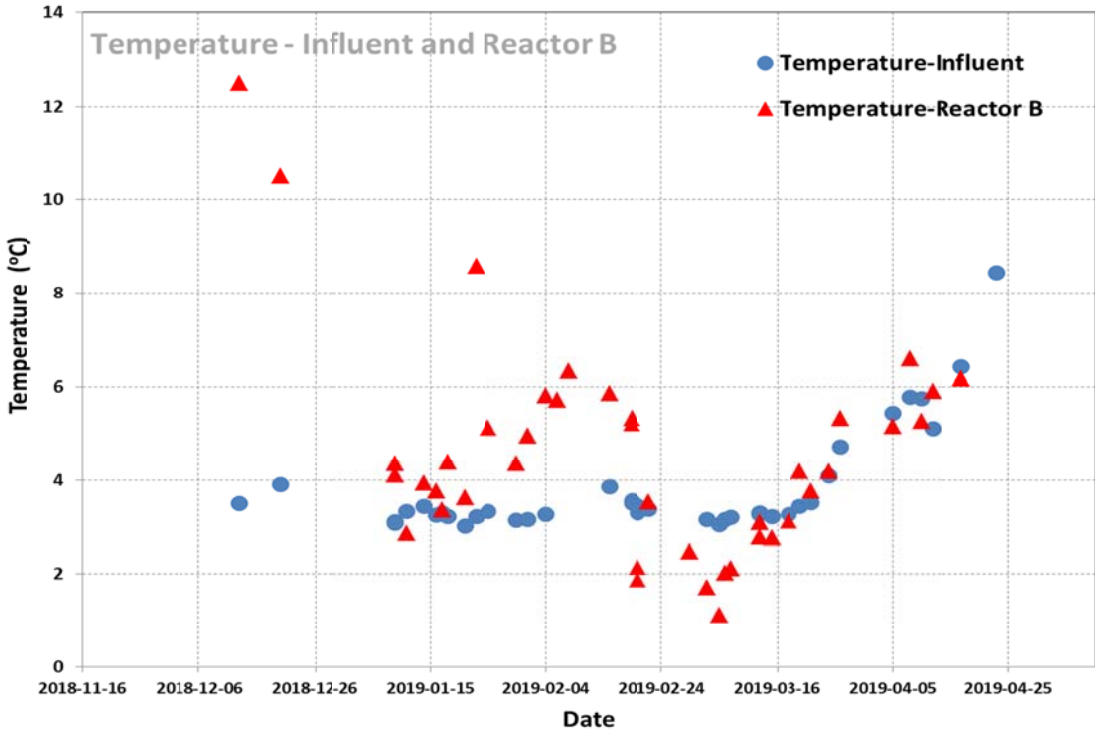

Figure 4-2 Influent and Reactor B temperature

4.3 SOLUBLE BOD_5

As the MBBR treatment chain includes a combined BOD polishing and nitrification zone, monitoring the lagoons performance during the critical winter period was paramount to determine the process performance and evaluate the proposed treatment chain. The effluent of the last treatment lagoon (location of pilot) should achieve less than 25 mg BOD/L. The LagoonGuard™ process will preferentially remove the soluble BOD. At the Mapleton facility, the average lagoon effluent $sBOD_5$ was 8.8 ± 3.8 mg/L (Figure 4-3) while the effluent from RA was 6.3 ± 2.0 mg/L. At these low concentrations, there is often difficulty in analytical analysis; however, the result indicates the sBOD exiting the final lagoon was not significantly inhibitory to the nitrification process. Hence, the Mapleton lagoon is achieving the desired sBOD removal and confirmed the proposed treatment chain is appropriate for the Township of Mapleton.

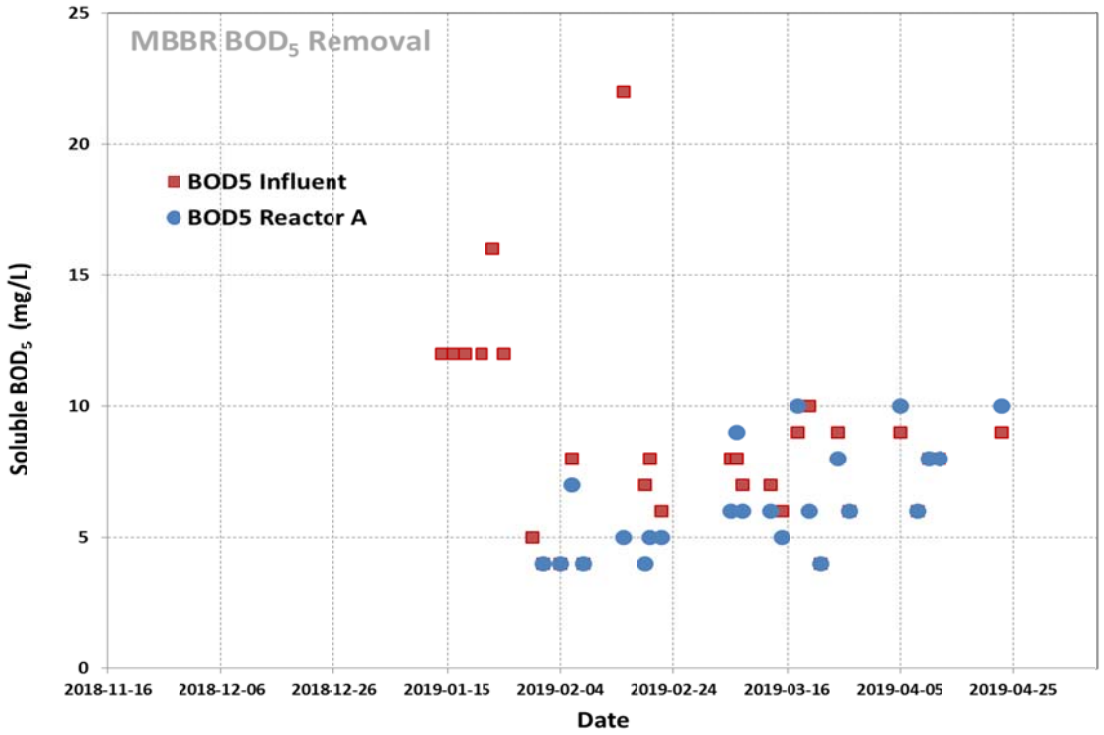

Figure 4-3 Lagoon effluent / MBBR influent $sBOD_5$ concentrations throughout the pilot trials

4.4 NITRIFICATION

4.4.1 Ammonia removal

The influent ammonia concentrations increased linearly (R^2 = 0.912) from a minimum of 3.9 mgTAN/L on December 20th to a maximum of 18.1 mgTAN/L on March 20th (Figure 4-4). At the same time, the lagoon effluent nitrite and nitrate remained stable with average concentrations of 0.13 mgNO_2-N/L and 0.35 mgNO_3-N/L (Figure 4-5). This indicates the total nitrogen is removed during the summer months either by means of volatilization, assimilated by algae or conventional nit-denit pathways. During the fall and winter months these means of ammonia removal are not viable. Hence, the concentration increases as the raw water displaces the treated water in the lagoon. During the 2019 winter, the buffering capacity of the lagoon was sufficient to prevent the lagoon effluent from reaching the worst-case scenario of 48 mgTAN/L (assumed raw water influent concentration).

The start-up period to achieve full performance in the reactors required approximately one month. As previously mentioned, the carriers used were pre-seeded with a different microbiome than a municipal nitrifying system. A typical ramp-up strategy was used to shift the microbial community to a municipal nitrifying system.

After the one month start-up period, the first reactor (RA) was removing the majority of the ammonia. During the coldest days of operation (February 20th to March 20th), the effluent ammonia from RA was 3.3 ± 0.9 mgTAN/L (Figure 4-4). At this concentration, the system is kinetic limited rather than substrate limited. As such, Veolia was able to confirm the design rates.

The second reactor (RB) is used as a polishing reactor to ensure the final effluent objective is met. It is more efficient and robust to have a highly loaded reactor to remove the majority of influent ammonia followed by a polishing reactor to achieve the very stringent effluent requirement. After the start up period and through the coldest period (January 18th to March 20th), the final effluent (RB) averaged 0.2 ± 0.1 mgTAN/L with a maximum daily value of 0.6 mgTAN/L (Figure 4-4). These results confirmed effluent ammonia objective of 1 mgTAN/L was achieved using the LagoonGuard™ process.

The last month of operation (March 22nd to April 23rd) included a decrease in the ammonia concentration from 18.1 to 13.7 mgTAN/L (24% decrease). At the same time, the influent alkalinity decreased from 350 to 247 mg/L (29% decrease). It is reasonable to assume this was due to a dilution effect from snowmelt and the lagoon was transitioning into spring / summer condition. At the same time, the water temperature increased. From a process perspective, the effluent ammonia from RA and RB averaged 0.8 and 0.1 mgTAN/L

respectively (Figure 4-4). As such, the pilot demonstration had successfully captured the most critical point of operation.

As previously mentioned, the first reactor in series was intended to polish sBOD and nitrify. The initial start-up required nearly a month.

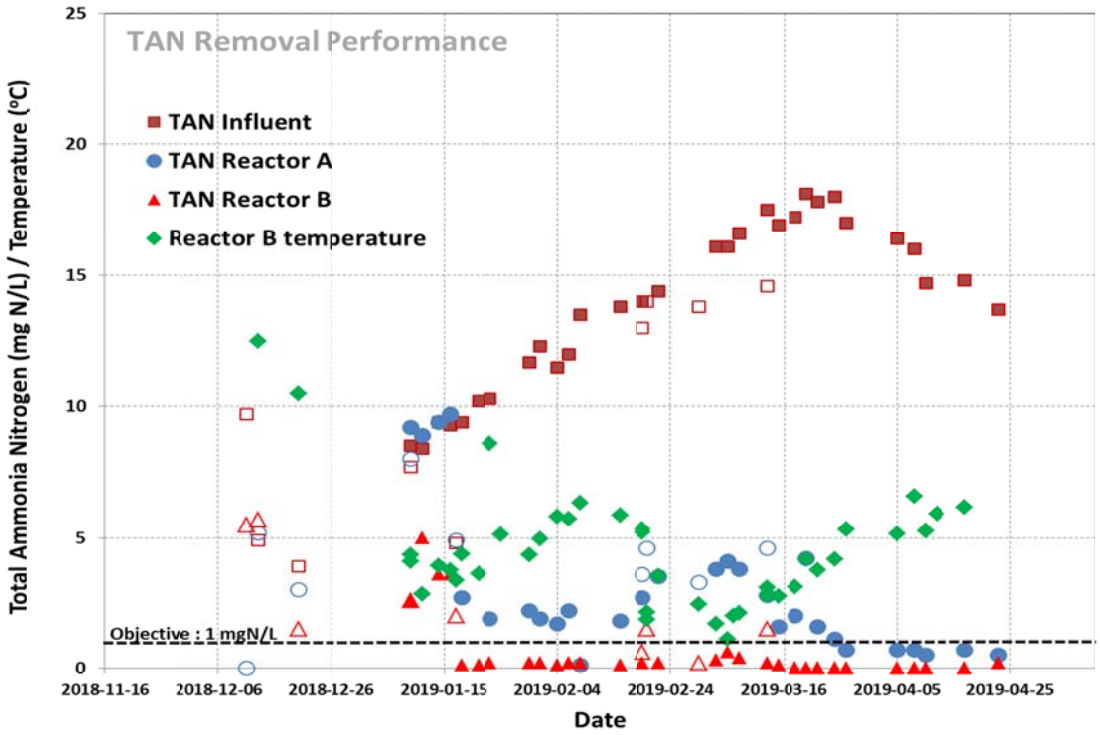

Figure 4-4 Influent, Reactor A and Reactor B TAN concentration (Full dots: external laboratory; Empty dots: Veolia)

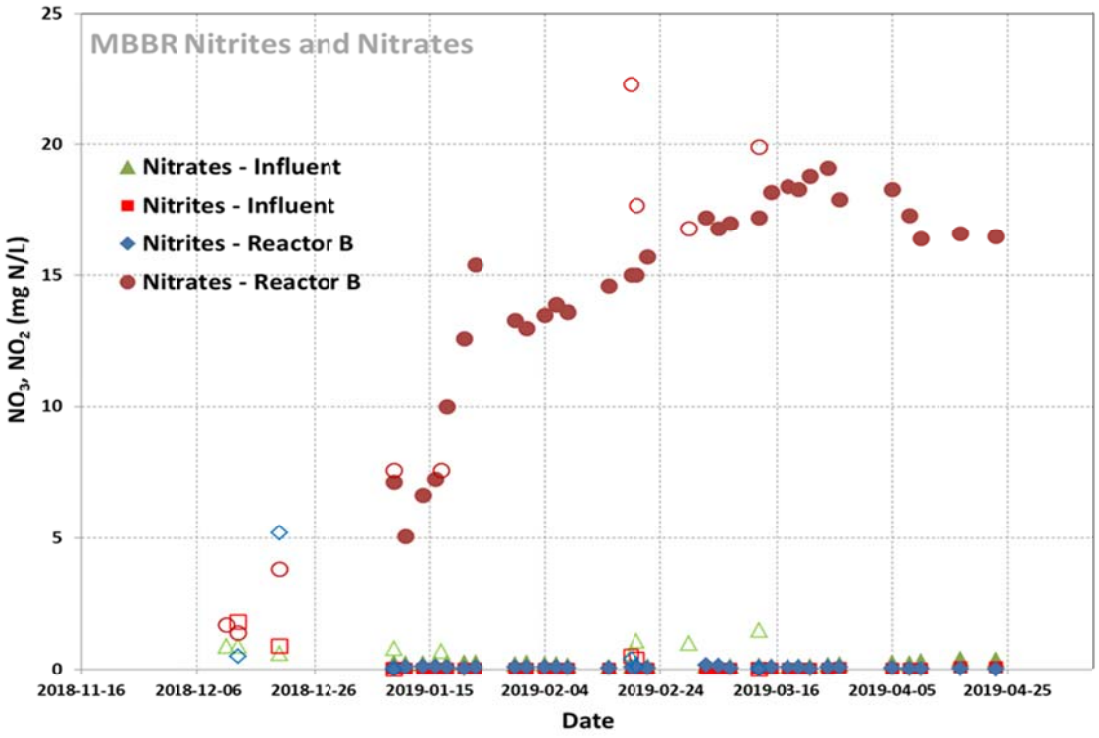

Figure 4-5 Nitrites and Nitrates in Influent and Reactor B (Full dots: external laboratory; Empty dots: Veolia)

4.4.2 Total Nitrogen Balance

Throughout the experimental trial the nitrification process was complete with all ammonia being converted to nitrate in the reactors. Compared to the influent, the average effluent total nitrogen was 0.9 mgN/L and 1.1 mgN/L higher in RA and RB respectively. This could be a result of residual organic nitrogen that as hydrolyzed and nitrified in the LagoonGuard™ reactors or analytical error. Without considering the organic nitrogen, the mass balance showed an average error of 10.2% which is a reasonable check and validation of the data collection.

4.4.3 Acute toxicity testing

Three (3) toxicity tests were performed, for *Daphnia magna* (48 hours) and rainbow trout (96 hours), on non-diluted samples (100%):

- March 13th, 2019: Influent, Reactor B effluent and Reactor B effluent supernatant after 2.5 hours of settling;
- March 28th, 2019: Influent and Reactor B effluent;
- April 23rd, 2019: Influent and Reactor B effluent.

The official certificates from the external laboratory are presented in Appendix D.

Table 4-1 presents the results of the three toxicity tests. The lagoon effluent (influent to the pilot) failed all three acute lethality tests for rainbow trout with 100% mortality. Conversely, all the Reactor B effluent samples were found to be non-acutely lethal with 0% mortality. Both the lagoon effluent and LagoonGuard™ effluent passed the *Daphnia magna* test with 0% mortality and 0% immobility.

Table 4-1 Toxicity tests results

Date	Samples	*Daphnia magna* (48 hours)		Rainbow trout (96 hours)	
		Mortality (%)	Immobility (%)	Mortality (%)	Immobility (%)
March 13th, 2019	Influent	0	0	100	0
	Reactor B	0	0	0	0
	Reactor B Settled	0	0	0	0
March 28th, 2019	Influent	0	0	100	0
	Reactor B	0	0	0	0
April 23rd, 2019	Influent	0	0	100	0
	Reactor B	0	0	0	0

4.4.4 Process ammonia loading and removal rates

Figure 4-6 presents the loading and removal rates for Nitrogen ammonia throughout the pilot testing program, expressed in g N/m^3 of reactor volume/d. The highest values were recorded on March 20th.

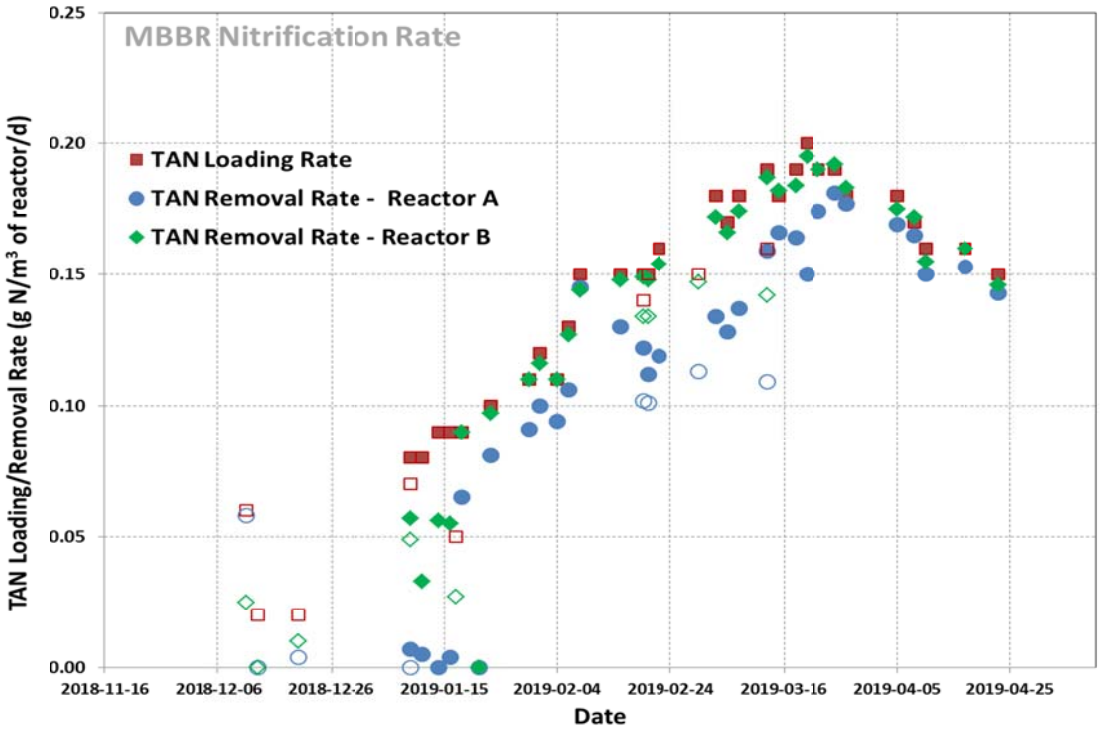

Figure 4-6 MBBR Nitrification rates

4.5 pH AND ALKALINITY

The nitrification reaction theoretically consumes 7.14 $gCaCO_3/gTAN$ oxidized. At the Mapleton lagoon facility the lagoon effluent discharged on average 311 $mgCaCO_3/L$. Even at the highest influent concentration of 18.1 mgTAN/L, the maximum alkalinity consumption during nitrification would be 130 $mgCaO_3/L$. As such, there was sufficient alkalinity for nitrification. Using the process data after the start-up phase through the end of the trial, the average calculated alkalinity consumption was 7.1 $gCaCO_3/gTAN$ oxidized. This provides another data validation check for the nitrification reaction in the LagoonGuard™ reactors.

On average, there was 226 mg$CaCO_3$/L at the effluent of RB. Concomitantly, the pH values measured by the external lab for Reactor A and Reactor B were not significantly different from the values measured for the influent (Figure 4-7). As such, the nitrification process does not require any supplemental alkalinity.

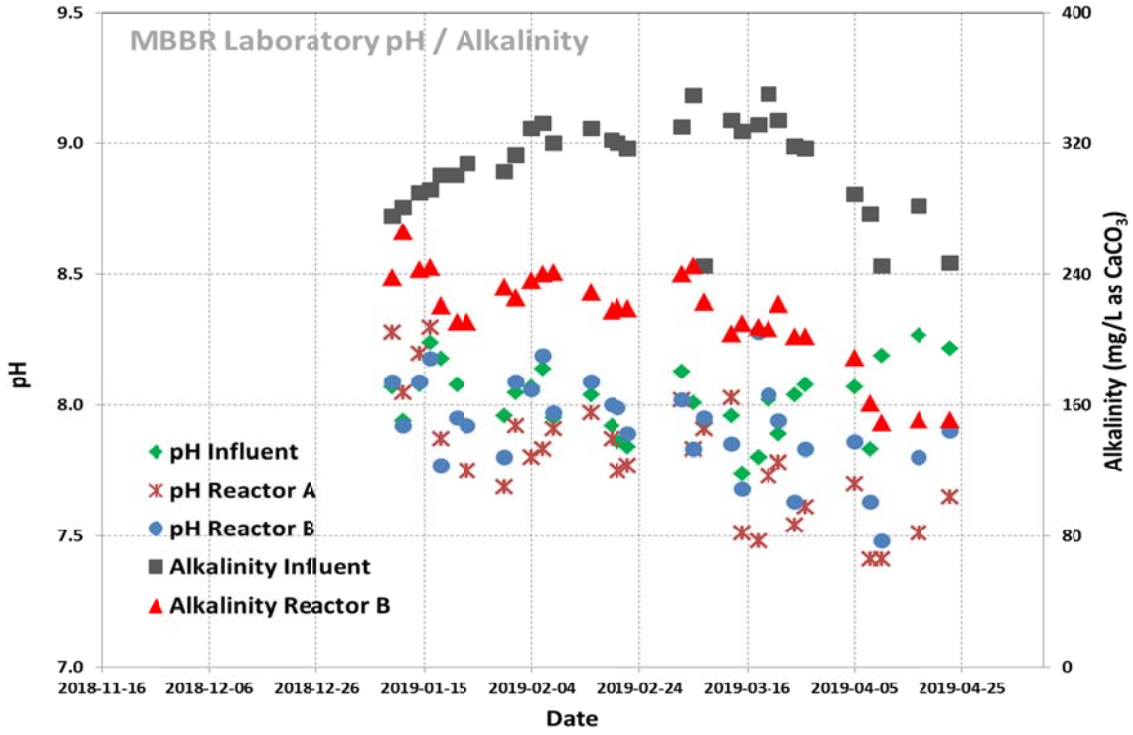

Figure 4-7 Laboratory pH/alkalinity in Influent, Reactor A and Reactor B

4.6 NON-TARGET PARAMETERS

In addition to the constituents that directly affect the process, there were various parameters analyzed (not as specific targets) to monitor the process and ensure that the biomass have the optimum growth conditions. In general, the lagoon effluent was ideal for the post-lagoon nitrification system. There was sufficient phosphorus for the biological growth and minimal biodegradable COD.

Although the TSS was only measured once, the nitrification process did not demonstrate an increase in the effluent TSS concentrations. In general, the yield of the system is 0.10 to 0.14 gTSS/gTAN oxidized. As such, the effluent TSS concentration of the LagoonGuard™ process could be on average 1.8 to 2.5 mg/L higher than the influent concentration. In the case of Mapleton, the solids will be polished prior to environmental discharge.

Table 4-2 Non-target parameters in Reactor A and Reactor B

Parameters	Reactor	Units	Average	Minimum	Maximum
Orthophosphate	**Influent**	**mg/L as P**	3.49	1.8	4.95
	A		3.48	2.85	5.10
	B		3.44	0.50	4.65
Total Chemical Oxygen Demand (COD)	**Influent**	**mg/L**	59.5	32	94
	A		60	43	96
	B		60	33	98
Soluble Chemical Oxygen Demand (sCOD)	**Influent**	**mg/L**	34.2	7	64
	A		32	18	61
	B		39	19	64
Total Suspended Solids (TSS)	**Influent**	**mg/L**	9*	9	9
	A		10*	10	10
	B		8*	8	8

* One series of samples was taken on March 13th, 2019

5. CONCLUSION

The pilot testing program of the LagoonGuard™ technology for ammonia removal in cold water was successfully achieved at the Township of Mapleton's Drayton WPCP. A complete sampling campaign was efficient in showing that the MBBR technology is suitable for this application. Moreover, the pilot testing program showed that:

- The LagoonGuard™ was optimized at low temperatures (T_{min} = 1.1°C);
- The lagoon effluent ammonia concentration increased steadily from 5 mg N/L in December to 18 mg N/L in the end of March, before decreasing slightly to 14 mg N/L at the end of the pilot trial;
- The final LagoonGuard™ effluent averaged 0.2 mgTAN/L during low temperature operation;
- Nitrogen mass balance showed all ammonia was oxidized to nitrate validating the results and a sign of non-stressed bacterial growth;
- Three toxicity tests were performed on *Daphnia magna* and rainbow trout: 0% mortality was recorded for the final effluent (Reactor B).
- The biomass growth parameters were measured at optimum values and were not limiting factors for bacterial growth: pH, alkalinity, phosphorus, dissolved oxygen, etc.;

Based on the results, the LagoonGuard™ technology is a natural fit for the Township of Mapleton, ON lagoon upgrade and Veolia is prepared to offer a process design complete with a process guarantee.

APPENDIX A

CHRONOLOGY OF THE PILOT TESTING PROGRAM

Date	**Activities**
December 5th – 7th, 2018	• Reception of the trailer; • Power connection; • Hydraulic connections; • Insulation (pipes and straw bales); • Preliminary tests; • Starting the influent submersible pump to the EQ tank.
December 10th, 2018	• Feeding Reactor A and Reactor B with influent; • Final installation of the on-line probes.
December 11th, 2018	• Training session at Township Office and visit on site; • Loading media in Reactor B.
December 21st, 2018 – January 10th, 2019	• Increasing stepwise the flow rate from 70 to 160 L/h.
January 3rd, 2019	• Influent submersible pump stopped for work at the plant: no flow from 9:50 to 16:05.
January 7th – 9th, 2019	• Decreasing the temperature inside the pilot trailer to keep the reactors as cold as possible; • Starting the automatic sampler in Reactor B and first sampling for the external laboratory.
January 17th, 2019	• Short visit by Veolia: Reduction of aeration in Reactor A, internal laboratory analyses and online probes calibration.

January 20th – 22nd, 2019	• Power outage on Jan 20th (> 10 hours); • Influent pump and submersible pump frozen: Flow stopped. • Flow back to normal on January 22nd PM.
January 26th – 28th, 2019	• Influent flow stopped: GFI electrical receptacle tripped for the submersible pump. Reset and piping inspection by Phoenix Mechanical.
March 13th, 2019	• First toxicity test.
March 28th, 2019	• Second toxicity test.
March 31st – April 3rd , 2019	• Influent flow stopped: GFI electrical receptacle tripped for the submersible pump. Reset and unplugging the heat tracers by OCWA.
April 23rd, 2019	• Third toxicity test.
April 23rd – 24th, 2019	• End of pilot testing; • Pilot trailer decommissioning.

APPENDIX B

COMPLETE PILOT TRIAL RESULTS

Date	Time	Sampler	Influent Flow (L/h)	Hydraulic residence time (hours)			Online pH			Lab pH			Influent Temp (°C)
				RA	RB	TOTAL	pHIT20-001 (EQ)	AIT5-012 (RA)	AIT5-013 (RB)	Influent	RA	RB	
Dec 11	14:00:00	Veolia	100.0	4.00	4.00	8.00	-	-	-	-	-	-	-
Dec 13	08:45:00	Veolia	70.0	5.71	5.71	11.43	8.05	8.31	8.33	-	-	-	3.50
Dec 20	09:45:00	Veolia	69.9	5.72	5.72	11.44	7.98	8.00	8.06	-	-	-	3.90
Jan 9	09:00:00	Veolia	160.0	2.50	2.50	5.00	7.81	7.82	7.77	-	-	-	3.10
Jan 9	11:40:00	OCWA	161.6	2.48	2.48	4.95	7.72	7.73	7.78	8.07	8.28	8.09	3.08
Jan 11	16:00:00	OCWA	160.1	2.50	2.50	5.00	7.64	7.66	7.82	7.94	8.05	7.92	3.33
Jan 14	13:50:00	OCWA	161.2	2.48	2.48	4.96	7.65	7.66	7.74	8.08	8.20	8.09	3.43
Jan 16	10:40:00	OCWA	160.1	2.50	2.50	5.00	7.66	7.65	7.74	8.24	8.30	8.18	3.25
Jan 17	09:10:00	Veolia	160.1	2.50	2.50	5.00	7.72	7.71	7.76	-	-	-	3.30
Jan 18	17:00:00	OCWA	160.5	2.49	2.49	4.98	7.67	7.66	7,63	8.18	7.87	7.77	3.21
Jan 21	15:00:00	OCWA	-	-	-	-	7.71	7.71	8.04	8.08		7.95	3.01
Jan 23	14:00:00	OCWA	160.5	2.49	2.49	4.98	7.66	7.66	7.61	7.92	7.75	7.92	3.22
Jan 25	10:00:00	OCWA	159.4	2.51	2.51	5.02	7.60	7.61	7.66				3.33
Jan 30	14:10:00	OCWA	158.8	2.52	2.52	5.04	7.61	7.63	7.65	7.96	7.69	7.80	3.14
Feb 1	09:10:00	OCWA	159.6	2.51	2.51	5.01	7.66	7.67	7.62	8.05	7.92	8.09	3.16
Feb 4	15:10:00	OCWA	160.1	2.50	2.50	5.00	7.62	7.64	7.65	8.07	7.80	8.06	3.27
.Feb 6	12:10:00	OCWA	180.0	2.22	2.22	4.44	7.53	7.53	7.56	8.14	7.83	8.19	-
Feb 8	16:15:00	OCWA	180.0	2.22	2.22	4.44	7.48	7.46	8.04	7.95	7.91	7.97	-
Feb 8	Influent flow stopped from 9:40 to 16:35.												
Feb 15	15:30:00	OCWA	180.6	2.21	2.21	4.43	7.44	7.45	7.54	8.04	7.97	8.09	3.85
Feb 18	15:20:00	OCWA	180.4	2.22	2.22	4.43	7.44	7.45	7.51	7.92	7.87	8.00	3.56
Feb 19	08:15:00	Veolia	180.4	2.22	2.22	4.44	7.44	7.46	7.48	-	-	-	3.50
Feb 20	09:05:00	Veolia	178.9	2.24	2.24	4.47	7.50	7.51	7.62	-	-	-	3.30
Feb 20	12:35:00	OCWA	180.9	2.21	2.21	4.42	7.50	7.51	7.63	7.86	7.75	7.99	3.45
Feb 20	The heat was turned off on February 19th, at 8:00 AM. The whole Feb 20 sample was taken after the heater was shut.												
Feb 22	17:25:00	OCWA	181.3	2.21	2.21	4.41	7.48	7.48	7.56	7.84	7.77	7.89	3.38
Mar 1	09:30:00	Veolia	180.0	2.22	2.22	4.44	7.54	7.53	7.54	-	-	-	
Mar 4	17:15:00	OCWA	181.5	2.20	2.20	4.41	7.49	7.48	7.6	8.13	8.02	8.02	3.15
Mar 6	16:25:00	OCWA	178.3	2.24	2.24	4.49	7.48	7.49	7.6	8.01	7.83	7.83	3.05
Mar 7	17:10:00	OCWA	181.1	2.21	2.21	4.42	7.47	7.48	7.56				3.15
Mar 8	13:15:00	OCWA	178.9	2.24	2.24	4.47	7.46	7.46	7.51	7.93	7.91	7.95	3.20
Mar 13	08:30:00	Veolia	180.9	2.21	2.21	4.42	7.46	7.45	7.69	-	-	-	3.30
Mar 13	10:00:00	JM/OCWA	180.6	2.21	2.21	4.43	7.46	7.46	7.58	7.96	8.03	7.85	3.27
Mar 15	13:05:00	OCWA	180.4	2.22	2.22	4.44	7.49	7.48	7.58	7.74	7.51	7.68	3.21
Mar 18	13:15:00	OCWA	179.6	2.23	2.23	4.45	7.50	7.51	7.58	7.80	7.48	8.28	3.26
Mar 20	15:40:00	OCWA	180.4	2.22	2.22	4.44	7.47	7.47	7.59	8.02	7.73	8.04	3.44
Mar 22	08:25:00	OCWA	179.1	2.23	2.23	4.47	7.46	7.47	7.62	7.89	7.78	7.94	3.51
Mar 25	15:40:00	OCWA	178.9	2.24	2.24	4.47	7.57	7.57	7.56	8.04	7.54	7.63	4.09
Mar 27	18:15:00	OCWA	180.8	2.21	2.21	4.43	7.60	7.60	7.58	8.08	7.61	7.83	4.72
Apr 5	10:05:00	OCWA	179.4	2.23	2.23	4.46	7.52	7.53	7.62	8.07	7.70	7.86	5.44
Apr 8	13:20:00	OCWA	180.2	2.22	2.22	4.44	7.71	7.73	7.68	7.83	7.41	7.63	5.78
Apr 10	16:30:00	OCWA	176.4	2.27	2.27	4.54	8.03	8.03	7.59	8.19	7.41	7.48	5.75
Apr 12	16:25:00	OCWA	179.6	2.23	2.23	4.45	8.12	8.12	7.6	-	-	-	5.10
Apr 17	14:05:00	OCWA	180.9	2.21	2.21	4.42	8.37	8.38	7.61	8.27	7.51	7.80	6.42
Apr 23	13:25:00	OCWA	180.0	2.22	2.22	4.44	-	-	-	8.22	7.65	7.90	8.43

Date	Online Temperature (°C)		DO (mgO_2/L)		Online NH_3 (mg/L N)	Online NO_3 (mg/L N)	Online NH_3 (mg/L N)	Online NO_3 (mg/L N)	TSS (mg/L)		
	TIT1-011 (RA)	TIT1-021 (RB)	AIT20-001 (RA)	AIT20-002 (RB)	AIT20-005 (Influent)	AIT20-006 (Influent)	AIT20-003 (RB)	AIT20-004 (RB)	Influent	RA	RB
Dec 11	-	-	-	-	-	-	-	-	-	-	-
Dec 13	10.50	12.50	9.76	11.50	-	-	2.90	0.40	-	-	-
Dec 20	9.50	10.50	10.03	11.69	-	-	0.90	4.16	-	-	-
Jan 9	4.83	4.36	10.84	13.07	7.77	0.78	2.67	7.55	-	-	-
Jan 9	4.63	4.11	10.93	13.08	7.77	0.83	2.80	7.38	-	-	-
Jan 11	3.97	2.85	11.65	13.47	7.81	0.78	4.56	5.93	-	-	-
Jan 14	4,69	3.94	10.99	13.18	8.21	0.79	3.03	7.63	-	-	-
Jan 16	4.51	3.77	10.84	13.18	8.36	0.89	2.91	8.45	-	-	-
Jan 17	4.14	3.36	11.38	13.38	8.46	0.70	3.17	8.29	-	-	-
Jan 18	4.64	4,39	11.32	11.00	4.93	0.77	0.03	13.28	-	-	-
Jan 21	3.42	3.63	12.28	13.42	5.08	0.81	0.00	16.27	-	-	-
Jan 23	7.52	8.58	10.13	10.11	5.38	0.83	0.02	14.64	-	-	-
Jan 25	5.18	5.13	11.00	10.96	5.28	0.88	0.00	15.89	-	-	-
Jan 30	4.97	4.36	11.31	11.36	5.72	1.24	0.00	15.95	-	-	-
Feb 1	5.43	4.95	11.42	11.42	5.51	1.19	0.00	15.47	-	-	-
Feb 4	5.67	5.81	11.42	11.04	5.71	1.09	0.00	14.96	-	-	-
.Feb 6	5.88	5.72	11.41	10.61	7.53	1.02	0.00	14.79	-	-	-
Feb 8	7.31	6.32	11.42	12.14	5.72	1.00	0.01	15.18	-	-	-
Feb 8										-	-
Feb 15	6.21	5.85	11.42	9.83	6.53	1.04	0.00	11.79	-	-	-
Feb 18	5.48	5.22	11.43	10.01	6.75	1.08	0.00	12.31	-	-	-
Feb 19	5.68	5.32	11.42	10.49	6.80	1.01	0.01	11.70	-	-	-
Feb 20	3.39	1.88	11.43	10.88	13.35	0.64	0.74	23.33	-	-	-
Feb 20	3.60	2.14	11.42	10.79	14.08	1.16	1.42	17.64	--	-	-
Feb 20										-	-
Feb 22	4.48	3.53	11.43	10.64	14.31	1.27	1.11	17.46	-	-	-
Mar 1	3.58	2.46	11.43	10.76	13.87	1.01	0.14	16.97	-	-	-
Mar 4	3.20	1.70	11.44	11.36	13.94	0.70	0.07	14.69	-	-	-
Mar 6	2.85	1.11	11.43	11.56	13.98	0.83	0.16	16.86	-	-	-
Mar 7	3.43	2.02	11.43	10.92	13.14	0.89	0.05	17.28	-	-	-
Mar 8	3.51	2.11	11.43	10.73	13.76	1.08	0.08	17.79	-	-	-
Mar 13	3.96	3.09	11.42	9.60	15.56	0.11	0.71	15.56	-	-	-
Mar 13	3.79	2.78	11.42	10.40	14.71	1.53	1.46	19.84	9	10	8
Mar 15	3.82	2.76	11.43	11.36	14.34	1.71	1.48	19.88	-	-	-
Mar 18	4.08	3.13	11.15	10.06	14.10	20.72	1.28	19.92	-	-	-
Mar 20	4.77	4.18	11.10	9.20	14.68	25.62	1.28	19.63	-	-	-
Mar 22	4.50	3.77	11.05	8.97	15.01	8.38	1.16	19.34	-	-	-
Mar 25	5.04	4.19	11.08	8.58	13.29	18.68	1.19	19.42	-	-	-
Mar 27	6.02	5.32	10.88	7.55	3.98		1.88	22.98	-	-	-
Apr 5	6.16	5.16	11.14	6.36	3.67	1.01	0.92	17.40	-	-	-
Apr 8	7.24	6,59	10.87	5.74	0.07	26.10	2.24	23.61	-	-	-
Apr 10	6.38	5.26	11.37	6.72	0.08	20.20	2.61	21.08	-	-	-
Apr 12	6.57	5.90	11.15	6,25	0.09	1.95	2.59	20.84	-	-	-
Apr 17	7.23	6.17	11.10	5.98	3.52	34.80	2.58	19.94	-	-	-
Apr 23	-	-	-	-	-	-	-	-	-	-	-

Date	Alkalinity (mg/L $CaCO_3$)			Total. Phosphorus (mg P/L)			Ortho-Phosphate-P (mg P/L)			Total COD (mg/L)			Soluble COD (mg/L)		
	Influent	RA	RB	Influent	RA	RB	Influent	RA	RB	Influent	RA	RB	Influent	RA	RB
Dec 11	320	340	340	3.85	-	5.15	3.35	-	3.35	32	82	98	25	40	64
Dec 13	320	320	320	3.80	4.00	5.70	3.35	3.35	4.25	33	48	88	7	20	25
Dec 20	320	320	300	3.70	4.00	4.20	3.45	3.35	3.35	38	47	63	17	34	37
Jan 9	280	280	240	3.90	3.25	4.90	3.60	3.10	3.55	52	59	49	27	51	32
Jan 9	276	282	238	3.49	-	3.65	2.94	-	3.14	69	72	-	29	33	-
Jan 11	281	274	266	-	-	-	-	-	-	-	-	-	-	-	-
Jan 14	290	295	243	3.51	-	3.82	3.15	-	3.46	71	96	-	31	31	-
Jan 16	292	286	244	-	-	-	-	-	-	57	59	-	35	35	-
Jan 17	300	300	260	4.05	4.15	4.25	1.80	2.85	3.30	47	55	55	38	37	62
Jan 18	301	240	221	-	-	-	-	-	-	45	43		23	27	-
Jan 21	301	-	211	3.64	-	3.47	3.44	-	3.31	54	-	33			-
Jan 23	308	233	211	-	-	-	-	-	-	54	62	-	26	24	-
Jan 25	-	-	-	-	-	-	-	-	-	49	52	-	29	28	-
Jan 30	303	240	232	-	-	-	-	-	-	57	58	-	31	30	-
Feb 1	313	244	226	-	-	-	-	-	-	54	54	-	26	27	-
Feb 4	329	250	236	4.18	-	4.49	3.63	-	3.70	55	51	-	26	28	-
.Feb 6	332	284	240	-	-	-	-	-	-	60	56	-	35	32	-
Feb 8	320	236	241	-	-	-	-	-	-	47	48	-	48	32	-
Feb 8	-	-	-	-	-	-	-	-	-		-	-			-
Feb 15	329	240	229	-	-	-	-	-	-	56	51	-	31	28	-
Feb 18	322	229	218	4.28	-	4.34	3.84	-	3.94	59	52	-	30	38	-
Feb 19	380	280	260	4.85	5.10	4.70	4.50	3.20	3.90	64	60	49	49	34	43
Feb 20	340	260	240	4.90	4.95	5.00	3.10	3.45	0.50	52	69	61	27	18	27
Feb 20	320	251	220	-	-	-	-	-	-	71	65	-	37	29	-
Feb 20	-	-	-	-	-	-	-	-	-		-	-		-	-
Feb 22	317	238	219	-	-	-	-	-	-	58	51	-	31	27	
Mar 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mar 4	330	254	240	4,37	-	4,49	4,06	-	4,14		-	-		-	-
Mar 6	349	275	245	-	-	-	-	-	-	64	58	-	35	32	-
Mar 7	-	-	-	-	-	-	-	-	-	60	83	-	57	61	-
Mar 8	245	262	223	-	-	-	-	-	-	74	46	-	46	43	-
Mar 13	360	260	220	5.00	5.25	5.15	4.95	5.10	4.65	55	53	48	18	35	19
Mar 13	334	253	204	-	-	-	-	-	-	84	54	-	29	29	-
Mar 15	327	224	210	-	-	-	-	-	-	87	76	-	49	44	-
Mar 18	331	213	208	-	-	-	-	-	-	57	56	-	48	36	-
Mar 20	350	222	207	-	-	-	-	-	-	65	60	-	33	26	-
Mar 22	334	211	222	-	-	-	-	-	-	83	70	-	64	36	-
Mar 25	318	204	202	5.30	-	5.44	3.80	-	3.80	94	76	-	61	49	-
Mar 27	317	200	202	-	-	-	-	-	-	65	62	-	32	27	-
Apr 5	289	188	189	-	-	-	-	-	-	100	56	-	28	24	-
Apr 8	277	167	161	-	-	-	-	-	-	85	77	-	25	22	-
Apr 10	245	156	149	-	-	-	-	-	-	62	63	-	30	26	-
Apr 12	-	-	-	-	-	-	-	-	-	88	54	-	23	22	-
Apr 17	282	161	151	-	-	-	-	-	-	-	-	-	-	-	-
Apr 23	247	148	151	-	-	-	-	-	-	72	49	-	22	22	-

Date	Soluble BOD_5			NH_4-N (mgN/L)			NO_3-N (mgN/L)			NO_2-N (mgN/L)			NO_2+NO_3 (mgN/L)		
	Influent	RA	RB	Influent	RA	RB	Influent	RA	RB	Influent	RA	RB	Influent	RA	RB
Dec 11	-	-	-	9.7	0.0	5.5	0.90	0.80	1.70	-	-	-	-	-	-
Dec 13	-	-	-	4.9	5.2	5.7	0.90	0.90	1.40	1.80	0.30	0.50	2.7	1.2	1.9
Dec 20	-	-	-	3.9	3.0	1.5	0.60	0.80	3.80	0.90	0.00	5.20	1.5	0.8	9.0
Jan 9	-	-	-	7.7	8.0	2.6	0.80	1.20	7.60	0.00	0.00	0.00	0.8	1.2	7.6
Jan 9	-	-	-	8.5	9.2	2.6	0.24	0.44	7.13	0.03	0.08	0.05	0.27	0.52	7.18
Jan 11	-	-	-	8.4	8.9	5.0	0.21	0.43	5.06	0.04	0.07	0.07	0.25	0.50	5.13
Jan 14	12	-	-	9.4	9.4	3.6	0.21	0.48	6.65	0.04	0.13	0.10	0.25	0.61	6.75
Jan 16	12	-	-	9.3	9.7	3.6	0.23	0.56	7.26	0.04	0.10	0.12	0.27	0.66	7.38
Jan 17	-	-	-	4.8	4.9	2.0	0.70	1.00	7.60	-	-	-	0.70	1.00	7.60
Jan 18	12	-	-	9.4	2.7	0.1	0.25	7.56	10.00	0.04	0.81	0.09	0.29	8.37	10.09
Jan 21	12	-	-	10.2	-	0.1	0.25	-	12.60	0.04		0.04	0.29	-	12.64
Jan 23	16	-	-	10.3	1.9	0.2	0.24	9.51	15.40	0.03	1.09	0.09	0.24	10.60	15.49
Jan 25	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jan 30	5	-	-	11.7	2.2	0.2	0.19	10.20	13.30	0.04	1.07	0.09	0.24	11.27	13.39
Feb 1	4	4	-	12.3	1.9	0.2	0.24	10.50	13.00	0.03	0.99	0.09	0.24	11.5	13.1
Feb 4	4	4	-	11.5	1.7	0.1	0.20	10.70	13.50	0.03	1.21	0.07	0.20	11.9	13.6
.Feb 6	8	7	-	12.0	2.2	0.2	0.20	9.97	13.90	0.03	2.60	0.08	0.2	12.6	14.0
Feb 8	4	4	-	13.5	0.1	0.2	0.15	15.70	13.60	0.03	0.14	0.06	0.15	15.80	13.70
Feb 8		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Feb 15	22	5	-	13.8	1.8	0.1	0.09	11.40	14.60	0.03	1.97	0.06	0.09	13.40	14.70
Feb 18	7	4	-	14.0	2.7	0.2	0.10	11.50	15.00	0.03	1.25	0.08	0.10	12.80	15.10
Feb 19	-	-	-	13.0	3.6	0.6	0.60	13.00	22.30	0.50	1.60	0.40	1.10	14.60	22.70
Feb 20	-	-	-	14.0	4.6	1.5	1.10	12.10	17.70	0.40	0.00	0.10	1.50	12.10	17.80
Feb 20	8	5	-	-	-	-	0.20	11.10	15.00	0.04	0.75	0.08	0.24	11.85	15.08
Feb 20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Feb 22	6	5	-	14.4	3.5	0.2	0.11	11.70	15.70	0.03	0.70	0.06	0.1	12.4	15.8
Mar 1	-	-	-	13.8	3.3	0.2	1.00	13.00	16.80	-	-	-	-	-	-
Mar 4	-	-	-	16.1	3.8	0.3	0.13	13.30	17.20	0.03	0.91	0.16	0.13	14.20	17.40
Mar 6	8	6	-	16.1	4.1	0.6	0.13	12.90	16.80	0.03	0.55	0.14	0.13	13.50	16.90
Mar 7	8	9	-	-	-	-	-	-	-	-	-	-	-	-	-
Mar 8	7	6	-	16.6	3.8	0.4	0.12	13.10	17.00	0.03	0.42	0.06	0.12	13.50	17.10
Mar 13				14.6	4.6	1.5	1.50	15.30	19.90	0.00	0.30	0.00	1.50	15.60	19.90
Mar 13	7	6	-	17.5	2.8	0.2	0.13	14.30	17.20	0.03	0.45	0.09	0.13	14.8	17.3
Mar 15	6	5	-	16.9	1.6	0.1	0.10	16.00	18.20	0.03	0.50	0.07	0.10	16.5	18.3
Mar 18	9	10	-	17.2	2.0	< 0.1	0.10	16.30	18.40	0.03	0.49	0.08	0.10	16.8	18.5
Mar 20	10	6	-	18.1	4.2	< 0.1	0.12	16.70	18.30	0.03	0.42	0.08	0.12	17.1	18.4
Mar 22	<4	4	-	17.8	1.6	< 0.1	0.11	16.90	18.80	0.03	0.31	0.04	0.11	17.2	18.8
Mar 25	9	8	-	18.0	1.1	< 0.1	0.18	17.50	19.10	0.03	0.58	0.09	0.21	18.1	19.2
Mar 27	6	6	-	17.0	0.7	< 0.1	0.19	16.70	17.90	0.05	0.61	0.09	0.2	17.3	18.0
Apr 5	9	10	-	16.4	0.7	< 0.1	0.26	17.10	18.30	0.04	0.30	0.06	0.3	17.4	18.4
Apr 8	6	6	-	16.0	0.7	< 0.1	0.22	16.30	17.30	0.03	0.34	0.04	0.3	16.6	17.3
Apr 10	8	8	-	14.7	0.5	< 0.1	0.30	15.40	16.40	0.03	0.41	0.04	0.3	15.8	16.4
Apr 12	8	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Apr 17	-	-	-	14.8	0.7	< 0.1	0.39	16.10	16.60	0.07	0.12	0.04	0.5	16.2	16.6
Apr 23	9	10	-	13.7	0.5	0.2	0.36	15.80	16.50	0.08	0.19	< 0.03	0.4	16.0	16.5

Date	Balance N (mgN/L)			SALR (gN/m^3 reactor/d)		SARR (gN/m^3 reactor/d)		Removal efficiency (%)	
	Influent	RA	RB	RA-NH4	RB-NH4	RA-NH4	RB-NH4	RA-NH4	RB-NH4
Dec 11	-	-	-	0.06	0.06	0.058	0.025	100.0	43.3
Dec 13	7.6	6.4	7.6	0.02	0.02	-0.001	-0.003	-	-
Dec 20	5.4	3.8	10.5	0.02	0.02	0.004	0.010	23.1	61.5
Jan 9	8.5	9.2	10.2	0.07	0.07	-0.003	0.049	-	66.2
Jan 9	8.8	9.7	9.8	0.08	0.08	-0.007	0.057	-	69.4
Jan 11	8.7	9.4	10.1	0.08	0.08	-0.005	0.033	-	40.5
Jan 14	9.7	10.0	10.4	0.09	0.09	0.000	0.056	-	61.7
Jan 16	9.6	10.4	11.0	0.09	0.09	-0.004	0.055	-	61.3
Jan 17	5.5	5.9	9.6	0.05	0.05	-0.001	0.027	-	-
Jan 18	9.7	11.1	10.1	0.09	0.09	0.065	0.090	71.3	98.9
Jan 21	10.5	-	12.7	-	-	0.000	0.000	100.0	99.0
Jan 23	10.5	12.5	15.7	0.10	0.10	0.081	0.097	81.6	98.1
Jan 25	-	-	-	-	-	-	-	-	-
Jan 30	11.9	13.5	13.6	0.11	0.11	0.091	0.110	81.2	98.3
Feb 1	12.5	13.4	13.3	0.12	0.12	0.100	0.116	84.6	98.4
Feb 4	11.7	13.6	13.7	0.11	0.11	0.094	0.110	85.2	99.1
.Feb 6	12.2	14.8	14.2	0.13	0.13	0.106	0.127	81.7	98.3
Feb 8	13.7	15.9	13.9	0.15	0.15	0.145	0.144	99.3	98.5
Feb 8	-	-	-	-	-			-	-
Feb 15	14.7	15.2	14.8	0.15	0.15	0.130	0.148	87.0	99.3
Feb 18	14.1	15.5	15.3	0.15	0.15	0.122	0.149	80.7	98.6
Feb 19	11.7	18.2	23.3	0.14	0.14	0.102	0.134	72.3	95.4
Feb 20	15.5	16.7	19.3	0.15	0.15	0.101	0.134	67.1	89.3
Feb 20	14.2	15.6	15.5	0.15	0.15	0.112	0.148	73.6	97.1
Feb 20	-	-	-	-	-	-	-	-	-
Feb 22	14.5	15.9	16.0	0.16	0.16	0.119	0.154	75.7	98.6
Mar 1	-	-	-	0.15	0.15	0.113	0.147	76.1	98.6
Mar 4	16.2	18.0	17.7	0.18	0.18	0.134	0.172	76.4	98.1
Mar 6	16.2	17.6	17.5	0.17	0.17	0.128	0.166	74.5	96.3
Mar 7	-	-	-	-	-	-	-	-	-
Mar 8	16.7	17.3	17.5	0.18	0.18	0.137	0.174	77.1	97.6
Mar 13	15.5	20.2	21.4	0.16	0.16	0.109	0.142	68.5	89.7
Mar 13	17.6	17.6	17.5	0.19	0.19	0.159	0.187	84.0	98.9
Mar 15	17.0	18.1	18.4	0.18	0.18	0.166	0.182	90.5	99.4
Mar 18	17.3	18.8	18.5	0.19	0.19	0.164	0.184	88.4	99.4
Mar 20	18.2	21.3	18.4	0.20	0.20	0.150	0.195	76.8	99.4
Mar 22	17.9	18.8	18.8	0.19	0.19	0.174	0.190	91.0	99.4
Mar 25	18.2	19.2	19.2	0.19	0.19	0.181	0.192	93.9	99.4
Mar 27	17.2	18.0	18.0	0.18	0.18	0.177	0.183	95.9	99.4
Apr 5	16.7	18.1	18.5	0.18	0.18	0.169	0.175	95.7	99.4
Apr 8	16.3	17.3	17.4	0.17	0.17	0.165	0.172	95.6	99.4
Apr 10	15.0	16.3	16.5	0.16	0.16	0.150	0.155	96.6	99.3
Apr 12	-	-	-	-	-	-	-	-	-
Apr 17	15.3	16.9	16.7	0.16	0.16	0.153	0.160	95.3	99.3
Apr 23	14.1	16.5	16.7	0.15	0.15	0.143	0.146	96.4	98.5

APPENDIX C

RESULTS FROM THE EXTERNAL LABORATORY

SGS Canada Inc.
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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : PO#017844

17-January-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

136 Main St., E.
Shelburne, ON
L9V 3K5, Canada

Phone: 519-343-2921, 519-925-1938 ext. 225
Fax:

Date Rec. : 11 January 2019
LR Report: **CA12266-JAN19**

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	7: Raw Raw-Pilot-Influent	8: Eff Eff-Pilot-Reactor A	9: Eff Eff-Pilot-Reactor B
Sample Date & Time					09-Jan-19 11:30	09-Jan-19 11:35	09-Jan-19 11:45
Temperature Upon Receipt [°C]	---	---	---	---	2.0	2.0	2.0
pH [no unit]	11-Jan-19	12:51	15-Jan-19	11:40	8.07	8.28	8.09
Alkalinity [mg/L as CaCO3]	11-Jan-19	12:51	15-Jan-19	11:40	276	282	238
Ammonia+Ammonium (N) [as N mg/L]	11-Jan-19	20:00	14-Jan-19	12:51	8.5	9.2	2.6
Nitrite (as N) [mg/L]	12-Jan-19	8:35	17-Jan-19	13:47	0.03	0.08	0.05
Nitrate (as N) [mg/L]	12-Jan-19	8:35	17-Jan-19	13:47	0.24	0.44	7.13
Nitrate + Nitrite (as N) [mg/L]	12-Jan-19	8:35	17-Jan-19	13:47	0.27	0.52	7.18

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Project Specialist
Environmental Services, Analytical

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0001634143

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Project : PO#017844

15-January-2019

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Fax:

Date Rec. : 11 January 2019
LR Report: **CA12267-JAN19**

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L
1: Analysis Start Date		---	14-Jan-19	14-Jan-19
2: Analysis Start Time		---	11:12	11:12
3: Analysis Completed Date		---	15-Jan-19	15-Jan-19
4: Analysis Completed Time		---	15:38	15:38
7: Raw Raw-Pilot-Influent	09-Jan-19 11:30	2.0	69	29
8: Final Final-Pilot-Reactor A	09-Jan-19 11:35	2.0	72	33

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Environmental Services, Analytical

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Project : PO#017844

15-January-2019

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Fax:

Date Rec. : 11 January 2019
LR Report: **CA13448-JAN19**

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Phosphorus (total reactive) mg/L	Phosphorus (total) mg/L
1: Analysis Start Date		---	11-Jan-19	11-Jan-19
2: Analysis Start Time		---	11:00	16:00
3: Analysis Completed Date		---	14-Jan-19	15-Jan-19
4: Analysis Completed Time		---	08:53	14:19
7: Raw Raw-Pilot-Influent	09-Jan-19 11:30	2.0	2.94	3.49
8: Eff Eff-Pilot-Reactor B	09-Jan-19 11:45	2.0	3.14	3.65

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Project : PO#017844

18-January-2019

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Fax:

Date Rec. : 15 January 2019
LR Report: **CA13496-JAN19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	pH no unit	Alkalinity mg/L as CaCO3	Ammonia+Ammonium (N) as N mg/L	Nitrite (as N) mg/L	Nitrate (as N) mg/L	Nitrate + Nitrite (as N) mg/L
1: Analysis Start Date		---	15-Jan-19	15-Jan-19	15-Jan-19	16-Jan-19	16-Jan-19	16-Jan-19
2: Analysis Start Time		---	13:05	13:05	21:00	18:54	18:54	18:54
3: Analysis Completed Date		---	17-Jan-19	17-Jan-19	16-Jan-19	18-Jan-19	18-Jan-19	18-Jan-19
4: Analysis Completed Time		---	09:25	09:25	15:37	10:19	10:19	10:19
7: Raw Raw-Pilot-Influent	11-Jan-19 15:50	6.0	7.94	281	8.4	0.04	0.21	0.25
8: Eff Eff-Pilot-Reactor A	11-Jan-19 16:00	6.0	8.05	274	8.9	0.07	0.43	0.50
9: Eff Eff-Pilot-Reactor B	11-Jan-19 16:10	6.0	7.92	266	5.0	0.07	5.06	5.13

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Project : PO#017844

18-January-2019

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Date Rec. : 15 January 2019
LR Report: **CA12286-JAN19**

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Phosphorus (total) mg/L	Phosphorus (total reactive) mg/L
1: Analysis Start Date		---	16-Jan-19	15-Jan-19
2: Analysis Start Time		---	16:15	15:00
3: Analysis Completed Date		---	18-Jan-19	17-Jan-19
4: Analysis Completed Time		---	15:43	10:42
7: Raw Raw-Pilot-Influent	14-Jan-19 13:40	3.0	3.51	3.15
8: Effluent-Effluent-Pilot-Reactor B	14-Jan-19 14:00	3.0	3.82	3.46

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Project : PO#017844

22-January-2019

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Phone: 519-343-2921, 519-925-1938 ext. 225
Fax:

Date Rec. : 15 January 2019
LR Report: **CA13477-JAN19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Soluble Biochemical Oxygen Demand (BOD5) mg/L	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L
1: Analysis Start Date		---	16-Jan-19	16-Jan-19	16-Jan-19
2: Analysis Start Time		---	17:35	08:32	16:57
3: Analysis Completed Date		---	21-Jan-19	21-Jan-19	21-Jan-19
4: Analysis Completed Time		---	16:04	16:04	16:04
7: Raw Raw-Pilot-Influent	14-Jan-19 13:40	5.0	< 12	71	31
8: Final Final-Pilot-Reactor A	14-Jan-19 13:50	5.0	---	96	31

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Project : PO#017844

22-January-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 15 January 2019
LR Report: **CA13478-JAN19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	7: Raw Raw-Pilot-Influent	8: Effluent Effluent-Pilot-Reactor A	9: Effluent Effluent-Pilot-Reactor B
Sample Date & Time					14-Jan-19 13:40	14-Jan-19 13:50	14-Jan-19 14:00
Temperature Upon Receipt [°C]	---	---	---	---	5.0	5.0	5.0
pH [no unit]	15-Jan-19	13:05	17-Jan-19	09:24	8.08	8.20	8.09
Alkalinity [mg/L as CaCO3]	15-Jan-19	13:05	17-Jan-19	09:24	290	295	243
Ammonia+Ammonium (N) [as N mg/L]	15-Jan-19	21:00	16-Jan-19	15:35	9.4	9.4	3.6
Nitrite (as N) [mg/L]	17-Jan-19	10:51	22-Jan-19	08:42	0.04	0.13	0.10
Nitrate (as N) [mg/L]	17-Jan-19	10:51	22-Jan-19	08:42	0.21	0.48	6.65
Nitrate + Nitrite (as N) [mg/L]	17-Jan-19	10:51	22-Jan-19	08:42	0.25	0.61	6.75

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Project : PO#017844

23-January-2019

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Date Rec. : 17 January 2019
LR Report: **CA13610-JAN19**

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor A	7: Eff Eff-Pilot-Reactor B
Sample Date & Time					16-Jan-19 10:35	16-Jan-19 10:45	16-Jan-19 10:55
Temperature Upon Receipt [°C]	---	---	---	---	1.0	1.0	1.0
Soluble Biochemical Oxygen Demand (BOD5) [mg/L]	18-Jan-19	15:16	23-Jan-19	14:09	< 12	---	---
Chemical Oxygen Demand [mg/L]	18-Jan-19	08:51	23-Jan-19	14:09	57	59	---
Soluble Chemical Oxygen Demand [mg/L]	18-Jan-19	08:51	23-Jan-19	14:09	35	35	---
pH [no unit]	17-Jan-19	16:10	18-Jan-19	13:36	8.24	8.30	8.18
Alkalinity [mg/L as CaCO3]	17-Jan-19	16:10	18-Jan-19	13:36	292	286	244
Ammonia+Ammonium (N) [as N mg/L]	17-Jan-19	16:50	21-Jan-19	10:12	9.3	9.7	3.6
Nitrite (as N) [mg/L]	18-Jan-19	22:47	22-Jan-19	14:42	0.04	0.10	0.12
Nitrate (as N) [mg/L]	18-Jan-19	22:47	22-Jan-19	14:42	0.23	0.56	7.26
Nitrate + Nitrite (as N) [mg/L]	18-Jan-19	22:47	22-Jan-19	14:42	0.27	0.66	7.38

Carrie Greenlaw
Project Specialist
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Project : PO#017844

06-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 01 February 2019
LR Report: **CA12020-FEB19**

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136 Main St., E.
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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Ammonia+Ammonium (N) as N mg/L
1: Analysis Start Date		---	05-Feb-19
2: Analysis Start Time		---	21:05
3: Analysis Completed Date		---	06-Feb-19
4: Analysis Completed Time		---	12:49
5: Eff Eff-Pilot-Reactor B	18-Jan-19 17:10	1.0	< 0.1

*Re-assay of Ammonia + Ammonium result from report CA12389-JAN19

Carrie Greenlaw
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OnLine LIMS

0001651955

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Project : PO#017844

25-January-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Date Rec. : 22 January 2019
LR Report: **CA12389-JAN19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor A	7: Eff Eff-Pilot-Reactor B
Sample Date & Time					18-Jan-19 16:50	18-Jan-19 17:00	18-Jan-19 17:10
Temperature Upon Receipt [°C]	---	---	---	---	1.0	1.0	1.0
pH [no unit]	22-Jan-19	14:18	24-Jan-19	14:24	8.18	7.87	7.77
Alkalinity [mg/L as CaCO3]	22-Jan-19	14:18	24-Jan-19	14:24	301	240	221
Ammonia+Ammonium (N) [as N mg/L]	22-Jan-19	18:10	23-Jan-19	09:23	9.4	2.7	**2.8**
Nitrite (as N) [mg/L]	22-Jan-19	20:01	24-Jan-19	14:30	0.04	0.81	0.09
Nitrate (as N) [mg/L]	22-Jan-19	20:01	24-Jan-19	14:30	0.25	7.56	10.0
Nitrate + Nitrite (as N) [mg/L]	22-Jan-19	20:01	24-Jan-19	14:30	0.29	8.37	10.1

Kimberley Didsbury
Project Specialist
Environmental Services, Analytical

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0001641909

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Project : PO#017844

29-January-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Date Rec. : 22 January 2019
LR Report: **CA12390-JAN19**

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Final Final-Pilot-Reactor A
Sample Date & Time					18-Jan-19 16:50	18-Jan-19 17:00
Temperature Upon Receipt [°C]	---	---	---	---	1.0	1.0
Chemical Oxygen Demand [mg/L]	23-Jan-19	08:19	28-Jan-19	10:44	45	43
Soluble Chemical Oxygen Demand [mg/L]	23-Jan-19	08:19	28-Jan-19	10:44	23	27
Soluble Biochemical Oxygen Demand (BOD5) [mg/L]	22-Jan-19	16:44	28-Jan-19	10:44	< 12	---

Patti Stark
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001644473

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P.O. Box 4300 - 185 Concession St.
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Project : PO#017844

29-January-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

136 Main St., E.
Shelburne, ON
L9V 3K5, Canada

Phone: 519-343-2921, 519-925-1938 ext. 225
Fax:

Date Rec. : 23 January 2019
LR Report: **CA12407-JAN19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Effluent Effluent-Pilot-Reactor B
Sample Date & Time					21-Jan-19 14:50	21-Jan-19 15:05
Temperature Upon Receipt [°C]	---	---	---	---	3.0	3.0
Phosphorus (total reactive) [mg/L]	23-Jan-19	10:00	25-Jan-19	09:41	3.44	3.31
Phosphorus (total) [mg/L]	23-Jan-19	19:12	28-Jan-19	10:44	3.64	3.47

Patti Stark
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0001644501

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Project : PO#017844

29-January-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

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Phone: 519-343-2921, 519-925-1938 ext. 225
Fax:

Date Rec. : 23 January 2019
LR Report: **CA12421-JAN19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent
Sample Date & Time					21-Jan-19 14:50
Temperature Upon Receipt [°C]	---	---	---	---	6.0
Soluble Biochemical Oxygen Demand (BOD5) [mg/L]	24-Jan-19	17:39	29-Jan-19	13:57	12
Chemical Oxygen Demand [mg/L]	25-Jan-19	08:41	29-Jan-19	13:57	54
Soluble Chemical Oxygen Demand [mg/L]	25-Jan-19	08:41	29-Jan-19	13:57	33

Patti Stark
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Project : PO#017844

29-January-2019

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Phone: 519-343-2921, 519-925-1938 ext. 225
Fax:

Date Rec. : 23 January 2019
LR Report: **CA12429-JAN19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor B
Sample Date & Time					21-Jan-19 14:50	21-Jan-19 15:05
Temperature Upon Receipt [°C]	---	---	---	---	6.0	6.0
pH [no unit]	24-Jan-19	08:19	29-Jan-19	11:53	8.08	7.95
Alkalinity [mg/L as CaCO3]	24-Jan-19	08:19	29-Jan-19	11:53	301	211
Ammonia+Ammonium (N) [as N mg/L]	23-Jan-19	17:24	24-Jan-19	12:02	10.2	0.1
Nitrite (as N) [mg/L]	23-Jan-19	20:27	28-Jan-19	10:54	0.04	0.04
Nitrate (as N) [mg/L]	23-Jan-19	20:27	28-Jan-19	10:54	0.25	12.6
Nitrate + Nitrite (as N) [mg/L]	23-Jan-19	20:27	28-Jan-19	10:54	0.29	12.6

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Project : PO#017844

05-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 30 January 2019
LR Report: **CA13968-JAN19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Soluble Biochemical Oxygen Demand (BOD5) mg/L	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L
1: Analysis Start Date		---	30-Jan-19	31-Jan-19	31-Jan-19
2: Analysis Start Time		---	17:08	08:23	08:23
3: Analysis Completed Date		---	05-Feb-19	05-Feb-19	05-Feb-19
4: Analysis Completed Time		---	11:09	11:09	11:09
5: Raw Raw-Pilot-Influent	25-Jan-19 09:50	3.0	< 12	49	29
6: Final Final-Pilot-Reactor A	25-Jan-19 10:00	3.0	---	52	28

Carrie Greenlaw
Project Specialist,
Environment, Health & Safety

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0001651006

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Project : PO#017844

11-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 31 January 2019
LR Report: **CA12590-JAN19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Soluble Biochemical Oxygen Demand (BOD5) mg/L	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L
1: Analysis Start Date		---	05-Feb-19	01-Feb-19	01-Feb-19
2: Analysis Start Time		---	16:12	08:53	08:53
3: Analysis Completed Date		---	11-Feb-19	01-Feb-19	01-Feb-19
4: Analysis Completed Time		---	13:33	15:42	15:42
5: Raw Raw-Pilot-Influent	30-Jan-19 14:00	Frozen	5	57	31
6: Final Final-Pilot-Reactor A	30-Jan-19 14:10	Frozen	---	58	30

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0001655731

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Project : PO#017844

05-February-2019

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Date Rec. : 31 January 2019
LR Report: **CA12591-JAN19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Effluent Effluent-Pilot-Reactor A	7: Effluent Effluent-Pilot-Reactor B
Sample Date & Time					30-Jan-19 14:00	30-Jan-19 14:10	30-Jan-19 14:20
Temperature Upon Receipt [°C]	---	---	---	---	Frozen	Frozen	Frozen
pH [no unit]	01-Feb-19	08:11	05-Feb-19	08:41	7.96	7.69	7.80
Alkalinity [mg/L as CaCO3]	01-Feb-19	08:11	05-Feb-19	08:41	303	240	232
Ammonia+Ammonium (N) [as N mg/L]	31-Jan-19	18:35	01-Feb-19	10:34	11.7	2.2	0.2
Nitrite (as N) [mg/L]	02-Feb-19	01:50	04-Feb-19	14:01	0.04	1.07	0.09
Nitrate (as N) [mg/L]	02-Feb-19	01:50	04-Feb-19	14:01	0.19	10.2	13.3
Nitrate + Nitrite (as N) [mg/L]	02-Feb-19	01:50	04-Feb-19	14:01	0.23	11.3	13.4

Carrie Greenlaw
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001650556

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Project : PO#017844

07-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 05 February 2019
LR Report: **CA13025-FEB19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	pH no unit	Alkalinity mg/L as CaCO3	Ammonia+Ammonium (N) as N mg/L	Nitrite (as N) mg/L	Nitrate (as N) mg/L	Nitrate + Nitrite (as N) mg/L
1: Analysis Start Date		---	05-Feb-19	05-Feb-19	05-Feb-19	05-Feb-19	05-Feb-19	05-Feb-19
2: Analysis Start Time		---	14:34	14:34	21:05	17:45	17:45	17:45
3: Analysis Completed Date		---	06-Feb-19	06-Feb-19	07-Feb-19	07-Feb-19	07-Feb-19	07-Feb-19
4: Analysis Completed Time		---	12:20	12:20	10:54	10:39	10:39	10:39
5: Raw Raw-Pilot-Influent	01-Feb-19 09:00	9.0	8.05	313	12.3	< 0.03	0.24	0.24
6: Eff Eff-Pilot-Reactor A	01-Feb-19 09:10	9.0	7.92	244	1.9	0.99	10.5	11.5
7: Eff Eff-Pilot-Reactor B	01-Feb-19 09:15	9.0	8.09	226	0.2	0.09	13.0	13.1

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Project : PO#017844

11-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 05 February 2019
LR Report: **CA13026-FEB19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	07-Feb-19	07-Feb-19	05-Feb-19
2: Analysis Start Time		---	08:15	08:15	16:12
3: Analysis Completed Date		---	11-Feb-19	11-Feb-19	11-Feb-19
4: Analysis Completed Time		---	13:24	13:24	13:24
5: Raw Raw-Pilot-Influent	01-Feb-19 09:00	9.0	54	26	< 4
6: Final Final-Pilot-Reactor A	01-Feb-19 09:10	9.0	54	27	4

Carrie Greenlaw
Project Specialist,
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OnLine LIMS

00016558866

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Project : PO#017844

19-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 06 February 2019
LR Report: **CA12393-FEB19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Phosphorus (total reactive) mg/L	Phosphorus (total) mg/L
1: Analysis Start Date		---	06-Feb-19	06-Feb-19
2: Analysis Start Time		---	10:58	17:33
3: Analysis Completed Date		---	19-Feb-19	11-Feb-19
4: Analysis Completed Time		---	11:02	15:13
5: Raw Raw-Pilot-Influent	04-Feb-19 15:05	4.0	3.63	4.18
6: Eff Eff-Pilot-Reactor B	04-Feb-19 15:20	4.0	3.70	4.49

Carrie Greenlaw
Project Specialist,
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0001661656

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Project : PO#017844

11-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 06 February 2019
LR Report: **CA12401-FEB19**

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Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	07-Feb-19	07-Feb-19	06-Feb-19
2: Analysis Start Time		---	08:15	08:15	16:34
3: Analysis Completed Date		---	08-Feb-19	08-Feb-19	11-Feb-19
4: Analysis Completed Time		---	11:33	11:33	14:19
5: Raw Raw-Pilot-Influent	04-Feb-19 15:05	4.0	55	26	< 4
6: Final Final-Pilot-Reactor A	04-Feb-19 15:10	4.0	51	28	< 4

Carrie Greenlaw
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OnLine LIMS

0001655832

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Project : PO#017844

11-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 06 February 2019
LR Report: **CA12419-FEB19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor A	7: Eff Eff-Pilot-Reactor B
Sample Date & Time					04-Feb-19 15:05	04-Feb-19 15:10	04-Feb-19 15:20
Temperature Upon Receipt [°C]	---	---	---	---	4.0	4.0	4.0
pH [no unit]	07-Feb-19	08:29	08-Feb-19	14:23	8.07	7.80	8.06
Alkalinity [mg/L as CaCO3]	07-Feb-19	08:29	08-Feb-19	14:23	329	250	236
Ammonia+Ammonium (N) [as N mg/L]	06-Feb-19	18:12	08-Feb-19	09:58	11.5	1.7	0.1
Nitrite (as N) [mg/L]	08-Feb-19	08:47	11-Feb-19	10:00	< 0.03	1.21	0.07
Nitrate (as N) [mg/L]	08-Feb-19	08:47	11-Feb-19	10:00	0.20	10.7	13.5
Nitrate + Nitrite (as N) [mg/L]	08-Feb-19	08:47	11-Feb-19	10:00	0.20	11.9	13.6

Carrie Greenlaw
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001655463

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Project : PO#017844

13-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 07 February 2019
LR Report: **CA12096-FEB19**

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L9V 3K5, Canada

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	08-Feb-19	08-Feb-19	08-Feb-19
2: Analysis Start Time		---	08:53	08:53	15:42
3: Analysis Completed Date		---	13-Feb-19	13-Feb-19	13-Feb-19
4: Analysis Completed Time		---	14:10	14:10	14:10
5: Raw Raw-Pilot-Influent	06-Feb-19 12:10	5.0	60	35	8
6: Final Final-Pilot-Reactor A	06-Feb-19 12:15	5.0	56	32	7

Carrie Greenlaw
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001657430

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Project : PO#017844

13-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 07 February 2019
LR Report: **CA13154-FEB19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor A	7: Eff Eff-Pilot-Reactor B
Sample Date & Time					06-Feb-19 12:10	06-Feb-19 12:15	06-Feb-19 12:25
Temperature Upon Receipt [°C]	---	---	---	---	5.0	5.0	5.0
pH [no unit]	07-Feb-19	19:32	13-Feb-19	15:40	8.14	7.83	8.19
Alkalinity [mg/L as CaCO3]	07-Feb-19	19:32	13-Feb-19	15:40	332	284	240
Ammonia+Ammonium (N) [as N mg/L]	07-Feb-19	22:00	11-Feb-19	08:37	12.0	2.2	0.2
Nitrite (as N) [mg/L]	12-Feb-19	10:54	13-Feb-19	14:50	< 0.03	2.60	0.08
Nitrate (as N) [mg/L]	12-Feb-19	10:54	13-Feb-19	14:50	0.20	9.97	13.9
Nitrate + Nitrite (as N) [mg/L]	12-Feb-19	10:54	13-Feb-19	14:50	0.20	12.6	14.0

Carrie Greenlaw
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001657603

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Project : PO#017844

15-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 12 February 2019
LR Report: **CA12182-FEB19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor A	7: Eff Eff-Pilot-Reactor B
Sample Date & Time					08-Feb-19 16:15	08-Feb-19 16:20	08-Feb-19 16:30
Temperature Upon Receipt [°C]	---	---	---	---	1.0	1.0	1.0
pH [no unit]	13-Feb-19	08:16	13-Feb-19	22:07	7.95	7.91	7.97
Alkalinity [mg/L as CaCO3]	13-Feb-19	08:16	13-Feb-19	22:07	320	236	241
Ammonia+Ammonium (N) [as N mg/L]	12-Feb-19	15:45	15-Feb-19	12:01	13.5	0.1	0.2
Nitrite (as N) [mg/L]	14-Feb-19	17:50	15-Feb-19	11:06	< 0.03	0.14	0.06
Nitrate (as N) [mg/L]	14-Feb-19	17:50	15-Feb-19	11:06	0.15	15.7	13.6
Nitrate + Nitrite (as N) [mg/L]	14-Feb-19	17:50	15-Feb-19	11:06	0.15	15.8	13.7

Carrie Greenlaw
Project Specialist,
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OnLine LIMS

0001660354

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Project : PO#017844

19-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 12 February 2019
LR Report: **CA12189-FEB19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	14-Feb-19	14-Feb-19	12-Feb-19
2: Analysis Start Time		---	10:38	10:38	16:49
3: Analysis Completed Date		---	19-Feb-19	19-Feb-19	19-Feb-19
4: Analysis Completed Time		---	10:23	10:23	10:38
5: Raw Raw-Pilot-Influent	08-Feb-19 16:15	1.0	47	48	< 4
6: Final Final-Pilot-Reactor A	08-Feb-19 16:20	1.0	48	32	< 4

Carrie Greenlaw
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001661618

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Works #: 120001782
Project : PO#017844

25-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

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L9V 3K5, Canada

Phone: 519-343-2921, 519-925-1938 ext. 225
Fax:

Date Rec. : 20 February 2019
LR Report: **CA12519-FEB19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	pH no unit	Alkalinity mg/L as CaCO3	Ammonia+Ammonium (N) as N mg/L	Nitrite (as N) mg/L	Nitrate (as N) mg/L	Nitrate + Nitrite (as N) mg/L
1: Analysis Start Date		---	20-Feb-19	20-Feb-19	20-Feb-19	20-Feb-19	20-Feb-19	20-Feb-19
2: Analysis Start Time		---	15:31	15:31	20:00	20:23	20:23	20:23
3: Analysis Completed Date		---	21-Feb-19	21-Feb-19	21-Feb-19	22-Feb-19	22-Feb-19	22-Feb-19
4: Analysis Completed Time		---	13:47	13:47	12:03	16:27	16:27	16:27
5: Raw Raw-Pilot-Influent	15-Feb-19 15:20	4.0	8.04	329	13.8	< 0.03	0.09	0.09
6: Eff Eff-Pilot-Reactor A	15-Feb-19 15:30	4.0	7.97	240	1.8	1.97	11.4	13.4
7: Eff Eff-Pilot-Reactor B	15-Feb-19 15:40	4.0	8.09	229	0.1	0.06	14.6	14.7

Carrie Greenlaw
Project Specialist,
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Works #: 120001782
Project : PO# 017844

26-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

136 Main St., E.
Shelburne, ON
L9V 3K5, Canada

Phone: 519-343-2921, 519-925-1938 ext. 225
Fax:

Date Rec. : 20 February 2019
LR Report: **CA13353-FEB19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Soluble Biochemical Oxygen Demand (BOD5) mg/L	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L
1: Analysis Start Date		---	20-Feb-19	21-Feb-19	21-Feb-19
2: Analysis Start Time		---	17:47	07:50	07:50
3: Analysis Completed Date		---	25-Feb-19	26-Feb-19	26-Feb-19
4: Analysis Completed Time		---	14:47	13:30	13:30
5: Raw Raw-Pilot-Influent	15 -Feb-19 15:20	4.0	22	56	31
6: Final Final-Pilot-Reactor A	15 -Feb-19 15:30	4.0	5	51	28

Carrie Greenlaw
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Project : PO#017844

25-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Phone: 519-343-2921, 519-925-1938 ext. 225
Fax:

Date Rec. : 20 February 2019
LR Report: **CA12505-FEB19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Phosphorus (total reactive) mg/L	Phosphorus (total) mg/L
1: Analysis Start Date		---	20-Feb-19	20-Feb-19
2: Analysis Start Time		---	11:14	17:28
3: Analysis Completed Date		---	21-Feb-19	25-Feb-19
4: Analysis Completed Time		---	12:09	10:43
5: Raw Raw-Pilot-Influent	18-Feb-19 15:10	3.0	3.84	4.28
6: Eff Eff-Pilot-Reactor B	18-Feb-19 15:30	3.0	3.94	4.34

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Project : PO# 017844

25-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 20 February 2019
LR Report: **CA12521-FEB19**

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	pH no unit	Alkalinity mg/L as CaCO3	Ammonia+Ammonium (N) as N mg/L	Nitrite (as N) mg/L	Nitrate (as N) mg/L	Nitrate + Nitrite (as N) mg/L
1: Analysis Start Date		---	21-Feb-19	21-Feb-19	20-Feb-19	20-Feb-19	20-Feb-19	20-Feb-19
2: Analysis Start Time		---	12:33	12:33	20:00	20:23	20:23	20:23
3: Analysis Completed Date		---	22-Feb-19	22-Feb-19	21-Feb-19	22-Feb-19	22-Feb-19	22-Feb-19
4: Analysis Completed Time		---	16:50	16:50	12:03	16:28	16:28	16:28
5: Raw Raw-Pilot-Influent	18-Feb-19 15:10	3.0	7.92	322	14.0	< 0.03	0.10	0.10
6: Eff Eff-Pilot-Reactor A	18-Feb-19 15:20	3.0	7.87	229	2.7	1.25	11.5	12.8
7: Eff Eff-Pilot-Reactor B	18-Feb-19 15:30	3.0	8.00	218	0.2	0.08	15.0	15.1

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Project : PO#017844

26-February-2019

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Date Rec. : 20 February 2019
LR Report: **CA12535-FEB19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	21-Feb-19	21-Feb-19	20-Feb-19
2: Analysis Start Time		---	07:50	07:50	17:47
3: Analysis Completed Date		---	26-Feb-19	26-Feb-19	25-Feb-19
4: Analysis Completed Time		---	13:29	13:29	14:47
5: Raw Raw-Pilot-Influent	18-Feb-19 15:10	3.0	59	30	7
6: Final Final-Pilot-Reactor A	18-Feb-19 15:20	3.0	52	38	4

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Project : PO#017844

28-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 22 February 2019
LR Report: **CA12657-FEB19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	25-Feb-19	25-Feb-19	22-Feb-19
2: Analysis Start Time		---	08:46	08:46	15:43
3: Analysis Completed Date		---	27-Feb-19	27-Feb-19	27-Feb-19
4: Analysis Completed Time		---	13:39	13:39	16:20
5: Raw Raw-Pilot-Influent	20-Feb-19 12:35	5.0	71	37	8
6: Final Final-Pilot-Reactor A	20-Feb-19 12:30	5.0	65	29	5

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Project : PO#017844

26-February-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 22 February 2019
LR Report: **CA12658-FEB19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor A	7: Eff Eff-Pilot-Reactor B
Sample Date & Time					20-Feb-19 12:35	20-Feb-19 12:30	20-Feb-19 12:40
Temperature Upon Receipt [°C]	---	---	---	---	5.0	5.0	5.0
pH [no unit]	22-Feb-19	18:10	25-Feb-19	18:00	7.86	7.75	7.99
Alkalinity [mg/L as CaCO3]	22-Feb-19	18:10	25-Feb-19	18:00	320	251	220
Ammonia+Ammonium (N) [as N mg/L]	22-Feb-19	18:21	26-Feb-19	13:38	14.0	3.7	0.4
Nitrite (as N) [mg/L]	22-Feb-19	15:48	25-Feb-19	10:01	0.04	0.75	0.08
Nitrate (as N) [mg/L]	22-Feb-19	15:48	25-Feb-19	10:01	0.20	11.1	15.0
Nitrate + Nitrite (as N) [mg/L]	22-Feb-19	15:48	25-Feb-19	10:01	0.24	11.9	15.1

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Project : PO#017844

04-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 27 February 2019
LR Report: **CA13530-FEB19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Soluble Biochemical Oxygen Demand (BOD5) mg/L	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L
1: Analysis Start Date		---	27-Feb-19	28-Feb-19	28-Feb-19
2: Analysis Start Time		---	17:54	10:09	10:09
3: Analysis Completed Date		---	04-Mar-19	04-Mar-19	04-Mar-19
4: Analysis Completed Time		---	15:42	15:42	15:42
5: Raw Raw-Pilot-Influent	22-Feb-19 17:15	4.0	6	58	31
6: Final Final-Pilot-Reactor A	22-Feb-19 17:25	4.0	5	51	27

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Project : PO#017844

05-March-2019

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Date Rec. : 27 February 2019
LR Report: **CA13535-FEB19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	pH no unit	Alkalinity mg/L as CaCO3	Ammonia+Ammonium (N) as N mg/L	Nitrite (as N) mg/L	Nitrate (as N) mg/L	Nitrate + Nitrite (as N) mg/L
1: Analysis Start Date		---	28-Feb-19	28-Feb-19	27-Feb-19	27-Feb-19	27-Feb-19	27-Feb-19
2: Analysis Start Time		---	13:19	13:19	18:00	20:04	20:04	20:04
3: Analysis Completed Date		---	04-Mar-19	04-Mar-19	28-Feb-19	28-Feb-19	28-Feb-19	28-Feb-19
4: Analysis Completed Time		---	17:36	17:36	15:05	10:44	10:44	10:44
5: Raw Raw-Pilot-Influent	22-Feb-19 17:15	4.0	7.84	317	14.4	< 0.03	0.11	0.11
6: Effluent Effluent-Pilot-Reactor A	22-Feb-19 17:25	4.0	7.77	238	3.5	0.70	11.7	12.4
7: Effluent Effluent-Pilot-Reactor B	22-Feb-19 17:35	4.0	7.89	219	0.2	0.06	15.7	15.8

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Project : PO#017844

11-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Date Rec. : 06 March 2019
LR Report: **CA12193-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor A	7: Eff Eff-Pilot-Reactor B
Sample Date & Time					04-Mar-19 17:05	04-Mar-19 17:15	04-Mar-19 17:25
Temperature Upon Receipt [°C]	---	---	---	---	3.0	3.0	3.0
pH [no unit]	07-Mar-19	13:25	08-Mar-19	14:36	8.13	8.02	8.02
Alkalinity [mg/L as CaCO3]	07-Mar-19	13:25	08-Mar-19	14:36	330	254	240
Ammonia+Ammonium (N) [as N mg/L]	06-Mar-19	18:20	07-Mar-19	14:17	16.1	3.8	0.3
Nitrite (as N) [mg/L]	08-Mar-19	12:42	11-Mar-19	14:03	< 0.03	0.91	0.16
Nitrate (as N) [mg/L]	08-Mar-19	12:42	11-Mar-19	14:03	0.13	13.3	17.2
Nitrate + Nitrite (as N) [mg/L]	08-Mar-19	12:42	11-Mar-19	14:03	0.13	14.2	17.4

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Project : PO#017844

11-March-2019

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Date Rec. : 06 March 2019
LR Report: **CA13063-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Phosphorus (total reactive) mg/L	Phosphorus (total) mg/L
1: Analysis Start Date		---	06-Mar-19	06-Mar-19
2: Analysis Start Time		---	12:34	18:00
3: Analysis Completed Date		---	08-Mar-19	08-Mar-19
4: Analysis Completed Time		---	13:54	16:01
5: Raw Raw-Pilot-Influent	04-Mar-19 17:05	3.0	4.06	4.37
6: Effluent Effluent-Pilot-Reactor B	04-Mar-19 17:25	3.0	4.14	4.49

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Project : PO#017844

12-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 06 March 2019
LR Report: **CA13064-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	07-Mar-19	07-Mar-19	06-Mar-19
2: Analysis Start Time		---	11:55	11:55	17:56
3: Analysis Completed Date		---	11-Mar-19	11-Mar-19	11-Mar-19
4: Analysis Completed Time		---	15:42	15:42	15:42
5: Raw Raw-Pilot-Influent	04-Mar-19 17:05	3.0	60	57	8
6: Final Final-Pilot-Reactor A	04-Mar-19 17:15	3.0	83	61	9

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Project : PO#017844

13-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Date Rec. : 08 March 2019
LR Report: **CA13135-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	11-Mar-19	11-Mar-19	08-Mar-19
2: Analysis Start Time		---	10:11	10:11	15:55
3: Analysis Completed Date		---	13-Mar-19	13-Mar-19	13-Mar-19
4: Analysis Completed Time		---	13:47	13:47	13:47
5: Raw Raw-Pilot-Influent	06-Mar-19 16:15	4.0	64	35	8
6: Final Final-Pilot-Reactor A	06-Mar-19 16:15	4.0	58	32	6

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OnLine LIMS

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Project : PO#017844

13-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Fax:

Date Rec. : 08 March 2019
LR Report: **CA13136-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor A	7: Eff Eff-Pilot-Reactor B
Sample Date & Time					06-Mar-19 16:15	06-Mar-19 16:25	06-Mar-19 16:35
Temperature Upon Receipt [°C]	---	---	---	---	4.0	4.0	4.0
pH [no unit]	08-Mar-19	13:43	12-Mar-19	15:54	8.01	7.83	7.83
Alkalinity [mg/L as CaCO3]	08-Mar-19	13:43	12-Mar-19	15:54	349	275	245
Ammonia+Ammonium (N) [as N mg/L]	08-Mar-19	16:05	12-Mar-19	15:18	16.1	4.1	0.6
Nitrite (as N) [mg/L]	08-Mar-19	23:07	12-Mar-19	13:01	< 0.03	0.55	0.14
Nitrate (as N) [mg/L]	08-Mar-19	23:07	12-Mar-19	13:01	0.13	12.9	16.8
Nitrate + Nitrite (as N) [mg/L]	08-Mar-19	23:07	12-Mar-19	13:01	0.13	13.5	16.9

Carrie Greenlaw
Project Specialist,
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OnLine LIMS

0001682941

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Project : PO#017844

13-March-2019

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Date Rec. : 08 March 2019
LR Report: **CA13136-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor A	7: Eff Eff-Pilot-Reactor B
Sample Date & Time					06-Mar-19 16:15	06-Mar-19 16:25	06-Mar-19 16:35
Temperature Upon Receipt [°C]	---	---	---	---	4.0	4.0	4.0
pH [no unit]	08-Mar-19	13:43	12-Mar-19	15:54	8.01	7.83	7.83
Alkalinity [mg/L as CaCO3]	08-Mar-19	13:43	12-Mar-19	15:54	349	275	245
Ammonia+Ammonium (N) [as N mg/L]	08-Mar-19	16:05	12-Mar-19	15:18	16.1	4.1	0.6
Nitrite (as N) [mg/L]	08-Mar-19	23:07	12-Mar-19	13:01	< 0.03	0.55	0.14
Nitrate (as N) [mg/L]	08-Mar-19	23:07	12-Mar-19	13:01	0.13	12.9	16.8
Nitrate + Nitrite (as N) [mg/L]	08-Mar-19	23:07	12-Mar-19	13:01	0.13	13.5	16.9

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Project : PO#017844

15-March-2019

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Fax:

Date Rec. : 12 March 2019
LR Report: **CA13172-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	pH no unit	Alkalinity mg/L as CaCO3	Ammonia+Ammonium (N) as N mg/L	Nitrite (as N) mg/L	Nitrate (as N) mg/L	Nitrate + Nitrite (as N) mg/L
1: Analysis Start Date		---	12-Mar-19	12-Mar-19	12-Mar-19	12-Mar-19	12-Mar-19	12-Mar-19
2: Analysis Start Time		---	11:55	11:55	18:30	15:17	15:17	15:17
3: Analysis Completed Date		---	15-Mar-19	15-Mar-19	14-Mar-19	13-Mar-19	13-Mar-19	13-Mar-19
4: Analysis Completed Time		---	12:40	12:40	14:48	15:50	15:50	15:50
5: Raw Raw-Pilot-Influent	08-Mar-19 13:05	6.0	7.93	245	16.6	< 0.03	0.12	0.12
6: Eff Eff-Pilot-Reactor A	08-Mar-19 13:15	6.0	7.91	262	3.8	0.42	13.1	13.5
7: Eff Eff-Pilot-Reactor B	08-Mar-19 13:25	6.0	7.95	223	0.4	0.06	17.0	17.1

Carrie Greenlaw
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001686687

SGS Canada Inc.
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Project : PO#017844

15-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

136 Main St., E.
Shelburne, ON
L9V 3K5, Canada

Phone: 519-343-2921, 519-925-1938 ext. 225
Fax:

Date Rec. : 12 March 2019
LR Report: **CA13172-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	pH no unit	Alkalinity mg/L as CaCO3	Ammonia+Ammonium (N) as N mg/L	Nitrite (as N) mg/L	Nitrate (as N) mg/L	Nitrate + Nitrite (as N) mg/L
1: Analysis Start Date		---	12-Mar-19	12-Mar-19	12-Mar-19	12-Mar-19	12-Mar-19	12-Mar-19
2: Analysis Start Time		---	11:55	11:55	18:30	15:17	15:17	15:17
3: Analysis Completed Date		---	15-Mar-19	15-Mar-19	14-Mar-19	13-Mar-19	13-Mar-19	13-Mar-19
4: Analysis Completed Time		---	12:40	12:40	14:48	15:50	15:50	15:50
5: Raw Raw-Pilot-Influent	08-Mar-19 13:05	6.0	7.93	245	16.6	< 0.03	0.12	0.12
6: Eff Eff-Pilot-Reactor A	08-Mar-19 13:15	6.0	7.91	262	3.8	0.42	13.1	13.5
7: Eff Eff-Pilot-Reactor B	08-Mar-19 13:25	6.0	7.95	223	0.4	0.06	17.0	17.1

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Project : PO#017844

25-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Date Rec. : 12 March 2019
LR Report: **CA13177-MAR19**

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	13-Mar-19	13-Mar-19	12-Mar-19
2: Analysis Start Time		---	08:39	08:39	16:39
3: Analysis Completed Date		---	21-Mar-19	21-Mar-19	18-Mar-19
4: Analysis Completed Time		---	16:24	16:24	11:52
5: Raw Raw-Pilot-Influent	08-Mar-19 13:05	6.0	74	46	7
6: Final Final-Pilot-Reactor A	08-Mar-19 13:15	6.0	61	43	6

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Project : PO#017844

21-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 15 March 2019
LR Report: **CA12466-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	18-Mar-19	18-Mar-19	15-Mar-19
2: Analysis Start Time		---	09:41	09:41	15:41
3: Analysis Completed Date		---	20-Mar-19	21-Mar-19	20-Mar-19
4: Analysis Completed Time		---	14:17	09:35	12:23
5: Raw Raw-Pilot-Influent	13-Mar-19 09:55	9.0	84	29	7
6: Final Final-Pilot-Reactor A	13-Mar-19 10:00	9.0	54	29	6

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Project : PO#017844

21-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 15 March 2019
LR Report: **CA12482-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor A	7: Eff Eff-Pilot-Reactor B
Sample Date & Time					13-Mar-19 09:55	13-Mar-19 10:00	13-Mar-19 10:05
Temperature Upon Receipt [°C]	---	---	---	---	9.0	9.0	9.0
pH [no unit]	15-Mar-19	13:22	20-Mar-19	11:19	7.96	8.03	7.85
Alkalinity [mg/L as CaCO3]	15-Mar-19	13:22	20-Mar-19	11:33	334	253	204
Ammonia+Ammonium (N) [as N mg/L]	15-Mar-19	16:16	19-Mar-19	12:54	17.5	2.8	0.2
Nitrite (as N) [mg/L]	15-Mar-19	22:57	20-Mar-19	15:32	< 0.03	0.45	0.09
Nitrate (as N) [mg/L]	15-Mar-19	22:57	20-Mar-19	15:32	0.13	14.3	17.2
Nitrate + Nitrite (as N) [mg/L]	15-Mar-19	22:57	20-Mar-19	15:32	0.13	14.8	17.3
Total Suspended Solids [mg/L]	18-Mar-19	10:11	19-Mar-19	15:01	9	10	8

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Project : PO#017844

21-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Date Rec. : 15 March 2019
LR Report: **CA12482-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor A	7: Eff Eff-Pilot-Reactor B
Sample Date & Time					13-Mar-19 09:55	13-Mar-19 10:00	13-Mar-19 10:05
Temperature Upon Receipt [°C]	---	---	---	---	9.0	9.0	9.0
pH [no unit]	15-Mar-19	13:22	20-Mar-19	11:19	7.96	8.03	7.85
Alkalinity [mg/L as CaCO3]	15-Mar-19	13:22	20-Mar-19	11:33	334	253	204
Ammonia+Ammonium (N) [as N mg/L]	15-Mar-19	16:16	19-Mar-19	12:54	17.5	2.8	0.2
Nitrite (as N) [mg/L]	15-Mar-19	22:57	20-Mar-19	15:32	< 0.03	0.45	0.09
Nitrate (as N) [mg/L]	15-Mar-19	22:57	20-Mar-19	15:32	0.13	14.3	17.2
Nitrate + Nitrite (as N) [mg/L]	15-Mar-19	22:57	20-Mar-19	15:32	0.13	14.8	17.3
Total Suspended Solids [mg/L]	18-Mar-19	10:11	19-Mar-19	15:01	9	10	8

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Project : PO#017844

25-March-2019

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Date Rec. : 19 March 2019
LR Report: **CA13295-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	20-Mar-19	20-Mar-19	19-Mar-19
2: Analysis Start Time		---	08:04	08:04	16:13
3: Analysis Completed Date		---	25-Mar-19	25-Mar-19	25-Mar-19
4: Analysis Completed Time		---	13:47	13:47	13:24
5: Raw Raw-Pilot-Influent	15-Mar-19 13:00	4.0	87	49	6
6: Final Final-Pilot-Reactor A	15-Mar-19 13:05	4.0	76	44	5

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Project : PO#017844

25-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 19 March 2019
LR Report: **CA13296-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor A	7: Eff Eff-Pilot-Reactor B
Sample Date & Time					15-Mar-19 13:00	15-Mar-19 13:05	15-Mar-19 13:10
Temperature Upon Receipt [°C]	---	---	---	---	4.0	4.0	4.0
pH [no unit]	19-Mar-19	14:00	20-Mar-19	11:49	7.74	7.51	7.68
Alkalinity [mg/L as CaCO3]	19-Mar-19	14:00	20-Mar-19	11:49	327	224	210
Ammonia+Ammonium (N) [as N mg/L]	19-Mar-19	20:05	25-Mar-19	08:52	16.9	1.6	0.1
Nitrite (as N) [mg/L]	19-Mar-19	23:03	22-Mar-19	12:27	< 0.03	0.50	0.07
Nitrate (as N) [mg/L]	19-Mar-19	23:03	22-Mar-19	12:27	0.10	16.0	18.2
Nitrate + Nitrite (as N) [mg/L]	19-Mar-19	23:03	22-Mar-19	12:27	0.10	16.5	18.3

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Project : PO#017844

25-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 20 March 2019
LR Report: **CA12616-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Phosphorus (total reactive) mg/L	Phosphorus (total) mg/L
1: Analysis Start Date		---	20-Mar-19	20-Mar-19
2: Analysis Start Time		---	11:44	19:35
3: Analysis Completed Date		---	22-Mar-19	22-Mar-19
4: Analysis Completed Time		---	10:16	11:30
5: Raw Raw-Pilot-Influent	18-Mar-19 13:05	7.0	3.95	5.01
6: Eff Eff-Pilot-Reactor B	18-Mar-19 13:25	7.0	4.00	5.13

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Project : PO#017844

27-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Date Rec. : 20 March 2019
LR Report: **CA13360-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Soluble Biochemical Oxygen Demand (BOD5) mg/L	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L
1: Analysis Start Date		---	20-Mar-19	21-Mar-19	25-Mar-19
2: Analysis Start Time		---	16:33	08:20	17:20
3: Analysis Completed Date		---	25-Mar-19	27-Mar-19	27-Mar-19
4: Analysis Completed Time		---	16:13	14:11	14:11
5: Raw Raw-Pilot-Influent	18-Mar-19 13:05	7.0	9	57	48
6: Final Final-Pilot-Reactor A	18-Mar-19 13:15	7.0	10	56	36

Carrie Greenlaw
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OnLine LIMS

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Project : PO#017844

27-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 20 March 2019
LR Report: **CA13365-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor A	7: Eff Eff-Pilot-Reactor B
Sample Date & Time					18-Mar-19 13:05	18-Mar-19 13:15	18-Mar-19 13:25
Temperature Upon Receipt [°C]	---	---	---	---	7.0	7.0	7.0
pH [no unit]	20-Mar-19	14:47	26-Mar-19	15:34	7.80	7.48	8.28
Alkalinity [mg/L as CaCO3]	20-Mar-19	14:47	26-Mar-19	15:34	331	213	208
Ammonia+Ammonium (N) [as N mg/L]	20-Mar-19	19:00	27-Mar-19	15:42	17.2	2.0	< 0.1
Nitrite (as N) [mg/L]	21-Mar-19	13:49	22-Mar-19	11:00	< 0.03	0.49	0.08
Nitrate (as N) [mg/L]	21-Mar-19	13:49	22-Mar-19	11:00	0.10	16.3	18.4
Nitrate + Nitrite (as N) [mg/L]	21-Mar-19	13:49	22-Mar-19	11:00	0.10	16.8	18.5

Carrie Greenlaw
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Project : PO#017844

28-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Phone: 519-343-2921, 519-925-1938 ext. 225
Fax:

Date Rec. : 22 March 2019
LR Report: **CA13444-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Effluent Effluent-Pilot-Reactor A	7: Effluent Effluent-Pilot-Reactor B
Sample Date & Time					20-Mar-19 15:30	20-Mar-19 15:40	20-Mar-19 15:50
Temperature Upon Receipt [°C]	---	---	---	---	8.0	8.0	8.0
pH [no unit]	25-Mar-19	08:01	25-Mar-19	16:31	8.02	7.73	8.04
Alkalinity [mg/L as CaCO3]	25-Mar-19	08:01	25-Mar-19	16:31	350	222	207
Ammonia+Ammonium (N) [as N mg/L]	22-Mar-19	13:45	27-Mar-19	16:13	18.1	4.2	< 0.1
Nitrite (as N) [mg/L]	23-Mar-19	00:55	26-Mar-19	14:08	< 0.03	0.42	0.08
Nitrate (as N) [mg/L]	23-Mar-19	00:55	26-Mar-19	14:08	0.12	16.7	18.3
Nitrate + Nitrite (as N) [mg/L]	23-Mar-19	00:55	26-Mar-19	14:08	0.12	17.1	18.4

Carrie Greenlaw
Project Specialist,
Environment, Health & Safety

OnLine LIMS

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Project : PO#017844

27-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Fax:

Date Rec. : 22 March 2019
LR Report: **CA13445-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	25-Mar-19	25-Mar-19	22-Mar-19
2: Analysis Start Time		---	08:49	08:49	15:53
3: Analysis Completed Date		---	27-Mar-19	27-Mar-19	27-Mar-19
4: Analysis Completed Time		---	12:44	12:44	12:44
5: Raw Raw-Pilot-Influent	20-Mar-19 15:50	8.0	65	33	10
6: Final Final-Pilot-Reactor A	20-Mar-19 15:40	8.0	60	26	6

Carrie Greenlaw
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0001696806

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Project : PO#017844

02-April-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

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Phone: 519-343-2921, 519-925-1938 ext. 225
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Date Rec. : 26 March 2019
LR Report: **CA12772-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	27-Mar-19	27-Mar-19	27-Mar-19
2: Analysis Start Time		---	16:52	16:52	16:35
3: Analysis Completed Date		---	01-Apr-19	01-Apr-19	01-Apr-19
4: Analysis Completed Time		---	18:07	18:07	18:07
5: Raw Raw-Pilot-Influent	22-Mar-19 08:15	Frozen	83	64	< 4
6: Final Final-Pilot-Reactor A	22-Mar-19 08:25	Frozen	70	36	< 4

Carrie Greenlaw
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001702391

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Project : PO#017844

29-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 26 March 2019
LR Report: **CA12773-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor A	7: Eff Eff-Pilot-Reactor B
Sample Date & Time					22-Mar-19 08:15	22-Mar-19 08:25	22-Mar-19 08:35
Temperature Upon Receipt [°C]	---	---	---	---	Frozen	Frozen	Frozen
pH [no unit]	27-Mar-19	07:59	28-Mar-19	17:55	7.89	7.78	7.94
Alkalinity [mg/L as CaCO3]	27-Mar-19	07:59	28-Mar-19	17:55	334	211	222
Ammonia+Ammonium (N) [as N mg/L]	26-Mar-19	18:00	28-Mar-19	10:18	17.8	1.6	< 0.1
Nitrite (as N) [mg/L]	26-Mar-19	16:10	27-Mar-19	12:33	< 0.03	0.31	0.04
Nitrate (as N) [mg/L]	26-Mar-19	16:10	27-Mar-19	12:33	0.11	16.9	18.8
Nitrate + Nitrite (as N) [mg/L]	26-Mar-19	16:10	27-Mar-19	12:33	0.11	17.2	18.8

Carrie Greenlaw
Project Specialist,
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Project : PO#017844

02-April-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Fax:

Date Rec. : 27 March 2019
LR Report: **CA13566-MAR19**

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	27-Mar-19	27-Mar-19	27-Mar-19
2: Analysis Start Time		---	16:52	16:52	16:35
3: Analysis Completed Date		---	01-Apr-19	01-Apr-19	01-Apr-19
4: Analysis Completed Time		---	18:20	18:20	18:20
5: Raw Raw-Pilot-Influent	25-Mar-19 11:35	7.0	94	61	9
6: Final Final-Pilot-Reactor A	25-Mar-19 11:45	7.0	76	49	8

Carrie Greenlaw
Project Specialist,
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Project : PO#017844

29-March-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 27 March 2019
LR Report: **CA13571-MAR19**

Copy: #1

136 Main St., E.
Shelburne, ON
L9V 3K5, Canada

Phone: 519-343-2921, 519-925-1938 ext. 225
Fax:

CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Phosphorus (total reactive) mg/L	Phosphorus (total) mg/L
1: Analysis Start Date		---	27-Mar-19	28-Mar-19
2: Analysis Start Time		---	16:30	16:15
3: Analysis Completed Date		---	29-Mar-19	29-Mar-19
4: Analysis Completed Time		---	09:35	14:47
5: Raw Raw-Pilot-Influent	25-Mar-19 11:35	7.0	3.80	5.30
6: Eff Eff-Pilot-Reactor B	25-Mar-19 11:55	7.0	3.80	5.44

Total Reactive Phosphorous was received/processed after the recommended holding time of 48 hours.

Carrie Greenlaw
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001701123

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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : PO#017844

01-April-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

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Date Rec. : 27 March 2019
LR Report: **CA13579-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	pH no unit	Alkalinity mg/L as CaCO3	Ammonia+Ammonium (N) as N mg/L	Nitrite (as N) mg/L	Nitrate (as N) mg/L	Nitrate + Nitrite (as N) mg/L
1: Analysis Start Date		---	28-Mar-19	28-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19
2: Analysis Start Time		---	08:30	08:30	18:00	19:44	19:44	19:44
3: Analysis Completed Date		---	29-Mar-19	29-Mar-19	01-Apr-19	28-Mar-19	28-Mar-19	28-Mar-19
4: Analysis Completed Time		---	15:03	15:03	08:17	08:34	08:34	08:34
5: Raw Raw-Pilot-Influent	25-Mar-19 11:35	7.0	8.04	318	18.0	0.03	0.18	0.21
6: Effluent Effluent-Pilot-Reactor A	25-Mar-19 11:45	7.0	7.54	204	1.1	0.58	17.5	18.1
7: Effluent Effluent-Pilot-Reactor B	25-Mar-19 11:55	7.0	7.63	202	< 0.1	0.09	19.1	19.2

Carrie Greenlaw
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0001701444

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Project : PO#017844

03-April-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 29 March 2019
LR Report: **CA13624-MAR19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	01-Apr-19	01-Apr-19	29-Mar-19
2: Analysis Start Time		---	09:57	09:57	16:14
3: Analysis Completed Date		---	03-Apr-19	03-Apr-19	03-Apr-19
4: Analysis Completed Time		---	14:37	14:37	14:37
5: Raw Raw-Pilot-Influent	27-Mar-19 18:05	10.0	65	32	6
6: Final Final-Pilot-Reactor A	27-Mar-19 18:15	10.0	62	27	6

Carrie Greenlaw
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0001704151

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Project : PO#017844

03-April-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Date Rec. : 29 March 2019
LR Report: **CA13625-MAR19**

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor A	7: Eff Eff-Pilot-Reactor B
Sample Date & Time					27-Mar-19 18:05	27-Mar-19 18:15	27-Mar-19 18:25
Temperature Upon Receipt [°C]	---	---	---	---	10.0	10.0	10.0
pH [no unit]	31-Mar-19	16:28	02-Apr-19	17:22	8.08	7.61	7.83
Alkalinity [mg/L as CaCO3]	31-Mar-19	16:28	02-Apr-19	17:22	317	200	202
Ammonia+Ammonium (N) [as N mg/L]	29-Mar-19	20:30	02-Apr-19	12:54	17.0	0.7	< 0.1
Nitrite (as N) [mg/L]	29-Mar-19	20:37	01-Apr-19	11:15	0.05	0.61	0.09
Nitrate (as N) [mg/L]	29-Mar-19	20:37	01-Apr-19	11:15	0.19	16.7	17.9
Nitrate + Nitrite (as N) [mg/L]	29-Mar-19	20:37	01-Apr-19	11:15	0.24	17.3	18.0

Carrie Greenlaw
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Environment, Health & Safety

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0001703768

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Project : PO#017844

12-April-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 09 April 2019
LR Report: **CA12384-APR19**

Copy: #1

136 Main St., E.
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Phone: 519-343-2921, 519-925-1938 ext. 225
Fax:

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Effluent Effluent-Pilot-Reactor A	7: Effluent Effluent-Pilot-Reactor B
Sample Date & Time					05-Apr-19 09:55	05-Apr-19 10:05	05-Apr-19 10:15
Temperature Upon Receipt [°C]	---	---	---	---	9.0	9.0	9.0
pH [no unit]	10-Apr-19	07:58	11-Apr-19	14:36	8.07	7.70	7.86
Alkalinity [mg/L as CaCO3]	10-Apr-19	07:58	11-Apr-19	14:36	289	188	189
Ammonia+Ammonium (N) [as N mg/L]	09-Apr-19	15:13	12-Apr-19	10:04	16.4	0.7	< 0.1
Nitrite (as N) [mg/L]	09-Apr-19	16:22	10-Apr-19	12:34	0.04	0.30	0.06
Nitrate (as N) [mg/L]	09-Apr-19	16:22	10-Apr-19	12:34	0.26	17.1	18.3
Nitrate + Nitrite (as N) [mg/L]	09-Apr-19	16:22	10-Apr-19	12:34	0.30	17.4	18.4

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0001714029

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Project : PO#017844

18-April-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Fax:

Date Rec. : 12 April 2019
LR Report: **CA12530-APR19**

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Effluent Effluent-Pilot-Reactor A	7: Effluent Effluent-Pilot-Reactor B
Sample Date & Time					10-Apr-19 16:20	10-Apr-19 16:30	10-Apr-19 16:35
Temperature Upon Receipt [°C]	---	---	---	---	10.0	10.0	10.0
pH [no unit]	15-Apr-19	10:09	17-Apr-19	21:21	8.19	7.41	7.48
Alkalinity [mg/L as CaCO3]	15-Apr-19	10:09	17-Apr-19	21:21	245	156	149
Ammonia+Ammonium (N) [as N mg/L]	12-Apr-19	16:00	15-Apr-19	12:13	14.7	0.5	< 0.1
Nitrite (as N) [mg/L]	13-Apr-19	01:32	16-Apr-19	15:15	0.03	0.41	0.04
Nitrate (as N) [mg/L]	13-Apr-19	01:32	16-Apr-19	15:15	0.30	15.4	16.4
Nitrate + Nitrite (as N) [mg/L]	13-Apr-19	01:32	16-Apr-19	15:15	0.33	15.8	16.4

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0001718874

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Project : PO#017844

17-April-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 12 April 2019
LR Report: **CA12562-APR19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	15-Apr-19	15-Apr-19	12-Apr-19
2: Analysis Start Time		---	07:46	07:46	16:11
3: Analysis Completed Date		---	17-Apr-19	17-Apr-19	17-Apr-19
4: Analysis Completed Time		---	13:50	13:50	13:50
5: Raw Raw-Pilot-Influent	10-Apr-19 16:20	5.0	62	30	8
6: Final Final-Pilot-Reactor A	10-Apr-19 16:30	5.0	63	26	8

Carrie Greenlaw
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Project : PO#017844

22-April-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Date Rec. : 16 April 2019
LR Report: **CA12636-APR19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Final Final-Pilot-Reactor A
Sample Date & Time					12-Apr-19 16:15	12-Apr-19 16:25
Temperature Upon Receipt [°C]	---	---	---	---	6.0	6.0
Chemical Oxygen Demand [mg/L]	17-Apr-19	10:43	22-Apr-19	13:57	88	54
Soluble Chemical Oxygen Demand [mg/L]	18-Apr-19	08:23	22-Apr-19	13:57	23	22
Soluble Biochemical Oxygen Demand (BOD5) [mg/L]	16-Apr-19	16:52	22-Apr-19	13:57	8	5

Kimberley Didsbury
Project Specialist,
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0001722931

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Project : PO#017844

24-April-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 18 April 2019
LR Report: **CA12776-APR19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Effluent Effluent-Pilot-Reactor A	7: Effluent Effluent-Pilot-Reactor B
Sample Date & Time					17-Apr-19 13:55	17-Apr-19 14:05	17-Apr-19 14:15
Temperature Upon Receipt [°C]	---	---	---	---	6.0	6.0	6.0
pH [no unit]	18-Apr-19	16:11	23-Apr-19	09:25	8.27	7.51	7.80
Alkalinity [mg/L as CaCO3]	18-Apr-19	16:11	23-Apr-19	09:26	282	161	151
Ammonia+Ammonium (N) [as N mg/L]	18-Apr-19	18:20	23-Apr-19	10:17	14.8	0.7	< 0.1
Nitrite (as N) [mg/L]	22-Apr-19	14:56	24-Apr-19	13:25	0.07	0.12	0.04
Nitrate (as N) [mg/L]	22-Apr-19	14:56	24-Apr-19	13:25	0.39	16.1	16.6
Nitrate + Nitrite (as N) [mg/L]	22-Apr-19	14:56	24-Apr-19	13:25	0.46	16.2	16.6

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0001725220

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Project : PO#017844

29-April-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Date Rec. : 24 April 2019
LR Report: **CA12917-APR19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	25-Apr-19	25-Apr-19	24-Apr-19
2: Analysis Start Time		---	08:41	08:41	17:57
3: Analysis Completed Date		---	29-Apr-19	29-Apr-19	29-Apr-19
4: Analysis Completed Time		---	14:09	14:09	14:08
5: Raw Raw-Pilot-Influent	23-Apr-19 13:15	9.0	72	22	9
6: Final Final-Pilot-Reactor A	23-Apr-19 13:25	9.0	49	22	10

Carrie Greenlaw
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OnLine LIMS

0001730819

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Project : PO#017844

16-April-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 09 April 2019
LR Report: **CA13192-APR19**

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	11-Apr-19	11-Apr-19	09-Apr-19
2: Analysis Start Time		---	08:55	08:55	17:47
3: Analysis Completed Date		---	15-Apr-19	15-Apr-19	15-Apr-19
4: Analysis Completed Time		---	16:24	16:24	16:24
5: Raw Raw-Pilot-Influent	05-Apr-19 09:55	9.0	100	28	9
6: Final Final-Pilot-Reactor A	05-Apr-19 10:05	9.0	56	24	10

Kimberley Didsbury
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Project : PO#017844

16-April-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
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Fax:

Date Rec. : 10 April 2019
LR Report: **CA13236-APR19**

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Chemical Oxygen Demand mg/L	Soluble Chemical Oxygen Demand mg/L	Soluble Biochemical Oxygen Demand (BOD5) mg/L
1: Analysis Start Date		---	12-Apr-19	12-Apr-19	11-Apr-19
2: Analysis Start Time		---	09:16	09:16	16:50
3: Analysis Completed Date		---	16-Apr-19	16-Apr-19	16-Apr-19
4: Analysis Completed Time		---	14:39	14:39	14:39
5: Raw Raw-Pilot-Influent	08-Apr-19 13:10	7.0	85	25	6
6: Final Final-Pilot-Reactor A	08-Apr-19 13:20	7.0	77	22	6

Kimberley Didsbury
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Project : PO#017844

16-April-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

Date Rec. : 10 April 2019
LR Report: **CA13237-APR19**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Effluent Effluent-Pilot-Reactor A	7: Effluent Effluent-Pilot-Reactor B
Sample Date & Time					08-Apr-19 13:10	08-Apr-19 13:20	08-Apr-19 13:30
Temperature Upon Receipt [°C]	---	---	---	---	7.0	7.0	7.0
pH [no unit]	11-Apr-19	08:19	12-Apr-19	10:14	7.83	7.41	7.63
Alkalinity [mg/L as CaCO3]	11-Apr-19	08:19	12-Apr-19	10:14	277	167	161
Ammonia+Ammonium (N) [as N mg/L]	10-Apr-19	18:00	12-Apr-19	10:26	16.0	0.7	< 0.1
Nitrite (as N) [mg/L]	10-Apr-19	15:05	15-Apr-19	15:59	0.03	0.34	0.04
Nitrate (as N) [mg/L]	10-Apr-19	15:05	15-Apr-19	15:59	0.22	16.3	17.3
Nitrate + Nitrite (as N) [mg/L]	10-Apr-19	15:05	15-Apr-19	15:59	0.25	16.6	17.3

Patti Stark
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001716724

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Project : PO#017844

01-May-2019

OCWA-Mapleton (Drayton Lagoons-MBBR Pilot)
Attn : Don Irvine

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Phone: 519-343-2921, 519-925-1938 ext. 225
Fax:

Date Rec. : 24 April 2019
LR Report: **CA13566-APR19**

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Raw Raw-Pilot-Influent	6: Eff Eff-Pilot-Reactor A	7: Eff Eff-Pilot-Reactor B
Sample Date & Time					23-Apr-19 13:15	23-Apr-19 13:25	23-Apr-19 13:35
Temperature Upon Receipt [°C]	---	---	---	---	9.0	9.0	9.0
pH [no unit]	25-Apr-19	08:18	26-Apr-19	13:26	8.22	7.65	7.90
Alkalinity [mg/L as CaCO3]	25-Apr-19	08:18	26-Apr-19	13:26	247	148	151
Ammonia+Ammonium (N) [as N mg/L]	24-Apr-19	16:00	30-Apr-19	16:29	13.7	0.5	0.2
Nitrite (as N) [mg/L]	25-Apr-19	17:20	29-Apr-19	14:55	0.08	0.19	< 0.03
Nitrate (as N) [mg/L]	25-Apr-19	17:20	29-Apr-19	14:55	0.36	15.8	16.5
Nitrate + Nitrite (as N) [mg/L]	25-Apr-19	17:20	29-Apr-19	14:55	0.44	16.0	16.5

Carrie Greenlaw
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001732143

APPENDIX D

TOXICITY TESTS RESULTS

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

TOXICITY TEST REPORT

Daphnia magna
EPS 1/RM/14

Work Order : 238609
Sample Number : 58308

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Date Collected :	2019-03-13
Location :	Saint-Laurent QC	Time Collected :	08:30
Substance :	INFLUENT	Date Received :	2019-03-13
Sampling Method :	Grab	Time Received :	13:25
Sampled By :	Not provided	Temperature on Receipt :	10.0 °C
Sample Description :	Clear, green, odourless.	Date Tested :	2019-03-14

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	9.8 days
Organism Batch :	Dm19-04	Average Brood Size :	29.4 young
Culture Mortality :	1.2% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Organisms / Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms / Test Level :	30
Pre-aeration Time :	0 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride	Historical Mean LC50 :	6.2 g/L
Date Tested :	2019-03-05	Warning Limits (± 2SD) :	5.6 - 6.9 g/L
LC50 :	6.2 g/L	Organism Batch :	Dm19-04
95% Confidence Limits :	6.0 - 6.4 g/L	Analyst(s) :	MW, MJT, SEW
Statistical Method :	Spearman-Kärber		

COMMENTS

All test validity criteria as specified in the test method were satisfied.

Date : 2019-03-22
yyyy-mm-dd

Approved By : Nancy Kreager
Project Manager

AQUATOX

TOXICITY TEST REPORT

Daphnia magna

EPS 1/RM/14

Work Order : 238609
Sample Number : 58308

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Water Chemistry (100%) :	7.8	7.3	1483	20.0	86	280 mg/L

0 HOURS

Date & Time 2019-03-14 9:35
Analyst(s) : CG

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation (%)*	Hardness
100	A	0	0	7.8	7.3	1483	20.0	86	280
100	B	0	0	7.8	7.3	1483	20.0	86	280
100	C	0	0	7.8	7.3	1483	20.0	86	280
Control	A	0	0	8.5	8.6	814	20.0	99	230
Control	B	0	0	8.5	8.6	814	20.0	99	230
Control	C	0	0	8.5	8.6	814	20.0	99	230

Notes:

24 HOURS

Date & Time 2019-03-15 9:35
Analyst(s) : NM(CG)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	0	–	–	–	20.0
100	B	–	0	–	–	–	20.0
100	C	–	0	–	–	–	20.0
Control	A	–	0	–	–	–	20.0
Control	B	–	0	–	–	–	20.0
Control	C	–	0	–	–	–	20.0

Notes:

48 HOURS

Date & Time 2019-03-16 9:35
Analyst(s) : MJT

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	0	0	8.7	8.4	1474	20.0
100	B	0	0	8.7	8.5	1465	20.0
100	C	0	0	8.6	8.5	1460	20.0
Control	A	0	0	8.5	8.6	851	20.0
Control	B	0	0	8.5	8.6	830	20.0
Control	C	0	0	8.5	8.5	827	20.0

Notes:

Number immobile does not include number dead.

– = not measured/not required
* adjusted for temperature and barometric pressure

Test Data Reviewed By : RB
Date : 2019-03-21

AquaTox Testing & Consulting Inc.
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TOXICITY TEST REPORT
Rainbow Trout

Work Order : 238609
Sample Number : 58308

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Time Collected :	08:30
Location :	Saint-Laurent QC	Date Collected :	2019-03-13
Substance :	INFLUENT	Date Received :	2019-03-13
Sampling Method :	Grab	Date Tested :	2019-03-14
Sampled By :	Not provided	Temp. on arrival :	10.0°C
Sample Description :	Clear, green, odourless.		

Test Method : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	100.0 %

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	T19-01	Date Tested :	2019-03-12
LC50 :	3378 mg/L	Historical Mean LC50 :	3746 mg/L
95% Confidence Limits :	2743 - 3844 mg/L	Warning Limits (± 2SD) :	3243 - 4328 mg/L
Statistical Method :	Linear Regression (MLE)	Analyst(s) :	KP, MDH, MW

TEST FISH

Control Fish Sample Size :	10	Cumulative stock tank mortality:	0 % (prev. 7 days)
Mean Fish Weight (± 2 SD) :	0.56 ± 0.39 g	Mean Fish Fork Length (± 2 SD) :	39.0 ± 7.0 mm
Range of Weights :	0.34 - 1.02 g	Range of Fork Lengths (mm) :	34 - 46 mm
Fish Loading Rate :	0.3 g/L		

TEST CONDITIONS

Test Organism :	*Oncorhynchus mykiss*	Volume Tested (L) :	19
Sample Treatment :	None	Number of Replicates :	1
pH Adjustment :	None	Organisms Per Replicate :	10
Test Aeration :	Yes	Total Organisms Per Test Level :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Test Method Deviation(s) :	None

Date: 2019-03-22
yyyy-mm-dd

Approved by: Nancy Kneap
Project Manager

Work Order: 238609
Sample Number: 58308

Total Pre-Aeration Time (h)		pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*
0:30	**Initial Water Chemistry:**	7.5	7.2	1502	15.0	–
	Chemistry after 30min air:	7.6	8.4	1497	15.0	90

0 hours

Date & Time 2019-03-14 9:40
Technician: BH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*
100	0	0	7.6	8.4	1497	15.0	90
Control	0	0	8.0	9.8	853	14.0	100

Notes:

24 hours

Date & Time 2019-03-15 9:40
Technician: MW

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	9	0	8.3	9.0	1466	14.0
Control	0	0	–	–	–	14.0

Notes:

48 hours

Date & Time 2019-03-16 9:40
Technician: MDH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	10	0	8.4	9.2	1475	15.0
Control	0	0	–	–	–	15.0

Notes:

72 hours

Date & Time 2019-03-17 9:40
Technician: MDH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	10	0	–	–	–	–
Control	0	0	–	–	–	15.0

Notes:

96 hours

Date & Time 2019-03-18 9:40
Technician: KP

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	10	0	–	–	–	–
Control	0	0	8.2	9.1	802	15.0

Notes:

Control organisms showing stress: 0
Organism Batch : T19-01

"–" = not measured/not required
Number immobile does not include number of mortalities.
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: EJS
Date: 2019-03-19

AquaTox Testing & Consulting Inc.
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TOXICITY TEST REPORT

Daphnia magna
EPS 1/RM/14

Work Order : 238609
Sample Number : 58309

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Date Collected :	2019-03-13
Location :	Saint-Laurent QC	Time Collected :	08:30
Substance :	REACTOR B	Date Received :	2019-03-13
Sampling Method :	Grab	Time Received :	13:25
Sampled By :	Not provided	Temperature on Receipt :	10.0 °C
Sample Description :	Clear, green, odourless.	Date Tested :	2019-03-14

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	9.8 days
Organism Batch :	Dm19-04	Average Brood Size :	29.4 young
Culture Mortality :	1.2% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Organisms / Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms / Test Level :	30
Pre-aeration Time :	0 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride	Historical Mean LC50 :	6.2 g/L
Date Tested :	2019-03-05	Warning Limits (± 2SD) :	5.6 - 6.9 g/L
LC50 :	6.2 g/L	Organism Batch :	Dm19-04
95% Confidence Limits :	6.0 - 6.4 g/L	Analyst(s) :	MW, MJT, SEW
Statistical Method :	Spearman-Kärber		

COMMENTS

All test validity criteria as specified in the test method were satisfied.

Date : 2019-03-22
yyyy-mm-dd

Approved By : Nancy Keenan
Project Manager

AQUATOX

TOXICITY TEST REPORT

Daphnia magna

EPS 1/RM/14

Work Order : 238609
Sample Number : 58309

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Water Chemistry (100%) :	7.8	8.1	1390	20.0	96	270 mg/L

0 HOURS

Date & Time 2019-03-14 9:40
Analyst(s) : CG

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation (%)*	Hardness
100	A	0	0	7.8	8.1	1390	20.0	96	270
100	B	0	0	7.8	8.1	1390	20.0	96	270
100	C	0	0	7.8	8.1	1390	20.0	96	270
Control	A	0	0	8.5	8.6	814	20.0	99	230
Control	B	0	0	8.5	8.6	814	20.0	99	230
Control	C	0	0	8.5	8.6	814	20.0	99	230

Notes:

24 HOURS

Date & Time 2019-03-15 9:40
Analyst(s) : NM(CG)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	0	–	–	–	20.0
100	B	–	0	–	–	–	20.0
100	C	–	0	–	–	–	20.0
Control	A	–	0	–	–	–	20.0
Control	B	–	0	–	–	–	20.0
Control	C	–	0	–	–	–	20.0

Notes:

48 HOURS

Date & Time 2019-03-16 9:40
Analyst(s) : MJT

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	0	0	8.5	8.1	1410	20.0
100	B	0	0	8.5	8.2	1402	20.0
100	C	0	0	8.5	8.0	1399	20.0
Control	A	0	0	8.6	8.6	833	20.0
Control	B	0	0	8.6	8.7	830	20.0
Control	C	0	0	8.5	8.7	828	20.0

Notes:

Number immobile does not include number dead.

– = not measured/not required
* adjusted for temperature and barometric pressure

Test Data Reviewed By : RD
Date : 2019-03-21

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TOXICITY TEST REPORT
Rainbow Trout

Work Order : 238609
Sample Number : 58309

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Time Collected :	08:30
Location :	Saint-Laurent QC	Date Collected :	2019-03-13
Substance :	REACTOR B	Date Received :	2019-03-13
Sampling Method :	Grab	Date Tested :	2019-03-14
Sampled By :	Not provided	Temp. on arrival :	10.0°C
Sample Description :	Clear, green, odourless.		

Test Method : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	T19-01	Date Tested :	2019-03-12
LC50 :	3378 mg/L	Historical Mean LC50 :	3746 mg/L
95% Confidence Limits :	2743 - 3844 mg/L	Warning Limits (± 2SD) :	3243 - 4328 mg/L
Statistical Method :	Linear Regression (MLE)	Analyst(s) :	KP, MDH, MW

TEST FISH

Control Fish Sample Size :	10	Cumulative stock tank mortality:	0 % (prev. 7 days)
Mean Fish Weight (± 2 SD) :	0.50 ± 0.31 g	Mean Fish Fork Length (± 2 SD) :	38.0 ± 6.5 mm
Range of Weights :	0.30 - 0.75 g	Range of Fork Lengths (mm) :	33 - 43 mm
Fish Loading Rate :	0.3 g/L		

TEST CONDITIONS

Test Organism :	*Oncorhynchus mykiss*	Volume Tested (L) :	19
Sample Treatment :	None	Number of Replicates :	1
pH Adjustment :	None	Organisms Per Replicate :	10
Test Aeration :	Yes	Total Organisms Per Test Level :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Test Method Deviation(s) :	None

Date: 2019-03-22
yyyy-mm-dd

Approved by: Nancy Kreager
Project Manager

Work Order: 238609
Sample Number: 58309

Total Pre-Aeration Time (h)		pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*
0:30	**Initial Water Chemistry:**	7.5	8.7	1412	15.0	–
	Chemistry after 30min air:	7.6	9.0	1409	15.0	95

0 hours

Date & Time 2019-03-14 9:50
Technician: BH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*
100	0	0	7.6	9.0	1409	15.0	95
Control	0	0	8.0	9.8	853	14.0	100

Notes:

24 hours

Date & Time 2019-03-15 9:50
Technician: MW

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	14.0
Control	0	0	–	–	–	14.0

Notes:

48 hours

Date & Time 2019-03-16 9:50
Technician: MDH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	15.0
Control	0	0	–	–	–	15.0

Notes:

72 hours

Date & Time 2019-03-17 9:50
Technician: MDH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	15.0
Control	0	0	–	–	–	15.0

Notes:

96 hours

Date & Time 2019-03-18 9:50
Technician: KP

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	8.2	9.2	1410	15.0
Control	0	0	8.1	9.1	837	15.0

Notes:

Control organisms showing stress: 0
Organism Batch : T19-01

"–" = not measured/not required
Number immobile does not include number of mortalities.
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: EJS
Date: 2019-03-19

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Puslinch, ON N0B 2J0
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Fax. (519) 763-4419

TOXICITY TEST REPORT

Daphnia magna
EPS 1/RM/14

Work Order : 238609
Sample Number : 58310

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Date Collected :	2019-03-13
Location :	Saint-Laurent QC	Time Collected :	08:30
Substance :	REACTOR B - SETTLED	Date Received :	2019-03-13
Sampling Method :	Grab	Time Received :	13:25
Sampled By :	Not provided	Temperature on Receipt :	10.0 °C
Sample Description :	Clear, green, odourless.	Date Tested :	2019-03-14

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	9.8 days
Organism Batch :	Dm19-04	Average Brood Size :	29.4 young
Culture Mortality :	1.2% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Organisms / Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms / Test Level :	30
Pre-aeration Time :	0 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride	Historical Mean LC50 :	6.2 g/L
Date Tested :	2019-03-05	Warning Limits (± 2SD) :	5.6 - 6.9 g/L
LC50 :	6.2 g/L	Organism Batch :	Dm19-04
95% Confidence Limits :	6.0 - 6.4 g/L	Analyst(s) :	MW, MJT, SEW
Statistical Method :	Spearman-Kärber		

COMMENTS

All test validity criteria as specified in the test method were satisfied.

Date : 2019-03-22
yyyy-mm-dd

Approved By : Nancy Trepper
Project Manager

AQUATOX

TOXICITY TEST REPORT

Daphnia magna

EPS 1/RM/14

Work Order : 238609
Sample Number : 58310

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Water Chemistry (100%) :	7.9	8.4	1389	20.0	98	280 mg/L

0 HOURS

Date & Time 2019-03-14 9:45
Analyst(s) : CG

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation (%)*	Hardness
100	A	0	0	7.9	8.4	1389	20.0	98	280
100	B	0	0	7.9	8.4	1389	20.0	98	280
100	C	0	0	7.9	8.4	1389	20.0	98	280
Control	A	0	0	8.5	8.6	814	20.0	99	230
Control	B	0	0	8.5	8.6	814	20.0	99	230
Control	C	0	0	8.5	8.6	814	20.0	99	230

Notes:

24 HOURS

Date & Time 2019-03-15 9:45
Analyst(s) : NM(CG)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	0	–	–	–	20.0
100	B	–	0	–	–	–	20.0
100	C	–	0	–	–	–	20.0
Control	A	–	0	–	–	–	20.0
Control	B	–	0	–	–	–	20.0
Control	C	–	0	–	–	–	20.0

Notes:

48 HOURS

Date & Time 2019-03-16 9:45
Analyst(s) : MJT

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	0	0	8.5	8.2	1420	20.0
100	B	0	0	8.5	8.1	1417	20.0
100	C	0	0	8.5	8.2	1413	20.0
Control	A	0	0	8.5	8.6	834	20.0
Control	B	0	0	8.5	8.6	831	20.0
Control	C	0	0	8.5	8.6	824	20.0

Notes:

Number immobile does not include number dead.

– = not measured/not required
* adjusted for temperature and barometric pressure

Test Data Reviewed By : DB
Date : 2019-03-21

AQUATOX
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TOXICITY TEST REPORT
Rainbow Trout

Work Order : 238609
Sample Number : 58310

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Time Collected :	08:30
Location :	Saint-Laurent QC	Date Collected :	2019-03-13
Substance :	REACTOR B - SETTLED	Date Received :	2019-03-13
Sampling Method :	Grab	Date Tested :	2019-03-14
Sampled By :	Not provided	Temp. on arrival :	10.0°C
Sample Description :	Clear, green, odourless.		

Test Method : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	T19-01	Date Tested :	2019-03-12
LC50 :	3378 mg/L	Historical Mean LC50 :	3746 mg/L
95% Confidence Limits :	2743 - 3844 mg/L	Warning Limits (± 2SD) :	3243 - 4328 mg/L
Statistical Method :	Linear Regression (MLE)	Analyst(s) :	KP, MDH, MW

TEST FISH

Control Fish Sample Size :	10	Cumulative stock tank mortality:	0 % (prev. 7 days)
Mean Fish Weight (± 2 SD) :	0.48 ± 0.42 g	Mean Fish Fork Length (± 2 SD) :	37.3 ± 8.8 mm
Range of Weights :	0.26 - 0.97 g	Range of Fork Lengths (mm) :	33 - 47 mm
Fish Loading Rate :	0.3 g/L		

TEST CONDITIONS

Test Organism :	*Oncorhynchus mykiss*	Volume Tested (L) :	19
Sample Treatment :	None	Number of Replicates :	1
pH Adjustment :	None	Organisms Per Replicate :	10
Test Aeration :	Yes	Total Organisms Per Test Level :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Test Method Deviation(s) :	None

Date: 2019-03-22
yyyy-mm-dd

Approved by: Nancy Meep
Project Manager

Work Order: 238609
Sample Number: 58310

Total Pre-Aeration Time (h)		pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*
0:30	**Initial Water Chemistry:**	7.5	8.9	1408	15.0	–
	Chemistry after 30min air:	7.5	9.1	1410	15.0	97

0 hours

Date & Time 2019-03-14 10:00
Technician: BH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*
100	0	0	7.5	9.1	1410	15.0	97
Control	0	0	8.0	9.8	853	14.0	100

Notes:

24 hours

Date & Time 2019-03-15 10:00
Technician: MW

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	14.0
Control	0	0	–	–	–	14.0

Notes:

48 hours

Date & Time 2019-03-16 10:00
Technician: MDH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	15.0
Control	0	0	–	–	–	15.0

Notes:

72 hours

Date & Time 2019-03-17 10:00
Technician: MDH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	15.0
Control	0	0	–	–	–	15.0

Notes:

96 hours

Date & Time 2019-03-18 10:00
Technician: KP

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	8.1	9.2	1411	15.0
Control	0	0	8.1	9.3	827	15.0

Notes:

Control organisms showing stress: 0
Organism Batch : T19-01

"–" = not measured/not required
Number immobile does not include number of mortalities.
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: EJS
Date: 2019-03-19

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 238609

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	
Field Sampler Name (print):	
Signature:	
Affiliation:	
Sample Storage (prior to shipping):	
Custody Relinquished by:	
Date/Time Shipped:	

Client: VEOLIA WATER TECHNOLOGIES CANADA
4105 Sartelon
St-Laurent, QC
H4S 2B3

Phone: 514-334-7230

Fax: 514-334-5070

Contact: JANIN MICHAUD (514-709-1559)

Sample Identification					Analyses Requested							Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow trout Single Concentration	*Daphnia magna* Single Concentration	Fathead minnow 7-day Survival and Growth	*Ceriodaphnia dubia* 7-day Survival and Reproduction	*Pseudokirchneriella subcapitata* Growth	*Lemna minor* Growth	other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2019/03/13	08:30	INFLUENT	58308	10.0	X	X						X		1 X 20L
"	"	REACTOR B	58309	10.0	X	X						X		1 X 20L
"	"	REACTOR B - SETTLED	58310	10.0	X	X						X		1 X 20L

For Lab Use Only

Received By: RK
Date: 2019-03-13
Time: 13:25
Storage Location:
Storage Temp.(°C)

RK

Please list any special requests or instructions:
Please forward results to : janin.michaud@veolia.com

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
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TOXICITY TEST REPORT

Daphnia magna
EPS 1/RM/14

Work Order : 238609
Sample Number : 58308

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Date Collected :	2019-03-13
Location :	Saint-Laurent QC	Time Collected :	08:30
Substance :	INFLUENT	Date Received :	2019-03-13
Sampling Method :	Grab	Time Received :	13:25
Sampled By :	Not provided	Temperature on Receipt :	10.0 °C
Sample Description :	Clear, green, odourless.	Date Tested :	2019-03-14

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	9.8 days
Organism Batch :	Dm19-04	Average Brood Size :	29.4 young
Culture Mortality :	1.2% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Organisms / Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms / Test Level :	30
Pre-aeration Time :	0 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride	Historical Mean LC50 :	6.2 g/L
Date Tested :	2019-03-05	Warning Limits (± 2SD) :	5.6 - 6.9 g/L
LC50 :	6.2 g/L	Organism Batch :	Dm19-04
95% Confidence Limits :	6.0 - 6.4 g/L	Analyst(s) :	MW, MJT, SEW
Statistical Method :	Spearman-Kärber		

COMMENTS

All test validity criteria as specified in the test method were satisfied.

Date : 2019-03-22
yyyy-mm-dd

Approved By : Nancy Kreager
Project Manager

AQUATOX
AquaTox Testing & Consulting Inc.
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TOXICITY TEST REPORT

Daphnia magna
EPS 1/RM/14

Work Order : 238955
Sample Number : 58793

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Date Collected :	2019-04-23
Location :	Saint-Laurent QC	Time Collected :	11:00
Substance :	INFLUENT	Date Received :	2019-04-23
Sampling Method :	Grab	Time Received :	12:20
Sampled By :	J. Michaud	Temperature on Receipt :	11.0 °C
Sample Description :	Cloudy, dark green, odourless.	Date Tested :	2019-04-23

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	8.8 days
Organism Batch :	Dm19-07	Average Brood Size :	33.3 young
Culture Mortality :	0.8% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Organisms / Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms / Test Level :	30
Pre-aeration Time :	30 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride	Historical Mean LC50 :	6.2 g/L
Date Tested :	2019-04-16	Warning Limits (± 2SD) :	5.6 - 6.9 g/L
LC50 :	6.2 g/L	Organism Batch :	Dm19-07
95% Confidence Limits :	5.9 - 6.7 g/L	Analyst(s) :	KP, CG, NM, AW
Statistical Method :	Linear Regression (MLE)		

COMMENTS

All test validity criteria as specified in the test method were satisfied.

Date : 2019-05-09
yyyy-mm-dd

Approved By : Nancy Wenger
Project Manager

Work Order : 238955
Sample Number : 58793

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Water Chemistry (100%) :	8.4	10.7	1192	20.0	126	210 mg/L

0 HOURS

Date & Time 2019-04-23 14:20
Analyst(s) : KP(AW)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation (%)*	Hardness
100	A	0	0	8.4	9.8	1189	20.0	114	210
100	B	0	0	8.4	9.8	1189	20.0	114	210
100	C	0	0	8.4	9.8	1189	20.0	114	210
Control	A	0	0	8.5	8.7	798	20.0	100	210
Control	B	0	0	8.5	8.7	798	20.0	100	210
Control	C	0	0	8.5	8.7	798	20.0	100	210

Notes:

24 HOURS

Date & Time 2019-04-24 14:20
Analyst(s) : MDS

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	**	–	–	–	20.0
100	B	–	**	–	–	–	20.0
100	C	–	**	–	–	–	20.0
Control	A	–	0	–	–	–	20.0
Control	B	–	0	–	–	–	20.0
Control	C	–	0	–	–	–	20.0

Notes: **Test organisms in the 100% concentration were not all visible due to the dark colour of the sample. (MDS)

48 HOURS

Date & Time 2019-04-25 14:20
Analyst(s) : TZL/KP

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	0	0	8.7	9.3	1175	20.0
100	B	0	0	8.7	9.4	1172	20.0
100	C	0	0	8.7	9.4	1172	20.0
Control	A	0	0	8.4	8.6	814	20.0
Control	B	0	0	8.5	8.6	814	20.0
Control	C	0	0	8.5	8.6	822	20.0

Notes:

Number immobile does not include number dead.

– = not measured/not required
* adjusted for temperature and barometric pressure

Test Data Reviewed By : RD
Date : 2019-04-30

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TOXICITY TEST REPORT
Rainbow Trout
EPS 1/RM/13

Work Order : 238955
Sample Number : 58793

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Date Collected :	2019-04-23
Location :	Saint-Laurent QC	Time Collected :	11:00
Substance :	INFLUENT	Date Received :	2019-04-23
Sampling Method :	Grab	Time Received :	12:20
Sampled By :	J. Michaud	Temperature on Receipt :	11.0 °C
Sample Description :	Cloudy, dark green, odourless.	Date Tested :	2019-04-24
Test Method(s) :	Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).		

96-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	100.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Test Organism :	*Oncorhynchus mykiss*	Average Fork Length (± 2 SD) :	36.5 mm (±5.9)
Organism Batch :	T19-07	Range of Fork Lengths :	31 - 41 mm
Control Sample Size :	10	Average Wet Weight (± 2 SD) :	0.44 g (±0.26)
Cumulative stock tank mortality rate :	0% (previous 7 days)	Range of Wet Weights :	0.22 - 0.63 g
Control organisms showing stress :	0 (at test completion)	Organism Loading Rate :	0.2 g/L

TEST CONDITIONS

Sample Treatment :	None	Volume Tested (L) :	21
pH Adjustment :	None	Number of Replicates :	1
Test Aeration :	Yes	Organisms Per Replicate :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Organisms Per Test Level :	10
Total Pre-Aeration Time :	30 minutes	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Potassium Chloride	Date Tested :	2019-04-17
Organism Batch :	T19-07	Historical Mean LC50 :	3771 mg/L
LC50 :	4086 mg/L	Warning Limits (± 2SD) :	3205 - 4437 mg/L
95% Confidence Limits :	3752 - 4449 mg/L	Analyst(s) :	MV, TA
Statistical Method :	Spearman-Kärber		

COMMENTS

•All test validity criteria as specified in the test method were satisfied.

Date : 2019-05-09
yyyy-mm-dd

Approved By : Nancy Kreger
Project Manager

Work Order : 238955
Sample Number : 58793

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*
Initial Water Chemistry (100%) :	8.1	8.6	1174	15.5	–
After 30 min pre-aeration :	8.2	8.5	1182	15.5	91

0 HOURS

Date & Time 2019-04-24 9:00
Analyst(s) : KP

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation*
100%	0	0	8.2	8.5	1182	15.5	91
Control	0	0	8.2	9.7	848	14.0	100

Notes:

24 HOURS

Date & Time 2019-04-25 9:00
Analyst(s) : BH(MW)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	5	0	8.1	9.2	1187	15.0
Control	0	0	–	–	–	15.0

Notes:

48 HOURS

Date & Time 2019-04-26 9:00
Analyst(s) : ALC/FS

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	6	1	–	–	–	15.0
Control	0	0	–	–	–	15.0

Notes:

72 HOURS

Date & Time 2019-04-27 9:00
Analyst(s) : FS

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	7	3	–	–	–	15.0
Control	0	0	–	–	–	15.0

Notes: Three test organisms in the highest concentration have dark pigmentation, with one of them being immobile.

96 HOURS

Date & Time 2019-04-28 9:00
Analyst(s) : KP

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	10	0	8.3	9.2	1197	15.0
Control	0	0	8.1	9.3	779	15.0

Notes:

"–" = not measured/not required
Number impaired does not include number dead.
* adjusted for temperature and barometric pressure

Test Data Reviewed By : AW
Date : 2019-04-29

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
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Fax. (519) 763-4419

TOXICITY TEST REPORT

Daphnia magna
EPS 1/RM/14

Work Order : 238955
Sample Number : 58794

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Date Collected :	2019-04-23
Location :	Saint-Laurent QC	Time Collected :	11:00
Substance :	REACTOR B - EFFLUENT	Date Received :	2019-04-23
Sampling Method :	Grab	Time Received :	12:20
Sampled By :	J. Michaud	Temperature on Receipt :	11.0 °C
Sample Description :	Cloudy, dark green, odourless.	Date Tested :	2019-04-23

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	8.8 days
Organism Batch :	Dm19-07	Average Brood Size :	33.3 young
Culture Mortality :	0.8% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Organisms / Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms / Test Level :	30
Pre-aeration Time :	30 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride	Historical Mean LC50 :	6.2 g/L
Date Tested :	2019-04-16	Warning Limits (± 2SD) :	5.6 - 6.9 g/L
LC50 :	6.2 g/L	Organism Batch :	Dm19-07
95% Confidence Limits :	5.9 - 6.7 g/L	Analyst(s) :	KP, CG, NM, AW
Statistical Method :	Linear Regression (MLE)		

COMMENTS

All test validity criteria as specified in the test method were satisfied.

Date : 2019-05-09
yyyy-mm-dd

Approved By : Nancy Xuereb
Project Manager

AQUATOX

TOXICITY TEST REPORT

Daphnia magna

EPS 1/RM/14

Work Order : 238955
Sample Number : 58794

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Water Chemistry (100%) :	7.9	9.9	1126	20.0	117	280 mg/L

0 HOURS

Date & Time 2019-04-23 14:15
Analyst(s) : KP(AW)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation (%)*	Hardness
100	A	0	0	8.1	8.9	1125	20.0	105	280
100	B	0	0	8.1	8.9	1125	20.0	105	280
100	C	0	0	8.1	8.9	1125	20.0	105	280
Control	A	0	0	8.5	8.7	798	20.0	100	210
Control	B	0	0	8.5	8.7	798	20.0	100	210
Control	C	0	0	8.5	8.7	798	20.0	100	210

Notes:

24 HOURS

Date & Time 2019-04-24 14:15
Analyst(s) : MDS

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	**	–	–	–	20.0
100	B	–	**	–	–	–	20.0
100	C	–	**	–	–	–	20.0
Control	A	–	0	–	–	–	20.0
Control	B	–	0	–	–	–	20.0
Control	C	–	0	–	–	–	20.0

Notes: **Test organisms in the 100% concentration were not all visible due to the dark colour of the sample. (MDS)

48 HOURS

Date & Time 2019-04-25 14:15
Analyst(s) : TZL/KP

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	0	0	8.6	9.1	1126	20.0
100	B	0	0	8.6	9.1	1131	20.0
100	C	0	0	8.6	9.2	1130	20.0
Control	A	0	0	8.5	8.5	818	20.0
Control	B	0	0	8.5	8.6	813	20.0
Control	C	0	0	8.5	8.6	819	20.0

Notes:

Number immobile does not include number dead.

– = not measured/not required
* adjusted for temperature and barometric pressure

Test Data Reviewed By : RD
Date : 2019-04-30

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TOXICITY TEST REPORT

Rainbow Trout
EPS 1/RM/13

Work Order : 238955
Sample Number : 58794

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Date Collected :	2019-04-23
Location :	Saint-Laurent QC	Time Collected :	11:00
Substance :	REACTOR B - EFFLUENT	Date Received :	2019-04-23
Sampling Method :	Grab	Time Received :	12:20
Sampled By :	J. Michaud	Temperature on Receipt :	11.0 °C
Sample Description :	Cloudy, dark green, odourless.	Date Tested :	2019-04-24

Test Method(s) : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Test Organism :	*Oncorhynchus mykiss*	Average Fork Length (± 2 SD) :	38.4 mm (±4.2)
Organism Batch :	T19-07	Range of Fork Lengths :	35 - 41 mm
Control Sample Size :	10	Average Wet Weight (± 2 SD) :	0.53 g (±0.17)
Cumulative stock tank mortality rate :	0% (previous 7 days)	Range of Wet Weights :	0.36 - 0.64 g
Control organisms showing stress :	0 (at test completion)	Organism Loading Rate :	0.3 g/L

TEST CONDITIONS

Sample Treatment :	None	Volume Tested (L) :	21
pH Adjustment :	None	Number of Replicates :	1
Test Aeration :	Yes	Organisms Per Replicate :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Organisms Per Test Level :	10
Total Pre-Aeration Time :	30 minutes	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Potassium Chloride	Date Tested :	2019-04-17
Organism Batch :	T19-07	Historical Mean LC50 :	3771 mg/L
LC50 :	4086 mg/L	Warning Limits (± 2SD) :	3205 - 4437 mg/L
95% Confidence Limits :	3752 - 4449 mg/L	Analyst(s) :	MV, TA
Statistical Method :	Spearman-Kärber		

COMMENTS

•All test validity criteria as specified in the test method were satisfied.

Date : 2019-05-09
yyyy-mm-dd

Approved By : Nancy Keogh
Project Manager

Work Order : 238955
Sample Number : 58794

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*
Initial Water Chemistry (100%) :	7.5	8.4	1116	15.5	–
After 30 min pre-aeration :	7.6	8.5	1117	15.5	91

0 HOURS

Date & Time 2019-04-24 9:00
Analyst(s) : KP

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation*
100%	0	0	7.6	8.5	1117	15.5	91
Control	0	0	8.3	9.7	848	14.0	100

Notes:

24 HOURS

Date & Time 2019-04-25 9:00
Analyst(s) : BH(MW)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	–	–	–	15.0
Control	0	0	–	–	–	15.0

Notes:

48 HOURS

Date & Time 2019-04-26 9:00
Analyst(s) : ALC(FS)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	–	–	–	15.0
Control	0	0	–	–	–	15.0

Notes:

72 HOURS

Date & Time 2019-04-27 9:00
Analyst(s) : FS

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	–	–	–	15.0
Control	0	0	–	–	–	15.0

Notes:

96 HOURS

Date & Time 2019-04-28 9:00
Analyst(s) : KP

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.9	9.0	1122	15.0
Control	0	0	8.1	9.2	792	15.0

Notes:

"–" = not measured/not required
Number impaired does not include number dead.
* adjusted for temperature and barometric pressure

Test Data Reviewed By : AW
Date : 2019-04-29

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 238955

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	
Field Sampler Name (print):	JANIN MICHAUD
Signature:	Janin Michaud
Affiliation:	
Sample Storage (prior to shipping):	
Custody Relinquished by:	
Date/Time Shipped:	

Client:	VEOLIA WATER TECHNOLOGIES CANADA 4105 SARTELON ST-LAURENT, QC H4S 2B3
Phone:	514-709-1559
Fax:	514-334-5070
Contact:	JANIN MICHAUD

Sample Identification					Analyses Requested							Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow trout Single Concentration	*Daphnia magna* Single Concentration	Fathead minnow 7-day Survival and Growth	*Ceriodaphnia dubia* 7-day Survival and Reproduction	*Pseudokirchneriella subcapitata* Growth	*Lemna minor* Growth	other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2019-04-23	11:00	INFLUENT	58793	11.0	X	X						X		1 x 20L
"	"	REACTOR B - EFFLUENT	58794	11.0	X	X						X		1 x 20L

For Lab Use Only

Received By:	SEW
Date:	2019-04-23
Time:	12:20
Storage Location:	
Storage Temp.(°C)	

NK

Please list any special requests or instructions:

AQUATOX

TOXICITY TEST REPORT

Daphnia magna

EPS 1/RM/14

Work Order : 238609
Sample Number : 58308

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Water Chemistry (100%) :	7.8	7.3	1483	20.0	86	280 mg/L

0 HOURS

Date & Time 2019-03-14 9:35
Analyst(s) : CG

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation (%)*	Hardness
100	A	0	0	7.8	7.3	1483	20.0	86	280
100	B	0	0	7.8	7.3	1483	20.0	86	280
100	C	0	0	7.8	7.3	1483	20.0	86	280
Control	A	0	0	8.5	8.6	814	20.0	99	230
Control	B	0	0	8.5	8.6	814	20.0	99	230
Control	C	0	0	8.5	8.6	814	20.0	99	230

Notes:

24 HOURS

Date & Time 2019-03-15 9:35
Analyst(s) : NM(CG)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	0	–	–	–	20.0
100	B	–	0	–	–	–	20.0
100	C	–	0	–	–	–	20.0
Control	A	–	0	–	–	–	20.0
Control	B	–	0	–	–	–	20.0
Control	C	–	0	–	–	–	20.0

Notes:

48 HOURS

Date & Time 2019-03-16 9:35
Analyst(s) : MJT

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	0	0	8.7	8.4	1474	20.0
100	B	0	0	8.7	8.5	1465	20.0
100	C	0	0	8.6	8.5	1460	20.0
Control	A	0	0	8.5	8.6	851	20.0
Control	B	0	0	8.5	8.6	830	20.0
Control	C	0	0	8.5	8.5	827	20.0

Notes:

Number immobile does not include number dead.

– = not measured/not required
* adjusted for temperature and barometric pressure

Test Data Reviewed By : RB
Date : 2019-03-21

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

TOXICITY TEST REPORT
Rainbow Trout

Work Order : 238609
Sample Number : 58308

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Time Collected :	08:30
Location :	Saint-Laurent QC	Date Collected :	2019-03-13
Substance :	INFLUENT	Date Received :	2019-03-13
Sampling Method :	Grab	Date Tested :	2019-03-14
Sampled By :	Not provided	Temp. on arrival :	10.0°C
Sample Description :	Clear, green, odourless.		

Test Method : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	100.0 %

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	T19-01	Date Tested :	2019-03-12
LC50 :	3378 mg/L	Historical Mean LC50 :	3746 mg/L
95% Confidence Limits :	2743 - 3844 mg/L	Warning Limits (± 2SD) :	3243 - 4328 mg/L
Statistical Method :	Linear Regression (MLE)	Analyst(s) :	KP, MDH, MW

TEST FISH

Control Fish Sample Size :	10	Cumulative stock tank mortality:	0 % (prev. 7 days)
Mean Fish Weight (± 2 SD) :	0.56 ± 0.39 g	Mean Fish Fork Length (± 2 SD) :	39.0 ± 7.0 mm
Range of Weights :	0.34 - 1.02 g	Range of Fork Lengths (mm) :	34 - 46 mm
Fish Loading Rate :	0.3 g/L		

TEST CONDITIONS

Test Organism :	*Oncorhynchus mykiss*	Volume Tested (L) :	19
Sample Treatment :	None	Number of Replicates :	1
pH Adjustment :	None	Organisms Per Replicate :	10
Test Aeration :	Yes	Total Organisms Per Test Level :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Test Method Deviation(s) :	None

Date: 2019-03-22
yyyy-mm-dd

Approved by: Nancy Kneap
Project Manager

Work Order: 238609
Sample Number: 58308

Total Pre-Aeration Time (h)		pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*
0:30	**Initial Water Chemistry:**	7.5	7.2	1502	15.0	–
	Chemistry after 30min air:	7.6	8.4	1497	15.0	90

0 hours

Date & Time 2019-03-14 9:40
Technician: BH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*
100	0	0	7.6	8.4	1497	15.0	90
Control	0	0	8.0	9.8	853	14.0	100

Notes:

24 hours

Date & Time 2019-03-15 9:40
Technician: MW

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	9	0	8.3	9.0	1466	14.0
Control	0	0	–	–	–	14.0

Notes:

48 hours

Date & Time 2019-03-16 9:40
Technician: MDH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	10	0	8.4	9.2	1475	15.0
Control	0	0	–	–	–	15.0

Notes:

72 hours

Date & Time 2019-03-17 9:40
Technician: MDH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	10	0	–	–	–	–
Control	0	0	–	–	–	15.0

Notes:

96 hours

Date & Time 2019-03-18 9:40
Technician: KP

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	10	0	–	–	–	–
Control	0	0	8.2	9.1	802	15.0

Notes:

Control organisms showing stress: 0
Organism Batch : T19-01

"–" = not measured/not required
Number immobile does not include number of mortalities.
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: EJS
Date: 2019-03-19

AquaTox Testing & Consulting Inc.
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Tel. (519) 763-4412
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TOXICITY TEST REPORT

Daphnia magna
EPS 1/RM/14

Work Order : 238609
Sample Number : 58309

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Date Collected :	2019-03-13
Location :	Saint-Laurent QC	Time Collected :	08:30
Substance :	REACTOR B	Date Received :	2019-03-13
Sampling Method :	Grab	Time Received :	13:25
Sampled By :	Not provided	Temperature on Receipt :	10.0 °C
Sample Description :	Clear, green, odourless.	Date Tested :	2019-03-14

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	9.8 days
Organism Batch :	Dm19-04	Average Brood Size :	29.4 young
Culture Mortality :	1.2% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Organisms / Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms / Test Level :	30
Pre-aeration Time :	0 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride	Historical Mean LC50 :	6.2 g/L
Date Tested :	2019-03-05	Warning Limits (± 2SD) :	5.6 - 6.9 g/L
LC50 :	6.2 g/L	Organism Batch :	Dm19-04
95% Confidence Limits :	6.0 - 6.4 g/L	Analyst(s) :	MW, MJT, SEW
Statistical Method :	Spearman-Kärber		

COMMENTS

All test validity criteria as specified in the test method were satisfied.

Date : 2019-03-22
yyyy-mm-dd

Approved By : Nancy Keenan
Project Manager

AQUATOX

TOXICITY TEST REPORT

Daphnia magna

EPS 1/RM/14

Work Order : 238609
Sample Number : 58309

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Water Chemistry (100%) :	7.8	8.1	1390	20.0	96	270 mg/L

0 HOURS

Date & Time 2019-03-14 9:40
Analyst(s) : CG

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation (%)*	Hardness
100	A	0	0	7.8	8.1	1390	20.0	96	270
100	B	0	0	7.8	8.1	1390	20.0	96	270
100	C	0	0	7.8	8.1	1390	20.0	96	270
Control	A	0	0	8.5	8.6	814	20.0	99	230
Control	B	0	0	8.5	8.6	814	20.0	99	230
Control	C	0	0	8.5	8.6	814	20.0	99	230

Notes:

24 HOURS

Date & Time 2019-03-15 9:40
Analyst(s) : NM(CG)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	0	–	–	–	20.0
100	B	–	0	–	–	–	20.0
100	C	–	0	–	–	–	20.0
Control	A	–	0	–	–	–	20.0
Control	B	–	0	–	–	–	20.0
Control	C	–	0	–	–	–	20.0

Notes:

48 HOURS

Date & Time 2019-03-16 9:40
Analyst(s) : MJT

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	0	0	8.5	8.1	1410	20.0
100	B	0	0	8.5	8.2	1402	20.0
100	C	0	0	8.5	8.0	1399	20.0
Control	A	0	0	8.6	8.6	833	20.0
Control	B	0	0	8.6	8.7	830	20.0
Control	C	0	0	8.5	8.7	828	20.0

Notes:

Number immobile does not include number dead.

– = not measured/not required
* adjusted for temperature and barometric pressure

Test Data Reviewed By : RD
Date : 2019-03-21

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Tel. (519) 763-4412
Fax. (519) 763-4419

TOXICITY TEST REPORT
Rainbow Trout

Work Order : 238609
Sample Number : 58309

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Time Collected :	08:30
Location :	Saint-Laurent QC	Date Collected :	2019-03-13
Substance :	REACTOR B	Date Received :	2019-03-13
Sampling Method :	Grab	Date Tested :	2019-03-14
Sampled By :	Not provided	Temp. on arrival :	10.0°C
Sample Description :	Clear, green, odourless.		

Test Method : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	T19-01	Date Tested :	2019-03-12
LC50 :	3378 mg/L	Historical Mean LC50 :	3746 mg/L
95% Confidence Limits :	2743 - 3844 mg/L	Warning Limits (± 2SD) :	3243 - 4328 mg/L
Statistical Method :	Linear Regression (MLE)	Analyst(s) :	KP, MDH, MW

TEST FISH

Control Fish Sample Size :	10	Cumulative stock tank mortality:	0 % (prev. 7 days)
Mean Fish Weight (± 2 SD) :	0.50 ± 0.31 g	Mean Fish Fork Length (± 2 SD) :	38.0 ± 6.5 mm
Range of Weights :	0.30 - 0.75 g	Range of Fork Lengths (mm) :	33 - 43 mm
Fish Loading Rate :	0.3 g/L		

TEST CONDITIONS

Test Organism :	*Oncorhynchus mykiss*	Volume Tested (L) :	19
Sample Treatment :	None	Number of Replicates :	1
pH Adjustment :	None	Organisms Per Replicate :	10
Test Aeration :	Yes	Total Organisms Per Test Level :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Test Method Deviation(s) :	None

Date: 2019-03-22
yyyy-mm-dd

Approved by: Nancy Kreager
Project Manager

Work Order: 238609
Sample Number: 58309

Total Pre-Aeration Time (h)		pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*
0:30	**Initial Water Chemistry:**	7.5	8.7	1412	15.0	–
	Chemistry after 30min air:	7.6	9.0	1409	15.0	95

0 hours

Date & Time 2019-03-14 9:50
Technician: BH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*
100	0	0	7.6	9.0	1409	15.0	95
Control	0	0	8.0	9.8	853	14.0	100

Notes:

24 hours

Date & Time 2019-03-15 9:50
Technician: MW

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	14.0
Control	0	0	–	–	–	14.0

Notes:

48 hours

Date & Time 2019-03-16 9:50
Technician: MDH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	15.0
Control	0	0	–	–	–	15.0

Notes:

72 hours

Date & Time 2019-03-17 9:50
Technician: MDH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	15.0
Control	0	0	–	–	–	15.0

Notes:

96 hours

Date & Time 2019-03-18 9:50
Technician: KP

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	8.2	9.2	1410	15.0
Control	0	0	8.1	9.1	837	15.0

Notes:

Control organisms showing stress: 0
Organism Batch : T19-01

"–" = not measured/not required
Number immobile does not include number of mortalities.
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: EJS
Date: 2019-03-19

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

TOXICITY TEST REPORT

Daphnia magna
EPS 1/RM/14

Work Order : 238609
Sample Number : 58310

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Date Collected :	2019-03-13
Location :	Saint-Laurent QC	Time Collected :	08:30
Substance :	REACTOR B - SETTLED	Date Received :	2019-03-13
Sampling Method :	Grab	Time Received :	13:25
Sampled By :	Not provided	Temperature on Receipt :	10.0 °C
Sample Description :	Clear, green, odourless.	Date Tested :	2019-03-14

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	9.8 days
Organism Batch :	Dm19-04	Average Brood Size :	29.4 young
Culture Mortality :	1.2% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Organisms / Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms / Test Level :	30
Pre-aeration Time :	0 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride	Historical Mean LC50 :	6.2 g/L
Date Tested :	2019-03-05	Warning Limits (± 2SD) :	5.6 - 6.9 g/L
LC50 :	6.2 g/L	Organism Batch :	Dm19-04
95% Confidence Limits :	6.0 - 6.4 g/L	Analyst(s) :	MW, MJT, SEW
Statistical Method :	Spearman-Kärber		

COMMENTS

All test validity criteria as specified in the test method were satisfied.

Date : 2019-03-22
yyyy-mm-dd

Approved By : Nancy Trepper
Project Manager

AQUATOX

TOXICITY TEST REPORT

Daphnia magna

EPS 1/RM/14

Work Order : 238609
Sample Number : 58310

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Water Chemistry (100%) :	7.9	8.4	1389	20.0	98	280 mg/L

0 HOURS

Date & Time 2019-03-14 9:45
Analyst(s) : CG

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation (%)*	Hardness
100	A	0	0	7.9	8.4	1389	20.0	98	280
100	B	0	0	7.9	8.4	1389	20.0	98	280
100	C	0	0	7.9	8.4	1389	20.0	98	280
Control	A	0	0	8.5	8.6	814	20.0	99	230
Control	B	0	0	8.5	8.6	814	20.0	99	230
Control	C	0	0	8.5	8.6	814	20.0	99	230

Notes:

24 HOURS

Date & Time 2019-03-15 9:45
Analyst(s) : NM(CG)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	0	–	–	–	20.0
100	B	–	0	–	–	–	20.0
100	C	–	0	–	–	–	20.0
Control	A	–	0	–	–	–	20.0
Control	B	–	0	–	–	–	20.0
Control	C	–	0	–	–	–	20.0

Notes:

48 HOURS

Date & Time 2019-03-16 9:45
Analyst(s) : MJT

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	0	0	8.5	8.2	1420	20.0
100	B	0	0	8.5	8.1	1417	20.0
100	C	0	0	8.5	8.2	1413	20.0
Control	A	0	0	8.5	8.6	834	20.0
Control	B	0	0	8.5	8.6	831	20.0
Control	C	0	0	8.5	8.6	824	20.0

Notes:

Number immobile does not include number dead.

– = not measured/not required
* adjusted for temperature and barometric pressure

Test Data Reviewed By : DB
Date : 2019-03-21

AQUATOX
AquaTox Testing & Consulting Inc.
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Tel. (519) 763-4412
Fax. (519) 763-4419

TOXICITY TEST REPORT
Rainbow Trout

Work Order : 238609
Sample Number : 58310

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Time Collected :	08:30
Location :	Saint-Laurent QC	Date Collected :	2019-03-13
Substance :	REACTOR B - SETTLED	Date Received :	2019-03-13
Sampling Method :	Grab	Date Tested :	2019-03-14
Sampled By :	Not provided	Temp. on arrival :	10.0°C
Sample Description :	Clear, green, odourless.		

Test Method : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	T19-01	Date Tested :	2019-03-12
LC50 :	3378 mg/L	Historical Mean LC50 :	3746 mg/L
95% Confidence Limits :	2743 - 3844 mg/L	Warning Limits (± 2SD) :	3243 - 4328 mg/L
Statistical Method :	Linear Regression (MLE)	Analyst(s) :	KP, MDH, MW

TEST FISH

Control Fish Sample Size :	10	Cumulative stock tank mortality:	0 % (prev. 7 days)
Mean Fish Weight (± 2 SD) :	0.48 ± 0.42 g	Mean Fish Fork Length (± 2 SD) :	37.3 ± 8.8 mm
Range of Weights :	0.26 - 0.97 g	Range of Fork Lengths (mm) :	33 - 47 mm
Fish Loading Rate :	0.3 g/L		

TEST CONDITIONS

Test Organism :	*Oncorhynchus mykiss*	Volume Tested (L) :	19
Sample Treatment :	None	Number of Replicates :	1
pH Adjustment :	None	Organisms Per Replicate :	10
Test Aeration :	Yes	Total Organisms Per Test Level :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Test Method Deviation(s) :	None

Date: 2019-03-22
yyyy-mm-dd

Approved by: Nancy Meep
Project Manager

Work Order: 238609
Sample Number: 58310

Total Pre-Aeration Time (h)		pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*
0:30	**Initial Water Chemistry:**	7.5	8.9	1408	15.0	–
	Chemistry after 30min air:	7.5	9.1	1410	15.0	97

0 hours

Date & Time 2019-03-14 10:00
Technician: BH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*
100	0	0	7.5	9.1	1410	15.0	97
Control	0	0	8.0	9.8	853	14.0	100

Notes:

24 hours

Date & Time 2019-03-15 10:00
Technician: MW

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	14.0
Control	0	0	–	–	–	14.0

Notes:

48 hours

Date & Time 2019-03-16 10:00
Technician: MDH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	15.0
Control	0	0	–	–	–	15.0

Notes:

72 hours

Date & Time 2019-03-17 10:00
Technician: MDH(MW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	15.0
Control	0	0	–	–	–	15.0

Notes:

96 hours

Date & Time 2019-03-18 10:00
Technician: KP

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	8.1	9.2	1411	15.0
Control	0	0	8.1	9.3	827	15.0

Notes:

Control organisms showing stress: 0
Organism Batch : T19-01

"–" = not measured/not required
Number immobile does not include number of mortalities.
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: EJS
Date: 2019-03-19

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 238609

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	
Field Sampler Name (print):	
Signature:	
Affiliation:	
Sample Storage (prior to shipping):	
Custody Relinquished by:	
Date/Time Shipped:	

Client: VEOLIA WATER TECHNOLOGIES CANADA
4105 Sartelon
St-Laurent, QC
H4S 2B3

Phone: 514-334-7230

Fax: 514-334-5070

Contact: JANIN MICHAUD (514-709-1559)

Sample Identification					Analyses Requested							Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow trout Single Concentration	*Daphnia magna* Single Concentration	Fathead minnow 7-day Survival and Growth	*Ceriodaphnia dubia* 7-day Survival and Reproduction	*Pseudokirchneriella subcapitata* Growth	*Lemna minor* Growth	other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2019/03/13	08:30	INFLUENT	58308	10.0	X	X						X		1 X 20L
"	"	REACTOR B	58309	10.0	X	X						X		1 X 20L
"	"	REACTOR B - SETTLED	58310	10.0	X	X						X		1 X 20L

For Lab Use Only

Received By: RK
Date: 2019-03-13
Time: 13:25
Storage Location:
Storage Temp.(°C)

RK

Please list any special requests or instructions:
Please forward results to : janin.michaud@veolia.com

D

Appendix D: ACS Technical Report

Technical Memorandum

Date: **January 9, 2024**

To: **Mohammad Sajjad Khan (MECP)**

CC: **Warren Saint, Adam Moore (CIMA+); Jamie Morgan (Mapleton Township)**

From: **Joel Harrison and Deborah Sinclair**

Re: **230079 – Mapleton WPCP ACS Update**

1. Introduction and Background

The Mapleton Water Pollution Control Plant (WPCP) is located at 7101 Sideroad 15, Mapleton Township, County of Wellington, Ontario. It is a five-cell (two treatment, three treatment/storage) lagoon system that discharges seasonally (March–April and October–December) at a maximum daily rate defined by their ECA and at a rate approximately proportional to the flow in the Conestogo River (to maintain dilution). Effluent discharges to the Conestogo River and flows approximately 1.2 km before entering Conestogo Lake. Downstream of Conestogo Lake, the watercourse flows through agricultural areas before discharging into the Grand River, upstream of Waterloo.

In 2017, an assimilative capacity study (ACS)[1] was completed to support the Class A Environmental Assessment[1] undertaken to allow for the expansion of the Mapleton WPCP from 750 m^3/d to 1,300 m^3/d, with a continuous discharge from October 1 to April 30 (Table 1). January and February were added to the discharge window to provide more dilution of the effluent and allow discharge when Conestogo Reservoir, located downstream of the WPCP, is exhibiting riverine behaviour. During this time, additional nutrients will flow through the reservoir, and not be retained in the reservoir during the summer months.

Table 1. Discharge volumes for the Mapleton WPCP.

Month	Rated Capacity	
	750 m^3/d	**1,300 m^3/d[1]**
Jan	-	3,000
Feb	-	2,660
Mar	1,581	2,110
Apr	3,154	3,773
Oct	233	300
Nov	1,754	1,760
Dec	4,000	4,000

Note: 1 - discharge volumes proposed in 2017 ACS

[1] EXP Services Inc. 2017. Mapleton WPCP Class EA - Receiving Water Impact Assessment (Final). 197 pgs.

The 2017 ACS determined that downstream water quality in the Conestogo River would be maintained with the expansion with a reduction in effluent limits for total phosphorus and total ammonia nitrogen (Table 2). In their review of the ACS, the MECP identified the limited, dated river water quality data for January and February as a source of uncertainty that needed to be addressed before Class EA could be finalized and the full expansion to 1,300 m^3/d could proceed.

Table 2. Effluent limits for the Mapleton WPCP.

Month	**Rated Capacity**	
	750 m^3/d	**1,300 m^3/d[1]**
TAN	5.0	3.0
TP	0.5	0.3
$cBOD_5$	7.5/10	7.5/10
TSS	-	15
E. coli	200 org/100 mL	200 org/100 mL

Note: 1 – effluent limits proposed in 2017 ACS

To resolve this uncertainty, the MECP and the Township implemented a two-phase approach to WPCP expansion. In Phase 1, the capacity of the existing WPCP would increase to 900 m^3/d while maintaining the same discharge windows. This provided an opportunity for the Township to collect winter data to determine the potential impact of the January and February discharge period on un-ionized ammonia concentrations while increasing WPCP flows. In Phase 2, additional treatment works would be designed and constructed at the WPCP capacity would increase to 1,300 m^3/d.

On behalf of the Township, the Grand River Conservation Authority (GRCA) conducted winter monitoring of the Congestogo River from 2016 to 2018. An amended Environmental Compliance Approval (ECA) for an interim rated capacity of 900 m^3/d was issued in 2018 (ECA 1391-B38PLA).

The purpose of this memorandum is to update the 2017 ACS based on the additional winter water quality data from Conestogo River, to support expansion to 1,300 m^3/d. The parameters of concern for the update are total ammonia nitrogen (TAN), unionized ammonia (UIA), and total phosphorus (TP; for which Conestogo River is Policy 2).

2. Conestogo River Water Quality Data

The 2017 ACS used data collected from the inactive (1995–2006) PWQMN station (#16018410002) located approximately 4-km upstream of Drayton, and the active (2007–2014) PWQMN station (PWQMN; station #16018407502) located approximately 1-km upstream of the WPCP (Figure 1). Winter (January and February) TAN and TP data used for the 2017 ACS were collected in 1990–2013 (Table 3).

Figure 1. Map of the study area.

Table 3. January and February data availability for the 2017 ACS.

	Number of Data (*n*)		Period of Record	
Month	**TAN**	**TP**	**Min Year**	**Max Year**
Jan	4	9	1990	2013
Feb	5	10	1990	2002

Except for one sampling event in January 2013, the winter dataset was dated (collected between 1990 and 2002), remote (collected 4-km upstream of the WPCP), and limited (4 samples in January, 5 samples in February for TAN). The MECP identified this as a concern in their review of the ACS.

In 2016, the Township retained the GRCA to supplement the PWQMN sampling program with additional data collection. From 2016 to 2018 the GRCA collected approximately bi-weekly samples from PWQMN station 16018407502 (GRCA station #4389002) to support the ACS update. The most recently available PWQMN dataset (2007–2021) and the GRCA dataset (2016–2018) were combined (Table 4) and updated statistics were calculated (Tables A2 and A4, located in Appendix).

Table 4. Conestogo River water quality data (PWQMN + GRCA) used for ACS update.

	Number of Data (*n*)		Period of Record		
Month	**TAN**	**TP**	**# Years**	**Min Year**	**Max Year**
Jan	8	8	3	2017	2021
Feb	9	9	5	2013	2021
Mar	18	18	9	2007	2021
Apr	19	19	14	2007	2021
May	18	19	13	2007	2021
Jun	16	16	14	2007	2021
Jul	18	18	13	2007	2021
Aug	19	20	14	2007	2021
Sep	15	15	14	2007	2021
Oct	17	18	14	2008	2021
Nov	18	18	13	2008	2021
Dec	1	1	1	2020	2020

Note: All samples collected from PWQMN station 16018407502

The updated winter TAN and TP concentrations were compared to those used in the 2017 ACS. TAN 75th-percentile and maximum values were slightly higher but median, 25th percentile, and minimum values were lower (Table A4, Figure 2). The updated winter TP concentration data for Conestogo River were comparable to the data in the 2017 ACS, with generally higher concentrations in January but lower concentrations in February (Table A2 and Figure 2).

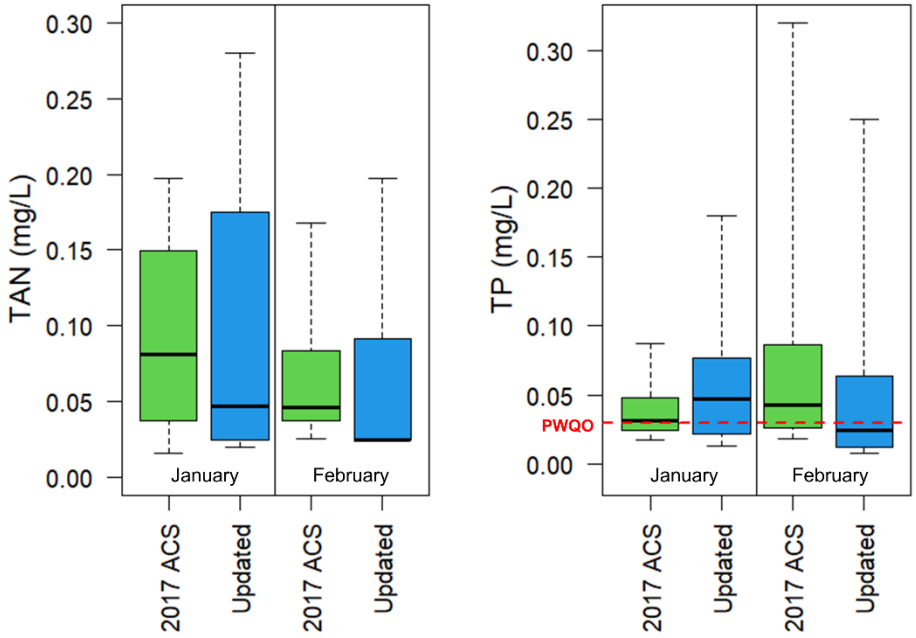


Figure 2. Winter TAN and TP concentrations in Conestogo River, upstream of the WPCP, based on 2017 ACS (green) and updated (blue) data availabilty. Note: Boxplots depict the minimum and maximum values (outer black horizontal lines), 25th and 75th percentiles (lower and upper limits of central boxes, respectively), and median values (central horizontal lines).

3. Mass-balance Modeling

Using the updated background concentrations mass-balance modeling was conducted to predict fully mixed concentrations of TAN, UI-AN, and TP downstream of the Mapleton WPCP. The approach was consistent with the ACS and described below.

Downstream concentrations (C) in the Conestoga River were calculated according to the mass-balance model:

$$C = \frac{Q_e \times C_e + Q_s \times C_s}{Q_e + Q_s}$$

where:

- Qe is the flow of WPCP effluent;
- Qs is the flow of Conestogo River (monthly 7Q20s), upstream of the WPCP outfall;
- Ce is the parameter concentration in the WPCP effluent;
- Cs is the parameter concentration in the river (75th percentile), upstream of the WPCP.

Following mass-balance modeling, UIA downstream of the WPCP was calculated from the downstream TAN concentration, downstream water temperature, and downstream pH. The fraction of TAN present as UIA was calculated as:

$$f = \frac{1}{10^{pKa-pH} + 1}$$

where,

$$pKa = \frac{0.09018 + 2729.92}{temp\ (°C) + 273.16}$$

Downstream temperature and pH were also determined based on mass-balanced modeling, in the same fashion as chemical concentrations. For this modeling, pH was first converted to hydrogen ion concentration:

$[H^+] = 10^{-pH}$

Following mass-balance modeling, downstream pH was then calculated as the negative base-10 logarithm of the downstream hydrogen ion concentration.

$pH = -\log_{10}([H^+])$

3.1 Model Inputs

Except for the upstream background concentrations (see Section 2), model inputs used for the ACS update were obtained from the 2017 ACS. Proposed effluent limits (Ce) of 0.3 mg/L for TP and 3 mg/L for TAN and proposed monthly WPCP effluent discharge volumes (Qe) were obtained from the 2017 ACS. The updated 75th percentile concentrations (Tables A2 and A4) were used for upstream background concentrations (Cs) in the Conestogo River. The monthly 7Q20 flows for Conestogo River calculated in the 2017 ACS (Table A2) were used for the upstream flow (Qs).

3.2 Results

Results are provided in Tables A1–A8 of the Appendix and summarized below.

The updated downstream UIA concentrations are higher than those predicted in the 2017 ACS (Table A4 and Figure 3); however, the 2017 ACS used UIA (rather than TAN) inputs into the mass-balance model. The TAN values presented in Appendix F of the 2017 ACS were used to recalculate UIA (Table A4). The predicted downstream UIA concentrations are higher than the values predicted with the updated dataset (Figure 3).

At the rated capacity of 1,300 m^3/d downstream UIA concentrations are all predicted to be below the Provincial Water Quality Objective (PWQO) of 0.0164 mg-N/L (Figure 3);this meets MECP Policy 1, i.e., that water quality better than the PWQO shall be maintained at or above the objectives.

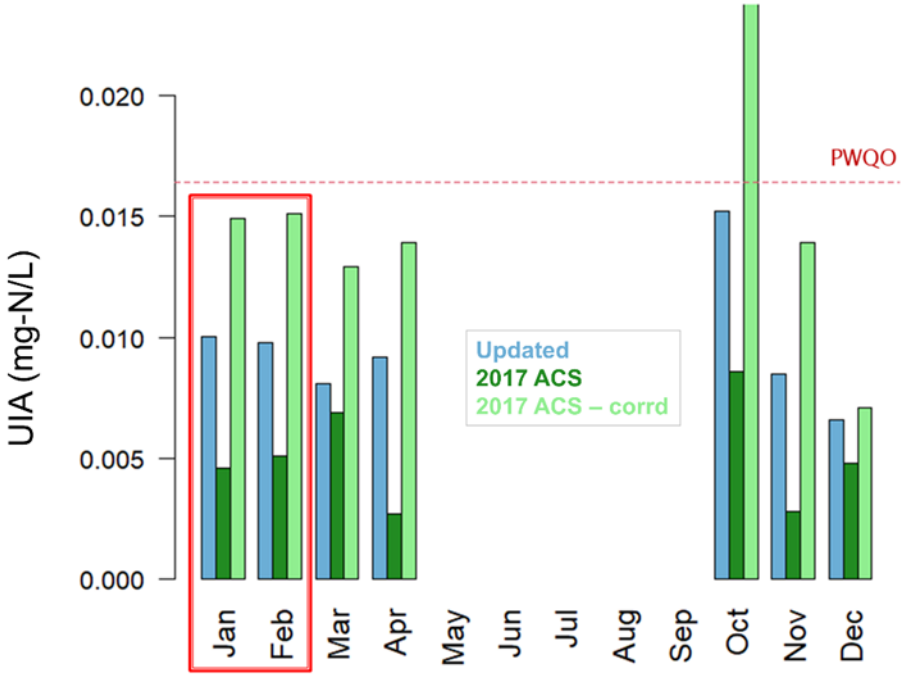


Figure 3. Predicted UIA concentrations downstream of WPCP at 1,300 m^3/d based on 2017 and updated data.

In addition, modeled downstream UIA concentrations are predicted to be lower after expansion to 1,300 m^3/d than at 750 m^3/d (Table A3 and A4; Figure 4); this is from the reduction in the TAN limit from 5 mg-N/L to 3 mg-N/L.

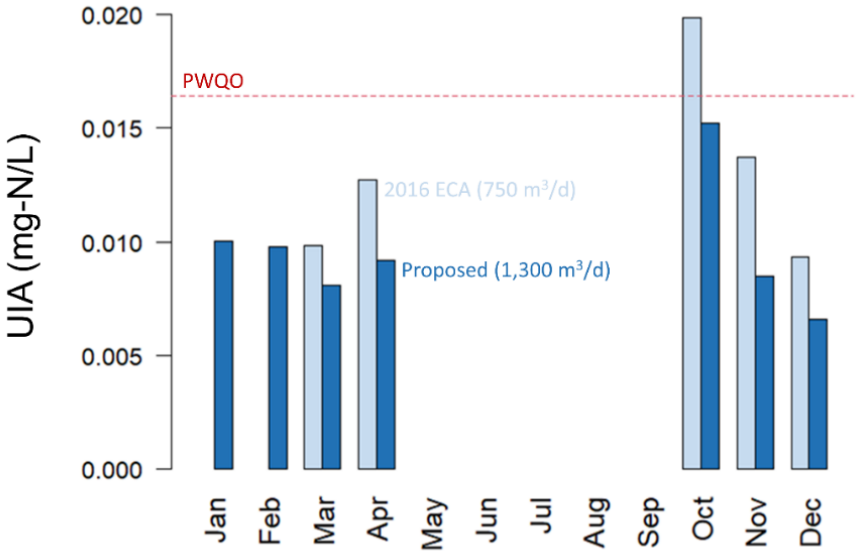


Figure 4. Predicted downstream UIA based on 2016 ECA (TAN = 5 mg/L) and proposed (TAN = 3 mg/L) effluent limits.

Based on the updated TP dataset, modelled downstream TP values are slightly lower in January and slightly higher in February relative to the predictions of the 2017 ACS (Table A2, Figure 5). Modeled downstream TP concentrations at the rated capacity of 1,300 m3/d are lower than at 750 m3/d with the TP limit (Tables A1 and A2, Figure 6); this is due to the reduction in effluent TP limits from 0.5 to 0.3 mg/L. In addition, TP loads from the WPCP after expansion to 1,300 m^3/d (159.7 kg/yr) will be less than the WPCP loads at 750 m^3/d (163.7 kg/yr; EXP 2017). The TP load from the WPCP represents < 1% of the total P load of the Conestogo River at Drayton (18,250 kg/yr)[2]. This meets MECP Policy 2, i.e., that no further degradation of water quality is permitted, and all reasonable and practical measures to improve water quality shall be undertaken.

[2] *GRCA 2019. Conestogo Belwood and Conestogo Water Management Reservoirs: An assessment of surface and ground water conditions*

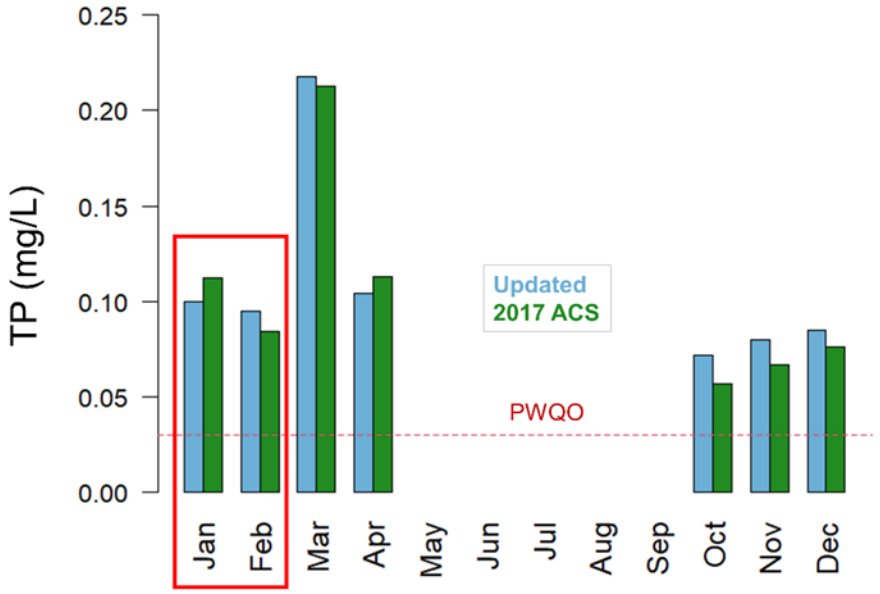


Figure 5. Predicted TP concentrations downstream of WPCP at 1,300 m³/d based on 2017 and updated data.

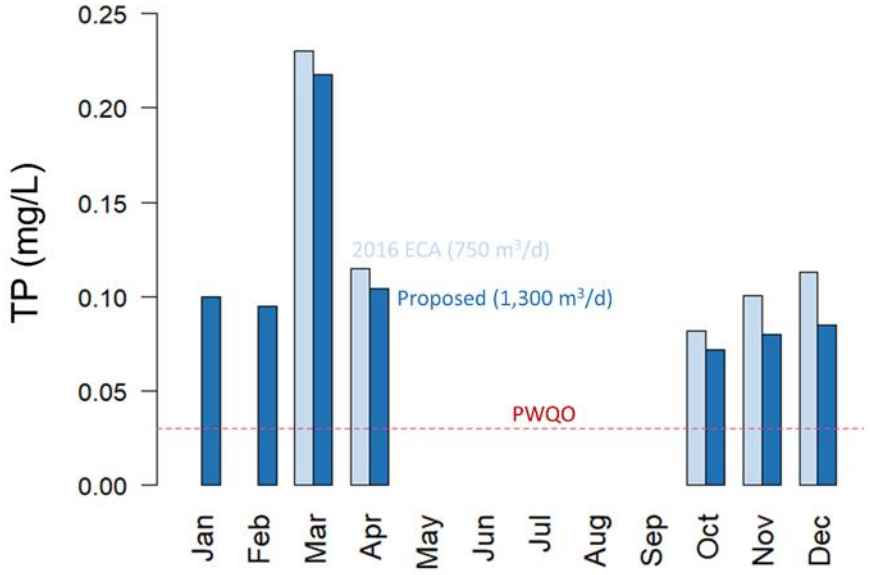


Figure 6. Predicted downstream TP based on 2016 ECA (0.5 mg/L) and proposed (0.3 mg/L) effluent limits.

4. Summary and Conclusions

The Township of Mapleton wishes to extend the Mapleton WPCP discharge window into January and February to accommodate a planned increase in rated capacity to 1,300 m^3/d as outlined in the 2017 Class EA). An ACS was conducted in 2017 to support the Class EA and expansion. In their review of the ACS, the MECP requested more recent upstream (background) January and February water quality data to confirm the modelled UIA concentrations downstream of the WPCP. Additional monitoring was conducted between 2016 to 2018 to supplement the PWQMN dataset. Updated mass-balance modelling using 2007–2021 data predicts that downstream un-ionized ammonia concentrations will remain below the PWQO during all months, meeting MECP Policy 1 for UIA. Predicted downstream TP concentrations and WPCP effluent TP loads will decrease, meeting MECP Policy 2 for TP. In addition, the updated mass-balance modelling predicted an improvement in downstream water quality for both parameters with WPCP expansion; this is due to the reduction in effluent limits for TAN and TP.

Analysis based on the additional winter data confirms the findings of the 2017 ACS; i.e., that downstream water quality in the Conestogo River would be maintained or improved with WPCP expansion to 1,300 m^3/d at the proposed discharge volumes and effluent limits.

5. Appendix – Mass-balance Model Data

Table A1. Mass-balance model of TP at limit of 0.5 mg/L and rated WPCP capacity of 750 m^3/d.

	Discharge (m^3/d)		75th Percentile Upstream TP (mg/L)		75th Percentile Downstream TP (mg/L)	
	Stream 7Q20	WPCP Flow	Updated	2017 ACS[1]	Updated	2017 ACS[1]
Mar	21,129	1,581	0.210	0.204	0.230	0.225
Apr	45,407	3,154	0.088	0.097	0.115	0.123
Oct	3,057	233	0.050	0.033	0.082	0.066
Nov	15,085	1,754	0.054	0.040	0.101	0.088
Dec	24,402	4,000	0.050	0.039	0.113	0.104

Notes: 1 – from EXP 2017.

Table A2. Mass-balance model of TP at limit of 0.3 mg/L and rated WPCP capacity of 1,300 m^3/d.

	Discharge (m^3/d)		75th Percentile Upstream TP (mg/L)		75th Percentile Downstream TP (mg/L)	
	Stream 7Q20	WPCP Flow	Updated	2017 ACS[1]	Updated	2017 ACS[1]
Jan	22,918	3,000	0.074	0.087	0.100	0.112
Feb	17,740	2,660	0.064	0.052	0.095	0.084
Mar	21,129	2,110	0.210	0.204	0.218	0.213
Apr	45,407	3,773	0.088	0.097	0.104	0.113
Oct	3,057	300	0.050	0.033	0.072	0.057
Nov	15,085	1,760	0.054	0.040	0.080	0.067
Dec	24,402	4,000	0.050	0.039	0.085	0.076

Notes: 1 – from EXP 2017.

Table A3. Mass-balance model of TAN at limit of 5 mg/L and rated WPCP capacity of 750 m^3/d.

	Discharge (m^3/d)		75th Percentile Upstream TAN (mg/L)		75th Percentile Downstream TAN (mg/L)	
	Stream 7Q20	WPCP Flow	Updated	2017 ACS[1]	Updated	2017 ACS[1]
Mar	21,129	1,581	0.116	–	0.456	–
Apr	45,407	3,154	0.065	–	0.385	–
Oct	3,057	233	0.038	–	0.389	–
Nov	15,085	1,754	0.029	–	0.547	–
Dec	24,402	4,000	0.286	–	0.950	–

Notes: 1 – not predicted in 2017 ACS.

Table A4. Mass-balance model of TAN at limit of 3 mg/L and rated WPCP capacity of 1,300 m^3/d.

	Discharge (m^3/d)		75th Percentile Upstream TAN (mg/L)		75th Percentile Downstream TAN (mg/L)	
	Stream 7Q20	WPCP Flow	Updated	2017 ACS[1]	Updated	2017 ACS[1]
Jan	22,918	3,000	0.133	–	0.464	–
Feb	17,740	2,660	0.092	–	0.471	–
Mar	21,129	2,110	0.116	–	0.377	–
Apr	45,407	3,773	0.065	–	0.290	–
Oct	3,057	300	0.038	–	0.303	–
Nov	15,085	1,760	0.029	–	0.339	–
Dec	24,402	4,000	0.286	–	0.668	–

Notes: 1 – not predicted in 2017 ACS.

Table A5. Mass-balance models of temperature and pH at rated WPCP capacity of 750 m^3/d.

Month	Upstream				WPCP Effluent				Downstream		
	Temp (°C)	pH	H^+ (L^{-1})	7Q20 (m^3/d)	Flow (m^3/d)	pH	H^+ (L^{-1})	Temp (°C)	H^+ (L^{-1})	pH	Temp (°C)
Mar	5.00	8.25	5.62E-09	21,129	1581	8.1	7.94E-09	8.6	5.78E-09	8.24	5.25
Apr	10.70	8.36	4.37E-09	45,407	3154	7.6	2.51E-08	9.5	5.71E-09	8.24	10.62
Oct	13.00	8.39	4.10E-09	3,057	233	8.1	7.94E-09	13.1	4.37E-09	8.36	13.01
Nov	7.05	8.45	3.55E-09	15,085	1754	7.6	2.51E-08	8.7	5.80E-09	8.24	7.22
Dec	0.50	8.06	8.71E-09	24,402	4000	7.9	1.26E-08	6.1	9.26E-09	8.03	1.29

Table A6. Mass-balance model of temperature and pH at rated WPCP capacity of 1,300 m^3/d.

Month	Upstream				WPCP Effluent				Downstream		
	Temp (°C)	pH	H^+ (L^{-1})	7Q20 (m^3/d)	Flow (m^3/d)	pH	H^+ (L^{-1})	Temp (°C)	H^+ (L^{-1})	pH	Temp (°C)
Jan	2.18	8.37	4.27E-09	22,918	3000	8	7.94E-09	7	4.69E-09	8.33	2.73
Feb	1.53	8.38	4.19E-09	17,740	2660	8	7.94E-09	7	4.68E-09	8.33	2.24
Mar	5.00	8.25	5.62E-09	21,129	2110	8.1	7.94E-09	9	5.83E-09	8.23	5.33
Apr	10.70	8.36	4.37E-09	45,407	3773	7.6	2.51E-08	10	5.96E-09	8.22	10.61
Oct	13.00	8.39	4.10E-09	3,057	300	8.1	7.94E-09	13	4.44E-09	8.35	13.01
Nov	7.05	8.45	3.55E-09	15,085	1760	7.6	2.51E-08	9	5.80E-09	8.24	7.22
Dec	0.50	8.06	8.71E-09	24,402	4000	7.9	1.26E-08	6	9.26E-09	8.03	1.29

Table A7. Calculation of downstream UIA at limit of 5 mg/L and WPCP flow of 750 m^3/d.

Month	pH	Temp. (°C)	pKa	*f*	Updated TAN (mg/L)	Updated UIA (mg-N/L)	2017 ACS UIA[1] (mg-N/L)
Mar	8.24	5.3	9.9	0.022	0.456	0.0098	0.0085
Apr	8.24	10.6	9.7	0.033	0.385	0.0127	0.0034
Oct	8.36	13.0	9.6	0.051	0.389	0.0199	0.0111
Nov	8.24	7.2	9.8	0.025	0.547	0.0137	0.0042
Dec	8.03	1.3	10.0	0.010	0.950	0.0093	0.0079

Notes: 1 – from EXP 2017.

Table A8. Calculation of downstream UIA at limit of 3 mg/L and rated WPCP capacity of 1,300 m^3/d.

Month	pH	Temp. (°C)	pKa	*f*	Updated TAN (mg/L)	Updated UIA (mg-N/L)	2017 ACS UIA[1] (mg-N/L)
Jan	8.33	2.7	10.0	0.022	0.464	0.0100	0.0046
Feb	8.33	2.2	10.0	0.021	0.471	0.0098	0.0051
Mar	8.23	5.3	9.9	0.021	0.377	0.0081	0.0069
Apr	8.22	10.6	9.7	0.032	0.290	0.0092	0.0027
Oct	8.35	13.0	9.6	0.050	0.303	0.0152	0.0086
Nov	8.24	7.2	9.8	0.025	0.339	0.0085	0.0028
Dec	8.03	1.3	10.0	0.010	0.668	0.0066	0.0048

Notes: 1 – from EXP 2017.

E

Appendix E: Reference List

VEOLIA

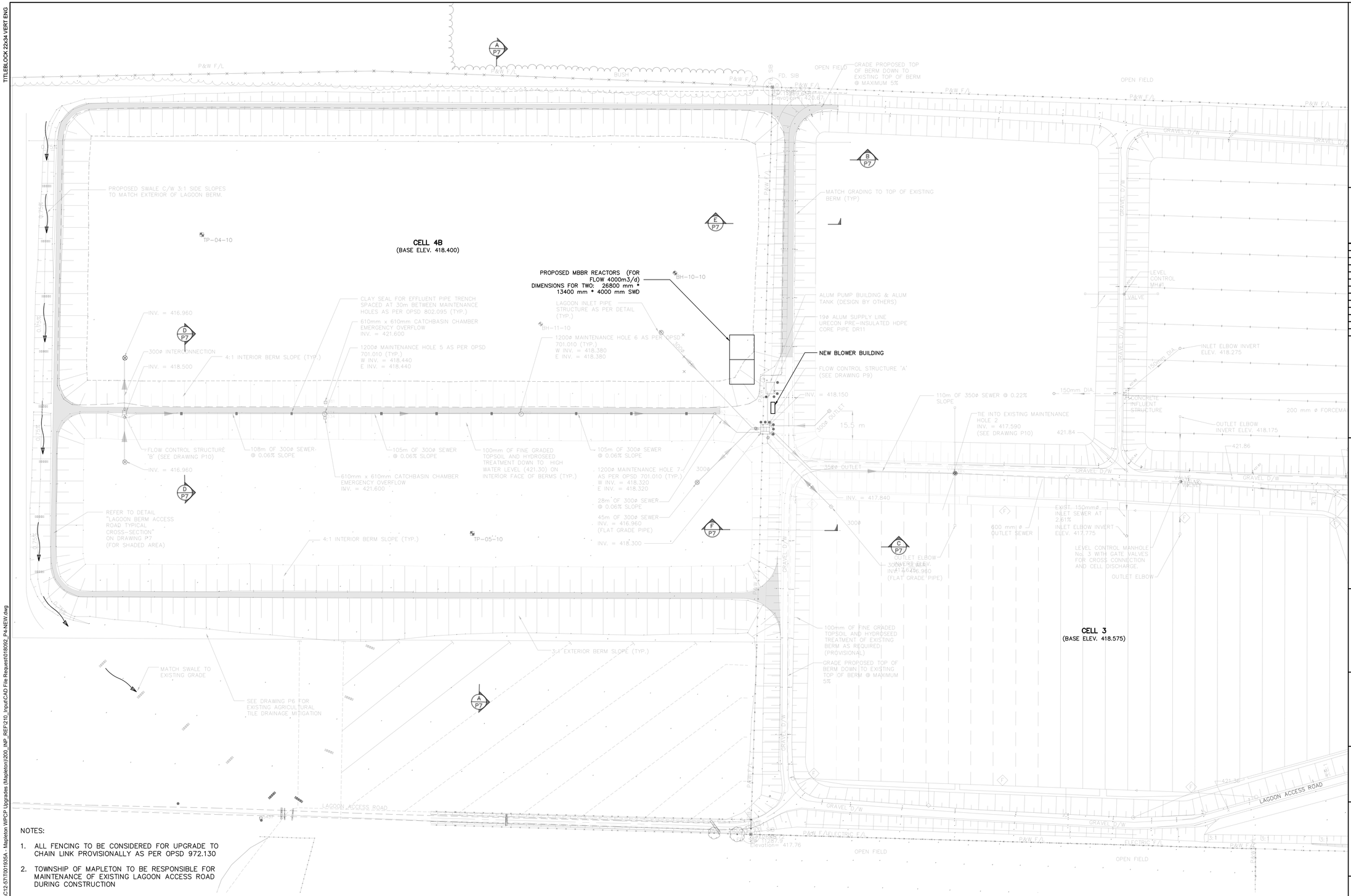
REFERENCE LIST

	PLANT INFORMATION							CONTACT INFORMATION	
Country	**Name of Plant**	**Year of Start-up**	**Design Flow (US : MGD Canada : m^3/d)**	**Type of System**	**Objectives**	**Temperature (°C)**	**Media Type (s)**	**Contact Phone**	**Contact Name**
USA	Johnstown, CO	2004	0,75	MBBR	LagoonGuard™ post-nitrification	4	K1	970-587-4664	Maurice Pribble mpribble@townofjohnstown.com
	NewBaden, IL	2010	0,78	MBBR	LagoonGuard™ NH_3-N : <1,4 mg/L summer <4 mg/L winter	NA	K3	618-688-3813	Ron Renth
	Marbleton, WY	2012	0,82	MBBR	LagoonGuard™ NH_3-N < 2 mg/L	5	K5	307-260-6214 (cell)	Todd Brown – Chief operator
	Belton, SC	2015	1,8	MBBR	LagoonGuard™ NH_3-N < 10 mg/L	5	K5	864-882-8194	Dannie Cannon
Canada	Ste-Julie, QC	2005	16700	MBBR	Complete WWTP BOD removal	5	K1	450-922-7152	Macel Dallaire mdallaire@ville.sainte-julie.qc.ca
	Noyan, QC	2010	400	MBBR	Complete WWTP BOD + nitrification	6	K1	450-291-4504	Benoit Pellerin bpellerin@ville.noyan.qc.ca
	Mascouche, QC	2010	45300	MBBR	LagoonGuard™ BOD removal	5	K3	NA	Not available
	Ste-Martine, QC	2015	3000	MBBR	LagoonGuard™ BOD removal	6	K3	NA	Not available
	Kawawachikamack, QC	2015	800	MBBR	LagoonGuard™ BOD removal	5	K5	NA	Not available

F

Appendix F: Preliminary Drawings

TITLEBLOCK 22x34 VERT ENG



NOTES:

1. ALL FENCING TO BE CONSIDERED FOR UPGRADE TO CHAIN LINK PROVISIONALLY AS PER OPSD 972.130
2. TOWNSHIP OF MAPLETON TO BE RESPONSIBLE FOR MAINTENANCE OF EXISTING LAGOON ACCESS ROAD DURING CONSTRUCTION

BM#62 ELEV. 420.874m

SPIKE IN NORTH FACE OF NORTH/WEST CORNER POST AT LAGOON ACCESS ROAD FENCELINE

BM#64 ELEV. 422.288m

TOP SOUTH WEST CORNER OF SQUARE CONCRETE PUMP & VALVE CHAMBER AT SOUTH/EAST CORNER OF CELL #2

AS-BUILT

NOTE:
THIS DRAWING HAS BEEN PREPARED BY R.J. BURNSIDE & ASSOCIATES LIMITED TO REFLECT AS-BUILT INFORMATION AND IS BELIEVED TO BE CORRECT, HOWEVER, THOSE RELYING ON THIS INFORMATION ARE ADVISED TO OBTAIN INDEPENDENT VERIFICATION AS TO ITS ACCURACY BEFORE APPLYING IT FOR ANY PURPOSE.

DISCLAIMER:

No.	Date	Description	By

STAMPS:

DESIGNED BY

APPROVED BY

CONSULTANT(S):

ENGINEER:

CIMA+
900-101 FREDERICK STREET,
KITCHENER, ON N2H 5R2
T 519.772.2299 F 519.772.2298
www.cima.ca

CLIENT:

Mapleton
PUBLIC WORKS DEPARTMENT AND ENGINEERING SERVICES
7275 SIDEROAD 16
DRAYTON, ONTARIO
N0G 1P0
(519) 638-3313

PROJECT NAME:

MOOREFIELD WATER SYSTEMS RENEWAL

CONTRACT No. RFT 2023-XX

SHEET TITLE:

SITE PLAN

DISCIPLINE:

CIVIL

DRAFTER: NP	SCALE: 1:1000
DESIGNER: NQ	DATE: 2024-04-29
APPROVER: AM	CHECKER: AM
PROJECT No:	DRAWING No: ####
SHEET No: of	

PRINT DATE: AM
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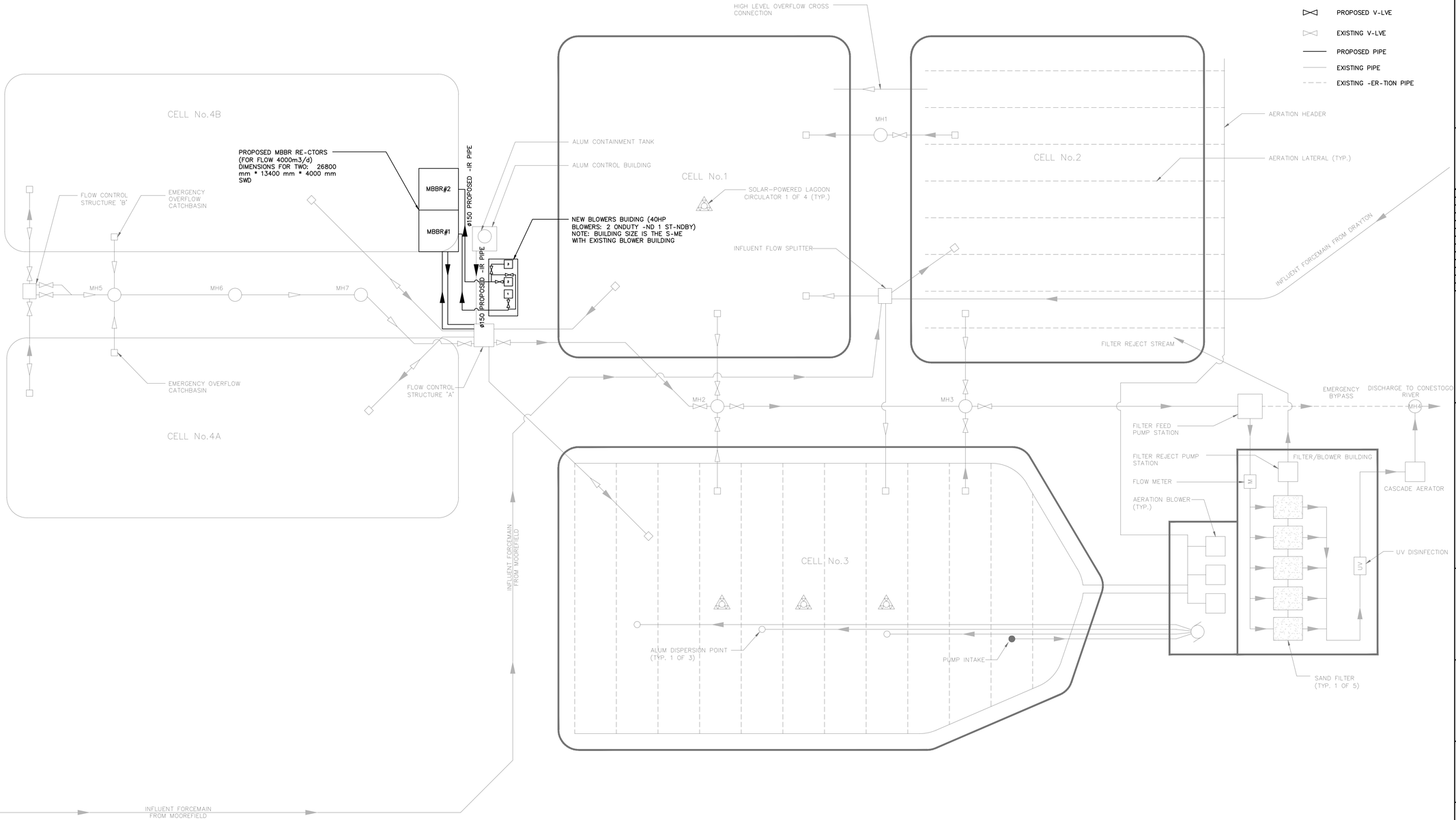

No.	Date	Description	By

STAMPS:

DESIGNED BY APPROVED BY

CONSULTANT(S):

ENGINEER:
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PROJECT NAME:
MOOREFIELD WATER SYSTEMS RENEWAL
CONTRACT No. RFT 2023-XX

SHEET TITLE:
PROCESS FLOW DIAGRAM

DISCIPLINE:
PROCESS

DRAFTER: NP	SCALE: 1:500
DESIGNER: NQ	DATE: 2024-03-19
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AIT-0401A NH4 CONCENTRATION
AIT-0401B DO CONCENTRATION
AIT-0401C PH
AIT-0401D TEMPERATURE
AIT-0401 NOT AVAILABLE
AIT-0402A NH4 CONCENTRATION
AIT-0402B DO CONCENTRATION
AIT-0402C PH
AIT-0402D TEMPERATURE
AIT-0402 NOT AVAILABLE

AI 402A | AI 402B | AI 402C | AI 402D | YA 402 | LI 402 | AI 401A | AI 401B | AI 401C | AI 401D | YA 401 | LI 401

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AE 401C
AE 401D
LT 401

AIT 402
LI 402
AIT 401
LI 401

FLOW INLET

No.	Date	Description	By

STAMPS:

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PROJECT NAME:
MOOREFIELD WATER SYSTEMS RENEWAL
CONTRACT No. RFT 2023-XX

SHEET TITLE:
PROCESS AND INSTRUMENTATION DIAGARAM

DISCIPLINE:
PROCESS

DRAFTER: NP	SCALE: ----
DESIGNER: NQ	DATE: 2024-03-19
APPROVER: AM	CHECKER: AM
PROJECT No:	DRAWING No: D006
SHEET No: of	

PRINT DATE: 2024-04-29 10:57:15 AM
PATH: I:\cima.ps.ca\mc\cima-C12\Projects\C12-457\T0001935A - Mapleton WRCP Upgrades (Mapleton)\300_DESIGN\310_Dwg\Acad\T0001935A-D006.dwg

G

Appendix G: Pre-consultation Comments

Meeting Summary

Meeting:	MECP Pre-consultation Meeting
Project:	Mapleton WPCP Upgrades and ACS
Date and Time:	November 16, 2023 / 1:30pm
Location:	Virtual via Microsoft Teams
Attendees:	Warren Saint, CIMA+ (WS) Adam Moore, CIMA+ (AM) Deborah Sinclair, Hutchinson Environmental Sciences Ltd. (DS) Joel Harrison, Hutchinson Environmental Sciences Ltd. (JH) Jamie Morgan, Township of Mapleton (JM) Mark Anderson, GRCA (MA) Rick Neubrand, MECP (RN) Mohammad Sajjad Khan, MECP (MSK)
Regrets:	Joan Del Villar Cuicas, MECP Yanhong Du, MECP
Issue Date:	November 21, 2023
Purpose:	Pre-consultation meeting with the MECP water quality technical staff to go over additional river water quality data to support the ACS of the 2017 Environmental Study Report (ESR).

Note: Please advise author immediately of any errors or omissions.

Discussion Topics		Action By
1. Introductions		
	WS gave a brief project introduction into the proposed upgrades to the Mapleton WPCP and the data that was obtained through the GRCA to support the original 2017 Class EA ESR (completed by exp).	INFO
	Warren Saint – Project Manger, CIMA+ Adam Moore – Project Engineer, CIMA+ Deborah Sinclair – Project Manager and Senior Aquatic Scientist, Hutchinson Environmental Sciences Ltd.	INFO

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cima.ca

	Discussion Topics	Action By
	Joel Harrison - Aquatic Scientist, Hutchinson Environmental Sciences Ltd. Jamie Morgan – Director of Public Works, Township of Mapleton Mark Anderson – Water Quality Engineer – Grand River Conservation Authority (GRCA) Rick Neubrand – Environmental Compliance Officer, MECP Mohammad Sajjad Khan – Surface Water Specialist Group Leader – Technical Support Section, MECP Joan Del Villar Cucius (not present at the meeting) – Environmental Coordinator, MECP Yanhong Du (not present at the meeting) - Technology Reviewer, MECP	
2.	**Background**	
	DS shared a PowerPoint presentation first providing a background introduction to the Assimilative Capacity Study (ACS) completed back in 2017, as part of the Class EA by exp. The purpose of the ACS was to determine if the receiving body can assimilate the projected increase in capacity from 750 m^3/d to 1,300 m^3/d. It was noted that the current ECA for the Mapleton WPCP is for a capacity of 900 m^3/d.	INFO
	MSK noted daily per capita sewage flow from Moorefield was considered 215 L/cap/d which was outside the ministry's recommended range of 225-450 L/cap/d (average daily domestic sewage flow exclusive of extraneous flows, of the MECP 2008 Design Guidelines for Sewage Works). An explanation should be provided to support the 215 L/cap/d determination. CIMA+ to review and advise.	CIMA+
3.	**WPCP Discharge Regime**	
	DS showed a breakdown of the discharge flows by month for the original (750 m^3/d), future (1300 m^3/d) and 7Q20 Conestogo River scenarios. The intent with the expansion to 1,300 m^3/d is to extend the discharge period into the months of December and January while slightly increasing the discharge volumes in the other months already approved under the current ECA.	INFO
	MSK asked if the Conestogo River is covered over in ice during the winter months?	INFO

Discussion Topics		Action By
	MA clarified the Conestogo River was ice covered but was still flowing during winter conditions. DS indicated that any ice that forms in the vicinity of the outfall of the wastewater plant melts from the treated effluent, which is above freezing. It was subsequently clarified that the difference between the effluent and stream temperatures would be minor because it is a lagoon system.	INFO
	MSK enquired if there were any restrictions in the area of the WPCP outfall? MA confirmed there were not; the river is free flowing at the outfall.	INFO
4. Interim Phasing		
	DS provided more context on the interim phasing. One of the primary concerns from the MECP was regarding the lack of river water quality data during the cold winter months (January and February) in order to assess if the effluent addition will impair river water quality with respect to un-ionized ammonia concentrations. Phase 1 – Interim Re-rating to 900 m^3/d GRCA was to implement a monitoring program for the Conestogo River and collect the additional data. Phase 2 – Full rating up to 1,300 m^3/d provided there was sufficient data generated to calculate the potential impact during the winter months to the WPCP's existing discharge regime.	INFO
5. Upstream Data		
	DS shared the datasets from the 2017 Class EA showing Total Ammonia Nitrogen (TAN) and Total Phosphorus (TP) for the months of January and February taken from two stations upstream of the WPCP (the furthest station is now out of service).	INFO
	MSK asked where the new water quality samples were collected? MSK asked where is the mixing zone located? DS showed the station locations on the Power Point presentation. The mixing zone is approximately 150-200m downstream of the WPCP.	INFO
	DS shared a slide of an aerial image showing the locations of the two original stations (16018410002, 16018407502) upstream of the WPCP, relative to the two stations where the GRCA monitoring program was set	INFO

Discussion Topics		Action By
	up. One station upstream (4389002) and one station downstream (439005).	
	MSK asked what is the water quality at the mixing zone? MA stated that it was not practical to collect samples at the outfall in winter conditions due to the slope of the terrain and the vegetation growth in that area. MA showed another aerial image of the area showing where the outfall was located and the vegetation. MSK suggested water quality samples be taken at 75m and 150m intervals downstream of the outfall once per month during the 2023-2024 discharge period. MA reiterated that sample was not going to be logistically feasible as the terrain and vegetation do not provide suitable conditions to perform sampling and that there were also health and safety concern with sending staff out into that area at this time of the year (i.e., hunting season and cold water). DS stated that HESL could easily use the results of the 2017 dye study to predict water quality in the mixing zone under any flow scenario the MECP desired. Water samples collected would be spot measurements, and not indicative of the low-flow conditions used to inform effluent limits in an ACS. MSK stated he did not want to see a simulation; he would like to see physical water quality samples taken from the mixing zone under current flow conditions. Suggested using a drone to remotely collect water samples JM offered to get to complete the sampling. He asked for input on the sampling frequency and locations to take the samples. MSK asked how urgent the Addendum report is needing to be complete? AM stated that the project team was looking to complete the Addendum as soon as possible. MSK stated sampling can take pace in November and December and two sample per month, at 75m and 150m intervals downstream of the outfall.	INFO
6.	**New Water Quality Dataset PWQMN + GRCA**	
	DS reviewed the additional water quality data received from the GCRA comparing the number of samples taken during the winter months (January and February)	INFO

Discussion Topics		Action By
7. Future Downstream Un-ionized Ammonia and TP		
	DS showed bar chart summaries comparing the downstream un-ionized ammonia concentrations from the original 2017 exp ACS, the corrected values from the 2017 exp ACS and the updated HESL 2023 dataset. Predicated concentrations for January and February were added as well. The bar chart showed that the re-calculated un-ionized ammonia concentrations (HESL 2023) were below the PWQO, meeting MECP Policy 1.	INFO
	DS showed a similar bar chart of TP concentrations comparing the results from the original 2017 exp ACS and the HESL model. Downstream concentrations were similar to those predicted in the 2017 ACS.	
8. TP Loading		
	DS showed the projected effluent TP load for all discharge months (including January and February) comparing the TP limit (0.5 mg/L) for 750 m^3/d and the proposed future effluent limit (0.3 mg/L) at 1,300 m^3/d. The TP loading from the WPCP at 1,300 m^3/d will be less than at 750 m^3/d, meeting MECP policy 2. The TP load from the WPCP is < 1% of the total in-stream phosphorus load in the Conestogo River at Drayton, which is largely from agricultural runoff.	INFO
	MSK asked to confirm the effluent limit of 0.5 mg/L for WWTPs in the Lake Erie watershed MA confirmed it was 0.5 mg/L. MA later shared an excerpt from the Great Lakes Water Quality Agreement Annex 4 on nutrients *"programs to ensure that construction and operation of municipal wastewater treatment facilities that discharge one million liquid gallons or more per day achieve a maximum effluent concentration of 1.0 milligrams per litre total phosphorus for plants in the basins of Lakes Superior, Michigan and Huron , and of 0.5 milligrams per litre total phosphorus for plants in the basins of Lakes Ontario and Erie."* MA stated that the 0.5 mg/L guideline applies to plants that discharge more the 1 million gallons per day (3,785 m^3/d).	INFO
9. Comparison of Existing (750 m^3/d) and Future (1,300 m^3/d)		
	DS showed a comparison of un-ionized ammonia and TP for both flow scenarios (750 and 1,300 m^3/d) using the updated HESL data. January and February discharges were used for the 1,300 m^3/d scenario only. All	INFO

	Discussion Topics	Action By
	downstream concentrations for un-ionized ammonia and TP were lower for the future 1,300 m^3/d scenario than the 750 m^3/d scenario.	
10.	**Summary**	
	DS noted that adding the January and February data did not change the conclusions from the original 2017 ACS. The recent upstream data requested by the MECP for the months of January and February was to confirm ACS predictions for UIA. This data was provided including 75th percentile TAN and TP concentrations that were updated with recent upstream data from the period of 2007 to 2021. The projected effluent un-ionized ammonia meets MECP Policy 1 requirements and projected effluent TP concentrations meet MECP Policy 2 requirements.	INFO
	DS to share a copy of the presentation after the meeting. DS emailed the presentation to all attendees on November 16, 2023.	INFO
11.	**Additional Notes**	
	MA shared an image from Appendix H of the 2017 ESR showing water quality data sampled in 2016. This may satisfy the requirements for additional sampling. MSK was to review the appendices of the ESR and confirm if this data satisfies his request. *Post-Meeting Note: MSK reviewed the information in Appendix H and stated in a November 17, 2023 email that no additional sampling at the outfall would be required.*	MECP

Please Note: These above is a summary of the discussions that took place during the meeting. If this summary does not agree with your records, or if there are any errors or omissions, please advise the undersigned. Otherwise, it will be assumed that the contents of this document are accurate and that all attendees agree to its contents.

Minutes Prepared By: Adam Moore, P.Eng., CIMA+

cc: Warren Saint, P.Eng., CIMA+

Adam Moore

From: Khan, Mohammad Sajjad (MECP) <mohammad.khan@ontario.ca>
Sent: April 2, 2024 9:23 AM
To: Warren Saint
Cc: Del Villar Cuicas, Joan (MECP); Du, Yanhong (MECP); Neubrand, Rick (MECP); Jamie Morgan; Mark Anderson; Deborah Sinclair; Joel Harrison; Adam Moore; Charlotte Creron
Subject: RE: Mapleton WPCP 2017 Class EA ACS & Addendum

EXTERNAL EMAIL

Yes, Warren, this is acceptable to the ministry. You can proceed filling the addendum of the EA.

==========
Mohammad Sajjad Khan, Ph.D., P.Eng.
Surface Water Specialist Group Leader (A)
Technical Support Section, West Central Region
Ontario Ministry of the Environment, Conservation and Parks
119 King St W, 12th Floor, Hamilton ON L8P 4Y7
Tel: 365 889-4248; Fax: 905 521-7820
Email: mohammad.khan@ontario.ca
==========

From: Warren Saint <Warren.Saint@cima.ca>
Sent: April 1, 2024 7:09 PM
To: Khan, Mohammad Sajjad (MECP) <mohammad.khan@ontario.ca>
Cc: Del Villar Cuicas, Joan (MECP) <Joan.DelVillarCuicas@ontario.ca>; Du, Yanhong (MECP) <Yanhong.Du@ontario.ca>; Neubrand, Rick (MECP) <Rick.Neubrand@ontario.ca>; Jamie Morgan <JMorgan@mapleton.ca>; Mark Anderson <manderson@grandriver.ca>; Deborah Sinclair <Deborah.Sinclair@environmentalsciences.ca>; Joel Harrison <joel.harrison@environmentalsciences.ca>; Adam Moore <Adam.Moore@cima.ca>; Charlotte Creron <Charlotte.Creron@cima.ca>
Subject: RE: Mapleton WPCP 2017 Class EA ACS & Addendum

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Thanks Sajjad. The H_2S concentration was actually below the detection limit of the analyses so we don't know for sure it exceeded the PWQO but we do appreciate the concern. To not delay the filing of the EA Addendum, we would propose the H_2S sampling and analyses, as you described in 2) below, to be a condition of the new ECA. Please let us know if this is acceptable.

With regards to the Moorefield per capita flow being lower than the MECP guidelines as a result of it being a pressurized system, we would appreciate any timely comments from the review engineer, however, as it doesn't impact the ACS or the 1,300 m^3/d treatment capacity, we would appreciate the opportunity to file the Addendum regardless.

Please let us know if this sounds acceptable.

Regards,

-Warren

From: Khan, Mohammad Sajjad (MECP) <mohammad.khan@ontario.ca>
Sent: Monday, March 25, 2024 4:44 PM
To: Warren Saint <Warren.Saint@cima.ca>
Cc: Del Villar Cuicas, Joan (MECP) <Joan.DelVillarCuicas@ontario.ca>; Neubrand, Rick (MECP) <Rick.Neubrand@ontario.ca>; Du, Yanhong (MECP) <Yanhong.Du@ontario.ca>; Jamie Morgan <JMorgan@mapleton.ca>; Mark Anderson <manderson@grandriver.ca>; Deborah Sinclair <Deborah.Sinclair@environmentalsciences.ca>; Joel Harrison <joel.harrison@environmentalsciences.ca>; Adam Moore <Adam.Moore@cima.ca>
Subject: RE: Mapleton WPCP 2017 Class EA ACS & Addendum

EXTERNAL EMAIL

Hello Warren,

I have reviewed the updated ACS report for the Mapleton WPCP, prepared by Hutchinson and dated January 9, 2024. Based on this review, I offer the following comments and recommendations:

(1) The ministry supports extending the discharge window of the Mapleton WPCP into January and February to accommodate the increased rated capacity of 1,300 m^3/d, as outlined in the 2017 Class EA. Effluent limits for this extension are proposed as follows: CBOD5 = 7.5 mg/L (April & October) and 10 mg/L (January, February, March, November & December); TSS = 15 mg/L; TAN = 3 mg/L; TP = 0.3 mg/L; E.coli = 200 E.coli/100 mL (please refer to Appendix B of the 2017 ESR for the ACS details).

(2) Additionally, the ministry has reviewed the hydrogen sulphide (H2S) data for the final effluent collected on December 6, 2023, and December 20, 2023 (tabulated below). Both results exceeded the PWQO of 0.002 mg/L (undissociated/unionized H2S). Therefore, it is recommended that H2S be monitored in the effluent along with other parameters. This monitoring should occur with the following frequency: (a) lagoon contents should be sampled once at least seven (7) days prior to scheduled seasonal discharge, and (b) final effluent shall be sampled with a weekly frequency using 24-hour composite samples.

If concentrations of H2S in the effluent exceed PWQO persistently for two consecutive seasons, an effluent criterion for this parameter must be developed considering assimilative capacity of the receiver and an appropriate treatment system must be implemented to treat H2S to meet the designed objective and limit.

Hydrogen sulphide in the final effluent

Date sampled	pH	Temp (°C)	H2S (mg/L)	Undissociated H2S (mg/L)*	PWQO for undissociated H2S (mg/L)	Note
Dec 6, 2023	7.34	3.8	0.006	0.003	0.002	Exceeded guideline

Dec 20, 2023	7.7	5.3	0.02	0.005	0.002	Exceeded guideline

*Calculated using Clarke, R.R. 1974. Physical, chemical, and biological effects of H2S releases to Lake Huron. Information Report No. CNS-IE-191 for the Hydro-Electric Power Commission of Ontario, Thermal Generation Division, Central Nuclear Services.

(3) The Conestogo River monitoring program as specified in Schedule D of the current ECA upstream of the outfall at Drayton bridge will no logger be necessary. This monitoring can be discontinued.

(4) The ministry's review engineer will further examine the details of the per capita flow in Moorefield.

If you need any further clarifications regarding any of the comments and recommendations I have provided above, please don't hesitate to contact me.

Sincerely,

Sajjad

==========
Mohammad Sajjad Khan, Ph.D., P.Eng.
Surface Water Specialist Group Leader (A)
Technical Support Section, West Central Region
Ontario Ministry of the Environment, Conservation and Parks
119 King St W, 12th Floor, Hamilton ON L8P 4Y7
Tel: 365 889-4248; Fax: 905 521-7820
Email: mohammad.khan@ontario.ca
==========

From: Warren Saint <Warren.Saint@cima.ca>
Sent: February 7, 2024 2:20 PM
To: Khan, Mohammad Sajjad (MECP) <mohammad.khan@ontario.ca>
Cc: Del Villar Cuicas, Joan (MECP) <Joan.DelVillarCuicas@ontario.ca>; Neubrand, Rick (MECP) <Rick.Neubrand@ontario.ca>; Du, Yanhong (MECP) <Yanhong.Du@ontario.ca>; Jamie Morgan <JMorgan@mapleton.ca>; Mark Anderson <manderson@grandriver.ca>; Deborah Sinclair <Deborah.Sinclair@environmentalsciences.ca>; Joel Harrison <joel.harrison@environmentalsciences.ca>; Adam Moore <Adam.Moore@cima.ca>
Subject: Mapleton WPCP 2017 Class EA ACS & Addendum

Hi Sajjad,

Please see attached, for your review, the Assimilative Capacity Study (ACS) completed to support the 2017 Class Environmental Assessment undertaken to increase the rated capacity of the Mapleton WPCP to the influent flow of 1,300 m^3/d. The updated ACS builds on the ACS completed by EXP Services for the 2017 Class EA and incorporates

the winter river sampling completed by the GRCA to address the background receiver water quality data gaps identified by the MECP. The modeling completed in the updated ACS, supports the MECP policy objectives with respect to unionized ammonia concentrations and total phosphorus at the increased WPCP capacity.

Also attached are two effluent samples from the December discharge period which have been analyzed for hydrogen sulfide (H_2S) to determine if this is a parameter of concern. The concentration of the samples is below the analytical detection limit of 0.006 mg/L of the laboratory used by the Township's operator, however we understand that the PWQO for H_2S is 0.003 mg/L. Unfortunately, the winter discharge period is now closed and there won't be another opportunity to take additional samples until Spring. As the Mapleton WPCP was designed with a cascade aeration step (see photo and design drawing attached) prior to the effluent outfall to increase the DO in the effluent air and strip H_2S, the effluent H_2S is anticipated to be below the PWQO detection limits. If required, additional sampling can be undertaken in the Spring and a separate report can be generated, however, due to the necessity of WPCP expansion resulting from development pressures, the Township would appreciate that any request to investigate this additional parameter, not identified in earlier correspondence, occur outside of the Addendum to the 2017 Class EA so as not to delay its review, filing and approval.

With regards to the per capita flow in Moorefield being less than MECP Guidelines, we note that the Environmental Study Report documents, in Section 2.5.2.1, that the serviced population of Moorefield was estimated at 420 persons and average annual flows were less than 90 m^3/d which resulted in a per capita flow of 215 L/d. Moorefield's collection system is a low pressure, small diameter, system with each dwelling equipped with a grinder pump that discharges the sewage to a central pump station for secondary pumping to the Mapleton WPCP. The lower per capita day flows can be attributed to the system type; overwhelmingly residential and without connections to roof or foundation drains, and as it's pressurized, inflow and infiltration are essentially eliminated.

We appreciate your assistance and input on this file to date and look forward to receiving your comments on the information contained in this email. If further information is required, please contact the writer at your earliest convenience.

Regards,

-Warren

WARREN SAINT, P.Eng
Associate Partner / Director / Infrastructure – Water Engineering

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From: Adam Moore <Adam.Moore@cima.ca>
Sent: Tuesday, November 21, 2023 11:56 AM
To: Khan, Mohammad Sajjad (MECP) <mohammad.khan@ontario.ca>; Del Villar Cuicas, Joan (MECP) <Joan.DelVillarCuicas@ontario.ca>; Warren Saint <Warren.Saint@cima.ca>
Cc: Neubrand, Rick (MECP) <Rick.Neubrand@ontario.ca>; Jamie Morgan <JMorgan@mapleton.ca>; Deborah Sinclair <Deborah.Sinclair@environmentalsciences.ca>; Joel Harrison <joel.harrison@environmentalsciences.ca>; Du, Yanhong (MECP) <Yanhong.Du@ontario.ca>
Subject: RE: MECP Pre-Consultation Mapleton WPCP

Hi Sajjad,

Thank you for the feedback below. Apologies for the delay, please see the attached meeting minutes from our call last week.
We'll work on finalizing the ACS technical report for the MECP review and will follow up with input on the two other items noted below: hydrogen sulphide monitoring on the final effluent and the supporting data substantiating the sewage flow rates.

Have a good day!

Regards,

ADAM MOORE, M.A.Sc., P.Eng.
Project Engineer / Infrastructure – Water and Wastewater
M 519-830-7015
900–101 Frederick Street, Kitchener, ON N2H 6R2 CANADA

From: Khan, Mohammad Sajjad (MECP) <mohammad.khan@ontario.ca>
Sent: Friday, November 17, 2023 10:53 AM
To: Del Villar Cuicas, Joan (MECP) <Joan.DelVillarCuicas@ontario.ca>; Adam Moore <Adam.Moore@cima.ca>; Warren Saint <Warren.Saint@cima.ca>
Cc: Neubrand, Rick (MECP) <Rick.Neubrand@ontario.ca>; Jamie Morgan <JMorgan@mapleton.ca>; Deborah Sinclair <Deborah.Sinclair@environmentalsciences.ca>; Joel Harrison <joel.harrison@environmentalsciences.ca>; Du, Yanhong (MECP) <Yanhong.Du@ontario.ca>
Subject: RE: MECP Pre-Consultation Mapleton WPCP

EXTERNAL EMAIL

Hello Adam,

Further to yesterday's pre-consultation meeting on Mapleton WPCP, the ministry reviewed the January 20, 2017, dye study report (appendix H of the 2017 ESR, and the study was done on the river on November 17, 2016). It was noted that during the dye study consultant collected water

samples from the receiving water at eight locations downstream of the outfall starting from a distance of 2 m to 845 m from the outfall. Those samples were collected closer to the north shore of the river where dye concentrations were found to be at its highest level.

The water samples were analyzed for the all the parameters concerned. This study results satisfy the ministry's need to understand near-field impact on the receiver when instantaneous effluent flow rate was 26.4 L/s (i.e., the flow rate at the time of the dye study, not the average daily flow, which equates to 2,281 m^3/d). **Therefore, additional sampling of the receiver as discussed in the yesterday's meeting will not be required.**

The client can now submit to the ministry a revised assimilative capacity study (ACS) or a technical report describing potential impacts on the receiver due to expansion of the discharge window into January and February. The revised ACS or technical report should include an analysis of the additional data collected so far to support the study findings.

It is worth to mention that the lagoon contents during winter months may enrich with hydrogen sulphide to a level that may cause fish toxicity in the receiving stream. I have looked into the recent 2022 monitoring report (thanks Rick for forwarding me the report), did not find any hydrogen sulphide concentrations data in the final effluent. The reason could be, in the current ECA, the monitoring parameters did not include hydrogen sulphide as a parameter to be analyzed. **The ministry recommends adding this parameter to the regular monitoring.** Please provide the ministry hydrogen sulphide concentrations in the final effluent collected for at least four (4) months during final effluent discharge to the receiving stream. Also explain its impacts on the receiving waters and submit this analysis with the revised ACS/technical report. **Based on the findings of this assessment, please propose an effluent criterion for hydrogen sulphide, if warranted.**

A clearance from the ministry's regional tech support will be required for the revised ACS/technical report prior to publishing the Class EA addendum for public consultation.

On a separate note, during the review of the 2017 Class EA, the ministry's regional technical support office noted daily per capita sewage flow from Moorefield was considered 215 L/cap.d which was outside the ministry's recommended range of 225-450 L/cap.d (average daily domestic sewage flow exclusive of extraneous flows, see s.5.5.2.1, MECP 2008 Design Guidelines for Sewage Works). For Drayton that flow was considered 332 L/cap.d. Please submit to the ministry supporting data substantiating these sewage flow rates considered in calculating the rated capacity of the plant.

Sincerely,

Sajjad

==========
Mohammad Sajjad Khan, Ph.D., P.Eng.
Surface Water Specialist Group Leader (A)
Technical Support Section, West Central Region
Ontario Ministry of the Environment, Conservation and Parks
119 King St W, 12th Floor, Hamilton ON L8P 4Y7
Tel: 365 889-4248; Fax: 905 521-7820
Email: mohammad.khan@ontario.ca
==========

From: Del Villar Cuicas, Joan (MECP) <Joan.DelVillarCuicas@ontario.ca>
Sent: November 3, 2023 3:18 PM
To: Adam Moore <Adam.Moore@cima.ca>; Warren Saint <Warren.Saint@cima.ca>
Cc: Neubrand, Rick (MECP) <Rick.Neubrand@ontario.ca>; Khan, Mohammad Sajjad (MECP) <mohammad.khan@ontario.ca>; Jamie Morgan <JMorgan@mapleton.ca>; Deborah Sinclair <Deborah.Sinclair@environmentalsciences.ca>; Joel Harrison <joel.harrison@environmentalsciences.ca>
Subject: RE: MECP Pre-Consultation Meeting Request

Thank you Adam and Warren for providing the requested information.

Please let me know if any of the following proposed meeting dates/times work for you and your team:

- November 7 → 10 - 11am or 1:30 - 2:30pm
- November 16 → 1:30 - 2:30pm

Thanks,

Joan Del Villar Cuicas (she/her)
Regional Environmental Planner
Project Review Unit | Environmental Assessment Branch
Ontario Ministry of the Environment, Conservation and Parks
Joan.delvillarcuicas@ontario.ca | Phone: 365-889-1180

From: Adam Moore <Adam.Moore@cima.ca>
Sent: November 3, 2023 12:42 PM
To: Del Villar Cuicas, Joan (MECP) <Joan.DelVillarCuicas@ontario.ca>
Cc: Neubrand, Rick (MECP) <Rick.Neubrand@ontario.ca>; Jamie Morgan <JMorgan@mapleton.ca>; Deborah Sinclair <Deborah.Sinclair@environmentalsciences.ca>; Joel Harrison <joel.harrison@environmentalsciences.ca>; Warren Saint <Warren.Saint@cima.ca>
Subject: RE: MECP Pre-Consultation Meeting Request
L/pe

Hi Joan,

No problem, here are the links to the ESR and appendices.

Mapleton-WW-Servicing-Class-EA_ESR-FINAL.pdf
Appendices-A-E.pdf

ADAM MOORE, M.A.Sc., P.Eng.
Project Engineer / Infrastructure – Water and Wastewater
M 519-830-7015
900–101 Frederick Street, Kitchener, ON N2H 6R2 CANADA

From: Del Villar Cuicas, Joan (MECP) <Joan.DelVillarCuicas@ontario.ca>
Sent: Friday, November 3, 2023 11:00 AM
To: Warren Saint <Warren.Saint@cima.ca>; Adam Moore <Adam.Moore@cima.ca>
Cc: Neubrand, Rick (MECP) <Rick.Neubrand@ontario.ca>; Jamie Morgan <JMorgan@mapleton.ca>; Deborah Sinclair <Deborah.Sinclair@environmentalsciences.ca>; Joel Harrison <joel.harrison@environmentalsciences.ca>
Subject: RE: MECP Pre-Consultation Meeting Request

EXTERNAL EMAIL

Hi Warren,

Thank you for providing this information.

Yes @Adam Moore, we would like to have a copy of the complete ESR, if possible.

Thanks,

Joan Del Villar Cuicas (she/her)
Regional Environmental Planner
Project Review Unit | Environmental Assessment Branch
Ontario Ministry of the Environment, Conservation and Parks
Joan.delvillarcuicas@ontario.ca | Phone: 365-889-1180

From: Warren Saint <Warren.Saint@cima.ca>
Sent: November 2, 2023 7:18 PM
To: Del Villar Cuicas, Joan (MECP) <Joan.DelVillarCuicas@ontario.ca>
Cc: Neubrand, Rick (MECP) <Rick.Neubrand@ontario.ca>; Jamie Morgan <JMorgan@mapleton.ca>; Deborah Sinclair <Deborah.Sinclair@environmentalsciences.ca>; Joel Harrison <joel.harrison@environmentalsciences.ca>; Adam Moore <Adam.Moore@cima.ca>
Subject: RE: MECP Pre-Consultation Meeting Request

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Joan,

The Township of Mapleton completed a Class "A" Environmental Assessment to rerate the capacity of WPCP from 750 m3/day to 900 m3/day and ultimately to 1,300 m3/day. They received an interim re-rating of 900 m3/d. The ESR proposed an additional treatment step using a fixed film biological process to remove ammonia from the WPCP effluent to achieve the 1,300 m3/d capacity.

The ESR was accepted with the condition that additional water quality monitoring was to be completed during the winter months (see below the excerpt from the Executive Summary of the ESR) to validate the Receiving Water Impact Assessment (attached). The Grand River Conservation Authority (GRCA) completed the winter sampling of the receiver, and the Township has requested that CIMA+ complete the Addendum to ESR incorporating the sampling results. CIMA+ has subcontracted Hutchinson Environmental to assist with the incorporation of the GRCA data.

If you would like a copy of the complete ESR, Adam can send it to you upon request.

Hope this helps. Please don't hesitate to contact me if further information is required.

Regards,

-Warren

ES-7.2. Interim Phasing

One of the primary concerns raised by the MOECC regarding adding discharge in January and February is the lack of available river water quality background data during cold winter months. To resolve this uncertainty, a meeting was held with MOECC on September 18, 2017. In the meeting, it was agreed that the Township would phase in the implementation of the expansion in two phases:

Phase 1 - Interim Rating: The first phase of the expansion would raise the rated influent capacity of the WPCP to an interim-capacity. While the exact rating would be determined through the hydraulic and engineering assessment, it is estimated to be 900 m^3/day. This would be achieved through optimization of the existing WPCP, which will allow the Township to increase the WPCP's capacity without a large capital investment, thereby relieving the Township's immediate growth pressures while providing time for additional winter river water quality monitoring. As discussed previously, the GRCA has implemented a monitoring program for the Conestogo River, which would act as a source for the additional river water quality background data. The exact methods through which the WPCP would be optimized would be determined through the design and ECA amendment process. However, it would be ensured that the interim rating of the WPCP will meet MOECC's Policy 1 and Policy 2 water quality objectives.

Phase 2 - Full Rating: The second phase of the expansion would increase the facility's influent rating to 1,300 m^3/day, to be achieved through implementation of the EA's preferred design. It would occur once sufficient data has been generated to verify the conclusions of the RWIA that the addition of January and February discharge period to the WPCP's existing discharge regime would not cause a negative impact on the Conestogo River.

Prior to the full upgrade from 900 m^3/day to 1,300 m^3/day, the Township will complete an EA Addendum to revisit the RWIA, incorporate the additional river water quality data, and confirm the assimilative capacity of the Conestogo River. The RWIA will also ensure that the WPCP meets the MOECC's Policy 1 and Policy 2 water quality objectives as it proceeds to the ultimate rating of 1,300 m^3/day.

From: Warren Saint
Sent: Wednesday, November 1, 2023 4:52 PM
To: Del Villar Cuicas, Joan (MECP) <Joan.DelVillarCuicas@ontario.ca>
Cc: Deborah Sinclair <Deborah.Sinclair@environmentalsciences.ca>; Adam Moore <Adam.Moore@cima.ca>
Subject: RE: MECP Pre-Consultation Meeting Request

Hi Joan,

Thanks for contacting me. I'll put together a package of information tomorrow and send to you.

Regards,

-Warren

From: Del Villar Cuicas, Joan (MECP) <Joan.DelVillarCuicas@ontario.ca>
Sent: Wednesday, November 1, 2023 2:59 PM

To: Warren Saint <Warren.Saint@cima.ca>
Subject: RE: MECP Pre-Consultation Meeting Request

EXTERNAL EMAIL

Good afternoon Warren,

Rick Neubrand passed along your pre-consultation meeting request to me as I'm the main contact for Class EAs in West Central Region.

Would you be able to provide any current study or technical information on the proposal prior to booking the meeting? It would be beneficial for Technical support to review some information on the proposal in advance.

Thanks,

Joan Del Villar Cuicas (she/her)
Regional Environmental Planner
Project Review Unit | Environmental Assessment Branch
Ontario Ministry of the Environment, Conservation and Parks
Joan.delvillarcuicas@ontario.ca | Phone: 365-889-1180

From: Warren Saint <Warren.Saint@cima.ca>
Sent: September 12, 2023 2:30 PM
To: Neubrand, Rick (MECP) <Rick.Neubrand@ontario.ca>
Cc: Williamson, Lisa (MECP) <Lisa.Williamson@ontario.ca>; Jamie Morgan <JMorgan@mapleton.ca>; Mark Anderson <manderson@grandriver.ca>; Deborah Sinclair <Deborah.Sinclair@environmentalsciences.ca>; Stuart Winchester <stuart.winchester@cima.ca>; Adam Moore <Adam.Moore@cima.ca>
Subject: FW: MECP Pre-Consultation Meeting Request

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Rick,

Please see attached the completed Pre-Consultation Meeting Request Form. We appreciate your assistance on this file and in coordinating a meeting with an MECP Surface Water Quality Specialist.
Please contact me if additional information is required.

Regards,

-Warren

WARREN SAINT, P.Eng
Director / Infrastructure – Water Engineering

T 519-772-2299 **M** 519-573-9002 **F** 519-772-2298
900–101 Frederick Street, Kitchener, ON N2H 6R2 CANADA

From: Neubrand, Rick (MECP) <Rick.Neubrand@ontario.ca>
Sent: Monday, August 28, 2023 8:31 AM
To: Warren Saint <Warren.Saint@cima.ca>
Subject: RE: MECP Pre-Consultation Meeting Request

EXTERNAL EMAIL

Hi Warren –

As per your request and to assist with the scope of the meeting, please complete the attached form and submit this to the ministry's `*Client Services and Permissions Branch'* at enviropresubmission@ontario.ca. If you could please CC me on this that would be appreciated. Once received, I will coordinate with approvals and technical support to ensure we have the necessary subject matter experts available to assist.

Feel free to contact me if you have any questions.

Thanks

Rick

Rick Neubrand
Senior Environmental Officer / Inspector
Ministry of the Environment, Conservation and Parks
Guelph District Office
One Stone Road West
Guelph , Ontario
N1G 4Y2
Tel : 519 546-9301
Fax : 519 826-4286
E-mail: rick.neubrand@ontario.ca

From: Warren Saint <Warren.Saint@cima.ca>
Sent: August 23, 2023 4:18 PM
To: Neubrand, Rick (MECP) <Rick.Neubrand@ontario.ca>
Cc: Jamie Morgan <JMorgan@mapleton.ca>; Deborah Sinclair <Deborah.Sinclair@environmentalsciences.ca>; Stuart Winchester <stuart.winchester@cima.ca>; Adam Moore <Adam.Moore@cima.ca>
Subject: MECP Pre-Consultation Meeting Request

Hi Rick,

The Township of Mapleton completed a Schedule 'C' Class Environmental Assessment (Class EA) (exp., 2017) to allow a capacity increase from the Mapleton WPCP (ECA Number 1391-B38PLA) from the current 900 m^3/day to 1,300 m^3/day. The Class EA resulted in a preferred solution requiring the additional biological treatment of ammonia through an attached growth reactor. The Class EA also required the collection of additional river water quality data to verify the conclusions of the Receiving Water Impact Assessment (RWIA) (exp., 2017) and required the subsequent filing of an Addendum to the Class EA. Since the completion of the Class EA, the Township has successfully pilot tested a Moving Bed Bioreactor (MBBR) attached growth reactor and the Grand River Conservation Authority (GRCA) has collected additional river water quality data over the 2016-2018 period. The Township has retained CIMA Canada Inc. and their subconsultants, Hutchinson Environmental Sciences Ltd**.,** to complete and file the Addendum to the 2017 Class EA to allow the required capital works for the expansion of the WPCP to the 1,300 m^3/day capacity to proceed. Additionally, due to current development pressures, CIMA and Hutchinson have been retained to complete a separate Class EA to accommodate growth for the next 20-year planning horizon.

We would like to schedule a pre-consultation meeting with MECP's Technical Support to review, primarily, the requirements to completing RWIA and the filing of the Addendum to the 2017 Class EA. To that end, if you please put us in touch with the Surface Water Specialist that would be assigned to the project it would be appreciated. We would like to schedule a meeting as soon as possible.

Regards,

-Warren

WARREN SAINT, P.Eng
Director / Infrastructure – Water Engineering

T 519-772-2299 **M** 519-573-9002 **F** 519-772-2298
900–101 Frederick Street, Kitchener, ON N2H 6R2 CANADA

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Appendix H: Public Consultation

Township of Mapleton
Mapleton Wastewater Servicing
Municipal Class Environmental Assessment
Notice of Addendum

The Study and Background

The Township of Mapleton (the Township) completed the Mapleton Wastewater Servicing Municipal Class Environmental Assessment in 2017 to review wastewater management in the Township and identify a preferred approach to meeting future wastewater needs. An Addendum has now been completed to the Environmental Study Report (ESR) issued November 2017 to expand the Mapleton Wastewater Pollution Control Plant (WPCP) and to update the planning and design process by modifying the nitrification technology as stipulated in 2017 ESR.

The Process

The Addendum has been completed in accordance with the requirements of the Municipal Class Environmental Assessment process (October 2000, as amended in 2007, 2011, 2015 and 2023) as defined under the Ontario Environmental Assessment Act.

The Addendum is available for public, government agency and Indigenous Community review in accordance with the requirements of the Municipal Class Environmental Assessment. The Township is seeking comments on the proposed changes as outlined in the Addendum. Subject to comments received as a result of this Notice, and the receipt of necessary approvals, the Township of Mapleton intends to proceed with the design and construction.

The Addendum is available for review on the Township's website at (https://mapleton.ca/services/reports-and-studies/wastewater-reports), and at the following location:

Township of Mapleton Municipal Offices
Clerk's Department
7275 Sideroad 16
Drayton, Ontario, N0G 1P0
Monday – Friday, 9:00 am to 4:00 pm
P: (519) 638-3313

Interested persons may provide written comments to our project team by July 5, 2024. All comments and concerns should be sent directly to the Township's email at mapleton_ea@cima.ca.

In addition, a request to the Minister of the Environment, Conservation and Parks for an order imposing additional conditions or requiring an individual environmental assessment may be made on the grounds that the requested order may prevent, mitigate, or remedy adverse impacts on constitutionally protected Aboriginal and treaty rights. Requests should include your full name and contact information.

Requests should specify what kind of order is being requested (additional conditions or an individual environmental assessment), explain how an order may prevent, mitigate, or remedy potential adverse impacts, and can include any supporting information.

The request should be sent in hardcopy or by email to:

Minister of the Environment, Conservation and Parks
Ministry of Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto ON M7A 2J3
minister.mecp@ontario.ca

and

Director, Environmental Assessment Branch
Ministry of Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Floor
Toronto ON, M4V 1P5
EABDirector@ontario.ca

Requests should also be sent to the Township Director of Public Works by mail or by e-mail.

Please visit the ministry's website for more information on requests for orders under section 16 of the Environmental Assessment Act at: https://www.ontario.ca/page/class-environmental-assessments-part-ii-order

All personal information included in your request – such as name, address, telephone number and property location – is collected, under the authority of section 30 of the Environmental Assessment Act and is collected and maintained for the purpose of creating a record that is available to the general public. As this information is collected for the purpose of a public record, the protection of personal information provided in the Freedom of Information and Protection of Privacy Act (FIPPA) does not apply (s.37). Personal information you submit will become part of a public record that is available to the general public unless you request that your personal information remain confidential.

If there is no request received by July 5, 2024, the project will proceed to design, and construction as presented in the Addendum.

This Notice was issued June 4, 2024.

2017 Environmental Study Report Consultation

Contact List

Last Updated: April 2024

Notes: Contacts noted in red were carrid over from the original 2017 Class EA contact list. Some agencies, First Nations and community stakeholders have been updated based on recent consultation efforts with new contact information.

Salutation	First Name	Last Name	Company/Organization	Department	Job Title	Address A	Address B	City	Province	Postal Code	Email
First Nations											
~~Ms.~~	~~Joanne~~	~~Thomas~~	~~Six Nations of the Grand River~~	~~Land Use Unit~~	~~Consultation Supervisor~~	~~2498 Chiefswood Road~~	~~PO Box 5000~~	~~Ohsweken~~	~~ON~~	~~N0A 1M0~~	
~~Chief~~	~~G. Ava~~	~~Hill~~	~~Six Nations of the Grand River~~		~~Chief~~	~~1695 Chiefswood Road~~	~~PO Box 5000~~	~~Ohsweken~~	~~ON~~	~~N0A 1M0~~	
Mr.	Lonny	Bomberry	Six Nations of the Grand River	Land and Resource Department	Director	2498 Chiefswood Road	P.O. Box 5000	Ohsweken	ON	N0A 1M0	lonnybomberry@sixnations.ca
Ms.	Tanya	Hill-Montour	Six Nations of the Grand River		Archaeological Supervisor	2499 Chiefswood Road	P.O. Box 5000	Ohsweken	ON	N0A 1M0	tanyahill-montour@sixnations.ca
Ms.	Tayler	Hill	Six Nations of the Grand River		Director Trainee	2500 Chiefswood Road	P.O. Box 5000	Ohsweken	ON	N0A 1M0	tayler.hill@sixnations.ca
Ms.	Lauren	Jones	Six Nations of the Grand River		Wildlife and Stewardship Assistant	2498 Chiefswood Road	P.O. Box 5000	Ohsweken	ON	N0A 1M0	laurenjones@sixnations.ca
Mr.	Peter	Graham	Six Nations of the Grand River		Consultation Supervisor (Land Use unit)/Land Use Officer	2498 Chiefswood Road	P.O. Box 5000	Ohsweken	ON	N0A 1M0	petergraham@sixnations.ca
~~Grand Council Chief~~	~~Patrick~~	~~Madahbee~~	~~Anishinabek Nation~~			~~1 Migizi Mikan~~	~~PO Box 711~~	~~North Bay~~	~~ON~~	~~P1B 8J8~~	
Grand Council Chief	Glen	Hare	Anishinabek Nation		Communications Officer	1 Migizii Mikan	PO Box 711	North Bay	ON	P1B 8J8	ORCEA@coo.org
Ms.	Lynn	Bowerman	Anishinabek Nation		Communications Officer	1 Migizii Mikan	PO Box 711	North Bay	ON	P1B 8J8	ORC.Communications@coo.org
~~Mr.~~	~~Hahahes Leroy~~	~~Hill~~	~~Haudenosaunee Confederacy of Chiefs~~		~~Secretary~~	~~2624 6th Line Road~~	~~RR#2~~	~~Ohsweken~~	~~ON~~	~~N0A 1M0~~	
Mr.	Todd	Williams	Haudenosaunee Confederacy of Chiefs	Haudenosaunee Development Institute (HDI)	Monitoring Program Coordinator	16 Sunrise Court, Suite 600	P.O. Box 714	Ohsweken	ON	N0A 1M0	toddwilliams@hdi.land
Ms.	Sharann	Martin	Haudenosaunee Confederacy of Chiefs		Archaeology Logistics Coordinator	16 Sunrise Court, Suite 600	P.O. Box 714	Ohsweken	ON	N0A 1M0	shannonhill@hdi.land
~~Chief~~	~~R. Stacey~~	~~LaForme~~	~~Mississaugas of the New Credit First Nation~~			~~2789 Mississauga Road~~	~~RR#6~~	~~Hagersville~~	~~ON~~	~~N0A 1H0~~	
~~Ms.~~	~~Kawi~~	~~Saull~~	~~Mississaugas of the New Credit First Nation~~	~~Department of Consultation and Accomodation~~	~~Consultation Manager~~	~~2789 Mississauga Road~~	~~RR#6~~	~~Hagersville~~	~~ON~~	~~N0A 1H0~~	
Mr.	Mark	LaForme	Mississaugas of the Credit First Nation		Director, Department of Consultation and Accommodation	2789 Mississauga Road	RR#6	Hagersville	ON	N0A 1H0	Mark.Laforme@mncfn.ca
Ms.	Abby	LaForme	Mississaugas of the Credit First Nation		Consultation Manager	2789 Mississauga Road	RR#6	Hagersville	ON	N0A 1H0	Abby.LaForme@mncfn.ca
Federal Agencies											
Mr.	John	Fischer	Environment and Climate Change Canada		EA Coordinator District Manager	867 Lakeshore Road	PO Box 5050	Burlington	ON	L7R 4A6	
			Environment and Climate Change Canada								enviroinfo@ec.gc.ca
			Fisheries and Oceans Canada (DFO)	Fisheries Protection Program	District Manager	867 Lakeshore Road	PO Box 5050	Burlington	ON	L7S 1A1	info@dfo-mpo.gc.ca
Ms.	Kitty	Ma	Health Canada	Ontario Region	Regional Environmental Assessment Coordinator	180 Queen Street West		Toronto	ON	M5V 3L7	kitty.ma@hc-sc.gc.ca
Provincial Agencies											
Ms.	Barbara	Slattery	Ministry of Environment, Climate and Parks (MECP)	West Central Regional Office	Regional EA and Planning Coordinator	119 King Street West, 12th Floor		Hamilton	ON	L8P 4Y7	barbara.slattery@ontario.ca
~~Ms.~~	~~Jane~~	~~Glassco~~	~~Ministry of Environment, Climate and Parks (MECP)~~	~~Guelph District Office~~	~~Director~~	~~1 Stone Road West~~		~~Guelph~~	~~ON~~	~~N1G 4Y2~~	
Ms.	Martha	Weber	Ministry of Environment, Climate and Parks (MECP)	Guelph District Office	Provincial Officer, Water Inspection Program	4th Fl., 1 Stone Rd. W.		Guelph	ON	N1G 4Y2	Martha.Weber@ontario.ca
~~Mr.~~	~~Bruce~~	~~Curtis~~	~~Ministry of Municipal Affairs and Housing~~	~~Western Municipal Service Office~~	~~Manager, Community Planning and Development~~	~~659 Exeter Road, 2nd Floor~~		~~London~~	~~ON~~	~~N6E 1L3~~	
Mr.	Charles	O'Hara	Ministry of Municipal Affairs and Housing	Ontario Growth Secretariat	Manager, Growth Policy	777 Bay Street, 4th Floor, Suite 425		Toronto	ON	M5G 2E5	
Ms.	Erin	Cotnam	Ministry of Natural Resources and Forestry (MNRF)	Southern Region	Manager, Land Use Planning and Strategic Issues	300 Water Street, Box 7000	4th Floor, South Tower	Peterborough	ON	K9J 8M5	erin.cotnam@ontario.ca
Mr.	David	Marriott	Ministry of Natural Resources and Forestry (MNRF)	Guelph District	District Planner	1 Stone Road West	Ontario Government Building	Guelph	ON	N1G 4Y2	david.marriott@ontario.ca
Ms.	Carol	Neuman	Ministry of Agriculture, Food and Rural Affairs	Environmental & Land Use Policy Food Safety and Environmental Policy Branch	Regional Planner	6484 Wellington Road 7 – Unit 10		Elora	ON	N0B 1S0	Carol.neumann@ontario.ca
~~Mr.~~	~~Tony~~	~~Amalfa~~	~~Ministry of Health and Long-Term Care~~	~~Environmental Health Policy & Programs~~	~~Manager~~	~~393 University Avenue, 21st Floor~~		~~Toronto~~	~~ON~~	~~M7A 2S1~~	
Dr.	Nicola	Mercer	Wellington-Dufferin-Guelph Public Health Unit		Medical Officer of Health & Chief Executive Officer	474 Wellington Road 18, Suite 100	RR # 1	Fergus	ON	N1M 2W3	nicola.mercer@wdgpublichealth.ca
Ms.	Sandra	Cooke	Grand River Conservation Authority (GRCA)		Senior Water Quality Supervisor	400 Clyde Road	PO Box 729	Cambridge	ON	N1R 5W6	scooke@grandriver.ca
Mr.	Mark	Anderson	Grand River Conservation Authority (GRCA)		Water Quality Engineer	400 Clyde Road	PO Box 729	Cambridge	ON	N1R 5W6	manderson@grandriver.ca
~~Ms.~~	~~Nancy~~	~~Davy~~	~~Grand River Conservation Authority (GRCA)~~		~~Planner~~	~~400 Clyde Road~~	~~PO Box 730~~	~~Cambridge~~	~~ON~~	~~N1R 5W7~~	
~~Mr.~~	~~Jaime~~	~~Austin~~	~~Ministry of Energy and Infrastructure~~	~~Growth Policy, Planning and Analysis Branch~~	~~Manager, Growth Policy~~	~~777 Bay Street, 4th Floor~~	~~Suite 425~~	~~Toronto~~	~~ON~~	~~M5G 2E5~~	
~~Mr.~~	~~Kevin~~	~~Bentley~~	~~Ministry of Transportation~~	~~Southwest Region~~	~~Engineering Office Manager~~	~~659 Exeter Road~~	~~1st Floor~~	~~London~~	~~ON~~	~~N6E 1L3~~	
	Zsolt	Katzirz	Ministry of Transportation	Corridor Management, West Region	Corridor Management Planner	659 Exeter Road	1st Floor	London	ON	N6E 1L3	Zsolt.Katzirz@ontario.ca
Ms.	Paula	Brown	Ontario Provincial Police	Operational Policy and Support Bureau	Manager (Inspector)	777 Memorial Avenue, 3rd Floor		Orillia	ON	L3V 7V3	
Ms.	Laura	Hatcher	Ministry of Ministry of Citizenship & Multiculturalism	Culture Services Unit Programs and Services Branch	Team Lead (A)	401 Bay Street, Suite 1700		Toronto	ON	M7A 0A7	laura.hatcher@ontario.ca
Mr.	Chris	Stack	Ministries of Citizenship and Immigration, Tourism, Culture, and Sport	West Region	Manager	4275 King Street, 2nd Floor		Kitchener	ON	N2P 2E9	chris.stack@ontario.ca
Mr.	Michael	Spencer	Ministry of Environment, Climate and Parks (MECP)	Water Unit, West Central Region	Surface Water Group Leader	119 King Street West, 12th Floor		Hamilton	ON	L8P 4Y7	michael.spencer@ontario.ca
Mr.	Rick	Neubrand	Ministry of Environment, Climate and Parks (MECP)	Guelph District Office	Senior Environmental Officer / Inspector	1 Stone Road West		Guelph	ON	N1G 4Y2	rick.neubrand@ontario.ca
Utilities											
Mr.	Shawn	Artt	Union Gas/Enbridge Gas		Utility Service Manager (Guelph)	10 Surrey Street East		Guelph	ON	N1H 3P5	
Ms.	Yvonne	Huang	Union Gas/Enbridge Gas		Construction Project Manager	603 Kumpf Drive		Waterloo	ON	N2J 4A4	
Mr.	Naim	McQueen	Hydro One Inc.		Manager (Engineering and Construction Service)	483 Bay Street, North Tower, 14th Floor		Toronto	ON	M5G 2P5	
Ms.	Lena	Demarco	Bell Canada	Community Affairs	Regional Director	5025 Creekbank Road	5th Floor, Building A, Mail Room Number M3	Mississauga	ON	L4W 0B6	
Mr.	Doug	Benton	Mornington Communications Cooperative Limited			21 Wellington Street South, Unit 4		Drayton	ON	N0G 1P0	
Community Stakeholders											
Mr.	Scott	Wilson	County of Wellington		Chief Administrative Officer	74 Woolwich Street		Guelph	ON	N1H 3T9	scottw@wellington.ca
Mr.	Fred	Prior	Glenaviland Development Corporation		President	9 Kerr Crescent		Puslinch	ON	N0B 2J0	priordevelopment@rogers.com
Mr.	John	Mohle	Wellington Construction Ltd.			8718 Wellington Road 7	R.R. 1	Palmerston	ON	N0G 2P0	jmohle@wellingtonconstruction.on.ca
Mr.	Peter	Armbruster	Activa Holdings Inc		Chief Operating Officer	735 Bridge Street West		Waterloo	ON	N2V 2H1	
~~Mr.~~	~~Dennis~~	~~Cuomo~~	~~Upper Grand District School Board~~		~~Planner~~						
Mr.	Nathan	Duimering				7108 Sideroad 15	R.R. #2	Moorefield	ON	N0G 2K0	nrduimering@gmail.com
~~Mr.~~	~~Rick~~	~~Richardson~~	~~Mapleton Township Fire Rescue~~		~~Fire Chief~~	~~Box 1~~		~~Drayton~~	~~ON~~	~~N0G 1P0~~	

2017 Environmental Study Report Consultation

Contact List

Last Updated: April 2024

Notes: Contacts noted in red were carrid over from the original 2017 Class EA contact list. Some agencies, First Nations and community stakeholders have been updated based on recent consultation efforts with new contact information.

Mr.	Chris	Harrow	Mapleton/Minto Township Fire Rescue		Fire Chief	845 King Street		Palmerston	ON	N0G 2P0	charrow@mapleton.ca, c.harrow@mintofiredept.on.ca
	~~Doug and Brenda~~	~~Duimering~~									
~~Mr.~~	~~Bradley~~	~~Martin~~									
Mr.	Larry	Masseo	Activia Management Corporation		Vice President, Planning Development Services	55 Columbia Street East, Suite 2		Waterloo	ON	N2J 4N7	
~~Mr.~~	~~Dave~~	~~Peres~~	~~Activa Holdings Inc.~~		~~Activa Holdings Inc.~~						
Ms.	Emily	Bumbaco	Upper Grand District School Board		Planning Technician	500 Victoria Road North		Guelph	ON	N1E 6K2	emily.bumbaco@ugdsb.on.ca,
Mr.	Bill	Van Zwol	Wellington Construction Ltd.		Wellingdale Construction Ltd.	8718 Wellington Road 7	R.R. 1	Palmerston	ON	N0G 2P0	
~~Ms.~~	~~Jennifer~~	~~Voss~~	~~Activa Holdings Inc.~~		~~Activa Holdings Inc.~~						
~~Mr.~~	~~Luke~~	~~Lise~~									
Other Stakeholders											
Mr.	Jim	Curry	Quest Brands		Product Manager	1 Van Der Graf Court		Brampton	ON	L6T 5E5	info@questbrands.ca
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Appendix I: Evaluation Criteria

2017 ESR Evaluation

Evaluation Criteria Category	Evaluation Criteria	Alternative 1: Post-Lagoon Nitrification with SAGR	Score	Alternative 2: Pre-Lagoon Nitrification with MBBR	Score
Technical	Ability to meet Effluent Quality Objectives (key criteria)	• Can meet all effluent objectives consistently • Good performance during winter season	High	• Can meet all effluent objectives consistently • Good performance during winter season	High
	Impacts on Existing Operations	• Least impact on existing operations	High	• Some impacts on existing operations due to addition of new technology	Medium
	Ease of Implementation	• Can be implemented easily, with little interruption to plant operation. • Installation of post lagoon treatment will occur in existing storage lagoon without any interruption of lagoon based treatment.	High	• Can be implemented with relative ease, with minor interruption to plant operation • MBBR tanks can be added to empty/vacant space on WPCP property. • Due to existing site configuration, alternative will require more civil works, including extending (on site) the influent forcemain from Drayton and access roads to the new pre-treatment building	Medium
	Flexibility to Meet Long Term Objectives	• Can be expanded if lagoon volume is available or on empty space on WPCP property	Medium	• Easily expandable using higher density of the growth media • Aeration tank is modular and can be added easily.	High
	Maintainability of Plant Equipment and Process	• Little maintenance required.	High	• Maintenance of pre-treatment equipment required.	Medium
	Ease of Operation	• Easily operable process	High	• MBBR requires pre-treatment	Medium
	Track Record of Technology	• Relatively new process • Approved in provinces of Ontario and Quebec	Medium	• Established treatment technology	Medium
Natural Environment	Minimization of Impact on Aquatic Resources	• Will meet effluent discharge standards	High	• Will meet effluent discharge standards	High
	Minimization of Impact on Terrestrial Environment	• Little or no impact on terrestrial environment	High	• Little or no impact on terrestrial environment	High
Social/Cultural	Noise/air/odour and other nuisances	• Little or no impacts	High	• Little or no impacts	High
Financial	Capital Cost	• ~ 3.8 M + contingencies	High	• ~ 4.2 M + contingencies	Medium
	Annual Operating Cost	• Aeration costs for lagoon and SAGR • Will have least mechanical maintenance costs	High	• Aeration costs for MBBR • Will have some mechanical maintenance costs	High

Updated Evalution

Evaluation Criteria Category	Evaluation Criteria	Alternative 1: Post-Lagoon Nitrification with SAGR	Score	Alternative 2: Pre-Lagoon Nitrification with MBBR	Score
Performance	Proven record of Ammonia removal performance in cold climates	SAGR installations across Ontario and Canada have shown effective nitrification year-round in cold climates.	5	There are no installations in Ontario for MBBR for post-lagoon nitrification. Has been demonstrated successful in Northern US and Quebec.	4
Physical Dimensions	Ability to fit within existing treatment and site components	SAGR cells will require a large portion of Cell 1. However, existing lagoon capacity requirements are not as concerning.	3	MBBR requires significant depth excavation beyond the current depth of the lagoons to provide a SWD of 4.0m for the tank. However, the tank's footprint is much smaller than SAGR or a mechanical plant.	4
Maintenance and Operating Complexity	Minimize maintenance frequency and complexity	Medium maintenance. One (1) 50 HP blower in operation continuously. The aeration system will require one operator for approximately 0.5 – 1.0 hour per day for routine maintenance and inspection.	4	Medium maintenance. System will require intermittent inspections to ensure the MBBR tank. The aeration system will require one operator for approximately 0.5 – 1.0 hour per day for routine maintenance and inspection.	4
Capital Cost **Total 20-Year Net Present Value (NPV)**	Capital, energy and maintenance cost for the next 20 years. Assuming 4% interest rate.	Capital - $7.25M 20-year NPV - $8.07M	4	Capital - $5.8M 20-year NPV - $7.11M	5
	Total Score		**16**		**17**