

January 24, 2020

CAO Raymond Belanger and Council
The Corporation of the Town of Mattawa
160 Water Street, P.O. Box 390,
Mattawa, ON P0H 1V0

Re: 2019 Annual/Summary Report for the Mattawa Drinking Water System

Dear Raymond Belanger and Council:

Ontario's Drinking-Water Systems Regulation (O. Reg. 170/03), made under the *Safe Drinking Water Act in 2002*, requires that the owner of a drinking water system prepare an Annual Report and an Annual Summary Report of the operation of the system and the quality of its water.

Annual Report

The annual report must cover the period of January 1st to December 31st in a year and must be prepared not later than February 28th of the following year. Pursuant to the legislative requirements, enclosed for your records is the 2019 Annual Report for the Mattawa Drinking Water System.

In accordance with Section 11 (6), the annual report must:

- (a) contain a brief description of the drinking-water system, including a list of water treatment chemicals used by the system during the period covered by the report;
- (b) summarize any reports made to the Ministry under subsection 18 (1) of the Act or section 16-4 of Schedule 16 during the period covered by the report;
- (c) summarize the results of tests required under the Regulation, or an approval or order, including an OWRA order, during the period covered by the report and, if tests required under this Regulation in respect of a parameter were not required during that period, summarize the most recent results of tests of that parameter;
- (d) describe any corrective actions taken under Schedule 17 or 18 during the period covered by the report;
- (e) describe any major expenses incurred during the period covered by the report to install, repair or replace required equipment; and
- (f) if the case of a large municipal residential system or a small municipal residential system, include a statement of where a report prepared under Schedule 22 will be available for inspection under subsection 12 (4) O. Reg. 170/03, s. 11 (6).

In addition, Section 11 (7) gives the direction that a copy of an annual report for the system is given, without charge, to every person who requests a copy and be made available for inspection by any member of the public during normal business hours. The reports should be made available at the office of the Town, or at a location that is accessible to the users of the water system.

Summary Report

The annual summary report must cover the period of January 1st to December 31st in a year and must be prepared not later than March 31st of the following year. Pursuant to the legislative requirements, enclosed for your records is the 2019 Annual Summary for the Mattawa Drinking Water System.

As required in *Schedule 22, Summary Reports for Municipalities*, the annual summary must:

- (2) (a) list the requirements of the Act, the regulations, the system's approval, drinking water works permit, municipal drinking water licence, and any orders applicable to the system that were not met at any time during the period covered by the report; and

(b) for each requirement referred to in clause (a) that was not met, specify the duration of the failure and the measures that were taken to correct the failure.
- (3) The report must also include the following information for the purpose of enabling the owner of the system to assess the capability of the system to meet existing and planned uses of the system:
 1. A summary of the quantities and flow rates of the water supplied during the period covered by the report, including monthly average and maximum daily flows.
 2. A comparison of the summary referred to in paragraph 1 to the rated capacity and flow rates approved in the system's approval, drinking water works permit or municipal drinking water licence, or if the system is receiving all of its water from another system under an agreement pursuant to subsection 5 (4), to the flow rates specified in the written agreement.

In addition, Section 12 (1) – 4 – gives the direction that a copy of the annual summary for the system is given, without charge, to every person who requests a copy and be made available for inspection by any member of the public during normal business hours. The reports should be made available at the office of the Town, or at a location that is accessible to the users of the water system.

These reports were prepared by the Ontario Clean Water Agency on behalf of the Town of Mattawa and are based on information kept on record by OCWA at the Mattawa WTP. The reports cover the period January 1st to December 31st 2019.

Please note that any Provincial Officers Orders or non-compliance issues that you have received directly from the MOE should be reviewed. Where non-compliance with the Order or Issue is evident and it is not included in the attached 2019 Annual/Summary Report, then we recommend that this information be added to the report.

After your review and inclusion of any additional information, this report is to be provided to the Council members representing the Town of Mattawa before March 31, 2020. Please ensure this distribution.

Yours truly,
Ontario Clean Water Agency

Joshua Gravelle
Process and Compliance Technician

Copy to: Vesna Alimpic, Drinking Water Inspector, Ministry of the Environment, Conservation and Parks.



Ontario Clean Water Agency
Agence Ontarienne Des Eaux

Mattawa Drinking Water System

2019 ANNUAL/SUMMARY REPORT

Prepared by the Ontario Clean Water Agency
on behalf of the Corporation of the Town of Mattawa



Table of Contents

INTRODUCTION	2
Section 11 - ANNUAL REPORT	3
1.0 Introduction	3
2.0 Mattawa Drinking Water System (DWS No. 210001905)	4
3.0 List of Water Treatment Chemicals Used Over the Reporting Period	5
4.0 Significant Expenses Incurred in the Drinking Water System	5
5.0 Drinking Water System Highlights	6
6.0 Details on Notices of Adverse Test Results and Other Problems Reported to & Submitted to the Spills Action Center	6
7.0 Microbiological Testing Performed During the Reporting Period	6
8.0 Operational Testing Performed During the Reporting Period	7
Schedule 22 - SUMMARY REPORTS FOR MUNICIPALITIES	13
1.0 Introduction	13
2.0 Requirements the System Failed to Meet	13
3.0 Summary of Quantities and Flow Rates	15
CONCLUSION.....	18

List of Appendices

APPENDIX A – Monthly Summary of Microbiological Test Results

APPENDIX B – Monthly Summary of Operational Data



INTRODUCTION

Municipalities throughout Ontario have been required to comply with Ontario Regulation 170/03 made under the Safe Drinking Water Act (SDWA) since June 2003. The Act was enacted following recommendations made by Commissioner O'Conner after the Walkerton Inquiry. The Act's purpose is to protect human health through the control and regulation of drinking water systems. O. Reg. 170/03 regulates drinking water testing, use of licensed laboratories, treatment requirements and reporting requirements.

Section 11 of Regulation 170/03 requires the owner to produce an Annual Report. This report must include the following:

1. Description of system & chemical(s) used
2. Summary of any adverse water quality reports and corrective actions
3. Summary of all required testing
4. Description of any major expenses incurred to install, repair or replace equipment

This annual report must be completed by February 28th of each year.

Section 22 of the regulation also requires a Summary Report which must be presented & accepted by Council by March 31st of each year for the preceding calendar year.

The report must list the requirements of the Act, its regulations, the system's Drinking Water Works Permit (DWWP), Municipal Drinking Water Licence (MDWL), Certificate of Approval (if applicable), and any Provincial Officer Order the system failed to meet during the reporting period. The report must also specify the duration of the failure, and for each failure referred to, describe the measures that were taken to correct the failure.

The Safe Drinking Water Act (2002) and the drinking water regulations can be viewed at the following website: <http://www.e-laws.gov.on.ca>.

To enable the Owner to assess the rated capacity of their system to meet existing and future planned water uses, the following information is also required in the report.

1. A summary of the quantities and flow rates of water supplied during the reporting period, including the monthly average and the maximum daily flows,
2. A comparison of the summary to the rated capacity and flow rates approved in the systems approval, drinking water works permit or municipal drinking water licence or a written agreement if the system is receiving all its water from another system under an agreement.

The reports have been prepared by the Ontario Clean Water Agency (OCWA) on behalf of the Owner and presented to council as the 2019 Annual/Summary Report.



Mattawa Drinking Water System

Section 11

2019 ANNUAL REPORT



Section 11 - ANNUAL REPORT

1.0 Introduction

Drinking-Water System Name: MATTAWA DRINKING WATER SYSTEM
Drinking-Water System No.: 210001905
Drinking-Water System Owner: The Corporation of the Town of Mattawa
Drinking-Water System Category: Large Municipal, Residential System
Period being reported: January 1, 2019 to December 31, 2019

Does your Drinking Water System serve more than 10,000 people? No

Is your annual report available to the public at no charge on a web site on the Internet? Yes

Location where Report required under O. Reg. 170/03 Schedule 22 will be available for inspection.

Town Hall at 160 Water Street and on the Municipal website at www.mattawa.ca

Drinking Water Systems that receive drinking water from the Mattawa Drinking Water System

The Mattawa Drinking Water System (DWS) provides all drinking water to the community of Mattawa.

The Annual Report was not provided to any other Drinking Water System Owners.

The Ontario Clean Water Agency prepared the 2019 Annual/Summary Report for the Mattawa DWS and provided a copy to the system owner; the Town of Mattawa. The Mattawa DWS is a stand-alone system that does not receive water from or send water to another system.

Notification to system users that the Annual Report is available for viewing is accomplished through:

- A public access notice via the web and a public access notice via Town Office.
- System analysis and reports available in the water System Information Binder available for the public to review at the Town Office.



2.0 Mattawa Drinking Water System (DWS No. 210001905)

The Mattawa DWS is owned by the Corporation of the Town of Mattawa and consists of a Class II Distribution and Supply System. The Ontario Clean Water Agency (OCWA) is designated the Overall Responsible Operator for both the water supply and water distribution facilities.

Raw Water Supply

The water supply system for the Town of Mattawa consists of Well No. 1, Well No. 2, and an in-ground water storage reservoir that floats on the distribution system. These two groundwater supply wells, as well as the reservoir, provide drinking water to the residents of Mattawa. In accordance with the Municipal Drinking Water Licence, the drinking water system shall not be operated to exceed 6,540 cubic meters per day (m³/d).

Wells No. 1 and No. 2 are located inside a single structure situated at 400 Bissett Street in the Town of Mattawa. This facility houses two well pumps, an ultraviolet (UV) disinfection system, a sodium hypochlorite disinfection system, all control, monitoring, and alarm systems, as well as a standby diesel generator.

The wells are operated by OCWA and are utilized on a duty/standby basis. Well No. 1 is operated as the duty well from 6 am to midnight. Well No. 2 is used as the duty well from midnight to 6 am, for energy conservation purposes. The switchover of duty wells is automatically done via a timer within the plant programmable logic controller (PLC).

Well No. 1 is equipped with a vertical turbine pump capable of delivering 53.0 L/s at 105.8 m of total dynamic head. Well No. 2 has a vertical turbine pump rated at 22.7 L/s with a total dynamic head of 91.5 m.

Water Treatment

Primary disinfection equipment includes two UV disinfection systems, each designed to deliver the required UV dosage at the rated capacity of the facility. Chlorination equipment includes a 560 L sodium hypochlorite (NaOCl) storage tank and dual chemical feed pumps that inject liquid chlorine into the system. Output from Well No. 1 and No. 2 is governed by system demand (water level in the reservoir). As the water level in the reservoir drops to the low water level (LWL), the selected duty well pump automatically starts.

The well pumps, UV disinfection system, sodium hypochlorite injection system, and analyzers are all supervised locally via the PLC. All alarms are instantly transmitted from the PLC to the alarm panel, which dials a security company and pages the Operator-on-call. Refer to the Treatment System Process Flow Chart for more facility detail.

In 2012, a SCADA system was installed to allow for continuous monitoring and recording. It includes alarming, enhanced operator control of the waterworks, and increased security features.



Water Storage and Pumping Capabilities

There is a 795 m³ (175,000 IMPG) in-ground storage reservoir within the distribution system located approximately 700 meters (m) northwest of the Pump-house.

Emergency Power

Stand-by power is provided by an on-site diesel generator with an automatic transfer switch. In the event of a power outage in the area, the diesel generator automatically starts, providing continuous power to the Pump-house.

Distribution System

The Mattawa DWS is categorized as a Large Municipal Residential Drinking Water System and serves an estimated population of 2150 residents. The system has approximately 1,050 service connections to residential and commercial consumers. There is approximately 20,000 m of various sized cast iron, ductile iron and polyvinyl chloride piping. There are 107 fire hydrants and 239 valves in the distribution system.

3.0 List of Water Treatment Chemicals Used Over the Reporting Period

The following chemicals were used in the treatment process at the Mattawa Water Treatment Plant.

- Sodium hypochlorite – Secondary Disinfection

4.0 Significant Expenses Incurred in the Drinking Water System

OCWA is committed to maintaining the assets of the drinking water system and maintains a program of scheduled inspection and maintenance activities using a computerized Work Management System (WMS). OCWA implemented a new Workplace Management System (Maximo) in 2019, which better maintains and optimizes facility assets. All routine maintenance activities conducted at the water treatment plant were accomplished in 2019.

Significant expenses incurred in the drinking water system include:

- New outpost panel installed.
- Internet and OCWA network equipment installed.
- Stroma onsite to replace distribution pressure gauge, this allowed for pressure trending to continue.
- Stroma installed the blown PLC module at the reservoir which restored the secondary level indicator.
- Singer valve on well pump #1 was serviced. Diaphragm found to have a tear and a regulator port was clogged with rust.
- Repairs to reservoir communication equipment completed. Isolator was added to the phone line. New drawings were prepared showing the system updates.
- Repaired hydrant #113 at the fire hall.
- Divers performed an underwater assessment of the watermain river crossing.
- UV #2 ballasts failed. Replacements and spare put on order.



5.0 Drinking Water System Highlights

- OCWA became Operating Authority of the Mattawa DWS on August 1, 2019.
- The Ministry of the Environment, Conservation and Parks (MECP) performed an annual inspection on September 25, 2019. The inspection included a physical assessment of the Mattawa Water Treatment Plant and a document review. The system received a risk rating of 7.87% and a final inspection rating of 92.13%.
- New Operational Plan DWQMS version 2.0 completed and endorsed. Internal Audit, 36 Month Risk Assessment and Management Review completed.
- SAI Global conducted a Limited Scope Transitional Audit of the Mattawa Drinking Water System's Quality and Environmental Management System (QEMS). The nine elements were reviewed on July 30, 2019. No Non-Conformances identified with one Opportunity for Improvement identified, which has been addressed. Applied for Full Scope Audit on October 10, 2019. The system and processes associated with the QEMS are scheduled to be evaluated in June of 2020 to ensure implementation of the Operational Plan and procedures and conformance to the Drinking Water Quality Management Standard. LST Re-accreditation on DWQMS 2.0 was achieved on October 11, 2019.
- Remote monitoring system Wonderware, process data management (PDM) program WISKI and asset management program Maximo set up.
- Alarm monitoring systems transferred to OCWA.

6.0 Details on Notices of Adverse Test Results and Other Problems Reported to & Submitted to the Spills Action Center

Based on information kept on record by OCWA, the Mattawa Drinking Water System had no adverse water quality incidents reported to the MOE's Spills Action Centre (MOE SAC).

7.0 Microbiological Testing Performed During the Reporting Period

Summary of Microbiological Data

Sample Type	# of Samples	Range of <i>E. coli</i> Results (min to max)	Range of Total Coliform Results (min to max)	# of HPC Samples	Range of HPC Results (min to max)
Raw (Well No. 1)	54	0 to 0	0 to 1	0	N/A
Raw (Well No. 2)	54	0 to 0	0 to 3	0	N/A
Treated	53	0 to 0	0 to 0	53	0 to 24
Distribution	162	0 to 0	0 to 0	36	0 to 2

Maximum Allowable Concentration (MAC) for *E. coli* = 0 Counts/100 mL

MAC for Total Coliforms = 0 Counts/100 mL

"<" denotes less than the laboratory's method detection limit.



Notes: One microbiological sample is collected and tested each week from the raw (each well) and treated water supply. A total of three microbiological samples are collected and tested each week from the Mattawa distribution system.

Refer to *Appendix A* for a monthly summary of microbiological test results.

8.0 Operational Testing Performed During the Reporting Period

Summary of Raw Water Turbidity Data

Parameter	# of Samples	Range of Results (min to max)	Unit of Measure
Turbidity (Well No. 1)	12	0.20 to 0.67	NTU
Turbidity (Well No. 2)	12	0.18 to 0.64	

Summary of Chlorine Residual Data in the Distribution System

Parameter	No. of Samples	Range of Results (min to max)	Unit of Measure	Standard
Free Chlorine	367	0.12 to 1.15	mg/L	0.05

Note: A total of seven operational checks for chlorine residual in the distribution system are collected each week. Four (4) samples are tested one day and three (3) on a second day. The sample sets are collected at least 48-hours apart and samples collected on the same day are from different locations.

Refer to *Appendix B* for a monthly summary of the above operational data.

Summary of Nitrate & Nitrite Data (sampled at the water treatment plant)

Date of Sample	Nitrate Result Value	Nitrite Result Value	Unit of Measure	Exceedance
January 29	1.49	< 0.1	mg/L	No
April 2	1.34	< 0.1	mg/L	No
July 10	1.99	< 0.1	mg/L	No
October 1	< 1.0	< 0.1	mg/L	No

Maximum Allowable Concentration (MAC) for Nitrate = 10 mg/L
MAC for Nitrite = 1 mg/L

Summary of Total Trihalomethane Data (sampled in the distribution system)

Date of Sample	Result Value	Unit of Measure	Running Average	Exceedance
January 29	<0.002	mg/L	0.0024	No
April 2	<0.002			
July 10	<0.002			
October 1	0.00349			

Maximum Allowable Concentration (MAC) for Total Trihalomethanes = 0.100 mg/L (Four Quarter Running Average)



Summary of Total Haloacetic Acids Data (sampled in the distribution system)

Date of Sample	Result Value	Unit of Measure	Running Average	Exceedance
January 29	<0.002	mg/L	<0.002	No
April 2	<0.002			
July 10	<0.002			
October 1	<0.002			

Summary of Most Recent Lead Data under Schedule 15.1

(applicable to the following drinking water systems; large municipal residential systems, small, municipal residential systems, and non-municipal year-round residential systems)

The Mattawa DWS was eligible to follow the “Exemption from Plumbing Sampling” as described in section 15.1-5(9) and 15.1-5(10) of Schedule 15.1 of Ontario Regulation 170/03. The exemption applies to a drinking water system if, in two consecutive periods at reduced sampling, not more than 10% of all samples from plumbing exceed the maximum allowable concentration (MAC) of 10 ug/L or 0.01 mg/L for lead. As such, the system was required to test for total alkalinity and pH in one distribution sample collected during the periods of December 15 to April 15 (winter period) and June 15 to October 15 (summer period). This testing is required in every 12-month period with lead testing in every third 12-month period. The Town of Mattawa has been sampling lead every term.

Two rounds of lead, alkalinity and pH testing were carried out on April 10th and October 15th of 2019. Results are summarized in the table below.

Summary of Lead, pH & Alkalinity Data (sampled in the distribution system)

Date of Sample	# of Samples	Sample Location	Lead (mg/L)	Field pH	Alkalinity (mg/L)
April 10	1	Hydrant at Mattawa Marina	<0.0001	7.21	44.5
April 10	1	Hydrant at Champlain and Ottawa	<0.0001	7.32	44.5
October 15	1	Hydrant at Pine & Gorman St.	<0.0001	7.57	41.0
October 15	1	Hydrant at 1 st & Bissett	0.0002	7.46	41.5

Most Recent Schedule 23 Inorganic Data Tested at the Water Treatment Plant

Parameter	Result Value	Unit of Measure	Standard	Exceedance
Antimony	<0.001	mg/L	0.006	No
Arsenic	<0.001	mg/L	0.01	No
Barium	0.03	mg/L	1	No
Boron	0.01	mg/L	5	No
Cadmium	<0.0001	mg/L	0.005	No
Chromium	<0.001	mg/L	0.05	No
Mercury	<0.0001	mg/L	0.001	No
Selenium	<0.001	mg/L	0.05	No
Uranium	<0.001	mg/L	0.02	No

Note: Sample required every 36 months (sample date = July 31, 2018). Next sampling scheduled for July 2021.



Most Recent Schedule 24 Organic Data Tested at the Water Treatment Plant

Statement of Analytical Results - Final

Job 110913

Mattawa, Town of

210001905 - MATTAWA DRINKING WATER SYSTEM

Dan Finnigan

160 WATER ST, PO BOX 390, MATTAWA ON P0H 1V0

Lab ID	18G2192			Criteria	Reg 170					
Collection Date	2018-Jul-31			Criteria	SDWA /					
Collection Time	10:40			SDWA /	Ont. Reg.					
Matrix	Treated Water			170/03						
Description	WTP Treated Water: 400 Bissett St.									
				Criteria	Reg 170	Sampler	Received	Turn Around	Method	Completed
				SDWA /	Ont. Reg.	Josh Dewaal	2018 Jul 31 14:50	7 Day		Analyst
				170/03						
				MDL /	RDL	Units				
Antimony, total	<0.001	-	-	0.006	0.001	mg/L	ICP	2018-Sep-05	-	-
Arsenic, total	<0.001	-	-	0.025	0.001	mg/L	ICP/MS	2018-Sep-05	-	-
Barium, total	0.03	-	-	1.0	0.001	mg/L	ICP/MS	2018-Sep-05	-	-
Boron, total	0.01	-	-	5.0	0.002	mg/L	ICP/MS	2018-Sep-05	-	-
Cadmium, total	<0.0001	-	-	0.005	0.0001	mg/L	ICP/MS	2018-Sep-05	-	-
Chromium, total	<0.001	-	-	0.05	0.001	mg/L	ICP/MS	2018-Sep-05	-	-
Mercury, total	<0.0001	-	-	0.001	0.0001	mg/L	ICP	2018-Sep-05	-	-
Selenium, total	<0.001	-	-	0.01	0.001	mg/L	ICP	2018-Sep-05	-	-
Uranium, total	<0.001	-	-	0.02	0.001	mg/L	ICP/OES	2018-Sep-05	-	-
Dichloroethylene	<0.0005	-	-	0.014	0.0005	mg/L	GC/MS	2018-Sep-05	-	-
1,2-Dichlorobenzene	<0.0004	-	-	0.2	0.0004	mg/L	GC/MS	2018-Sep-05	-	-
1,2-Dichloroethane	<0.0002	-	-	0.005	0.0002	mg/L	GC/MS	2018-Sep-05	-	-
1,4-Dichlorobenzene	<0.0004	-	-	0.005	0.0004	mg/L	GC/MS	2018-Sep-05	-	-
Benzene	<0.0005	-	-	0.001	0.0005	mg/L	GC/MS	2018-Sep-05	-	-
Carbon tetrachloride	<0.0002	-	-	0.005	0.0002	mg/L	GC/MS	2018-Sep-05	-	-
Dichloromethane	0.004	-	-	0.05	0.004	mg/L	GC/MS	2018-Sep-05	-	-
Monochlorobenzene ²	<0.0005	-	-	0.08	0.0005	mg/L	GC/MS	2018-Sep-05	-	-
Tetrachloroethylene ²	<0.0003	-	-	0.030	0.0003	mg/L	GC/MS	2018-Sep-05	-	-
Trichloroethylene ²	<0.0003	-	-	0.005	0.0003	mg/L	GC/MS	2018-Sep-05	-	-
Vinyl chloride ²	<0.0002	-	-	0.002	0.0002	mg/L	GC/MS	2018-Sep-05	-	-
2 methyl-4-chlorophenoxyacetic acid (MCPA)	<0.010	-	-	-	0.010	mg/L	GC/MS	2018-Sep-05	-	-
2,3,4,6-Tetrachlorophenol	<0.001	-	-	0.100	0.001	mg/L	GC/MS	2018-Sep-05	-	-
2,4-D	<0.001	-	-	0.100	0.001	mg/L	GC/ECD	2018-Sep-05	-	-
2,4-Dichlorophenol	<0.0002	-	-	0.900	0.0002	mg/L	GC/MS	2018-Sep-05	-	-
2,4,6-Trichlorophenol	<0.001	-	-	0.005	0.0010	mg/L	GC/MS	2018-Sep-05	-	-



Lab ID	18G2192									
Collection Date	2018-Jul-31									
Collection Time	10:40									
Matrix	Treated Water									
Description	WTP Treated Water: 400 Bissett St.									
		Criteria		Reg 170						
		Sampler		Josh Dewaal						
		Received		2018 Jul 31 14:50						
		Turn Around		7 Day						
		Criteria	MDL /	Units	Method	Completed	Analyst			
		SDWA /	RDL							
		Ont. Reg.								
		170/03								
Alachlor	<0.0005	-	-	0.005	0.0005	mg/L	GC/MS	2018-Sep-05	-	
Atrazine + N-dealkylated metabolites	<0.001	-	-	0.005	0.001	mg/L	Calculation	2018-Sep-05	-	
Azinphos-methyl	<0.002	-	-	0.02	0.002	mg/L	GC/MS	2018-Sep-05	-	
Benzo(a)pyrene	<0.00001	-	-	0.00001	0.00001	mg/L	GC/MS	2018-Sep-05	-	
Bromoxynil	<0.0005	-	-	0.005	0.0005	mg/L	GC/ECD	2018-Sep-05	-	
Carbaryl	<0.005	-	-	0.09	0.005	mg/L	HPLC	2018-Sep-05	-	
Carbofuran	<0.005	-	-	0.09	0.005	mg/L	HPLC	2018-Sep-05	-	
Chlorpyrifos	<0.001	-	-	0.09	0.001	mg/L	GC/MS	2018-Sep-05	-	
Cyfluthrin	<0.001	-	-	0.02	0.001	mg/L	GC/MS	2018-Sep-05	-	
Dicamba	<0.001	-	-	0.12	0.001	mg/L	GC/ECD	2018-Sep-05	-	
Diclofop-methyl	<0.0009	-	-	0.009	0.0009	mg/L	GC/ECD	2018-Sep-05	-	
Dimethoate	<0.0025	-	-	0.02	0.0025	mg/L	GC/MS	2018-Sep-05	-	
Diquat	<0.005	-	-	0.07	0.005	mg/L	HPLC	2018-Sep-05	-	
Diuron	<0.01	-	-	0.15	0.01	mg/L	HPLC	2018-Sep-05	-	
Glyphosate	<0.01	-	-	0.28	0.01	mg/L	HPLC	2018-Sep-05	-	
Malathion ²	<0.005	-	-	0.19	0.005	mg/L	GC/MS	2018-Sep-05	-	
Metolachlor ²	<0.001	-	-	0.05	0.001	mg/L	GC/MS	2018-Sep-05	-	
Metribuzin ²	<0.005	-	-	0.08	0.005	mg/L	GC/MS	2018-Sep-05	-	
Paraquat ²	<0.001	-	-	0.01	0.001	mg/L	HPLC	2018-Sep-05	-	
Polychlorinated Biphenyls (PCBs) ²	<0.0001	-	-	0.003	0.0001	mg/L	GC/ECD	2018-Sep-05	-	
Pentachlorophenol ²	<0.001	-	-	0.06	0.001	mg/L	GC/MS	2018-Sep-05	-	
Phorate ²	<0.0005	-	-	0.002	0.0005	mg/L	GC/MS	2018-Sep-05	-	
Picloram ²	<0.005	-	-	0.19	0.005	mg/L	GC/ECD	2018-Sep-05	-	
Prometryne ²	<0.00025	-	-	0.001	0.00025	mg/L	GC/MS	2018-Sep-05	-	
Simazine ²	<0.001	-	-	0.01	0.001	mg/L	GC/MS	2018-Sep-05	-	
Terbufos ²	<0.0004	-	-	0.001	0.0004	mg/L	GC/MS	2018-Sep-05	-	
Triallate ²	<0.001	-	-	0.23	0.001	mg/L	GC/MS	2018-Sep-05	-	
Trifluralin ²	<0.001	-	-	0.045	0.001	mg/L	GC/MS	2018-Sep-05	-	

Note: Sample required every 36 months (sample date = July 31, 2018). Next sampling scheduled for July 2021.

Inorganic or Organic Test Results that Exceeded Half the Standard Prescribed in Schedule 2 of the Ontario Drinking Water Quality Standards.

No inorganic or organic parameter(s) listed in Schedule 23 and 24 of Ontario Regulation 170/03 exceeded half the standard found in Schedule 2 of the Ontario Drinking Water Standard (O. Reg. 169/03) during the reporting period.



Most Recent Sodium Data Sampled at the Water Treatment Plant

Date of Sample	# of Samples	Result Value	Unit of Measure	Standard	Exceedance
January 16, 2018	1	13	mg/L	20	No

Note: Sample required every 60 months. Next sampling scheduled for January 2023.

Most Recent Fluoride Data Sampled at the Water Treatment Plant

Date of Sample	# of Samples	Result Value	Unit of Measure	Standard	Exceedance
January 16, 2018	1	<0.15	mg/L	1.5	No

Note: Sample required every 60 months. Next sampling scheduled for January 2023.

Summary of Additional Testing Performed in Accordance with a Legal Instrument.

1. Schedule C, Section 1.6 of Municipal Drinking Water Licence #195-101 requires the UV disinfection system to maintain a continuous pass-through UV dose of at least 40 millijoules per square centimeter (mJ/cm^2) throughout the life span of the UV lamps.

A primary disinfection system consisting of two (2) parallel UV reactors (duty and standby), each rated to provide dosage of $40 \text{ mJ}/\text{cm}^2$ at a peak flow of 76 L/s, equipped with automatic switchover controls. Ultra-Violet Light Transmittance (UVT) is continuously monitored. If the duty reactor fails the following would occur:

- the low lift pump would shut off
- the (failed) duty UV reactor's water inlet valve would close
- an alarm would be generated and sent through the emergency call-out system to alert operators of the failure of the duty reactor
- the standby UV reactor would switchover and begin producing water

Table 4 of the licence also requires the following parameters related to the UV disinfection system to be continuously monitored and recorded every four (4) hours:

UV Intensity(Calculated UV Dose) Measured continuously by the UV system. UV intensity is monitored by each individual unit's control module and should the light intensity of the unit fall outside the specified range, the unit will automatically shut down and a standby unit will be activated. Such an event will be recorded by the UV control system.

Flow Rate The maximum flow rate through each of the units is 76 L/s (see Schedule A of DWWP 195-201) which is continuously measured by the raw/treated water flow meters. One flow meter measures flow from both wells, while the other flow meter only measures Well 2 flows. Each UV unit is equipped with a flow control valve and an electronically activated water shut-off valve which will automatically close in the event of a UV equipment malfunction, loss of power or ceases to provide an appropriate level of disinfection.

UV Transmittance UVT is continuously monitored.



Lamp Status Monitored by each unit's control module. Should the lamp status fail, the unit will automatically shut down and a standby unit will be activated. Such an event will be recorded by the UV control system.



Mattawa Drinking Water System

Schedule 22

2019 SUMMARY REPORT

FOR MUNICIPALITIES



Schedule 22 - SUMMARY REPORTS FOR MUNICIPALITIES

1.0 Introduction

Drinking-Water System Name:	MATTAWA DRINKING WATER SYSTEM
Municipal Drinking Water Licence (MDWL) No.:	195-101-2 (issued July 25, 2016)
Drinking Water Work Permit (DWWP) No.:	195-201-2 (issued July 25, 2016)
Permit to Take Water (PTTW) No.:	1546-9GHPLM (issued February 27, 2014)
Period being reported:	January 1, 2019 to December 31, 2019

2.0 Requirements the System Failed to Meet

The last MECP inspection report dated September 25, 2019 identified the following non-compliance items. There were five non-compliance items noted in inspection report from 2019.

Issue Identified in Report/Order	Required Action or Recommendation Identified in Report/Order	Resp. for Action Item? (Client, OCWA, Joint)	Issue Analysis	Status (Complete or In Progress)
1. The owner was not in compliance with all conditions of the PTTW. A review of available documents has shown that water taking from Well # 2 has exceeded the maximum taking per minute 1,364 L/min or 22.73 L/s on nine occasions in August 2019. Duration of exceedances ranged from 11 minutes to 4 hours and 33 minutes with the highest taking of 29.05 L/min. Failure to take water in accordance with the conditions from permit to take water is a violation of Ontario Water Resources Act.	During the preparation of this inspection report, the operating authority informed that they have been working with the owner to determine the cause of exceedances in water taking from Well #2. The owner must ensure that maximum water takings specified by the PTTW are not exceeded. If there is evidence that the water taking exceedance is a result of a change in water demand, the owner is required to apply for an amendment of the existing PTTW to reflect the actual water taking requirement.	Joint	Further troubleshooting is required to assess the issue with Well #2 and determine possible solutions. This plant was originally designed in a manner that does not allow significant space for piping modifications. Also, this issue is not new and has been occurring since the plant began operation. This is the first time MECP has raised this issue.	In Progress
2. All UV sensors were not checked and calibrated as required. During the inspection period, there were no duty UV sensor checks against a reference UV sensor in the months of May, June and July 2019. This happened because the reference UV sensor was being used as a duty UV sensor while duty UV sensors were shipped away for	The operating authority must ensure that UV sensors are checked against a reference sensor monthly, as per the requirements of Schedule E of the MDWL and at a frequency recommended by the UV equipment manufacturer.	Joint	OCWA recommends the purchase of a spare stand-by UV sensor to be used in the event of the duty UV sensor failure. This spare can be installed and checked with the reference UV sensor until the duty is repaired and returned. Town has agreed to purchase	In Progress



calibration, after which the reference UV sensor was sent off to be calibrated. The monthly reference checks continued after the reference check calibration. The manufacturer of the UV sensor, TrojanUV recommends monthly checking of duty sensors against a reference sensor. Failure to use or operate a municipal drinking-water system except under the authority of and in accordance with Drinking Water Works Permit is a violation of subsection 31(1)(b) of O. Reg. 170/03.			spare stand-by UV sensor to avoid future issues.	
3. Turbidity was not being tested at least once every month from each well that is supplying water to the system. In the inspection period, samples from each well were collected and tested for turbidity from 7 to 44 days apart. Failure to take monthly samples for each well that is supplying water to the system and have them tested for turbidity least 20 days, and not more than 40 days, after a sample was taken for that purpose in the previous month is a violation of Schedule 7 of O. Reg. 170/03.	Prior to issuance of this inspection report, the operating authority provided the inspector with written confirmation that training in regulatory requirements for turbidity sampling was conducted with the OCWA operator in charge of the DWS. No further action required.	OCWA	OCWA is now OIC/ORO for the WTP; monthly samples will be collected during the first week of every month to ensure wells are tested for turbidity at least 20 days, and not more than 40 days, after a sample was taken for that purpose in the previous month.	Complete
4. The Annual Report did not contain the required information and/or was not prepared by February 28th of the following year. OCWA became the overall responsible operator for Mattawa DWS on February 25, 2019. On the same day, OCWA requested a one month extension for the completion of the annual water report from the Ministry. A review of the legislation revealed that the regulation does not allow for an extension. Failure to prepare an annual report by February 28 is a violation of Section 11(3) of Drinking Water Systems Regulation O. Reg. 170/03.	The report was completed and submitted to the Owner on March 11, 2019. No further action required.	OCWA	OCWA is now Operating Authority and annual reports will be completed by February 28 going forward.	Complete
5. All changes to the system registration information were not provided within ten (10) days of the change. A change of DWS owner and	The owner of the drinking water system must ensure that the change to the system information is provided to the Director by	OCWA	OCWA is now Operating Authority and will update DWS profile as required. Currently the DWS	Complete



operating authority information and 24/7 contact which occurred in November 2018 were not documented in a drinking water system profile information form and provided to the Director within 10 (ten) days from the change. Changes of system information when OCWA started acting as ORO on February 25, 2019 and subsequently as the operating authority on August 1, 2019 were provided to the Director within the required 10 days. Failure to give the Director written notice of the change of system information within 10 (ten) days of the change constitutes a violation of O. Reg. 170/03.	written notice within 10 (ten) days of the change. Drinking water system profile information form submitted March 6, 2019. No further action required.		profile is up to date after numerous updates by OCWA. The only contact from the Town on the DWIS profile is Raymond Belanger. If any changes are required the Town must inform OCWA as soon as possible.	
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3.0 Summary of Quantities and Flow Rates

Flow Monitoring

MDWL No. 195-101 requires the owner to install a sufficient number of flow measuring devices to permit the continuous measurement and recording of:

- the flow rate and daily volume of treated water that flows from the treatment subsystem the distribution system, and
- the flow rate and daily volume of water that flows into the treatment subsystem.

The flow monitoring equipment identified in the MDWL is present and operating as required. The flow meter is calibrated on an annual basis as specified in the manufacturers' instructions.

Water Usage

The following water usage tables summarize the quantities and flow rates of water taken and produced during the 2019 reporting period, including total monthly volumes, average monthly volumes, maximum monthly volumes, and maximum flow rates.



Raw Water

2019 - Monthly Summary of Water Takings from the Source (Well #1)

Regulated by Permit to Take Water (PTTW) #1546-9GHPLM, issued February 27, 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year to Date
Total Volume (m ³)	32019	29146	37483	31528	28286	32277	42246	32603	27920	33676	41444	38838	407465
Average Volume (m ³ /d)	1033	1041	1209	1051	912	1076	1363	1052	931	1086	1381	1253	1116
Maximum Volume (m ³ /d)	1430	1298	1360	1588	1140	1476	1840	1437	1240	1484	1732	1386	1840
PTTW - Maximum Allowable Volume (m ³ /day)	4582	4582	4582	4582	4582	4582	4582	4582	4582	4582	4582	4582	4582
Maximum Flow Rate (L/min)	4975	4972	5012	5617	4517	4967	5068	4237	5107	4342	5189	4417	5617
PTTW - Maximum Allowable Flow Rate (L/min)	3183	3183	3183	3183	3183	3183	3183	3183	3183	3183	3183	3183	3183

Well #1 experiences false peaks on start up.

2019 - Monthly Summary of Water Takings from the Source (Well #2)

Regulated by Permit to Take Water (PTTW) #1546-9GHPLM, issued February 27, 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year to Date
Total Volume (m ³)	6927	4276	3213	5404	4298	4221	2576	4458	4270	4848	7270	9202	60964
Average Volume (m ³ /d)	223	153	104	180	139	141	83	144	142	156	242	297	167
Maximum Volume (m ³ /d)	473	502	527	561	416	437	484	473	451	517	582	507	582
PTTW - Maximum Allowable Volume (m ³ /day)	1964	1964	1964	1964	1964	1964	1964	1964	1964	1964	1964	1964	1964
Maximum Flow Rate (L/min)	1726	1720	1704	1736	1743	1730	1743	1743	1684	1690	1724	1696	1743
PTTW - Maximum Allowable Flow Rate (L/min)	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364

Well #2 continuously exceeds instantaneous limit.

2019 - Monthly Summary of Combined Water Takings from the Source (Well#1 and Well #2)

Regulated by Permit to Take Water (PTTW) #1546-9GHPLM, issued February 27, 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year to Date
Total Volume (m ³)	38946	33422	40696	36931	32583	36498	44822	37061	32190	38524	48715	48040	468429
Average Volume (m ³ /d)	1256	1194	1313	1231	1051	1217	1446	1196	1073	1243	1624	1550	1283
Maximum Volume (m ³ /d)	1855	1412	1469	1651	1296	1476	1840	1586	1315	1607	2138	1703	2138
PTTW - Maximum Allowable Volume (m ³ /day)	6546	6546	6546	6546	6546	6546	6546	6546	6546	6546	6546	6546	6546

The system's Permit to Take Water #1546-9GHPLM, allows the Municipality to withdraw water at the following rates:

Well No. 1: 4582.08 m³/day / 3183 L/minute

Well No. 2: 1964.16 m³/day / 1364 L/minute

Total Combined Daily Volume: 6546.24 m³/day

The system's Permit to Take Water #1546-9GHPLM allows the municipality to withdraw a maximum volume of 4582.08 m³ from Well No. 1 and 1964.16 m³ from Well No. 2 each day with a maximum of 6546.24 m³/d combined. A review of the raw water flow data indicates that the system never exceeded this allowable limit having a maximum volume of 2138 m³ in November 2019. The Permit also allows a maximum flow rate of 3183 L/minute for Well No. 1



and 1364 L/minute for Well No. 2. The PTTW instantaneous flow rates have been continuously exceeded for Well 2, with false peaks on start-up and switch over on Well 1, having a maximum recorded flow of 5617 L/minute in April 2019 for Well 1 and 1743 L/minute in May, July and August 2019 for Well 2.

Treated Water

2019 - Monthly Summary of Treated Water Supplied to the Distribution System

Regulated by Municipal Drinking Water Licence (MDWL) #195-101 - Issue 2, issued July 25, 2016

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year to Date
Total Volume (m ³)	38946	33422	40696	36931	32583	36498	44822	37061	32190	38524	48715	48040	468429
Average Volume (m ³ /d)	1256	1194	1313	1231	1051	1217	1446	1196	1073	1243	1624	1550	1283
Maximum Volume (m ³ /d)	1855	1412	1469	1651	1296	1476	1840	1586	1315	1607	2138	1703	2138
MDWL - Rated Capacity (m ³ /day)	6540	6540	6540	6540	6540	6540	6540	6540	6540	6540	6540	6540	6540

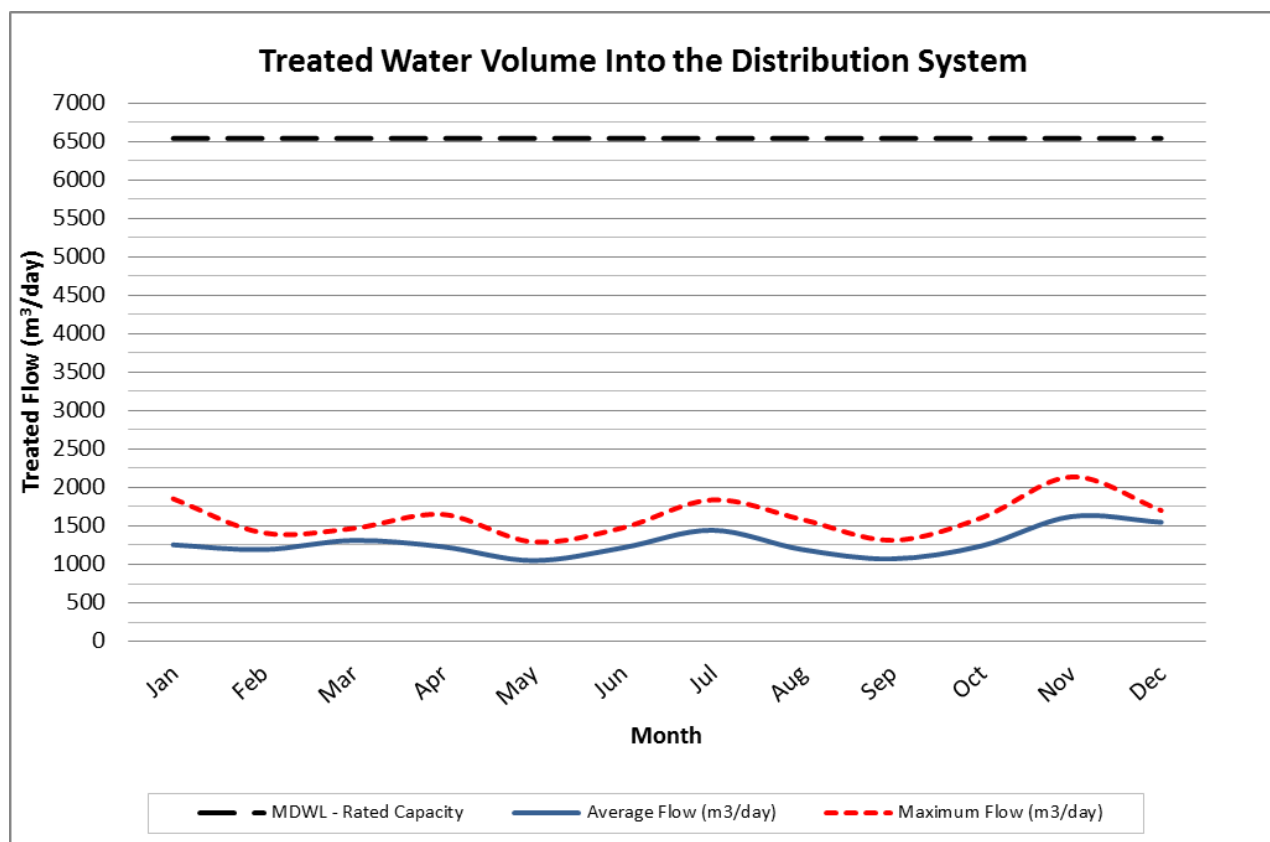
Schedule C, Section 1.1 of MDWL No. 195-101 states that the maximum daily volume of treated water that flows from the treatment subsystem to the distribution system shall not exceed a maximum flow rate of 6540 m³/day. The Mattawa DWS complied with this limit having a recorded maximum volume of 2138 m³ in November 2019, which is 32.7% of the rated capacity.

Figure 1 compares the average and maximum flow rates into the distribution system to the rated capacity of the system identified in the MDWL. This information enables the Owner to assess the system's existing and future planned water usage needs.

Comparison of the Flow Summary to the Systems Licence & Permit

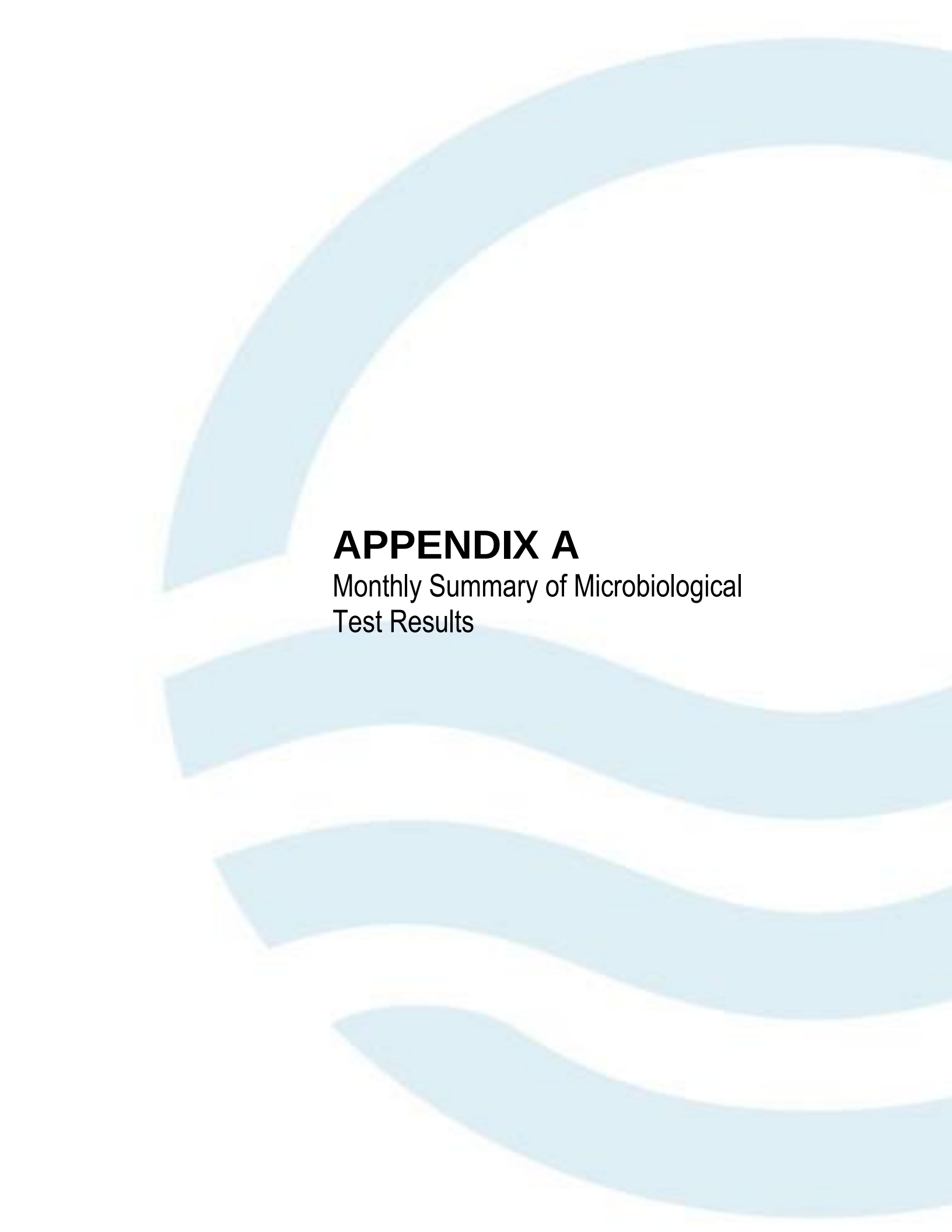
Rated Capacity of the Plant (MDWL)	6540 m ³ /day	
Average Daily Flow for 2019	1283 m ³ /day	19.6% of the rated capacity
Maximum Daily Flow for 2019	2138 m ³ /day	32.7% of the rated capacity
Total Treated Water Produced in 2019	468,429 m ³	

The Mattawa Water Treatment Plant is rated to produce 6540 cubic meters of water per day as specified in the system's Municipal Drinking Water Licence. The average daily flow was 1283 m³ per day, which is 19.6% of the rated capacity. This information clearly shows that the plant is well within its rated capacity and is able to meet current demands of consumers.



CONCLUSION

In 2019, the Mattawa DWS provided safe and reliable drinking water to the community of Mattawa. The system complied with the regulatory requirements of the Safe Drinking Water Act and its Regulations and met the terms and conditions outlined in its site specific drinking water works permit and municipal drinking water licence with the exception of five non-compliance issues during the reporting period. Five non-compliance items were identified during the annual MECP inspection on September 25, 2019. Furthermore, the Mattawa DWS did not have any adverse water quality incidents reported to the MOE's Spills Action Centre.



APPENDIX A

Monthly Summary of Microbiological Test Results

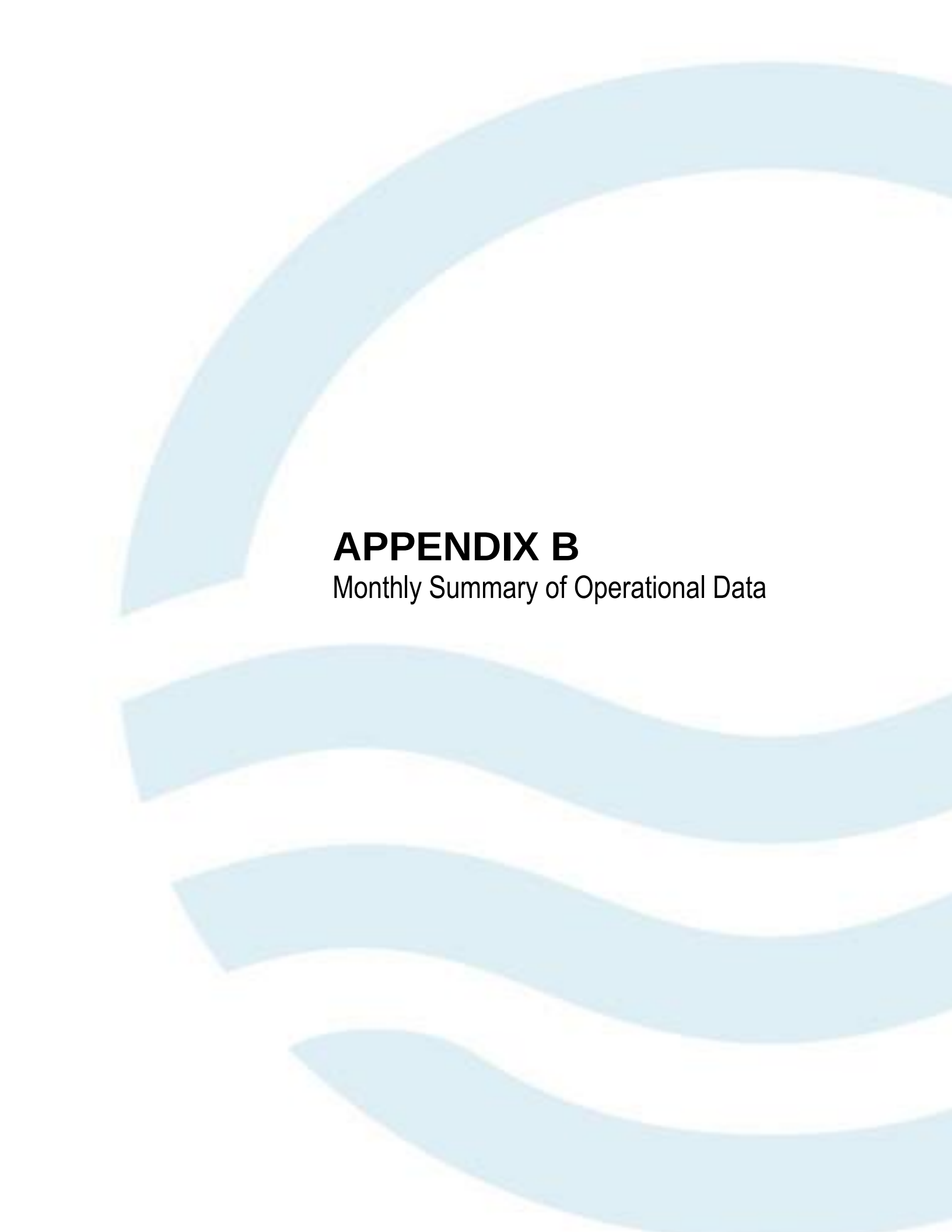
Mattawa Drinking Water System
Monthly Summary of Microbiological Test Results

From: 01/01/2019 to 31/12/2019

Report extracted 01/20/2020 09:51

Facility Org Number: 1517
Facility Works Number: 210001905
Facility Name: MATTAWA DRINKING WATER SYSTEM
Total Design Capacity: 6540.0 m3/day

	01/2019	02/2019	03/2019	04/2019	05/2019	06/2019	07/2019	08/2019	09/2019	10/2019	11/2019	12/2019	Total	Avg	Max	Min
DW / E. Coli - cfu/100mL																
Count Lab	15	12	12	15	12	15	15	12	12	15	12	15	162			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
DW / HPC - cfu/mL																
Count Lab	3	3	3	3	3	3	3	3	3	3	3	3	36			
Max Lab	1	1	0	0	0	0	0	0	0	0	1	2			2	
Mean Lab	0.333	0.333	0	0	0	0	0	0	0	0	0.333	0.667		0.139		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
DW / Total Coliform: TC - cfu/100mL																
Count Lab	15	12	12	15	12	15	15	12	12	15	12	15	162			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
TW / E. Coli: EC - cfu/100mL																
Count Lab	5	4	4	5	4	4	5	4	4	5	4	5	53			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
TW / HPC - cfu/mL																
Count Lab	5	4	4	5	4	4	5	4	4	5	4	5	53			
Max Lab	1	3	24	0	1	8	0	0	0	0	0	0			24	
Mean Lab	0.2	0.75	6	0	0.25	2	0	0	0	0	0	0		0.698		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
TW / Total Coliform: TC - cfu/100mL																
Count Lab	5	4	4	5	4	4	5	4	4	5	4	5	53			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
Well #1 / E. Coli: EC - cfu/100mL																
Count Lab	5	4	4	5	4	4	5	4	4	5	4	6	54			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
Well #1 / Total Coliform: TC - cfu/100mL																
Count Lab	5	4	4	5	4	4	5	4	4	5	4	6	54			
Max Lab	0	0	0	0	1	0	0	0	0	0	0	0			1	
Mean Lab	0	0	0	0	0.25	0	0	0	0	0	0	0		0.019		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
Well #2 / E. Coli: EC - cfu/100mL																
Count Lab	5	4	4	5	4	4	5	4	4	5	4	6	54			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
Well #2 / Total Coliform: TC - cfu/100mL																
Count Lab	5	4	4	5	4	4	5	4	4	5	4	6	54			
Max Lab	0	0	0	0	3	0	0	0	0	0	0	0			3	
Mean Lab	0	0	0	0	1.5	0	0	0	0	0	0	0		0.111		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0



APPENDIX B

Monthly Summary of Operational Data

**Mattawa Drinking Water System
Monthly Summary of Operational Data**

Report extracted 01/24/2020 10:41

From: 01/01/2019 to 31/12/2019

Facility Org Number: 1517
Facility Works Number: 210001905
Facility Name: MATTAWA DRINKING WATER SYSTEM
Total Design Capacity: 6540.0 m3/day

	01/2019	02/2019	03/2019	04/2019	05/2019	06/2019	07/2019	08/2019	09/2019	10/2019	11/2019	12/2019	Total	Avg	Max	Min
DW / CI Residual: Free DW1 - mg/L																
Count IH	31	28	31	30	31	30	29	9	8	10	8	9	254			
Total IH	16.6	14.07	17.79	18.8	16.3	13.06	12.11	4.6	4.6	5.69	7.23	5.37	136.22			
Max IH	0.67	0.7	0.72	0.72	0.61	0.64	0.65	0.79	0.67	0.84	1.15	0.66			1.15	
Mean IH	0.535	0.502	0.574	0.627	0.526	0.435	0.418	0.511	0.575	0.569	0.904	0.597		0.536		
Min IH	0.4	0.41	0.41	0.37	0.41	0.34	0.2	0.3	0.38	0.12	0.75	0.52				0.12
DW / CI Residual: Free DW2 - mg/L																
Count IH	0	0	0	0	0	0	1	9	8	10	8	9	45			
Total IH							0.5	4.23	4.49	5.39	6.34	5.2	26.15			
Max IH							0.5	0.71	0.89	0.99	1.01	0.73			1.01	
Mean IH							0.5	0.47	0.561	0.539	0.793	0.578		0.581		
Min IH							0.5	0.31	0.27	0.31	0.48	0.36				0.27
DW / CI Residual: Free DW3 - mg/L																
Count IH	0	0	0	0	0	0	1	9	8	10	8	9	45			
Total IH							0.39	3.18	2.99	5.91	6.15	5.1	23.72			
Max IH							0.39	0.44	0.67	0.87	1.11	0.7			1.11	
Mean IH							0.39	0.353	0.374	0.591	0.769	0.567		0.527		
Min IH							0.39	0.29	0.12	0.3	0.5	0.39				0.12
DW / CI Residual: Free DW4 - mg/L																
Count IH	0	0	0	0	0	0	1	4	4	5	4	5	23			
Total IH							0.4	2.71	1.56	2.2	2.86	2.69	12.42			
Max IH							0.4	0.84	0.6	0.6	0.89	0.68			0.89	
Mean IH							0.4	0.678	0.39	0.44	0.715	0.538		0.54		
Min IH							0.4	0.61	0.3	0.3	0.4	0.16				0.16
Well #1 / Turbidity - NTU																
Count IH	1	1	1	1	1	1	1	1	1	1	1	1	12			
Total IH	0.63	0.59	0.67	0.6	0.2	0.23	0.26	0.4	0.31	0.32	0.25	0.3	4.76			
Max IH	0.63	0.59	0.67	0.6	0.2	0.23	0.26	0.4	0.31	0.32	0.25	0.3			0.67	
Mean IH	0.63	0.59	0.67	0.6	0.2	0.23	0.26	0.4	0.31	0.32	0.25	0.3		0.397		
Min IH	0.63	0.59	0.67	0.6	0.2	0.23	0.26	0.4	0.31	0.32	0.25	0.3				0.2
Well #2 / Turbidity - NTU																
Count IH	1	1	1	1	1	1	1	1	1	1	1	1	12			
Total IH	0.58	0.64	0.61	0.58	0.18	0.2	0.27	0.55	0.33	0.33	0.3	0.31	4.88			
Max IH	0.58	0.64	0.61	0.58	0.18	0.2	0.27	0.55	0.33	0.33	0.3	0.31			0.64	
Mean IH	0.58	0.64	0.61	0.58	0.18	0.2	0.27	0.55	0.33	0.33	0.3	0.31		0.407		
Min IH	0.58	0.64	0.61	0.58	0.18	0.2	0.27	0.55	0.33	0.33	0.3	0.31				0.18