2020 Year End Report: MacTier Potable Water Plant

Drinking Water Works Permit: 143-207

Municipal Drinking Water License: 143-107

Ministry of Environment, Conservation and Parks Waterworks #: 220004224

Engineering and Public Works Department

70 Pine Street, Bracebridge, Ontario P1L 1N3

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Introduction

The MacTier Potable Water Plant serving the community of MacTier is owned and operated by the District Municipality of Muskoka.

It constructed in 1995 and has an initial design capacity of 1904 m^3 per day. The water system currently serves 277 customer service connections.

The plant operates under license 143-107 and permit 143-207, issued in September 2020 under the Municipal Drinking Water Licensing Program. The plant also presently operates under Ministry of Environment, Conservation and Parks (MOECP) permit to take water #0170-AXBLGH (expires May 2028), which permits the operation of up to 1,428m^3/day. The Raw Water intake structure is located Stewart Lake approximately 11 meters deep and 220 meters from shore.

The plant process is a conventional package filtration plant, with supplementary pH adjustment. The facility includes an intake crib, intake pipe, fixed screen, and a low lift pumping station. The treatment plant consists of flash mixing, variable speed flocculators, and two (2) dual media filters. Also located at the treatment plant are two (2) backwash holding tanks, two (2) contact chambers, one (1) clearwell, four (4) high lift pumps, two (2) backwash pumps, chemical storage, preparation, and feed equipment. The treatment plant system features chemical treatment consisting of Sodium Permanganate (Manganese control), hydrated lime, carbon dioxide (corrosion control), Powdered Activated Carbon (Taste and Odours), Polyaluminum chloride (coagulation), sodium hydroxide (pH control) and Sodium hypochlorite (disinfection). The addition of hydrofluorosilic acid (fluoridation) to prevent tooth decay completes the treatment process.

The distribution system includes a 1200 m^3 elevated storage tank with provisions for re-chlorination.

All treatment control systems use a Supervisory Control And Data Acquisition (SCADA) system for process control and monitoring.

Legislation Requirements

Safe Drinking Water Act

In the Part Two Report of the Walkerton Inquiry, Commissioner Dennis O'Connor recommended that the Ontario Government enact a Safe Drinking Water Act to deal with matters related to treatment and distribution of drinking water. The Safe Drinking Water Act (SDWA) received royal assent in December, 2002.

The purpose of the Act is to gather in one place all legislation and regulations relating to the treatment and distribution of drinking water. The Act serves to protect human health through the control and regulation of drinking water systems and drinking water testing.

The foundation provisions of the Safe Drinking Water Act include:

- Purpose of the Act
- Definitions
- Minister's Powers and Duties
- Inspections
- Compliance and Enforcement

- Appeals and Offences

Ontario Regulations

The Ontario Government has enacted several supporting regulations under the SDWA (2002). These regulations combine previous requirements under the Ontario Water Resources Act and the new requirements under the SDWA. Key components of the regulations include:

- System Categories
- Groundwater Under Direct Influence of Surface Water (GUDI)
- Exemptions
- Approval of Systems
- Treatment
- Testing and Operational Checks (General Rules)
- Operational Checks
- Microbiological Testing
- Chemical Testing
- Adverse Conditions
- Corrective Action
- Engineer's and Summary Reports

Municipal Drinking Water Licenses / Certificates of Approval

The Municipal Drinking Water Licensing Program has replaced the Certificate of Approval program for municipal residential drinking water systems. The Ontario Government has implemented the Municipal Drinking Water Licensing Program (MDWLP) as recommended by Justice O'Connor in the Part II Report of the Walkerton Inquiry. Justice O'Connor recommended a new approvals framework for municipal drinking water systems, which would require owners to obtain a license to operate their systems as well as incorporate the concept of quality management into their operations.

A municipal drinking water license is an approval that is issued by the MOECP to owners under the Safe Drinking Water Act, 2002 for the operation of municipal residential drinking water systems. The District of Muskoka operated under various Certificates of Approval until October 2010 when the operating licenses were issued.

Previous Certificates of Approval were required for the establishment, replacement or alteration of all municipal drinking water systems. The MOECP issued Certificates of Approval to ensure that all undertakings comply with the legislation (i.e. Acts and Regulations) and the Ministry's Environmental Guidelines and Procedures developed to provide consistency of approach to various aspects of environmental protection throughout the province. Municipal Drinking Water Licenses and Permits similar to previous Certificates of Approval provide specific details about the drinking water system including:

- Drinking Water System Description

- Definitions and Information
- General Information – Compliance, Other Legal Requirements, Adverse Effects, Inspections
- Performance – Rated Capacity, Management of Residue
- Monitoring and Recording – Flow Measuring Devices, Sampling
- Operations and Maintenance

Comparison to Rated Capacity and Flow Rates

The MacTier Potable Water Plant has a rated capacity of 1,904m^3 per day. In 2020, the total monthly average flow for the year was 226.5m^3 per day. The maximum day flow for the year was 537.6m^3/day, however the 3-year average for maximum day flow is 579m^3 per day. This represents 30% of the plant design capacity. No problems have been associated with this flow.

Monthly flows are shown in the attached table.

The Permit to Take Water (PTTW #0170-AXBLGH) permits 1,428.5 m^3 per day, therefore there were no exceedances of this permit.

Summary of Analytical Results

A total of 650 microbiological regulatory tests were performed in 2020 and compliance with Provincial standards was achieved throughout the entire year.

There were 210 free chlorine residual tests performed in the distribution system and all results were satisfactory. Staff continue to routinely sample all areas of the system to ensure adequate free chlorine residuals are available throughout the distribution system.

A summary of other analytical results is also shown in this report.

Summary of Treatment Chemicals

The following chemicals are used for the treatment of drinking water at the MacTier PWP:

- Lime: pH and Alkalinity Adjustment
- Co2: pH Adjustment
- Poly Aluminum Chloride: Primary Coagulant
- Sodium Hypochlorite: Disinfection
- Hydrofluosilicic Acid: Fluoride
- Sodium Hydroxide: pH Adjustment
- Sodium Permanganate: Manganese Control
- Polymer: Coagulant Aid (provisional)

A table summarizing the chemical use and average dosages is included in this report.

Documentation of System Repairs and Upgrades

The MacTier DWS received significant Capital upgrades including replacement of low lift, high lift and backwash pumps, fluoride dosing equipment replacement, replacement of several valves, meters, transmitters and analyzers, fuel storage tank replacement, pretreatment tank refurbish/coating and contact chamber addition.

External Audits

MOE Inspection

A MOE inspection was completed on August 21st, 2020 and is attached to this report. The overall rating was 100%.

DWQMS Audit

In 2020 all drinking water systems within the District had an off-site external audit performed. There were no minor non-conformances reported and all drinking water systems have been recertified. Overall, all drinking water systems are performing satisfactorily.

MacTier Water Distribution Summary 2020

New Services:

There was one (1) new water service installed in 2020.

Broken Watermains:

There were no watermain breaks to report in 2020.

Service Leaks:

There were two (2) service leaks to report in 2020.

Service Relocation:

There were no service relocations to report in 2020.

Frozen Services:

No municipal water services were frozen in 2020.

Replacement Watermains:

No watermain replacement occurred in 2020.

New Watermains:

There were no new watermains installed in 2020.

Valve Replacement:

No mainline valve replacements took place in 2020.

Fire Hydrants:

There are 291 municipally assumed hydrants maintained by the District in West Muskoka. They were inspected, operated, and/or flushed at least once, pumped dry in the fall, and scoped during the winter months to ensure they are not susceptible to freezing. There were no new fire hydrants replaced or repaired in 2020.

Meter Installations:

A total of thirteen (13) water meters were replaced in MacTier in 2020 as part of the aged meter change out program.

Service Box Maintenance:

District field staff excavated and repaired fourteen (14) curb stop boxes in 2020. Field staff also responded to 31 water turn on/off requests in 2020.

Air-Vacuum Release Valves:

Four (4) air release valves were inspected and tested for proper operation in 2020. Each of the chambers was inspected and pumped out as required.

Locates:

Field staff addressed 203 written locate requests in 2020

Table 1 Water Flow Summary - 2020

Month	Total Monthly (m^3)	Average Day Flow (m^3/d)	Maximum Day Flow (m^3/d)	Minimum Day Flow (m^3/d)
January	5,730	185	271	104
February	4,695	162	212	97
March	6,093	197	294	96
April	6,818	227	487	152
May	8,750	282	495	139
June	6,279	209	300	107
July	7,918	255	416	143
August	7,713	249	368	137
September	8,126	271	419	154
October	7,733	249	538	93
November	6,817	227	401	6
December	6,171	199	391	64

Total Flow: 82,841m3
Average Day: 226.5m3
Maximum Day: 537.6m3
Minimum Day: 6.1m3

Table 2 Raw Water Monthly Analysis Summary 2020 Part 1

Month	Alkalinity (mg/L)	Hardness (mg/L)	pH	Turbidity (ntu)	True Colour (tcu)	Temperature (Celsius)
January	28.9	30.0	7.3	1.0	27	5.4
February	27.8	30.0	7.2	1.0	31	5.1
March	28.8	31.0	7.2	0.9	24	6.0
April	29.8	31.0	7.2	0.9	38	7.4
May	29.8	27.0	7.4	0.8	30	10.8
June	31.0	30.0	7.3	0.6	29	11.4
July	30.6	28.2	7.1	0.6	30	12.1
August	32.8	32.8	7.2	0.7	26	13.0
September	29.1	28.9	7.0	1.1	27	11.8
October	32.3	33.1	7.3	1.8	23	12.4
November	33.3	34.5	7.7	1.3	24	9.6
December	30.3	30.8	7.6	1.1	27	7.0
Average	30.4	30.6	7.3	1.0	27.9	9.3

Table 3 Raw Water Monthly Analysis Summary 2020 Part 2

Month	Microcystin (ug/L)	Langliers Saturation Index	Total Coliforms (CFU/100mL)	E. Coli (CFU/100mL)	Total Number of Samples
January	Not Sampled	-1.7	5.0	0.0	4
February	Not Sampled	-1.8	3.0	0.0	4
March	Not Sampled	-1.9	2.0	0.8	5
April	Not Sampled	-1.9	7.0	0.5	4
May	<0.1	-1.8	5.0	0.3	4
June	<0.1	-1.7	3.0	0.0	5
July	<0.1	-1.8	0.3	0.0	4
August	<0.1	-1.8	0.8	0.4	5
September	<0.1	-1.8	2.8	0.3	4
October	<0.1	-2.0	11.5	0.8	4
November	<0.1	-1.2	12.2	1.0	5
December	Not Sampled	-1.4	18.5	0.3	4
Average	<0.1	-1.7	5.9	0.4	4

Table 4 Chemical Usage Summary: Hydrated Lime

Month	Average Dosage mg/L	Total kg
January	28.5	170.9
February	28.5	140.1
March	28.5	182.3
April	28.5	205.9
May	28.5	262.3
June	28.5	188.0
July	28.5	243.3
August	28.5	231.8
September	28.5	243.9
October	28.5	243.6
November	28.5	199.5
December	28.5	191.9
Average	29	208.6

Total Yearly Kilograms: 2,504kg

Table 5 Chemical Usage Summary: Carbon Dioxide

Month	Average Dosage mg/L	Total kg
January	48.1	287.8
February	50.5	246.5
March	52.0	328.4
April	51.1	371.2
May	52.7	481.8
June	51.6	339.3
July	34.5	305.4
August	21.4	173.6
September	22.2	187.7
October	27.1	221.5
November	28.2	202.6
December	33.8	227.4
Average	39.4	281.1

Total Yearly Kilograms: 3,373kg

Table 6 Chemical Usage Summary: Coagulant

Month	Average Dosage mg/L	Total kg
January	30.0	180
February	30.0	147
March	30.0	192
April	30.0	216
May	29.4	270
June	29.3	193
July	29.9	255
August	29.4	239
September	29.0	248
October	29.7	255
November	28.2	197
December	27.9	188
Average	29.4	215

Total Yearly Kilograms: 2,581kg

Table 7 Chemical Usage Summary: Sodium Hydroxide

Month	Average Dosage mg/L	Total kg
January	9.4	54
February	9.4	44
March	9.4	57
April	9.4	79
May	9.4	82
June	11.9	75
July	11.9	94
August	11.9	92
September	3.8	30
October	3.8	29
November	3.8	26
December	7.1	44
Average	8.4	59

Total Yearly Kilograms: 706kg

Table 8 Chemical Usage Summary: Fluoride

Month	Average Dosage mg/L	Total kg
January	0.70	3.9
February	0.70	3.2
March	0.70	4.1
April	0.70	4.6
May	0.70	5.9
June	0.70	4.3
July	0.70	5.5
August	0.70	5.2
September	0.70	5.6
October	0.71	5.8
November	0.71	4.7
December	0.71	4.5
Average	0.70	5

Total Yearly Kilograms: 57kg

Table 9 Chemical Usage Summary: Chlorine

Month	Average Dosage mg/L	Total kg
January	2.48	13.7
February	2.95	13.2
March	3.71	21.8
April	3.71	24.6
May	3.71	31.5
June	3.71	22.5
July	3.71	29.3
August	3.45	25.9
September	3.68	29.6
October	4.23	34.4
November	4.12	27.1
December	3.81	24.3
Average	3.79	28

Total Yearly Kilograms: 298kg

Table 10 Chemical Usage Summary: Sodium Permanganate

Month	Average Dosage mg/L	Total kg
January	0.0	0
February	0.0	0
March	0.0	0
April	0.0	0
May	0.0	0
June	0.0	0
July	0.2	26
August	1.3	215
September	1.4	242
October	1.3	235
November	1.3	46
December	0.5	16
Average	0.5	65

Total Yearly Kilograms: 781kg

MacTier 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

Marcus Firman, C.E.T.
Director, Water and Wastewater Services

Stewart Hurd
Manager of Water and Wastewater Operations

Drinking-Water Systems Regulation O. Reg. 170/03

OPTIONAL ANNUAL REPORT TEMPLATE

Drinking-Water System Number:	220004224
Drinking-Water System Name:	Beech Avenue (MacTier) Drinking Water System
Drinking-Water System Owner:	District Municipality of Muskoka
Drinking-Water System Category:	Large Municipal Residential
Period being reported:	January 01 to December 31, 2020

Complete if your Category is Large Municipal Residential or Small Municipal Residential

Does your Drinking-Water System serve more than 10,000 people? Yes [ ] No [X]

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

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

District Municipality of Muskoka
70 Pine Street
Bracebridge, Ontario
P1L 1N3
(705) 645-6764
www.muskoka.on.ca

Complete for all other Categories.

Number of Designated Facilities served:

N.A.

Did you provide a copy of your annual report to all Designated Facilities you serve?
Yes [ ] No [ ]

Number of Interested Authorities you report to: N.A.

Did you provide a copy of your annual report to all Interested Authorities you report to for each Designated Facility?
Yes [ ] No [ ]

Note: For the following tables below, additional rows or columns may be added or an appendix may be attached to the report

List all Drinking-Water Systems (if any), which receive all of their drinking water from your system:

Drinking Water System Name	Drinking Water System Number
N.A.	

Did you provide a copy of your annual report to all Drinking-Water System owners that are connected to you and to whom you provide all of its drinking water?
Yes [ ] No [ ]

Indicate how you notified system users that your annual report is available, and is free of charge.

[X] Public access/notice via the web
[X] Public access/notice via Government Office
[X] Public access/notice via a newspaper
[X] Public access/notice via Public Request
[ ] Public access/notice via a Public Library
[ ] Public access/notice via other method _____

Describe your Drinking-Water System

The water treatment plant serving the community of MacTier was constructed in 1995. The treatment process consists of chemically assisted coagulation-flocculation, sedimentation and filtration using multi-media filters with a combination of gravel, sand and anthracite coal. Disinfection in a post-treatment chlorine contact chamber is followed by final pH adjustment before the treated water is pumped to our customers. Our waterworks currently serves a population of approximately 740 persons. The rated water production capacity of the plant is 1,904 cubic meters per day. Our raw water source is Stewart Lake and the intake is located 1.5 meters above the lakebed at a depth of 11 meters and about 220 meters from shore.

List all water treatment chemicals used over this reporting period

Sodium Hypochlorite, Polyaluminum Chloride, Sodium Hydroxide, Carbon Dioxide, Hydrated Lime, Fluoride, Sodium Permanganate

Were any significant expenses incurred to?

[x] Install required equipment
[x] Repair required equipment
[x] Replace required equipment

Capital Upgrades were carried out throughout the facility in the amount of $1,392,526.32 and are summarized in the 2020 Year End Report.

Please provide a brief description and a breakdown of monetary expenses incurred

Provide details on the notices submitted in accordance with subsection 18(1) of the Safe Drinking-Water Act or section 16-4 of Schedule 16 of O.Reg.170/03 and reported to Spills Action Centre

Incident Date	Parameter	Result	Unit of Measure	Corrective Action	Corrective Action Date
May 04 2020	Sodium	28.8	mg/L	Resampled 33.4mg/L&18.5mg/L	May 26 2020

Microbiological testing done under the Schedule 10, 11 or 12 of Regulation 170/03, during this reporting period.

	Number of Samples	Range of E.Coli Or Fecal Results (min #)-(max #)	Range of Total Coliform Results (min #)-(max #)	Number of HPC Samples	Range of HPC Results (min #)-(max #)
Raw	52	0-3	0-40	0	N/A
Treated	52	0-0	0-0	52	0-1
Distribution	158	0-0	0-0	74	0-23

Operational testing done under Schedule 7, 8 or 9 of Regulation 170/03 during the period covered by this Annual Report.

	Number of Grab Samples	Range of Results (min #)-(max #)	Geometric Mean Average
Turbidity	8760	0.00-0.82 NTU	0.023 NTU
Chlorine	8760	0.37-2.08 mg/L	1.60 mg/L
Fluoride (If the DWS provides fluoridation)	8760	0.00-0.77 mg/L	0.67 mg/L

__NOTE__: For continuous monitors use 8760 as the number of samples.

__NOTE__: Record the unit of measure if it is __not__ milligrams per litre.
MDL = Method Detection Limit

Summary of additional testing and sampling carried out in accordance with the requirement of an approval, order or other legal instrument.

Date of legal instrument issued	Parameter	Date Sampled	Result	Unit of Measure
N.A.				

Summary of Inorganic parameters tested during this reporting period or the most recent sample results

Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
Antimony	May 04/2020	0.03<MDL	µg/L	No
Arsenic	May 04/2020	0.2<MDL	µg/L	No
Barium	May 04/2020	14.2	µg/L	No
Boron	May 04/2020	8	µg/L	No
Cadmium	May 04/2020	0.008	µg/L	No
Chromium	May 04/2020	0.27	µg/L	No
***Lead**	May 04/2020		µg/L	No
Mercury	May 04/2020	0.01<MDL	µg/L	No
Selenium	May 04/2020	0.04	µg/L	No
Sodium	May 04/2020	**28.8**	mg/L	**Yes***
Uranium	May 04/2020	0.002<MDL	µg/L	No
Fluoride	May 04/2020	0.68	mg/L	No

Nitrite	Feb 10/2020	0.003<MDL	mg/L	No
Nitrate	Feb 10/2020	0.072	mg/L	No
Nitrite	May 04/2020	0.003<MDL	mg/L	No
Nitrate	May 04/2020	0.133	mg/L	No
Nitrite	Aug 04/2020	0.003<MDL	mg/L	No
Nitrate	Aug 04/2020	0.155	mg/L	No
Nitrite	Nov 02/2020	0.003<MDL	mg/L	No
Nitrate	Nov 02/2020	0.041	mg/L	No

*only for drinking water systems testing under Schedule 15.2; this includes large municipal non-residential systems, small municipal non-residential systems, non-municipal seasonal residential systems, large non-municipal non-residential systems, and small non-municipal non-residential systems.

Summary of lead testing under Schedule 15.1 during this reporting period

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

Location Type	Number of Samples	Range of Lead Results (min#) – (max #)	Geometric Mean Average	Unit of Measure	Number of Exceedances
Plumbing	0	N.A.	N.A.	µg/L	N.A.
Distribution	4	0.05-0.09	0.07	µg/L	0

Summary of Organic parameters sampled during this reporting period or the most recent sample results

Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
Alachlor	May 04/2020	0.02<MDL	µg/L	No
Atrazine+N-dealkylated Metabolites	May 04/2020	0.01<MDL	µg/L	No
Azinphos-methyl	May 04/2020	0.05<MDL	µg/L	No
Benzene	May 04/2020	0.32<MDL	µg/L	No
Benzo(a)pyrene	May 04/2020	0.004<MDL	µg/L	No
Bromoxynil	May 04/2020	0.33<MDL	µg/L	No
Carbaryl	May 04/2020	0.05<MDL	µg/L	No
Carbofuran	May 04/2020	0.01<MDL	µg/L	No
Carbon Tetrachloride	May 04/2020	0.17<MDL	µg/L	No
Chorpyrifos	May 04/2020	0.02<MDL	µg/L	No
Diazinon	May 04/2020	0.02<MDL	µg/L	No
Dicamba	May 04/2020	0.20<MDL	µg/L	No
1,2 Dichlorobenzene	May 04/2020	0.41<MDL	µg/L	No
1,4 Dichlorobenzene	May 04/2020	0.36<MDL	µg/L	No
1,2 Dichloroethane	May 04/2020	0.35<MDL	µg/L	No
1,1 Dichloroethylene	May 04/2020	0.33<MDL	µg/L	No
Dichloromethane	May 04/2020	0.35<MDL	µg/L	No
2,4 Dichlorophenol	May 04/2020	0.15<MDL	µg/L	No
2,4-D	May 04/2020	0.19<MDL	µg/L	No
Diclofop-Methyl	May 04/2020	0.40<MDL	µg/L	No

Dimethoate	May 04/2020	0.06<MDL	µg/L	No
Diquat	May 04/2020	1<MDL	µg/L	No
Diuron	May 04/2020	0.03<MDL	µg/L	No
Glyphosate	May 04/2020	1<MDL	µg/L	No
Malathion	May 04/2020	0.02<MDL	µg/L	No
MCPA	May 04/2020	0.00012<MDL	µg/L	No
Metolachor	May 04/2020	0.01<MDL	µg/L	No
Metribuzin	May 04/2020	0.02<MDL	µg/L	No
Monochlorobenzene	May 04/2020	0.30<MDL	µg/L	No
Paraquat	May 04/2020	1<MDL	µg/L	No
Pentachlorophenol	May 04/2020	0.15<MDL	µg/L	No
Phorate	May 04/2020	0.01<MDL	µg/L	No
Picloram	May 04/2020	1<MDL	µg/L	No
PCB	May 04/2020	0.04<MDL	µg/L	No
Prometryne	May 04/2020	0.03<MDL	µg/L	No
Simazine	May 04/2020	0.01<MDL	µg/L	No
THM (NOTE: Annual average of 4 samples – Distribution system)	Feb 10/2020 - Nov 02/2020	65.6	µg/L	No
Terbufos	May 04/2020	0.01<MDL	µg/L	No
Tetrachloroethylene	May 04/2020	0.35<MDL	µg/L	No
2,3,4,6 - Tetrachlorophenol	May 04/2020	0.20<MDL	µg/L	No
Triallate	May 04/2020	0.01<MDL	µg/L	No
Trichloroethylene	May 04/2020	0.44<MDL	µg/L	No
2,4,6,- Trichlorophenol	May 04/2020	0.25<MDL	µg/L	No
Trifluralin	May 04/2020	0.02<MDL	µg/L	No
Vinyl Chloride	May 04/2020	0.17<MDL	µg/L	No
HAA5 (NOTE: Annual average of 4 samples – Distribution system)	Feb 10/2020- Nov 02/2020	66.6	µg/L	No

List any Inorganic or Organic parameter(s) that exceeded half the standard prescribed in Schedule 2 of Ontario Drinking Water Quality Standards.

Parameter	Result Value	Unit of Measure	Date of Sample
Sodium	28.8	Mg/L	May 04 2020
THM's	65.6	µg/L	Running Avg of 4 quarters
HAA's	66.6	µg/L	Running Avg of 4 quarters