

2023 Year End Report: Mactier Wastewater Treatment Plant (WWTP)



Environmental Compliance Approval: # 7599-7PCKPU

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Introduction

The MacTier Wastewater Treatment Plant (WWTP), which services the Town of MacTier, is owned and operated by the District Municipality of Muskoka. The plant is located at 20 Conger Marsh Lane and was commissioned in 2007. It currently services approximately 280 customer connections.

The Plant operates under the MECP Certificate of Approval (Sewage) #7599-7PCKPU issued February 18, 2009, and MECP Certificate of Approval (Air) #0571-67WJB7 issued on December 22, 2004. Under the terms of the Certificate of Approval, the average rated capacity of the plant is 691 cubic meters per day (m³/day). Additionally, effluent limit criteria are as follows.

Table 1 Effluent Limit Criteria

Effluent Parameter	Concentration
CBOD	10 mg/L
Total Suspended Solids	10 mg/L
Total Phosphorous	0.50 mg/L
Total Ammonia Nitrogen Summer (May 15 to September 30)	2.0 mg/L
Total Ammonia Nitrogen Winter (October 01 to May 14)	4.0 mg/L
E. coli	100 CFU/mL
pH	6.0-9.5 inclusive at all times

The treatment process is comprised of two (2) sequencing batch reactors, phosphorus precipitation using aluminum sulphate, effluent tertiary filtration, and ultraviolet disinfection. Treated effluent from the plant is discharged through a 300-millimeter effluent outfall line and discharge structure located in Conger Marsh.

Waste sludge from the plant process is digested aerobically at the plant and periodically hauled off site for disposal.

All pumping stations and treatment control systems use SCADA (Supervisor Control And Data Acquisition), in combination with Data Highway Plus, and programmable logic controllers.

General Information

A review of the District of Muskoka infrastructure needs is conducted annually by the Director of Water and Sewer Services, Area Manager and Chief Operator, and recommendations for maintenance, rehabilitation and renewal programs are considered.

Efforts to eliminate the discharge of untreated or partially treated wastewater to receiving waters are being accomplished by a long-term financial commitment to correct excessive infiltration into the wastewater collection system by means of sewer main rehabilitation / replacement, manhole rehabilitation and pumping station rehabilitation programs.

The treatment facility is capable of effective operation during emergencies, maintenance shutdowns, and power failures. This is achieved through such measures as preventive maintenance of duty / standby units, the duplication of major treatment components, the provision

of standby power sources and extensive use of the SCADA systems. All pumping stations and treatment control systems use SCADA (Supervisor control and Data Acquisition), in combination with Data Highway Plus, and programmable logic controllers.

All operators are qualified to operate the systems efficiently and effectively in order to achieve the highest level of treatment at all times. A commitment to provide Operator training and certification is being sustained.

Regulatory sampling is carried out to meet the requirements outlined in the ECA, and additional in-house operational sampling beyond these regulatory requirements is being performed on a routine basis. These efforts have resulted in an effective treatment process which ensures that effluent discharges consistently meet effluent objectives and are environmentally safe. All final effluent sample results for the MBR facilities met their effluent limits.

All data in this report is a compilation of test results received from SGS Canada and their accredited laboratory, Lakefield Research. All in-plant sampling, analysis and recording of results conforms, in order of precedence, to the following 3 standards: Ministry's Procedure F-10-1, "Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works", Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" and the American Water Works Association/Water Environment Federation (AWWA/WEF) publication "Standard Methods for the Examination of Water and Wastewater".

Executive Summary

In all respects, test results of the treated effluent for the parameters of CBOD5, suspended solids, ammonia, total phosphorous, and E. Coli are in compliance with the limits outlined in the ECA regarding monthly allowable concentrations and total effluent loading throughout the entire 2020.

Overall, the plant treatment processes performed satisfactorily and are deemed to be adequate. All sample test results of the final effluent were within levels outlined in the plant ECA (#7599-7PCKPU).

Quantity of Flow Summary

The plant has a daily average flow design capacity of 691 meters cubed per day. The actual average daily flow for the 2023 was 131 m³/day, however, the 3-year average was 143 m³/day which represents 21% of the plant capacity. None of the individual system components exceeded the design flow rating.

Plant Operational Upsets or Process Failures

There were plant operational problems in 2023 with maintaining adequate nitrification in the winter months. In January the effluent ammonia average was 3.3 mg/L exceeding the objective but within compliance. These events appear to be the result of high influent flows of cold water. Plant operators have changed the SBR method of control in 2024 to improve nitrification performance.

Important to note the January 5 flow of 373 m³ is the highest ever received by the facility in one day to date.

Summary of Maintenance

There were no significant plant upgrades on major infrastructure in 2023.

All equipment information at this plant is entered into a computer database. From this information, a scheduled preventive maintenance program has been established. The maintenance program includes (and not limited to):

- Monthly testing of emergency testing (under load) of the standby generators.
- Annual servicing of emergency standby generators.
- Annual replacement of U.V. bulbs.
- Annual infrared inspection of Motor Control panels.
- Annual calibration of flow metering devices.
- Annual cleaning of all sewage pumping stations.
- Marine inspection of effluent outfall and diffuser completed in 2022. (5-year cycle)

Evaluation of the Need for Improvement Works

The treatment facility is operating at a plant capacity of 21% and is in compliance with specified effluent parameter criteria. In addition, there has been no significant treatment process upsets and plant bypasses. As a result, there is no need for improvements to the existing works.

Evaluation Summary of Proposed Work Requiring Approval under OWRA

Since the treatment facility is operating satisfactorily there is no anticipated works requiring an ECA amendment for 2023.

Interpretation of Analytical Results

All sample results for Raw Sewage and Final Effluent are reported in this section. Other tables in this report include Chemical Usage, Biosolids Quality, and Biosolids Quantity.

Raw Sewage

The information reported in the Raw Sewage sample results summary table consists of test results of analysis conducted on composite samples of the plant influent flow as required by the plant ECA. Samples are sent for analysis to Lakefield Research, as well as analysis conducted on site using Standard Methods or equivalent. Weekly analysis has been performed and reported as specified under the terms outline in the ECA.

Influent Analysis

Table 2 Influent Analysis

Influent Parameter	Minimum	4 Week Average Maximum	Annual Average	Average loading kg/day
BOD5 (mg/L)	34	270	146	22.2
Suspended Solids (mg/L)	52	366	235	36.0
Total Phosphorus (mg/L)	0.9	8.0	4.7	0.7
Total Kjeldahl Nitrogen (mg/L)	10	46	30	4.6
pH	7.0	7.6 (max)	7.3	N/A

Effluent Analysis

The information reported in the Final Effluent sample results summary table 3 consists of test results of analysis conducted on final effluent composite samples. Bacteriological samples, however, consisted of grab samples. Weekly analysis has been performed and reported as specified under the terms outlined in the ECA.

Effluent Objective Analysis

Effluent objectives were not met at all times in 2023. In January the effluent ammonia average was 3.3 mg/L exceeding the objective but within compliance. The event appears to be the result of high influent flows of cold water.

Final Effluent Analysis Summary

All final effluent samples tested for CBOD5, suspended solids, ammonia, E. Coli, and total phosphorous were below non-compliance limits outlined in the ECA.

Table 3 Final Effluent Analysis Summary

Parameter	Minimum	4 Week Average Maximum	Annual Average	Average Loading kg/day
COBD5 (mg/L)	2.0	3.5	2.3	0.4
Suspended Solids (mg/L)	2.0	5.0	2.7	0.4
Total Phosphorus (mg/L)	0.03	0.08	0.06	0.01
Ammonia (mg/L)	0.1	4.38	0.70	0.11
E. Coli (#/100 mL)	0.0	0.8	0.1	N/A
pH	7.15	7.68 (max)	7.38	N/A

Average daily flow comparisons by day of week ensure ECA requirements for scheduled

sampling are taken at a time, and in a location characteristic of the quality and quantity of the sewage stream over the time period being monitored. Average daily flow rates by day of the week compare the flow to the average daily flow for the entire year. This data is used to determine if a particular day of the week is best to ensure samples are taken to meet the requirements of scheduled monitoring sections of the ECA's. Sampling plans are reviewed and updated yearly based on the previous yearly flow data.

Final Effluent Sampling Summary

All samples were collected following the frequency and methods required by the facility approval. For the coming year, 2024, no changes to the sampling plan are being considered at this time.

Biosolids Generation

The quality and volume of biosolids hauled from the facility for disposal is outlined in the table provided. Dewatered biosolids from the plant was hauled to an approved disposal location. Private contractors were used by the District of Muskoka to transfer all material for disposal in 2023 and will continue to do so in 2024. It is not anticipated that there will be a significant increase in the total volume of biosolids produced in 2024.

Summary of Complaints received throughout the reporting period.

There were no complaints received in the reporting period.

Mactier Wastewater Collection Summary

New or Replaced Sewer Mains:

No new or replaced sewers in 2023.

New Sewer Services:

2 new customers connected to existing municipal sewers.

Sewer Lateral Blockages:

No sewer lateral blockages in Mactier in 2023

Sewer Pump Stations:

All stations were inspected. Beech Station and Curling Club cleaned.

Main Line Sewer Blockages:

There were no main line sewer blockages in 2023.

Sewer Force Mains:

All the low-pressure sewage force mains within the collection system were flushed by field staff through our annual preventive maintenance program.

Air Release Valves:

All five (5) of the air release vacuum valves connected to the sewage force mains.

Sewer Flushing and Video Inspections:

2122.0m of Sanitary sewer mains flushed and cleaned. Camera reports also completed.

Sewer Rehabilitation:

There was no MH rehab for this year.

Locates:

Field staff addressed 98 locates for Mactier OneCall in 2023.

Table 4 Effluent Flow Summary - 2023

Month	Plant Total Monthly (m ³)	Average Day Flow (m ³ /d)	Maximum Day Flow (m ³ /d)	Minimum Day Flow (m ³ /d)
January	4,904	158	271	98
February	3,660	131	182	98
March	4,571	147	220	102
April	5,901	197	378	142
May	4,469	144	230	79
June	3,890	130	193	74
July	4,318	139	259	81
August	4,541	146	236	96
September	4,134	138	189	82
October	4,905	158	252	89
November	5,044	168	273	118
December	5,412	175	223	119

Total Flow: 55,750m³
 Average Day: 153m³
 Maximum Day: 378m³
 Minimum Day: 74m³

Table 5 Influent Quarterly Analysis Summary – Weekly 24-Hour Composite Sample

Sample Date	Sample Identification Number	BOD5 mg/L	Total Kjeldahl Nitrogen mg/L	Total Phosphorus mg/L	Suspended Solids mg/L
Feb-06-23	CA17693	270	40.2	4.1	311
May-01-23	CA14072	130	25.7	2.86	264
Aug-08-23	CA12307	78	35.6	2.03	303
Nov-06-23		131	40.6	5.6	597
Yearly Average	--	152.3	35.5	3.6	368.8
Maximum	--	270.0	40.6	5.6	597.0
Minimum	--	78.0	25.7	2.0	264.0

Table 6 Chemical Usage Summary: Alum

Month	Average Dosage mg/L	Total kg (dry)
January	80.4	830.8
February	89.8	750.4
March	81.3	830.8
April	83.3	1,058.6
May	146.9	1,440.5
June	112.5	951.4
July	79.9	733.6
August	78.0	747.05
September	77.6	715.2
October	76.0	811.7
November	79.2	850.9
December	91.6	1,105.5
Average	92	9,419

Total Yearly Kilograms: 10,826kg

Table 7 Chemical Usage Summary: Soda Ash

Month	Average Dosage mg/L	Total kg (dry)
January	163.9	874.0
February	164.3	672.0
March	160.1	809.0
April	155.8	1,031.0
May	156.0	771.0
June	159.6	662.0
July	178.7	835.5
August	114.9	550.0
September	132.5	596.5
October	140.8	747.0
November	163.6	861.5
December	173.45	1,024.0
Average	147	7,299

Total Yearly Kilograms: 9,434kg

Table 8 Effluent Quarterly Analysis Summary – Weekly 24-Hour Composite Sample

Sample Date	Sample Identification Number	CBOD5 mg/L	Total Ammonia Nitrogen mg/L	pH	Total Phosphorus mg/L	Suspended Solids mg/L
Feb-06-23	CA17693	<2	2.2	8.38	0.06	2
May-01-23	CA14072	2	0.6	7.96	0.09	11
Aug-08-23	CA12307	<2	<0.1	7.96	0.06	3
Nov-06-23		<2	<0.1	7.78	0.05	2
Yearly Average		2.0	1.4	8.02	0.065	4.5
Maximum		2.0	2.2	8.38	0.09	11
Minimum		2.0	0.6	7.78	0.05	2

Table 9 Effluent Loading and Concentration Summary 2023: COBD5

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.00	0.32	0.54
February	2.25	0.33	0.42
March	2.00	0.29	0.44
April	2.00	0.39	0.76
May	3.20	0.46	0.74
June	2.00	0.26	0.39
July	2.20	0.27	0.41
August	2.00	0.29	0.47
September	2.00	0.28	0.38
October	2.00	0.32	0.50
November	2.50	0.42	0.68
December	3.25	0.57	0.72
Average Monthly	2.28	0.35	0.54
Effluent Objective	5.0		
Non-Compliance	10.0		

Table 10 Effluent Loading and Concentration Summary 2023: Suspended Solids

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	3.00	0.47	0.81
February	2.00	0.29	0.38
March	2.50	0.37	0.55
April	2.50	0.49	0.95
May	4.80	0.69	1.10
June	2.25	0.29	0.43
July	2.80	0.36	0.54
August	2.25	0.33	0.53
September	2.00	0.28	0.38
October	2.60	0.41	0.66
November	2.25	0.38	0.61
December	3.25	0.57	0.72
Average Monthly	2.68	0.41	0.64
Effluent Objective	5.0		
Non-Compliance	10.0		

Table 11 Effluent Loading and Concentration Summary 2023: Total Ammonia Nitrogen Summer

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
April	0.4	0.08	0.15
May	0.58	0.08	0.13
June	0.20	0.03	0.04
July	0.12	0.02	0.02
August	0.10	0.01	0.02
September	0.10	0.01	0.02
October	0.18	0.03	0.05
Average Monthly	0.24	0.04	0.06
Effluent Objective	1.0		
Non-Compliance	2.0		

Table 12 Effluent Loading and Concentration Summary 2023: Total Ammonia Nitrogen Winter

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	3.28	0.52	0.89
February	1.05	0.15	0.2
March	0.90	0.13	0.2
November	0.50	0.08	0.14
December	0.68	0.12	0.15
Average Monthly	1.28	0.2	0.32
Effluent Objective	1.0		
Non-Compliance	4.0		

Table 13 Effluent Loading and Concentration Summary 2023: Fecal Coliform

Month	Geomean (#/100mL)	Maximum Daily (#/100mL)
January	0.25	1.00
February	0.00	0.00
March	0.00	0.00
April	0.00	0.00
May	0.00	0.00
June	0.00	0.00
July	0.20	0.04
August	0.00	0.00
September	0.00	0.00
October	0.00	0.00
November	0.25	0.07
December	0.50	0.11
Average Monthly	0.10	0.10
Effluent Objective		
Non-Compliance	100	

Table 14 Effluent Loading and Concentration Summary 2023: Total Phosphorus

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	0.07	0.01	0.02
February	0.05	0.01	0.01
March	0.05	0.01	0.01
April	0.05	0.01	0.02
May	0.10	0.01	0.02
June	0.04	0.01	0.01
July	0.07	0.01	0.01
August	0.05	0.01	0.01
September	0.05	0.01	0.01
October	0.05	0.01	0.01
November	0.05	0.01	0.01
December	0.07	0.01	0.02
Average Monthly	0.06	0.01	0.01
Effluent Objective	0.2		
Non-Compliance	0.5		

Table 15 Liquid Sludge Production Summary 2023

Month	Hauler	Liquid Volume m ³	Cake Weight kg	Destination
January	ROHES	109	N/A	ROHES Storage Site
February	ROHES	181	N/A	ROHES Storage Site N/A
March	N/A	N/A	N/A	N/A
April	ROHES	254.8	N/A	ROHES Storage Site N/A
May	N/A	N/A	N/A	N/A
June	N/A	N/A	N/A	N/A
July	N/A	N/A	N/A	N/A
August	N/A	N/A	N/A	N/A
September	N/A	N/A	N/A	N/A
October	N/A	N/A	N/A	N/A
November	N/A	N/A	N/A	N/A
December	N/A	N/A	N/A	N/A

Yearly Total Volume: 544.8 m³
 Yearly Average Volume: N/A
 Maximum Volume: N/A
 Minimum Volume: N/A

Table 16 Sludge Quality Analysis 2023

Parameter Sampled (mg/L)	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Date	Feb-06-23	May-01-23	Aug-08-23	Nov-06-23
Sample ID	CA17694	CA14074	CA12308	CA12248
Nitrate	8	97	97	132
Mercury	0.004	0.002	0.001	0.002
Chromium	0.35	0.14	0.09	0.17
Cobalt	0.05	0.02	0.01	0.02
Copper	8.9	3.3	2.1	4.1
Lead	0.3	0.1	<0.1	0.10
Molybdenum	0.14	< 0.060	<0.05	0.06
Nickel	0.27	0.13	0.07	0.14
Selenium	<0.1	<0.1	<0.1	<0.1
Arsenic	<0.1	<0.1	<0.1	<0.1
Zinc	13	5	3	6
Cadmium	0.016	0.005	<0.005	0.006
Ammonia+ Ammonium	5	4.1	6.1	2.2
Total Kjeldahl Nitrogen	800	367	379	636
Total Phosphorus	610	252	161	317
Total Solids	22400	9150	8040	22200
Total Suspended Solids	22400	9150	8040	22200
Nitrite	<0.2	0.6	<3	<3
PO4	50	45	34	44

Certification of Reports

I certify that the information in this document and all attachments are correct, accurate, and complete to the best of my knowledge.

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