GRAVENHURST

WATER SUMMARY

2015

REPORT

DRINKING WATER WORKS PERMIT: **143-209**
MUNICIPAL DRINKING WATER LICENCE: **143-109**

M.O.E. WATERWORKS#: **220002100**

INTRODUCTION

The Beach Road Water Treatment Plant (WTP) is owned and operated by the District Municipality of Muskoka. The WTP serving the community of Gravenhurst was constructed in 1983, replacing an old system that consisted of a well house at Nelson Street and a pump house supplying chlorinated water to the town from Gull Lake. The Gravenhurst WTP has a rated capacity of 10,000 cubic metres per day (m3/day) and the water system currently serves a population of approximately 7,400 people

The plant operates under licence 143-09 and permit 143-09, issued in October 2010 under the Municipal Drinking Water Licencing Program. The plant also presently operates under MOE permit to take water #2320-8G2MLQ (expires February 28, 2021), which permits the operation of up to 10,000 m3/d. The Raw Water intake structure is located near Brydon's Bay on Lake Muskoka approximately 11.5 meters deep and 1,000 meters from shore.

The plant process is a direct 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, four variable speed flocculators, and four dual media filters. Also located at the treatment plant are 2 backwash holding tanks, two contact chambers, two clear wells, 4 high lift pumps, 2 backwash pumps, chemical storage, preparation, and feed equipment.

The treatment plant system features chemical treatment consisting of hydrated lime / carbon dioxide (corrosion control), polyaluminum chloride (coagulation), polymer (filter aid), sodium hydroxide (pH control) and. disinfection in a chlorine contact chamber followed by final pH adjustment. The addition of hydrofluorosilic acid (fluoridation) to prevent tooth decay completes the treatment process.

The distribution system includes two elevated storage tanks supplying the urban area of Gravenhurst and one underground reservoir supplying Fenbrook Institutions owned by Correctional Services Canada.

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 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 Safe Drinking Water Act (2000) SDWA. 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 MOE 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 Ministry of Environment (MOE) 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 Affects, Inspections

Performance – Rated Capacity, Management of Residue
Monitoring and Recording – Flow Measuring Devices, Sampling
Operations and Maintenance

Comparison to Rated Capacity and Flow Rate

The Muskoka Beach Road water treatment plant has a rated capacity of 10,000 m3/day. In 2015, the total monthly average flow for the year was 3,187 m3/day. The maximum day flow for the year was 4,372 m3/day, however, the 3-year average for maximum day flow is 3,501 m3/day, which represents 35% of the plant design capacity.

Monthly flows are shown in the attached table.

The Permit to Take Water (PTTW #2320-8G2MLQ) permits 10,000 m3/day; therefore there were no exceedances of this permit.

Summary of Analytical Results

A total of 1,044 microbiological regulatory tests were performed in 2015 and compliance with Provincial standards was achieved throughout. There were 829 free chlorine residual tests performed in the distribution system, and all results were within guidelines. Staff continues 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 Muskoka Beach Road Water Treatment Plant:

Sodium Hypochlorite: Disinfectant
Polyaluminum Chloride (Stern PAC): Primary Coagulant
Polymer: Filter Aid
Sodium Hydroxide: Final pH adjustment
Hydrated Lime: Alkalinity and pH adjustment
Carbon Dioxide: pH adjustment
Sodium Permanganate: Taste and Odour Control, manganese precipitant
Hydrofluosilicic Acid: Fluoride to prevent tooth decay

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

Documentation of System Repairs and Upgrades

No significant capital expenses were incurred to conduct system repairs or upgrades in 2015.

External Audits

MOE Inspection

A MOE inspection was completed on February 5, 2016 and is attached to this report. The overall rating was 100%.

DWQMS Audit

In 2015 all drinking water systems had an external recertification audit performed. There were seven (7) minor non-conformances reported, all have subsequently been addressed and as a result all drinking water systems have been recertified. Overall, all drinking water systems are performing satisfactorily.

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

Part III Form 2
Section 11. ANNUAL REPORT.

Drinking-Water System Number:	**220002100**
Drinking-Water System Name:	Muskoka Beach Water Treatment Plant
Drinking-Water System Owner:	District Municipality of Muskoka
Drinking-Water System Category:	Large Municipal Residential
Period being reported:	January 01 to December 31, 2015

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:

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

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

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 in Gravenhurst was originally constructed in 1983. Significant improvements to process monitoring, control, and chemical feed systems were completed in 2004. The treatment process consists of chemically assisted coagulation-flocculation and direct filtration using dual media filters with a combination of sand and anthracite coal. Disinfection in a chlorine contact chamber followed by final pH adjustment and fluoridation completes the treatment process. The water system currently serves a population of approximately 7400 people. The rated water production of the plant is 10,000 cubic meters per day. Our raw water source is Lake Muskoka. Our intake is located approximately 11.5 meters deep, about 1000 meters from shore.

List all water treatment chemicals used over this reporting period

Sodium Hypochlorite, Sodium hydroxide, Polyaluminum Chloride, Carbon Dioxide, Hydrated Lime, Sodium Permanganate, Fluoride, Cationic Polymer

Were any significant expenses incurred to?

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

Describe

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
27/01/15	NDMA	0.018	µg/L	Resample	27/01/15
27/01/15	NDMA	0.014	mg/L	Resample	27/01/15
10/02/15	NDMA	0.014	mg/L	Resample	10/02/15
19/02/15	NDMA	0.010	mg/L	Resample	19/02/15
19/02/15	NDMA	0.019	mg/L	Resample	19/02/15

Microbiological testing done under section 8-2 during this reporting period

	Number of Samples	Range of E.Coli Or Fecal Results	Range of Total Coliform Results	Number of HPC Samples Or Background	Range of HPC Results (#-#) Or Background

		(#-#)	(#-#)	Colony Counts	Colony Counts
Raw	52	0 - 2	0 – 55	0	N/A
Treated	52	0 - 0	0 - 0	52	0 – 3
Distribution	313	0 - 0	0 - 0	195	0 – 3

Operational testing done under Schedule 7, 8 or 9 during the period covered by this Annual Report.

	Number of Grab Samples	**Range of Results (min # - max #)**	**Geometric Mean**
Turbidity	**8760**	0.0 – 0.10	0.04
Chlorine	**8760**	1.72 – 2.76	2.21
Chlorine Residual Distribution System	**8760**	0.14 – 2.02	1.17
Fluoride (If the DWS provides fluoridation)	**8760**	0.48 – 0.80	0.57

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

***NOTE**: Record the unit of measure if it is **not** milligrams per litre.*

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

Date of order or C of A	**Parameter**	**Date Sampled**	**Result**	**Unit of Measure**
Oct 10/10 Municipal Drinking Water Licence 143-109 Issue 1	E.Coli (backwash supernatant)	Jan - Dec	0 - 1	CFU/100 ml
Oct 14/10 Municipal Drinking Water Licence 143-109 Issue 1	Suspended Solids (backwash supernatant)	Jan - Dec	2.0 – 16.0	mg/L
Oct 14/10 Municipal Drinking Water Licence 143-109 Issue 1	Turbidity (backwash supernatant)	Jan - Dec	0.32 – 2.36	NTU
Oct 14/10 Municipal Drinking Water Licence 143-109 Issue 1	pH (backwash supernatant)	Jan - Dec	6.79 – 7.74	
Oct 14/10 Municipal Drinking Water Licence 143-109 Issue 1	Aluminum (backwash supernatant)	Jan - Dec	0.02 – 2.55	mg/L
Oct 14/10 Municipal Drinking Water Licence 143-109 Issue 1	Manganese (backwash supernatant)	Quarterly	0.0033 – 0.0057	mg/L
Oct 14/10 Municipal Drinking Water Licence 143-109 Issue 1	THM (backwash supernatant)	Quarterly	27 – 47	µg/L
Oct 14/10 Municipal Drinking Water Licence 143-109 Issue 1	Free Chlorine (backwash supernatant)	Jan - Dec	0.00 – 0.09	mg/L

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

Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
Antimony	May 19/15	0.05	µg/L	No
Arsenic	May 19/15	0.2<MDL	µg/L	No
Barium	May 19/15	12.0	µg/L	No
Boron	May 19/15	4.3	µg/L	No
Cadmium	May 19/15	0.009	µg/L	No
Chromium	May 19/15	0.06	µg/L	No
Lead*	May 19/15	0.01 <MDL	µg/L	No
Mercury	May 19/15	0.01<MDL	µg/L	No
Selenium	May 19/15	1<MDL	µg/L	No
Sodium	May 19/15	15.4	mg/L	No
Uranium	May 19/15	0.002<MDL	µg/L	No
Fluoride	May 19/15	0.48	mg/L	No
Nitrite	May 19/15	0.003<MDL	mg/L	No
Nitrate	May 19/15	0.224	mg/L	No
Nitrite	Feb 9/15	0.003<MDL	mg/L	No
Nitrate	Feb 9/15	0.229	mg/L	No
Nitrite	Aug 11/15	0.003<MDL	mg/L	No
Nitrate	Aug 11/15	0.247	mg/L	No
Nitrite	Nov 12/15	0.003<MDL	mg/L	No
Nitrate	Nov 12/15	0.177	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 small non-municipal non-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.	N.A.	N.A.
Distribution	1	0.01		µg/L	0

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

Parameter	Sample Date	Result Value	Unit of Measure	Exceedance

Alachlor	May 19/15	0.02<MDL	µg/L	No
Aldicarb	May 19/15	0.01<MDL	µg/L	No
Aldrin + Dieldrin	May 19/15	0.01<MDL	µg/L	No
Atrazine + N-dealkylated metobolites	May 19/15	0.01<MDL	µg/L	No
Azinphos-methyl	May 19/15	0.05<MDL	µg/L	No
Bendiocarb	May 19/15	0.01<MDL	µg/L	No
Benzene	May 19/15	0.32<MDL	µg/L	No
Benzo(a)pyrene	May 19/15	0.004<MDL	µg/L	No
Bromoxynil	May 19/15	0.33<MDL	µg/L	No
Carbaryl	May 19/15	0.05<MDL	µg/L	No
Carbofuran	May 19/15	0.01<MDL	µg/L	No
Carbon Tetrachloride	May 19/15	0.16<MDL	µg/L	No
Chlordane (Total)	May 19/15	0.01<MDL	µg/L	No
Chlorpyrifos	May 19/15	0.02<MDL	µg/L	No
Cyanazine	May 19/15	0.03<MDL	µg/L	No
Diazinon	May 19/15	0.02<MDL	µg/L	No
Dicamba	May 19/15	0.20<MDL	µg/L	No
1,2-Dichlorobenzene	May 19/15	0.41<MDL	µg/L	No
1,4-Dichlorobenzene	May 19/15	0.36<MDL	µg/L	No
Dichlorodiphenyltrichloroethane (DDT) + metabolites	May 19/15	0.01<MDL	µg/L	No
1,2-Dichloroethane	May 19/15	0.35<MDL	µg/L	No
1,1-Dichloroethylene (vinylidene chloride)	May 19/15	0.33<MDL	µg/L	No
Dichloromethane	May 19/15	0.35<MDL	µg/L	No
2-4 Dichlorophenol	May 19/15	0.15<MDL	µg/L	No
2,4-Dichlorophenoxy acetic acid (2,4-D)	May 19/15	0.19<MDL	µg/L	No
Diclofop-methyl	May 19/15	0.40<MDL	µg/L	No
Dimethoate	May 19/15	0.03<MDL	µg/L	No
Dinoseb	May 19/15	0.36<MDL	µg/L	No
Diquat	May 19/15	1<MDL	µg/L	No
Diuron	May 19/15	0.03<MDL	µg/L	No
Glyphosate	May 19/15	1<MDL	µg/L	No
Heptachlor + Heptachlor Epoxide	May 19/15	0.01<MDL	µg/L	No
Linadane (Total)	May 19/15	0.01<MDL	µg/L	No
Malathion	May 19/15	0.02<MDL	µg/L	No
Methoxychlor	May 19/15	0.01<MDL	µg/L	No
Metolachlor	May 19/15	0.01<MDL	µg/L	No
Metribuzin	May 19/15	0.02<MDL	µg/L	No
Monochlorobenzene	May 19/15	0.30<MDL	µg/L	No
Paraquat	May 19/15	1<MDL	µg/L	No
Parathion	May 19/15	0.02<MDL	µg/L	No
Pentachlorophenol	May 19/15	0.15<MDL	µg/L	No
Phorate	May 19/15	0.01<MDL	µg/L	No
Picloram	May 19/15	1<MDL	µg/L	No
Polychlorinated Biphenyls(PCB)	May 19/15	0.04<MDL	µg/L	No
Prometryne	May 19/15	0.03<MDL	µg/L	No
Simazine	May 19/15	0.01<MDL	µg/L	No
THM (NOTE: annual average from Distribution – 4 samples)	Feb, May Aug, Sept.	63	µg/L	No
Temephos	May 19/15	0.01<MDL	µg/L	No

Terbufos	May 19/15	0.01<MDL	µg/L	No
Tetrachloroethylene	May 19/15	0.35<MDL	µg/L	No
2,3,4,6-Tetrachlorophenol	May 19/15	0.20<MDL	µg/L	No
Triallate	May 19/15	0.01<MDL	µg/L	No
Trichloroethylene	May 19/15	0.44<MDL	µg/L	No
2,4,6-Trichlorophenol	May 19/15	0.25<MDL	µg/L	No
2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)	May 19/15	0.22<MDL	µg/L	No
Trifluralin	May 19/15	0.02<MDL	µg/L	No
Vinyl Chloride	May 19/15	0.17<MDL	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

District of Muskoka - Beach Road WTP - Gravenhurst

1.0 Water Flow Summary - 2015

Month	Total Monthly (m^3)	Average Day Flow (m^3/d)	Maximum Day Flow (m^3/d)	Minimum Day Flow (m^3/d)	Comments
January	76,084	2,454	3,239	2,001	
February	67,952	2,427	3,516	1,365	
March	79,251	2,556	2,983	2,186	
April	82,980	2,766	3,174	2,345	
May	106,105	3,423	4,372	2,729	
June	103,062	3,435	3,885	2,837	
July	106,813	3,446	4,288	2,845	
August	96,138	3,101	3,821	2,370	
September	85,982	2,866	3,413	2,271	
October	81,190	2,619	3,180	1,958	
November	78,185	2,606	3,176	1,734	
December	85,035	2,743	3,086	2,223	

Total	1,048,778
Average Day	2,867.9
Maximum Day	4,372.0
Minimum Day	1,364.8

District of Muskoka - Beach Road WTP - Gravenhurst

Raw Water Monthly Analysis Summary - 2015

Month	Alkalinity	Hardness	pH	Turbidity	True Colour	Temperature	TDS	Langliers Saturation Index	Total Coliform	E-coli	Total Number of Samples
Parameter	*mg/l*	*mg/l*	*pH*	*ntu*	*tcu*	*Celcius*	*mg/l*		*CFU/100ml*	*CFU/100ml*	
January	7.5	14	6.88	0.42	16	2.3	50.4	-3.1	9	0	4
February	7.4	15	6.86	0.46	15	2.1	51.2	-3.1	4	0	4
March	7.7	16	6.74	0.32	24	2.1	52.0	-3.2	1	0	5
April	7.8	14	6.79	0.36	20	3.4	52.2	-3.1	6	0	4
May	7.7	13	6.74	0.44	19	6.2	50.1	-3.2	3	0	4
June	7.2	16	6.79	0.33	21	9.3	48.9	-3.0	4	0	5
July	7.5	15	6.68	0.34	18	10.3	48.9	-3.2	5	0	4
August	6.8	13	6.54	0.36	18	10.7	49.3	-3.3	44	0	5
September	7.1	14	6.58	0.38	25	13.2	49.3	-3.3	27	0	4
October	7.8	13	6.85	0.36	13	12.0	51.1	-3.0	4	1	4
November	7.9	13	6.89	0.36	23	8.8	51.7	-3.0	13	1	5
December	8.1	14	6.92	0.26	33	6.5	N/A	N/A	6	1	4
Average	7.5	14	6.77	0.37	20	7.2	50.4	-3.1	11	0	4

District of Muskoka - Beach Road WTP - Gravenhurst

Chemical Usage Summary - 2015

Month	Powdered Activated Carbon		CO2		Hydrated Lime		Coagulant	
	Average Dosage mg/L	Total kg	Average Dosage mg/L	Total kg	Average Dosage mg/L	Total kg	Average Dosage mg/L	Total Kg
January	0.0	0.0	44.88	3,739.8	24.5	2,047.1	8.20	685
February	0.0	0.0	43.1	3,221.9	24.3	1,820.5	8.2	616
March	0.0	0.0	39.9	3,525.7	21.7	1,897.1	8.4	741
April	0.0	0.0	36.3	3,491.9	22.8	2,181.9	8.6	823
May	0.0	0.0	39.8	4,854.0	21.8	2,653.3	9.2	1,118
June	0.0	0.0	48.8	5,767.5	24.2	2,857.3	8.9	1,054
July	0.0	0.0	43.6	5,235.7	23.7	2,845.7	8.9	1,070
August	0.0	0.0	41.5	4,409.8	23.4	2,490.6	8.9	947
September	0.0	0.0	42.0	3,952.3	23.1	2,169.9	8.8	830
October	0.0	0.0	47.7	4,177.4	22.2	1,950.3	8.6	756
November	0.0	0.0	47.7	3,960.1	21.6	1,789.1	8.4	695
December	0.0	0.0	43.3	3,959.4	21.1	1,930.9	8.2	754
Average Monthly	0.0	0.0	43.2	4191.3	23	2219.5	8.6	841
Total Yearly		0	275/Del Chge	50,296		26,634		10,089

Month	Sodium Hydroxide		Fluoride		Chlorine		Soda Ash	
	Average Dosage mg/L	Total Kg	Average Dosage mg/L	Total kg	Average Dosage mg/L	Total Kg	Average Dosage mg/L	Total Kg
January	13.3	1,142	0.87	66.5	4.28	367.3	0.00	0.0
February	14.3	1,094	0.87	59.4	3.61	277.3	0.00	0.0
March	12.6	1,148	0.87	69.3	3.22	291.1	0.00	0.0
April	10.3	1,018	0.87	72.5	3.78	372.1	0.00	0.0
May	11.0	1,378	0.87	92.8	4.12	512.5	0.00	0.0
June	17.0	2,044	0.88	90.4	4.15	500.0	0.00	0.0
July	15.0	1,881	0.93	99.6	3.84	479.5	0.00	0.0
August	15.5	1,688	0.93	89.7	4.58	497.0	0.00	0.0
September	16.5	1,583	0.93	80.0	4.71	452.1	0.00	0.0
October	17.8	1,591	0.93	75.5	4.38	392.6	0.00	0.0
November	16.8	1,423	0.93	72.8	4.10	347.0	0.00	0.0
December	14.7	1,364	0.93	79.2	4.08	380.2	0.00	0.0
Average Monthly	14.6	1446	0.90	79	4.19	437	0	0
Total Yearly		17,354		948		4,869		0

Month	Potassium Permanganate		Polymer	
	Average Dosage mg/L	Total Kg	Average Dosage mg/L	Total Kg
January	0.0	0	7.5	194
February	0.0	0	7.6	178
March	0.0	0	8.2	213
April	0.0	0	9.1	228
May	0.0	0	4.1	107
June	0.0	0	5.6	141
July	0.0	0	6.1	159
August	0.0	0	5.4	139
September	0.0	0	4.8	120
October	0.0	0	4.3	109
November	0.0	0	4.1	102
December	0.0	0	4.3	112
Average Monthly	0.0	0	5.9	150
Total Yearly		0		1,802

2015 GRAVENHURST WATER DISTRIBUTION SUMMARY

New Services:
Three new services were installed in 2015.

Watermain Failures:
Two 25 mm lines were repaired at a total cost of $ 8,700.00.

Service Leaks:
Four water services leaks were repaired at an average cost of $ 2,230.00.

Frozen Services:
Nineteen water services located froze within the municipal roadway. 16 Frozen services were observed on private property.

Watermains:
No new water main was installed or replaced in 2015.

Valve Replacement:
One valve was replaced in 2015.

Water Service Replacement:
One 19 mm PE (160 psi) service was replaced at an approximate cost of $7,500.00. (This service had a history of freezing within the Municipal roadway).

Fire Hydrants:
468 municipally owned hydrant were inspected, operated, and/or flushed at least once in 2015.

Meter Replacement/Installations:
225 water meters were replaced as part of the aged meter change-out programme in 2015.

Service Box Repairs:
Four curb boxes where repaired in 2015.

Air-vacuum release valves:
All sixteen (17) Air-Vacuum release valves, were removed, cleaned, and tested for the yearly maintenance inspection.

Locates:
Field staff addressed 544 locate requests in 2015.

Ministry of the Environment and Climate Change

Safe Drinking Water Branch

Director's Office
2nd floor
40 St. Clair Ave West
Toronto ON M4V 1M2

Ministère de l'Environnement

Direction du contrôle de la qualité de l'eau potable

Bureau du directeur
2e étage
40, avenue St. Clair Ouest
Toronto (Ontario) M4V 1M2

February 12, 2016

The District Municipality of Muskoka
70 Pine Street
Bracebridge, Ontario
P1L 1N3

Attention: Mr. Marcus Firman, Director of Water and Wastewater Engineering

RE: 2015 Drinking Water Inspection Report
Gravenhurst (Muskoka Beach) Drinking Water System (DWS#220002100)
Date of MOECC inspection: February 5, 2016

Please find enclosed the Ministry of the Environment and Climate Change's 2015 Inspection Report for the Gravenhurst (Muskoka Beach) Drinking Water System (DWS#220002100), following an inspection of the water treatment plant and distribution system on February 5, 2016.

The primary focus of this inspection was to confirm compliance with Ministry of the Environment and Climate Change legislation and control documents, as well as conformance with Ministry drinking water related policies for the inspection period. The Ministry is implementing a rigorous and comprehensive approach in the inspection of water systems that focuses on the source, treatment, and distribution components as well as water system management practices.

In order to measure individual inspection results, the Ministry has established an inspection compliance risk framework based on the principles of the Inspection, Investigation & Enforcement (II&E) Secretariat and advice of internal and risk experts. The Inspection Summary Rating Record (IRR), included as Appendix D of the inspection report, provides the Ministry, the system Owner and the associated Public Health Units with a summarized quantitative measure of the drinking water system's annual inspection and regulated water quality testing performance. IRR ratings are published (for the previous inspection year) in the Ministry's Chief Drinking Water Inspector's Annual Report. If you have any questions or concerns regarding the rating, please contact Craig Seabrook, Water Program Supervisor, at 705-739-6392.

Section 19 of the Safe Drinking Water Act (Standard of Care) creates a number of obligations for individuals who exercise decision-making authority over municipal drinking water systems. Please be aware that the Ministry has encouraged such individuals, particularly municipal councillors, to take steps to be better informed about the drinking water systems over which they have decision-making authority. These steps could include asking for a copy of this inspection report and a review of its findings. Further information about Section 19 can be found in the Ministry's publication "Taking Care of Your Drinking Water: A guide for members of municipal council" found under the "Resources" tab on the Ministry's Drinking Water Ontario website at www.ontario.ca/drinkingwater.

If you have any questions or concerns regarding this inspection report, please contact the undersigned at 705-739-6379.

Respectfully,

James Crumbie
Provincial Officer
Ministry of the Environment and Climate Change
Barrie District Office
(705) 739-6379 (Tel)
(705) 739-6350 (Fax)
James.crumbie@ontario.ca

CC Mike Mitchell, District of Muskoka (email: mmitchell@muskoka.on.ca)
Maurice Belleau, Chief Operator, District of Muskoka (email: mbelleau@muskoka.on.ca)
Medical Officer of Health, Simcoe Muskoka District Health Unit
Barrie District Office File, Ministry of the Environment and Climate Change

Ontario

Ministry of the Environment and Climate Change

GRAVENHURST (MUSKOKA BEACH) DRINKING WATER SYSTEM

Inspection Report

Site Number:	220002100
Inspection Number:	1-BYLI7
Date of Inspection:	Feb 05, 2016
Inspected By:	James Crumbie

OWNER INFORMATION:

Company Name:	MUSKOKA, THE CORPORATION OF THE DISTRICT MUNICIPALITY OF		
Street Number:	70	**Unit Identifier:**	District Office
Street Name:	PINE St N		
City:	BRACEBRIDGE		
Province:	ON	**Postal Code:**	P1L 1N3

CONTACT INFORMATION

Type:	Operator	**Name:**	Maurice Belleau
Phone:	(705) 645-6764	**Fax:**	(705) 645-7599
Email:	mbelleau@muskoka.on.ca		
Title:	Chief Operator		

Type:	Main Contact	**Name:**	Mike Mitchell
Phone:	(705) 645-6764 x1331	**Fax:**	(705) 789-0385
Email:	mmitchell@muskoka.on.ca		
Title:	Manager of Water and Sewer Operations		

INSPECTION DETAILS:

Site Name:	GRAVENHURST (MUSKOKA BEACH) DRINKING WATER SYSTEM
Site Address:	1105 MUSKOKA BEACH RD GRAVENHURST P1P 1R1
County/District:	Gravenhurst
MOECC District/Area Office:	Barrie District
Health Unit:	SIMCOE MUSKOKA DISTRICT HEALTH UNIT
Conservation Authority	N/A
MNR Office:	N/A
Category:	Large Municipal Residential
Site Number:	220002100
Inspection Type:	Announced
Inspection Number:	1-BYLI7
Date of Inspection:	Feb 05, 2016
Date of Previous Inspection:	Dec 02, 2014

COMPONENTS DESCRIPTION

Site (Name):	MOE DWS Mapping		
Type:	DWS Mapping Point	**Sub Type:**	
Comments:			

Not Applicable

Site (Name): RAW WATER
Type: Source **Sub Type:** Surface Water
Comments:

Raw Water Intake

The raw water intake consists of a 1.0 metre (m) x 1.0 m x 2.0 m high intake crib, equipped with a 1.25 m diameter x 1.45 m high side entry intake hood extending from the intake crib which sits at a depth of approximately 11.5 m in Brydon Bay, Lake Muskoka. The valved, 600 millimetre (mm) diameter, approximately 1000 m long intake pipe runs west from the low lift pumping station (LLPS).

Low Lift Pumping Station

The concrete, below grade LLPS is located approximately 155 m north west of the water treatment plant (WTP) building. The chamber has one "J" shaped, screened vent pipe and is accessed by two locked, insulated and leak/contaminant proofed plate metal hatches and a ladder. The chamber is approximately 7.1 m x 3.7 m x 4.7 m deep, with the bottom section forming the low lift pump well (LLPW). Four submersible low lift pumps (LLP's) (with provision for a fifth) rest in the LLPW, two pumps are rated at 60.2 litres per second (L/s) at 19 m total dynamic head (TDH) and two are rated at 30.1 L/s at 19 m TDH. Each pump is individually valved and check valved. The common LLP discharge header directs water to the WTP via a 350 mm diameter, 185 m long polyethylene (PE) pipe. The header is equipped with a surge anticipating relief valve which will open and direct water into the LLPW if pressure gets too high, a valve and a pressure gauge. The chamber is level alarmed.

Plant Process Drainage Chamber (PPDC)

This concrete, below grade, 2.7 m x 1.9 m x 4.7 m deep chamber is located directly adjacent to the LLPW. It has a separate plate metal access hatch but is hydraulically connected to the LLPW by an overflow wall. This chamber is designed for the collection of supernatant from the backwash water holding tanks (BWHT's), filter-to-waste, chlorine contact tank (CCC) dewatering tank water and various process tank overflows. The contents of the PPDC can be discharged by gravity to the lake outfall, via a valved 500 mm diameter, approximately 385 m long pipe or to the LLPW via the overflow wall.

Site (Name): TREATED WATER PART 1
Type: Source **Sub Type:** Treatment Facility
Comments:

Gravenhurst Water Treatment Plant

The WTP is a cedar shake sided building located at 1105 Muskoka Beach Road in the Town of Gravenhurst. The facility features direct filtration with coagulation, flocculation, filtration and disinfection. The works are all contained within the building with the exception of the LLPS, the outdoor, below grade reservoirs and the generator building. Access is provided through a number of alarmed and locking steel doors. The current building was constructed in 1983 and considerable upgrades to the works have been completed since that time.

Raw Water Influent Chamber

This 2.0 m x 10.0 m x 2.5 m chamber in the bottom of the WTP is the point at which the raw water main enters the building. There is a sump pump draining to the sanitary sewers in this chamber. Raw water passes a valved supply line for the raw water turbidity and pH meters and sample line, a valved supply line for seal water to the sidestream circulation pump (SCP), a valved 75 mm supply line to the SCP loop, an air relief valve, the valved recycled supernatant return point, the sodium permanganate (NaMnO4) injection point, the continuously monitored raw water magnetic flow meter, the carbon dioxide gas injection point, and the raw water flow control valve (FCV). Immediately after the FCV, the lime slurry and SCP water is returned to the main.

Raw water supplies the SCP loop which has a centrifugal pump, rated at 3.5 L/s at 10.9 TDH, a manually read flow indicator (m3/hr), a valve, a lime slurry injection point, a strainer, a check valve and another valve before it is returned to the common raw header. The raw water acts as a carrier for the

lime slurry which is used to adjust raw water alkalinity. The loop provides detention time for dissolving lime particles.

After the lime addition, the water passes a valved supply line for the post lime addition pH and temperature meters, the coagulant and polymer addition points, a mechanical in-line mixer, an air relief valve and a valve.

The raw water pipe is then directed upwards to the pre-treatment facility.

Pre-Treatment Facility

The pre-treatment facility is located upstairs in the WTP. Water entering this area passes over a raw water overflow weir which directs excess water to a raw water overflow sump and then into a 350 mm diameter pipe leading to the BWHT's. There are two in-line 2.35 m x 1.4 m manually removable woven plastic or fiberglass mesh screens with 10 mm mesh openings in a screen chamber suspended on a chain hoist. A wash catchment directs waste wash water from the screens to the BWHT's. The screens are installed in series. Water then enters a 6.55 m x 1.4 m x 1.75 m deep baffled pre-treatment channel. Within this channel are two standby mechanical mixers with 1.5 kW motors which replace the in-line mixer in the raw water header if it is unusable. There is a normally closed, locked and chained 600 mm x 600 mm sluice gate at the downstream end of the pre-treatment channel which can be used to bypass the flocculation tanks. A continuous pH and temperature probe is situated in this channel. An unused supply pump drawing from this channel can be used to supply the unused permanganate analyser. At the end of this channel, water flows past two slide plate locations and into the flocculation tank influent channel. At either end of this channel, overflow weirs discharging to 250 mm diameter pipes, direct excess water to the BWHT's.

Flocculation Works

There are four flocculation tanks which are supplied from the influent channel. The tanks are valved to produce two separate passes (two sets of two tanks operate in series). Water enters the outside flocculation tanks (approximate size is 3.1 m x 3.0 m x 5.1 m) through sluice gates, exits these tanks through another gate below the first, through up shafts and enters the central tanks (approximate size 2.25 m x 3.0 m x 5.1 m). The flocculated water flows out of the two central tanks by way of a sluice gate and is directed into the filter influent channel. The outside tanks also have outflow sluice gates which are normally closed. The two central tanks have inlet sluice gates which are normally closed. Each tank is equipped with a mechanical mixer to keep the floc suspended and promote further floc production and a normally closed drain valve which can be used to empty the tanks and direct the resulting material to the BWHT's.

Filtration

The water entering the filter influent channel passes through a slide plate location, past two depth adjustable overflow weirs which drain to the BWHT's through 300 mm pipes and then into four separate filter inlet lines, each with a mechanical sluice gate. This channel has a level sensor which has control input for LLP operation and flow rate into the works, and flow governing baffles.

Filtration is achieved by four 2.3 m x 4.75 m x 1.05 m deep multi media filters located downstream of the filter inlet channel. Each filter has a filtration rate of 10.0 m/hr and is equipped with layers of anthracite (550 mm deep with effective size of 1.05 mm to 1.15 mm and uniformity coefficient not greater than 1.35), silica sand (200 mm deep, effective size of 0.42 mm to 0.46 mm and uniformity coefficient not greater than 1.40) and graded supporting gravel (300 mm deep) over the underdrains.

Each filter is equipped with a level sensor, a pressure differential indicator for monitoring head loss, motorized flow control valves on the backwash water inlet lines supplied by two backwash pumps located in the high lift pump well (HLPW), motorized valves on the backwash water outlet lines which empty to the BWHT's, filter-to-waste capability, and a surface wash system. Each surface wash system is composed of an agitator flow control valve rated at 5.5 L/s at 550 kPa, isolation valves and inlet lines throughout the filter media. The surface wash systems are supplied by domestic water and operate during backwashes.

Site (Name): TREATED WATER PART 2

Type: Source **Sub Type:** Treatment Facility

Comments:

The filtered water outlet lines from each filter are equipped with continuous magnetic flow meters, on-line turbidimeters, motorized flow control valves which direct filter-to-waste water to the BWHT's or in emergencies to the lake outfall, motorized flow control valves which direct filtered water to the valved chlorine contact inlet chamber. The backwash water supply line inputs before the flow meters.

Two centrifugal backwash pumps (one duty, one standby), each rated capacity at 160 L/s at a TDH of 11.2 m with a 30 kW constant speed drive, air relief valve, isolation valves, and backflow prevention, and with suction in the HLPW supply finished water for filter backwashes. These pumps discharge water through a continuously monitored venturi flow meter and a motorized flow control valve before directing it to any of the four filters.

Chlorine Contact Chambers (CCC's)

The valved filtered water lines combine into one common header. The chlorine injection point is located here. This line then splits into two valved lines which discharge into two 2.2 m x 1.1 m x 5.7 m deep, level regulated chlorine contact inlet chambers (these two tanks can be joined by two normally closed sluice gates) and then into the two CCC's.

Each of the two, in-ground, concrete CCC's measure approximately 10.75 m x 7.9 m x 6.7 m deep, have volumes of approximately 396 m3, are equipped with flow governing baffles, drain valves to the chlorine contact dewatering chamber, and an overflow weir wall to maintain constant volumes in the tanks. Individual sampling pumps draw from just after the overflow weirs and supply continuously monitored pH and free chlorine residual (primary disinfection and CT monitoring) analysers. Each CCC discharges to a reservoir, through an opening at the bottom middle of the south CCC wall, downstream of the weir wall. Sodium hydroxide is injected into the water as it enters the two reservoirs.

The plate metal access hatches to the CCC's are located on raised concrete sills in the floor of the HLP room.

Reservoirs

The two concrete, in-ground reservoirs, each approximately 13.45 m x 7.85 m x 6.7 m deep with usable volumes of approximately 608 m3, receive water from the CCC's. The two tanks are interconnected by a normally closed valve. Both reservoirs have an overflow weir discharging to the outfall chamber. Individual sampling pumps draw from these tanks and supply continuously monitored pH and temperature meters. The reservoirs are accessed by way of plate metal and locked double covered hatches on raised concrete platforms outside of the WTP. The screened vents are located in the sides of the access platforms. Water discharges from the two reservoirs into the HLPW through two sluice gates, one in each cell of the HLPW.

High Lift Pumping Station (HLPS)

The HLPS is comprised of two 4.2 m x 2.0 m x 6.7 m deep HLPW's (approximate usable volumes of 51 m3 each), supplied with water from the two reservoirs, and separated by a concrete wall equipped with a normally open sluice gate. Both cells are equipped with continuously monitored level sensors. Four vertical HLP's (three duty, one stand-by), two above each cell, draw water from this tank and direct it to the distribution system. One pump with a 37.5 kW constant speed drive is rated at 40 L/s at a TDH of 60 m, one pump with a 75 kW constant speed drive is rated at 80 L/s at a TDH of 62 m, and two pumps, are each with a 56 kW constant speed drive are rated at 60 L/s at a TDH of 61 m. Each pump discharge is fitted with an air relief valve, backflow prevention, a pressure gauge and an isolation valve before it directs water into the common HLP discharge header. The common header is equipped with a pressure relief valve arrangement which will open and return water to the HLPW if system pressure gets too high, an air relief valve, a trim chlorination injection point, a fluoride injection point, a continuously monitored pressure indicator, a continuously monitored magnetic flow meter, an isolation valve, a supply line which feeds finished water pH, free chlorine residual, turbidity and fluoride analysers and a sample line to the lab before it discharges to the distribution system.

Parts of the entire system, from raw water inlet to the distribution system, are monitored by and in certain instances, can be controlled by, the WTP supervisory control and data acquisition (SCADA) system. The control equipment for the various components and facilities is all routed through the various control panels and programmable logic controllers and then to the WTP.

All of the in plant floor drains reportedly empty to the sanitary sewers.

Stand-by Power Facility

A stand-by diesel generator with a minimum continuous rating of 255 kW, and two contained 1,150 L diesel fuel storage tanks with electronic and manual level monitoring, are located in a separate cedar shake sided building on the same property as the WTP. This equipment provides emergency power to critical process equipment (WTP and LLPS). A cooling water line from the diesel generator discharges into the sanitary sewers. It is programmed for automatic starts on a power failure and stops after power restoration.

Site (Name): CHEMICAL STORAGE AND FEED SYSTEMS

Type: Source **Sub Type:** Treatment Facility

Comments:

Chemical Storage and Feed Systems

The various chemical systems are programmed to start and stop on specific analyser set points and/or flows at the corresponding flow meters in the works. All of the supply lines are contained in polyvinyl chloride (PVC) conduit.

Hydrated Lime

The automated hydrated lime system for raw water alkalinity and pH adjustment consists of a dry hydrated lime bulk bag discharge and batching system complete with, monorail and hoist for bulk bag maneuvering, a 0.5 m3 storage hopper, volumetric feeder, dust collector and blower for outside venting, sump pump discharging to the sanitary sewers for removal of overflow and waste slurry, and 2000 L solution tank. The hopper, sump pit and slurry tank are all level alarmed. Domestic water feeds into the system through a continuously monitored magnetic flow meter and motorized flow control valve, enters the solution tank, where hydrated lime is added and mixed by two duty mechanical mixers. Two chemical metering pumps (one duty, one standby) with rated capacities of 2490 L/hr at 300 kPa and equipped with electronic flow sensors, pressure indicators, valving, backflow prevention, and pressure relief valves back to the slurry tank, draw lime slurry from the tank and inject it into the strainer in the raw water SCP loop.

Carbon Dioxide (CO2)

The carbon dioxide feed system, used for pH adjustment, injects carbon dioxide gas into the raw water header and consists of a 12680 kilogram bulk carbon dioxide storage tank located outside, just north of the WTP, control panels complete with control valves, monitored pressure transducer, pressure indicators, pressure relief valves, valving, pressure control valve, monitored coriolis mass flow meter and diffuser.

Coagulant

The addition of coagulant results in the impurities in the raw water sticking together and forming large particles (floc) which are more easily removed by filtration. The coagulant in use is polyaluminum chloride (StemPAC). The coagulant storage and feed system consists of two contained, level alarmed, vented, plastic bulk storage tanks having a total capacity of 13640 L, two positive displacement metering pumps (one duty, one standby), each with capacities of 17.1 L/hr at a discharge pressure of 400 kPa, a chemical feed line injecting PACL into the in-line mixer in the raw water header, electronic flow sensors, pressure indicators, valving, backflow prevention, and pressure relief valves back to the bulk tanks. The tanks are filled by truck from outside.

Disinfectant - Sodium Hypochlorite

The sodium hypochlorite storage and feed system consists of two contained, level alarmed, vented, plastic 4500 L bulk storage tanks, two positive displacement metering pumps (one duty, one standby),

each with capacities of 15.6 L/hr at a discharge pressure of 400 kPa which inject sodium hypochlorite into the filter effluent common header or the raw water header, one standby pump with a capacity of 6.3 L/hr at a discharge pressure of 1000 kPa which feeds sodium hypochlorite to the HLP header for top-up of chlorine residuals. All of the pumps are equipped with electronic flow sensors, valving, pressure indicators, backflow prevention, and pressure relief valves back to the bulk tanks.

Sodium Permanganate (NaMnO4) – not in use

The NaMnO4 feed system is utilized to control taste, odour and manganese. The system consists of a contained, continuously monitored drum weigh scale, direct from barrel draw, two chemical metering pumps (one duty, one standby), each with capacities of 2.1 L/hr at a discharge pressure of 1750 kPa, chemical feed line to the raw water header, electronic flow sensors, valving, pressure indicators, outdoor venting, backflow prevention, and pressure relief valves back to the barrel.

Sodium Hydroxide - NaOH

The NaOH storage and feed system is used for final pH adjustment and consists of one contained, level alarmed and vented, 6000 L Polyethylene bulk storage tank, three chemical pumps (two duty, one standby), each with capacities of 6.3 L/hr at a discharge pressure of 1000 kPa, pressure indicators, valving, outdoor venting, backflow prevention, supply lines, and pressure relief valves back to the bulk tank. The NaOH is injected into carrier water lines (domestic supply) for dilution, which then inject into the discharges of each of the two CCC's after the draw points for the CCC chlorine analysers. Flow indicators are in-place on the domestic water feed lines. There is a tank fill line to the outside.

Fluoridation

The hydrofluosilicic acid storage and feed system is used for tooth decay control and consists of one contained, isolated and vented, continuously monitored drum weigh scale, direct from barrel draw, two chemical pumps (one duty, one standby), each with capacities of 1.1 L/hr at a discharge pressure of 1750 kPa, chemical feed line to the HLP discharge header, valving, pressure indicators, outdoor venting, backflow prevention, and pressure relief valves back to the barrel. The pumps and works are shielded with clear plastic for safety.

Polymer

The polymer system, installed in 2013, acts as an aid to the coagulation process. Polymer is injected at the same point as the coagulant, on the raw water discharge header. The polymer system consists of two positive displacement metering pumps(one duty and one standby), each capable of 23.4 L/hr. The flow line is equipped with a flow monitor that has been incorporated into the SCADA system and is alarmed for pump failure. The polymer is added based on flow, and is controlled by the PLC. The polymer is fed from a chemical day tank. Spill containment has been provided for two chemical containment areas, the day tank/metering pump area, and the area where the polymer drums are being stored. The plant currently uses a cationic epichlorohydrin amine polymer filter aid BASF Magnafloc LT-7981 [N-methyl-methanamine with chloromethyl(oxirane)].

Site (Name): BACKWASH PROCESS RESIDUALS - TREATMENT AND RE-CIRCULATION

Type: Source **Sub Type:** Treatment Facility

Comments:

Backwash Process Residuals - Treatment and Re-Circulation

Backwash Holding Tanks – BWHT's

These two concrete, sloped bottom tanks, with built in sludge hoppers in the bottoms, and with approximate dimensions of 11.2 m x 7.9 m x 4.9 m deep, receive backwash waste water, filter-to-waste water, screen wash water, screen chamber overflow water, flocculation influent channel overflow water, flocculation tank drain water, and filter influent channel overflow water. Backwash water is directed through a continuously monitored turbidimeter before it discharges into the BWHT's. Motorized flow valves regulate the flow of backwash water and filter-to-waste water into the tanks and electronic level sensors determine which tank receives input. The backwash holding tanks settle out suspended solids in the waste water with sludge settling to the bottom and supernatant remaining at

the surface. Each tank is equipped with a floating decanter with sludge level sensor and motorized flow valve which draw off supernatant, direct it past a composite sampler and a continuously monitored turbidimeter and then to either of the supernatant recycling pump (normal operations) or to a flow valve discharging into the decant chamber (emergency operations).

The supernatant recycling flow is restricted to 20% of the raw water flow by one supernatant recycling pump with a capacity of 11.6 L/s at 14.6 m TDH, backflow prevention, one continuously monitored magnetic flow meter, and one flow control valve located on the recycle piping return to the raw water header.

Accumulated sludge and excess supernatant is withdrawn from the BWHT's by way of valved suction lines feeding two centrifugal sludge transfer pumps, each with capacities of 9.9 L/s at 15.8 m TDH and backflow prevention, and directed past a continuously monitored magnetic flow meter, isolation valves, a valved, high pressure domestic water wash line with backflow prevention, and to either of the valved sanitary sewer discharge and into the on-site sewage pumping station or to the sludge truck loading area.

The BWHT's are equipped with overflow weirs which direct any excess water to the plant outfall chamber.

Decant Chamber

The concrete decant chamber is a 1.05 m x 2.8 m x 11.9 m deep chamber located in the base of the WTP and can be used (very rare) to transfer supernatant water from the BWHT's to the outfall chamber. The chamber is equipped with one submersible pump having a rated capacity of 40.4 L/s at a TDH of 3.66 metres. This chamber is level alarmed and accessed by a plate metal hatch. Discharge to this chamber must be manually selected in the SCADA system and only occurs in emergency situations.

Dewatering Chamber

The concrete dewatering chamber consists of one 1.0 m x 1.0 m x 11.9 m deep chamber, used to drain the chlorine contact tanks reservoirs for inspection and/or cleaning. A submersible pump can be added to the chamber to transfer water to the outfall chamber. This chamber is accessed by a plate metal hatch and is located adjacent to the decant chamber.

Outfall Chamber

The concrete outfall chamber is comprised of one 5.2 m x 1.0 m x 2.15 m deep chamber can be used to transfer water by gravity from the decant chamber, BWHT overflows, reservoir overflows, filter-to-waste water, and chlorine contact tank dewatering chamber to the PPDC located at the LLPS in emergency situations. Approximately 185 m of 500 mm diameter pipe extends from the outfall chamber to the PPDC. Discharge to Lake Muskoka can be accomplished via a 500 mm diameter discharge pipe that is approximately 385 metres long.

Access to the outfall chamber is through a manhole located immediately adjacent to the outside rear of the WTP.

Sewage Pumping Station

This station consists of two submersible sanitary pumps, each having a rated capacity of 4.5 L/s at a TDH of 12.0 metres. The pumps are used to transfer accumulated sludge from the backwash holding tank sludge forcemain and sanitary waste from the WTP to an existing sanitary manhole on Muskoka Beach Road. This station is located south of the WTP, next to the diesel generator building.

Miscellaneous

Monorails

The Gravenhurst water system has one 2.0 tonne monorail (with electrically operated trolley hoist, for the lime supersac system), one 1.0 tonne monorail (installed at the screen well equipped with a hand chain operated hoist), one 1.5 tonne monorail (installed in Gallery 1 equipped with a hand chain operated hoist) and one 1.5 tonne monorail (installed in the high lift pumping station equipped with a hand chain operated hoist).

Site (Name): DISTRIBUTION (WATER INSPECTION)

Type: Other **Sub Type:** Other

Comments:

There is currently an estimated 86971 m of watermain within the distribution system, unchanged for the 2015 inspection year. The watermains are composed of various sizes ranging from 25 mm to 625 mm in diameter and compositions including cast iron (CI), ductile iron (DI), polyvinyl chloride (PVC), galvanized (GAL), polyethylene (PE), high density polyethylene (HDPE) and copper. There are regular extensions being completed.

There are approximately 467 district owned and 42 privately owned fire hydrants, 859 main valves, 24 blow off points, 16 air release valves, and one programmable automatic flushing unit in a locked container. The estimates are unchanged for the 2015 inspection year.

There is one public tap which is available for use year round at 700 Muskoka Road 169.

Revised 2015 data estimates are that the water system currently serves a population of approximately 7400 people. The system includes 2981 total service connections with approximately 2691 residential services, 223 commercial services, 63 institutional services and 4 industrial services.

There are three notable structures located within the distribution system:

1) The Beaver Creek Reservoir and Rechlorination Facility

2) The Muskoka Beach Road Elevated Tower

3) The Fairview Drive Elevated Tower

Site (Name): BEAVER CREEK (REAY ROAD) RESERVOIR, BOOSTER STATION AND RECHLORINATION FACILITY

Type: Other **Sub Type:** Booster Station

Comments:

The Beaver Creek Reservoir, Booster Station, and Re-chlorination Facility, located at 1900 Beaver Creek Drive is an entry alarmed, brick and block structure with locking steel doors. It is co-located with the Beaver Creek Sewage Pumping Station. This facility provides water to the Correctional Services Canada property and consists of an underground, three celled, concrete storage facility, with a total capacity of 1,200 m3. The top water level is at an elevation of 275.9 m. The distance between the water treatment plant and the Beaver Creek Reservoir is approximately 9 km, with no service connections along much of the line. The PVC piping and was installed during the early 1990's. Each in ground cell is equipped with level sensors.

Distribution water entering this facility passes an isolation valve, the continuously monitored inlet magnetic flow meter, an electronic pressure indicator, a flow control valve, air relief, and the top-up chlorination injection point. The inlet line then splits into two valved inlet lines into the two reservoir receiving cells. Water flows from these two cells via two valved lines into the high lift suction well. Five vertical turbine pumps draw from this well to provide pressure and fire protection for the upstream users. These pumps consist of three pressure pumps (2 duty, 1 standby) each rated to deliver 7.2 L/s at a TDH of 55 m and two fire pumps (one duty, one standby) rated to deliver 130 L/s at a TDH of 41 m. Each pump discharge is equipped with an isolation valve, air relief, backflow prevention and a pressure indicator. The five discharges combine into a common outlet header which is equipped with a pressure relief valve back into the suction well, an electronic pressure transducer, a valve, a continuously monitored outlet magnetic flow meter with a valved bypass, a domestic water supply line, and the on-line, chlorine analyser supply line before it discharges back out to the distribution system.

The chlorine booster pump operates in response to low chlorine levels of the outgoing water supplied to the Correctional Services Canada facility property and/ or based on fire demand.

The re-chlorination component of the facility is comprised of one duty and one standby pump for sodium hypochlorite addition at the reservoir inlet, a contained, unused bulk storage tank with level sensor and 100 L day tank. The PLC is programmed to monitor the chlorine residual in the out going reservoir water, and compares the monitored residual to an operator adjustable chlorine residual. If necessary, the pumps engage and boost the chlorine residual to match the set point. The chlorination system is alarmed.

There is a plate metal covered access hatch to the high lift suction well within the building. There are two double covered and padlocked plate metal access hatches on a concrete sill outside to the rear of the building which provide egress to the two reservoir cells. The reservoir overflow empties to the ground at the rear of the building and is covered by a metal swing plate. There are two screened, "J" shaped, vent pipes outside of the building, one for each reservoir cell. Emergency power for the facility is provided by a 150 kW diesel generator with on-site fuel supply. Spill containment is provided for the 1,100 L diesel fuel tank which is housed within the reservoir/booster building. The generator is programmed for automatic starts during power outages and stops with restoration of power.

The floor drains empty to the sanitary sewers.

There is an emergency storage tank with level sensor, vent and plate metal access hatch into which material from both the sewage pumping station and water system can drain. It does not appear that there is a cross-connection issue with this tank.

Continuous monitoring data of process parameters and controls are transmitted from the on-site PLC to the SCADA system at the WTP.

Site (Name): FAIRVIEW DRIVE ELEVATED TOWER

Type: Other **Sub Type:** Reservoir

Comments:

The 2062 m3 Fairview Drive elevated steel storage tank and concrete supporting structure is located at 9 Pineridge Gate, Unit 1 in the distribution system. The facility is equipped with a locking, entry alarmed steel door. The site is located adjacent to a medical building. Signage limiting access is provided.

The steel storage tank has a diameter of approximately 20 m while the concrete support has a diameter of approximately 10 m. The structure is approximately 33 m tall with a top water level of 290.3 m above sea level.

The works within the tower structure include a continuously monitored and alarmed free chlorine residual analyser with a 0-5 mg/L range and pH compensation for distribution free chlorine residual monitoring, an alarmed tank level sensor, a pressure transducer, an altitude valve, a valved 350 mm inlet/ outlet line with a valved (normally closed) connection to a valved 350 mm overflow line which discharges to the Bethune Drive roadside ditch. There is an additional 200 mm valved drain line which empties into a sump pit. The sample line empties to the sump pit. The sump pit empties to the Bethune Drive roadside ditch.

An uninterruptible power supply (UPS) is in place to ensure electronics operation during power failures.

HLP starts and stops are controlled by tower water level through the SCADA system.

System water pressure can be supplied by the tower(s) and the HLP's (usual method) or strictly by pump pressure by valving off the tower(s) (if maintenance is required).

Site (Name): MUSKOKA BEACH ROAD ELEVATED TOWER

Type: Other **Sub Type:** Reservoir

Comments:

The 2180 m3 Muskoka Beach Road elevated steel storage tank and concrete supporting structure is located at 520 Muskoka Beach Road in the distribution system. Entry is through a locking, entry alarmed steel door. Signage limiting access is provided.

The steel storage tank has a diameter of approximately 18 m while the concrete support has a diameter of approximately 10 m. The structure is approximately 29 m tall with a top water level of 292.5 m above sea level.

The works within the tower structure include an alarmed tank level sensor, a pressure transducer, an altitude valve, a valved inlet/ outlet line with a valved (normally closed) connection to a valved overflow line which discharges to the Muskoka Beach Road roadside ditch. There is a sample line within the structure.

An uninterruptible power supply (UPS) is to be installed to ensure electronics operation during power failures.

HLP starts and stops are controlled by tower water level through the SCADA system.

System water pressure can be supplied by the tower(s) and the HLP's (usual method) or strictly by pump pressure by valving off the tower(s) (if maintenance is required).

Upgrades to the altitude valves, including installation of solenoid valves, has been completed in recent years. The outcome has improved the control between water levels among the Fairview, Beach Road, and Beaver Creek reservoirs. Prior to the upgrades, both towers operated in unison with preferential filling of the Muskoka Beach tower due to its proximity to the WTP.

INSPECTION SUMMARY

INTRODUCTION

- **The primary focus of this inspection is to confirm compliance with Ministry of the Environment and Climate Change (MOECC) legislation as well as evaluating conformance with ministry drinking water related policies and guidelines during the inspection period. The ministry utilizes a comprehensive, multi-barrier approach in the inspection of water systems that focuses on the source, treatment and distribution components as well as management practices.**

This drinking water system is subject to the legislative requirements of the Safe Drinking Water Act, 2002 (SDWA) and regulations made therein, including Ontario Regulation 170/03, "Drinking Water Systems" (O.Reg. 170/03). This inspection has been conducted pursuant to Section 81 of the SDWA.

This report is based on a "focused" inspection of the system. Although the inspection involved fewer activities than those normally undertaken in a detailed inspection, it contained critical elements required to assess key compliance issues. This system was chosen for a focused inspection because the system's performance met the ministry's criteria, most importantly that there were no deficiencies as identified in O.Reg. 172/03 over the past 3 years. The undertaking of a focused inspection at this drinking water system does not ensure that a similar type of inspection will be conducted at any point in the future.

This inspection report does not suggest that all applicable legislation and regulations were evaluated. It remains the responsibility of the owner to ensure compliance with all applicable legislative and regulatory requirements.

The Gravenhurst (Muskoka Beach) drinking water system serves the Town of Gravenhurst, located along Provincial Highway 11, District Municipality of Muskoka, on the south east shore of Lake Muskoka. The drinking water system services an estimated population of 7400 persons. There are approximately 2981 total service connections, of which approximately 2691 are residential services; 223 are commercial services; 63 are institutional services, and approximately 4 are industrial services.

The Gravenhurst (Muskoka Beach) drinking water system is owned and operated by the Corporation of the District Municipality of Muskoka. The Corporation of the District Municipality of Muskoka is referred to as the Owner, Operator and/or Municipality for the purposes of this inspection report.

Drinking water for the Gravenhurst community is obtained from Lake Muskoka. The Gravenhurst (Muskoka Beach) drinking water treatment plant (WTP) commenced operation in 1983, with significant upgrades to the plant being undertaken in 2004. The drinking water treatment process consists of chemically assisted coagulation-flocculation, and direct filtration, using dual media filters with a combination of sand and anthracite coal. Pre-treatment Alkalinity and pH adjustment is provided to enhance on the coagulant process, through the addition of hydrated lime and carbon dioxide. A cationic polymer filter aid (BASF Magnafloc LT-7981) and a polyaluminum chloride coagulant (SternPAC) are used to promote coagulation and flocculation, prior to filtration. SternPAC has been used as the coagulant since 2004, and BASF Magnafloc has been used as a coagulant/filter aid since 2013. Disinfection is achieved by chlorination, through the use of sodium hypochlorite solution. A pre-treatment manganese control system exists, which would include the addition of sodium permanganate, however the need for this system has not been necessary. Sodium hydroxide is added to aid in pH and corrosion control within the distribution system, and fluoridation occurs through the addition of Hydrofluosilicic Acid prior to the treated water being conveyed to the distribution system.

INTRODUCTION

The Gravenhurst (Muskoka Beach) drinking water system is categorized as a Large Municipal Residential drinking water system as defined and regulated under the Safe Drinking Water Act, 2002 (SDWA) and regulations made therein, including Ontario Regulation (O.Reg.)170/03.

Operation of the Gravenhurst (Muskoka Beach)drinking water system is authorized under Municipal Drinking Water Licence #143-109 (Licence) and Drinking Water Works Permit 143-209 (Permit) which were originally issued to the District of Muskoka, respectively as Licence Issue#1 on October 14, 2010, and Permit Issue#1 on October 13, 2010. In November 2012, the Municipality submitted an application to the Ministry of the Environment and Climate Change (Ministry) proposing upgrades to the Gravenhurst (Muskoka Beach) Drinking Water System, which included the addition of the polymer filter/coagulant aid system; changes to the sodium hydroxide pump systems; and, modifications to the backwash wastewater supernatant recycling ratio. On February 14, 2013, the Ministry issued Schedule C Issue#1 for the Permit, approving the proposed works. On April 2, 2013, the polymer system was placed into service, the sodium hydroxide pump heads had been replaced and the supernatant recycling ratio changes had been made. Following these changes, the appropriate Director Notification was submitted to the Ministry on April 17, 2013, and the Ministry subsequently amended and issued Permit Issue #2 on July 12, 2013, to incorporate the changes.

On February 3, 2015, an application was also submitted by the Municipality to renew the Licence with the Ministry, as Licence Issue #1 was set to expire on October 13, 2015, and the Ministry renewed the Licence and re-issued Licence Issue #2 and Permit Issue #3 on October 6, 2015. Water takings from Lake Muskoka are permitted in accordance with Permit to Take Water (PTTW)# 2320-8G2MLQ, issued April 20, 2011. The PTTW allows the Municipality to take a maximum of 10000000 Litres per day (L/d) from Lake Muskoka, at a rate not exceeding 15900 Litres per minute (L/min). The PTTW expires on February 28, 2021. Compliance with the PTTW was not assessed during the course of this inspection; however, the Municipality is aware that water takings must be done in accordance with the conditions of a valid PTTW.

The Gravenhurst (Muskoka Beach) drinking water system was last inspected by the Ministry on December 2, 2014. Findings associated with that 2014 inspection were detailed in Inspection Report # 1-BBVIJ, issued to the Owner on January 9, 2015.

The February 5, 2016 inspection, to which this inspection report pertains, encompasses an inspection review period between December 2, 2014 and February 5, 2016. The February 5, 2016 inspection included a physical inspection of the water treatment equipment and facilities; interviews with operational staff; and a review of relevant documents for the inspection review period. Physical inspections of the Low lift pump station; the Beaver Creek (Reay Road) Reservoir, Booster Station, and Re-chlorination Facility; Fairview Drive Elevated Tower; and, the Muskoka Beach Road Elevated Tower were also undertaken.

CAPACITY ASSESSMENT

* **There was sufficient monitoring of flow as required by the Permit and Licence or Approval issued under Part V of the SDWA**

Condition 2.1, Schedule C of the Licence requires the Owner to ensure the continuous flow measurement and recording be undertaken for the flow rate and daily volume of water conveyed into the treatment system and the flow rate and daily volume of water conveyed from the treatment system into the distribution system.

To comply with this condition, the Owner has installed a magnetic flow measuring device on the combined raw water header, to measure raw water being taken from Lake Muskoka, and on the plant high lift pump discharge header, to measure the treated water being pumped to the distribution system. In addition, magnetic flow measuring devices have also been installed on each of the four separate filter effluent lines; the sidestream lime injection line and the lime slurry mixing line. A flow meter is also installed to measure the surface wash and backwash water flows directed to each filter, and to measure the filter backwash wastewater/sludge and sanitary wastewater being

CAPACITY ASSESSMENT

pumped from the water treatment plant to the sanitary sewers. A flow meter is also installed to measure the settled backwash wastewater supernatant that is recycled back into the raw water low lift pump discharge header for re-treatment.

Two flow measuring devices are installed at the Beaver Creek (Reay Road) Reservoir, to measure the flow into and out of that facility.

Instantaneous flow rates are measured by each flow measuring device and continuously trended and recorded on the Supervisory Control and Data Acquisition (SCADA) system associated with the drinking water system. Totalized daily flows are calculated by SCADA, and transcribed to record keeping mechanisms for reporting purposes. Several of the flow meters are also used for process control purposes. As the common raw water flow meter is installed downstream of the supernatant recycling discharge point, SCADA accounts for the supernatant flows, in calculating the totalized daily raw flow values, for water taking purposes.

All of the flow measuring devices were most recently calibrated between October 30 and November 2, 2015. There were reportedly no concerns identified with the 2015 calibrations.

In 2014, the flow measuring devices were calibrated between November 10 and 11, and there were reportedly no concerns identified with the 2014 calibrations.

- **The owner was in compliance with the conditions associated with maximum flow rate or the rated capacity conditions in the Permit and Licence or Approval issued under Part V of the SDWA.**

Condition 1.1, Schedule C of the Licence stipulates that the maximum daily volume of treated water that flows from the Gravenhurst (Muskoka Beach) water treatment plant to the distribution system shall not exceed 9996 cubic metres per day (m3/d).

In 2014, the maximum day demand occurred on August 7, 2014, when a total daily flow of 3857.0m3 or 39% of the rated capacity was noted to have occurred. The average day demand for 2014 was reported to be approximately 2794.7m3/d or 28% of the plant rated capacity.

In 2015, the maximum day demand occurred on May 20, 2015, when a total daily flow of 4372.0m3 or 44% of the rated capacity was noted to have occurred. The average day demand for 2015 was reported to be approximately 2867.9m3/d or 29% of the plant rated capacity.

A review of records made during this inspection review period, indicates that the Gravenhurst (Muskoka Beach) drinking water system was not operated to exceed the plant rated capacity set out in the Licence. Similarly, records indicate that the filters were not operated in excess of their designed production capacities, 2500 m3/d each, during the production of water.

During water production, the rate of flow into the treatment system is governed by an actuated valve situated between the flocculation tanks and the common filter inlet conduit. The valve is controlled through SCADA to ensure a sufficient level of flocculated water is maintained ahead of the filters. Actuated valves installed on each of the filter effluent lines modulate to control the flow through each respective filter, targeting the configured master production rate, and maintaining a sufficient water level in the filters and the downstream chlorine contact chambers and reservoirs. The filters are typically operated in unison, with staggered start and stop times. During the summer months, each filter is typically operated at a master production rate of 55m3/h, resulting in a combined production rate of 220m3/h or 5280 m3/d. During the winter months, each filter is typically operated at a master production rate of 35m3/h, resulting in a combined production rate of 140m3/h or 3360 m3/d. The master production rates are manually set in SCADA by operational staff to meet water demands. SCADA programming, does not allow operational staff to set the master production rates above 110m3/h. The Municipality is considering reprogramming SCADA, such that the master production rates cannot be configured above 104m3/h, to ensure the filter design capacities are not exceeded.

Records provided for review indicate, the maximum filter production volumes occurred on July 30, 2015, when Filter 1 produced 2162m3, Filter 2 produced 2221m3, Filter 3 produced 2185m3, and Filter 4 produced 2228 m3.

TREATMENT PROCESSES

* **The owner had ensured that all equipment was installed in accordance with Schedule A and Schedule C of the Drinking Water Works Permit.**

A review of the equipment installed at the Gravenhurst (Muskoka Beach) water treatment plant was referenced and found to compare favourably to the equipment listed in the Permit issued for the Gravenhurst (Muskoka Beach) Drinking Water System.

As previously discussed, an application was submitted by the Municipality in November 2012 proposing upgrades to the Gravenhurst (Muskoka Beach)Drinking Water System, which included the addition of the polymer filter/coagulant aid system; changes to the sodium hydroxide pump systems; and, modifications to the backwash wastewater supernatant recycling ratio. On February 14, 2013, the proposed works were approved by the Ministry through the issuance of Schedule C to the Permit.

On April 2, 2013, the approved alterations were placed into service, and the appropriate Director Notification was submitted to the Ministry on April 17, 2013. The Ministry subsequently amended and issued Permit Issue #2 on July 12, 2013, to incorporate the changes.

On February 3, 2015, an application was also submitted by the Municipality to renew the Licence with the Ministry, as Licence Issue #1 was set to expire on October 13, 2015. The Ministry renewed the Licence and re-issued Licence Issue #2 and Permit Issue #3 on October 6, 2015. Despite the fact that the Municipality submitted an updated Process Flow Diagram with their renewal application, the Ministry unfortunately did not update the Process Flow Diagram contained in Schedule D of Permit Issue #3 to reflect the new polymer system. During the course of this inspection, the Ministry's Approvals and Licensing Branch was advised of this oversight, and it is anticipated that Schedule D will be updated the next time the Permit is reviewed.

There were reportedly no other alterations to the drinking water system during this inspection review period, that required the completion of a Form 2 document or necessitated the need for an alteration to the description of the drinking water system components. Similarly, there were reportedly no watermain additions or modifications to necessitate the completion of any Form 1 documents, nor were there reportedly any minor modifications undertaken or additions made which required the completion of any Form 3 documents, during this inspection review period.

As described in the Ministry's previous inspection, Form 1 watermain documents were prepared in 2013 and 2014 to support watermain construction projects which occurred in the Town of Gravenhurst on Walton Street; along Muskoka Beach Road, between Palmer Drive and Brydon's Bay Road; on Pine Street; and, along Musquash Road. These Form 1 documents were completed and signed off by a Municipal representative, and were made readily available for this inspection.

* **Records indicated that the treatment equipment was operated in a manner that achieved the design capabilities required under Ontario Regulation 170/03 or a Permit, Licence or Approval issued under Part V of the SDWA at all times that water was being supplied to consumers.**

Treatment requirements are reportedly met through direct filtration followed by chlorination, with sodium hypochlorite, for both primary and secondary disinfection purposes.

According to the Ministry's Procedure for Disinfection and Schedule E of the Licence, the direct filtration process is credited with 2.0 log Giardia cyst removal, 2.0 log Cryptosporidium oocyst removal and 1.0 log virus removal credits, if the filtration process meets the following criteria:

-use a chemical coagulant at all times when the treatment plant is in operation;

-monitor and adjust chemical dosages in response to variations in raw water quality;

-maintain effective backwash procedures, including filter-to-waste or an equivalent procedure during filter ripening to ensure that the effluent turbidity requirements are met at all times;

-continuously monitor filtrate turbidity from each filter; and,

- meet the performance criterion for filtered water turbidity of less than or equal to 0.3 NTU in 95% of the measurements each month.

TREATMENT PROCESSES

To ensure these criteria are met, a coagulation system comprised of two (one duty, one standby) flow paced metering pumps have been installed to StemPAC into the common raw water header upstream of the filter pre-treatment flocculation tanks. To enhance on the coagulant/flocculation/filtration process, CO2, Hydrated Lime, and a Cationic Polymer are also added to the raw water header. The coagulant and polymer chemical metering pumps are equipped with flow sensors linked to SCADA for alarming purposes. In the event a low dosage is detected, or the pumping systems fail, the filter inlet and outlet valves close, such that water production ceases until such time the metering pump(s) are returned to service.

Continuous turbidimeters installed on each filter effluent line are configured to trigger an alarm and shut down the respective filter (inlet and outlet valves close), should filter effluent turbidity exceed 0.2NTU, or should the turbidimeter register a signal loss/malfunction.

Through SCADA, the dual media filters backwash automatically, independent of each other, based on filter run time, filter run volume, head loss (>2.8m) or elevated turbidity (>0.2NTU). Operational staff may configure the backwash triggers through SCADA. In the winter months, backwashing typically occurs every 35 hours of filter run time. During summer months, backwashing typically occurs every 20 hours of filter run time. Backwashing may also be manually initiated through SCADA and formalized filter backwashing and filter to waste procedures are available.

Following a backwash cycle, water is filtered to waste for approximately five minutes, or until filter turbidity has fallen below 0.1NTU, before the filter production resumes. The turbidimeters are supplied samples from the filter effluent line, such that turbidity is monitored during production and filter to waste processes. By design, water is not directed to the chlorine contact chamber until filtrate turbidity is below 0.2NTU.

Records indicate that the filters met the performance criterion of less than 0.3 NTU in 95% of the tests conducted each month during this inspection review period. SCADA is programmed to alarm should the trending results at the end of each month be out of compliance with the performance criteria. Records also indicate that the coagulant system was in operation when water was being produced, and backwash procedures were followed during this inspection review period. pH is a critical control parameter for the plant, and pH analyzers, linked to SCADA for trending and alarming purposes, are installed at appropriate locations throughout the treatment process; enabling operational staff to respond to abnormal conditions in a timely manner.

To achieve the remaining 1.0-log Giardia cysts and 3.0-log Virus removal or inactivation, a free available chlorine disinfection system is utilized and the CT disinfection concept is used to quantify the capability of the disinfection system for primary disinfection purposes. Free chlorine residual is achieved through the addition of a sodium hypochlorite solution to the filtered water being directed to the two dedicated chlorine contact chambers, where the contact time required for CT is afforded. The chlorine contact chambers (CCCs)are baffled (bf= 0.7), and each provide a dedicated chlorine contact volume of 396m3. Under normal operation, the CCCs are operated in unison. The system is operated to target a free chlorine residual of between 2.2 and 2.4mg/L at the end of the chlorine contact chambers, prior to the addition of sodium hydroxide, before the water is conveyed to the reservoir/high-lift pump chamber. The chlorine analyzers used for primary disinfection monitoring, are configured to trigger an alarm notification sequence should chlorine residuals fall below 1.6mg/L. Should the chlorine residual at the end of either CCC fall below 1.55mg/L, the filters and high lift pumps will shut down, ceasing water production until operational staff respond to the site and resolve any issues.

The SCADA system is also configured to calculate CT continuously and will alarm if CT is not met. A CT calculation spreadsheet is also available for operators to verify CT under varying operating conditions. Supporting documentation related to CT is available in the operations and maintenance manual.

Records reviewed, indicate that the water treatment plant was operated to achieve the necessary CT requirements for primary disinfection purposes during this inspection review period.

TREATMENT PROCESSES

* **Records confirmed that the water treatment equipment which provides chlorination or chloramination for secondary disinfection purposes was operated so that at all times and all locations in the distribution system the chlorine residual was never less than 0.05 mg/l free or 0.25 mg/l combined.**

  To ensure that sufficient free available chlorine residual is maintained out and into the distribution system for secondary disinfection purposes, the plant is operated to target a free chlorine residual of between 1.8 and 2.0mg/L in the finished water being conveyed to the distribution system. Following the completion of the intended chlorine contact time for primary disinfection purposes and the subsequent addition of sodium hydroxide and hydrofluorosilicic acid, trim chlorination may also occur on the high lift pump discharge header, but is not normally practiced. A finished water chlorine analyzer is installed on the high-lift pump discharge header and is supplied with continuous samples of water from a location downstream of the trim chlorine injection point. The analyzer may be used to control the trim chlorine injection rate if needed, and is configured to trigger an alarm should the chlorine residual in the treated water being conveyed from the plant drop below 1.25mg/L. Should the chlorine residual in the treated water being conveyed from the plant drop below 1.11 mg/L, the highlift pumps will shut down, ceasing water production until operational staff respond to the site and resolve any issues.

  Re-chlorination facilities also exist within the distribution system at the Beaver Creek (Reay Road) Reservoir, Booster Station, and Re-chlorination Facility, however re-chlorination at that facility is not typically practiced or required.

  The free chlorine residual concentrations within the distribution system are being measured by continuous analyzers installed at the Beaver Creek (Reay Road) Reservoir, Booster Station, and Re-chlorination Facility and the Fairview Drive Elevated Tower. At each of these locations analyzers are installed to measure the chlorine residuals in the drinking water that is conveyed either into or out of the respective facility. The analyzer at the Beaver Creek (Reay Road) facility may be used to control the re-chlorination system.

  The chlorine residual analyzer and re-chlorination system installed at the Beaver Creek (Reay Road) facility is configured to trigger an alarm notification if the free chlorine residual in the water being conveyed out of the reservoir falls below 0.45mg/L.

  The chlorine residual analyzer installed at the Fairview elevated tank will trigger an alarm notification if the free chlorine residual in the water being conveyed either into or out of the elevated tank falls below 0.65mg/L.

  In addition, chlorine residuals are measured during microbiological sampling and maintenance activities throughout the distribution system. System wide hydrant flushing is conducted each spring and dead end hydrant flushing is conducted each fall or in response to any issues.

  Records indicate that free chlorine residuals were typically maintained at or above the 0.2mg/L throughout the distribution system during this inspection review period; and, there were no records which indicated free chlorine residuals less than 0.05 mg/L at any time during the inspection review period. The recorded distribution system free chlorine residual concentrations ranged between 0.14mg/L and 2.12mg/L.

* **The Operator-in-Charge had ensured that all equipment used in the processes was monitored, inspected, and evaluated.**

  The operator in charge routinely evaluates the system processes at the Gravenhurst(Muskoka Beach) water treatment plant daily, Monday through Friday. The operating conditions are evaluated by reviewing the SCADA system trending and also using visual plant assessments. Any departures from normal operating conditions are documented as part of the review. Weekends and holidays are also considered, to ensure that the review of the continuous monitoring data does not exceed

TREATMENT PROCESSES

72 hours in duration. The specific operating conditions are recorded on checklists and stored electronically in excel spreadsheets. Records of the checks are noted in the water treatment plant and distribution system log books.

Operational staff also attend the Elevated Towers the Beaver Creek (Reay Road) Reservoir, Booster Station, and Re-chlorination Facility at least once each week, and make records of those checks in the record keeping mechanisms.

TREATMENT PROCESS MONITORING

* **Primary disinfection chlorine monitoring was being conducted at a location approved by Permit, Licence or Approval issued under Part V of the SDWA, or at/near a location where the intended CT had just been achieved.**

The primary disinfection chlorine monitoring points are currently located at the end of each of the dedicated baffled chlorine contact chambers, prior to sodium hydroxide addition, and the water entering the reservoirs and high-lift pump chambers. The pH compensated free chlorine residual analysers, installed for primary disinfection purposes, are supplied samples from the end of each respective chlorine contact chamber by a centrifugal pump. The chlorine analysers are linked to SCADA for continuous monitoring, trending and alarming purposes, and are used by SCADA and operational staff to calculate CT provisions.

* **Continuous monitoring of each filter effluent line was being performed for turbidity.**

In accordance with subsection 7-3(2)(b) of Schedule 7, O.Reg.170/03 the Owner has installed continuous turbidimeters on each filter train. The turbidimeters are supplied with continuous samples from the filter effluent discharge piping, such that the samples are indicative of filtered water during production as well as during the filter to waste process. For operational purposes, the Owner has also installed continuous turbidimeters for the purpose of measuring the turbidity of the raw water conveyed into the plant and the finished drinking water conveyed to the distribution system. All four of the turbidimeters are linked to the SCADA system for continuous trending, monitoring and alarm purposes.

The high turbidity alarm set points on the two filter trains is set at 0.20 NTU. SCADA is also configured to initiate an alarm should turbidity measure a low analog output (4mA), which might suggest a turbidimeter malfunction. Should either a high or low turbidity alarm condition occur, the filter inlet and outlet valves close, ceasing the production of water. The filter train alarms are present to help ensure compliance with the Procedure for Disinfection of Drinking Water in Ontario effluent turbidity requirements of being less than or equal to 0.30 NTU in 95% of the measurements recorded each month on each filter effluent line.

The turbidimeter installed to measure the treated water being pumped to the distribution system is configured to initiate an alarm if the treated water turbidity exceeds 0.30NTU and will shut down the highlift pumps if the treated water turbidity is above 1.0 NTU. The raw turbidimeter is configured to trigger an alarm if raw water turbidity exceeds 12.0 NTU and will shut down the filters if the raw water turbidity exceeds 15.0 NTU.

A turbidimeter has also been installed for the supernatant recycling system. Condition 7.1, Schedule B of the Permit, stipulates that supernatant from the backwash wastewater settling process may be recirculated back into the treatment process at a rate of less than 20 percent of the raw water intake flow, only if the recirculated supernatant turbidity is less than or equal to 10 NTU. To comply with this requirement, the turbidimeter installed on the supernatant recirculation line is linked to SCADA for trending and alarming purposes. An alarm notification is triggered if supernatant turbidity exceeds 5.0NTU, and the supernatant recycling system will shut down if the supernatant turbidity exceeds 9.0NTU. Should the supernatant system go into a forced shut down, all of the backwash wastewater, including supernatant, is then pumped to the sanitary sewers.

TREATMENT PROCESS MONITORING

* **The secondary disinfectant residual was measured as required for the distribution system.**

The free chlorine residual concentration within the distribution system is being measured by continuous analyzers installed at the Beaver Creek (Reay Road) Reservoir, Booster Station, and Re-chlorination Facility and the Fairview Drive Elevated Tower. The distribution chlorine residual analyzers are configured to trigger an alarm if chlorine residual drops below the setpoints, previously discussed, at either of the locations. In addition, chlorine residuals are measured during microbiological sampling and maintenance activities throughout the distribution system.

The recorded distribution system free chlorine residual concentrations ranged between 0.14mg/L and 2.12mg/L, during this inspection review period.

* **Operators were examining continuous monitoring test results and they were examining the results within 72 hours of the test.**

The data review is completed daily Monday through Friday. Weekends and holidays are considered. Operators are scheduled to conduct a data review so that the time between checks does not exceed the 72 hour regulatory requirement.

The weekend results of the continuous monitoring equipment are being reviewed on Mondays, or the day after in the case of a holiday and documented in the log book in order to satisfy Schedule 6, O.Reg.170/03 requirements for examination of continuous monitoring data.

* **All continuous monitoring equipment utilized for sampling and testing required by O. Reg. 170/03, or approval or order, were equipped with alarms or shut-off mechanisms that satisfied the standards described in Schedule 6.**

Continuous monitors are used to assess primary disinfection chlorine residual concentrations, secondary disinfection chlorine residual concentrations, and turbidity on each filter effluent. At the time of inspection, the analyzers used for primary disinfection monitoring each had a low chlorine alarm set point of 1.6mg/L and a low/low chlorine alarm set point of 1.55mg/L. The high and high/high chlorine alarm set points were at 2.90 and 3.00mg/L. By activating the low or high setpoints, an alarm notification process is initiated and an operator responds to the site. By activating the low/low or high/high alarm, the filters and highlift pumps will shut down, ceasing water production and allow time for an operator to intervene. As previously discussed, secondary disinfection is monitored in the distribution system at the Beaver Creek (Reay Road) Reservoir, Booster Station, and Re-chlorination Facility and the Fairview Drive Elevated Tower. The secondary disinfection alarm set point at the Fairview elevated tank is 0.65mg/L and a second low/low alarm set point is 0.50mg/L. At the Beaver Creek distribution facility, the low alarm setting is 0.45mg/L and the high alarm set point is 2.00mg/L.

The filter effluent turbidity high set point alarms are set at 0.20(NTU), and SCADA is configured to alarm if the turbidimeter generates a low analog signal (4mA). Should either the low or high turbidity alarms be triggered, the filter inlet and outlet valves shut down, ceasing the production of water from the respective filter, until rectified. By design, water is not directed to the chlorine contact chambers until filtrate turbidity is below 0.2NTU.

* **Continuous monitoring equipment that was being utilized to fulfill O. Reg. 170/03 requirements was performing tests for the parameters with at least the minimum frequency specified in the Table in Schedule 6 of O. Reg. 170/03 and recording data with the prescribed format.**

Schedule 6 of O.Reg.170/03 outlines the recording frequency requirements for continuous on line analysers. It requires that the free chlorine residual for primary disinfection be tested and recorded with a frequency of every five minutes. Turbidity monitoring must be performed with a minimum frequency of 15 minutes. If secondary disinfection monitoring uses continuous analysers, as is the case for secondary disinfection monitoring conducted at the Fairview Elevated Tower and the Beaver Creek (Reay Road) facility, the free chlorine residual in a distribution sample must have a minimum recording frequency of 1 hour.

TREATMENT PROCESS MONITORING

Complying with these requirements, continuous monitoring data is recorded and trended on the SCADA system at ten second intervals.

The chlorine residual is being recorded in milligrams per litre(mg/L) and the turbidity is being recorded in Nephelometric Turbidity Units(NTU) in order to comply with the requirements contained in Schedule 6.

As discussed, in more detail in a later section of this inspection report, the Municipality did proactively report an issue with the trending of continuous filter effluent turbidity on November 5, 2015, when, as a result of a power failure and a corresponding emergency generator failure, trending of continuous filter effluent turbidity monitoring did not occur for approximately 35 minutes. Prior to the event, each filter was filtering with filter effluent turbidity around 0.08NTU, and when the power and trending was restored filtrate turbidity remained consistent around 0.08NTU. There was also no impact reported on the chlorine disinfection process with residuals remaining above 2mg/L during and following the event.

* **All continuous analysers were calibrated, maintained, and operated, in accordance with the manufacturer's instructions or the regulation.**

The Gravenhurst (Muskoka Beach) drinking water system is equipped with continuous analysers for pH, chlorine residual, turbidity and fluoride. Calibrations/verifications are completed a minimum of at least once per month.

Procedures are available in the operations and maintenance manual for the calibration of the continuous analyzers.

The continuous chlorine analysers are calibrated when the unit reads 5% above or below in-house titration results. Records of each calibration are made in the daily log book and the maintenance log book at the treatment plant. Handheld colorimeters are verified against titration tests on a weekly basis, and the hand held unit is used to verify the calibration of the analyzers within the distribution system.

The turbidity and pH meters are calibrated/verified on a monthly frequency and a record is made in the daily log book and the maintenance log book at the treatment plant.

OPERATIONS MANUALS

* **The operations and maintenance manuals contained plans, drawings and process descriptions sufficient for the safe and efficient operation of the system.**

An operations and maintenance manual has been created and is available on-site for the utility operator's use at the water treatment plant. The operations manual is reviewed annually. The contingency plans were last reviewed in November 2015, and were reportedly under review at the time of this inspection.

The contents of the manuals appear to be sufficient, enabling staff to safely operate the drinking water system.

As previously discussed, the process flow diagram included in Schedule D of the Permit does not reflect the polymer addition which commenced in 2013. The Municipality did submit an updated process flow diagram to the Ministry, during the Licence renewal process, however, the Ministry unfortunately did not update the diagram in the Permit issued October 6, 2015. During the course of this inspection, the Ministry's Approvals and Licensing Branch was advised of this oversight, and it is anticipated that Schedule D will be updated the next time the Permit is reviewed.

* **The operations and maintenance manuals did meet the requirements of the Permit and Licence or Approval issued under Part V of the SDWA.**

Condition 16, Schedule B of the Licence prescribes that the operations and maintenance manual include at a minimum:

-the requirements of the licence and associated procedures;

-the requirements of the drinking water works permit for the drinking water system;

OPERATIONS MANUALS

-a description of the processes used to achieve primary and secondary disinfection within the drinking water system, including a copy of the CT calculations that were used as the basis for primary disinfection under worst case operating conditions.

-procedures for monitoring and recording the in-process parameters necessary for the control of any treatment subsystem and for assessing the performance of the drinking water system;

-procedures for the operation and maintenance of monitoring equipment;

-contingency plans and procedures for the provision of adequate equipment and material to deal with emergencies, upset conditions and equipment breakdown; and,

-procedures for the dealing with complaints related to the drinking water system, including the recording of the nature of the complaint and any investigation and corrective action taken in respect of the complaint.

Procedures necessary for the operation and maintenance of any alterations to the drinking water system must also be incorporated into the operations and maintenance manual prior to the alterations coming into operation.

The operations manual and the contingency plans for the drinking water system appear to address all of these topics sufficiently, providing the utility operators enough information to effectively operate the drinking water system.

The requirement for the operations manual to include a description of the processes used to achieve primary and secondary disinfection within the drinking water system, is a new condition, Condition 16.2.3, Schedule B), of the Licence that was issued on October 6, 2015 and the Municipality has until April 13, 2016 to comply with this condition.

In review of the information provided for this inspection, all of the information would appear to be available to satisfy this condition. The SCADA system is also configured to calculate CT continuously to ensure adequate disinfection is provided and will alarm if CT is not met, and a CT calculating spreadsheet is also installed on the computer in the control room which allows operators to verify CT under various conditions.

LOGBOOKS

* **Records or other record keeping mechanisms confirmed that operational testing not performed by continuous monitoring equipment was being done by a certified operator, water quality analyst, or person who suffices the requirements of O. Reg. 170/03 7-5.**

  Records reviewed, indicate that only the certified utility operators are the individuals that are performing the operational tests throughout the system. Operator certification was verified with the Ontario Water Wastewater Certification Office and all operators were in possession of valid certificates.

SECURITY

* **The owner had provided security measures to protect components of the drinking-water system.**

  The security measures in place throughout the Gravenhurst(Muskoka Beach) drinking water system include fencing, locked doors and security alarms. The security alarms have been linked to the SCADA system. There were no incidents of vandalism or reports of damage during the inspection review period.

CERTIFICATION AND TRAINING

CERTIFICATION AND TRAINING

* **The overall responsible operator had been designated for each subsystem.**

In accordance with Ontario Regulation 128/04 (Certification of Drinking Water System Operators and Water Quality Analysts) made under the SDWA, the Gravenhurst (Beach Road) Water Treatment Plant is classified as a Class 3 Water Treatment Subsystem (#1092 issued September 6, 2005), while the Gravenhurst Water Distribution System is classified as a Class 2 Water Distribution Subsystem (#1091 issued September 6, 2005.

At the time of this inspection, individuals possessing Class 4 Water Treatment Subsystem and Class 3 Water Distribution certificates, at a minimum, have been designated to act in the capacity of Overall Responsible Operator (ORO). Other operators, who possess, at a minimum, Class 2 Water Treatment certification and/or Class 1 Water Distribution certification, are also available and may serve in the ORO capacity, if required.

Records identifying the name of the individual serving in the capacity of ORO are documented within facility logbooks on a daily basis. There were no records to indicate that individuals other than sufficiently certified operators were acting in the capacity of ORO during this inspection review period.

The water treatment plant certificate is prominently displayed at the water treatment plant. Operator certificates are prominently displayed at the Water and Sewers Operations Centre, a location from where the collective drinking water system works are managed.

* **Operators in charge had been designated for all subsystems which comprised the drinking-water system.**

The Owner has designated the operators who possess the appropriate level of certification to act as Operator-in-Charge (OIC) as required. Typically, the operator doing facility checks is considered the OIC of the facility on that particular day.

* **Only certified operators made adjustments to the treatment equipment.**

Records provided for review indicate that the District of Muskoka utility operators appear to be the only persons who are adjusting water treatment equipment and processes at the water treatment plant. Operator certification was verified with the Ontario Water Wastewater Certification Office and all operators were in possession of valid certificates.

WATER QUALITY MONITORING

* **All microbiological water quality monitoring requirements for distribution samples were being met.**

The owner of a large municipal residential drinking water system shall ensure that if the system serves a population of 100,000 or less, at least eight distribution samples plus one for every thousand people served by the system are taken every month. At least one of the samples must be taken each week. As Gravenhurst's population is estimated to be 7400 residents, 15 samples must be collected monthly as a minimum requirement from the distribution system. These samples are required to be tested for E.Coli., total coliform; and at least 25 percent of the samples are required to be tested for general bacteria populations expressed as colony counts on a heterotrophic plate count.

Records reviewed in the course of this inspection indicate that the Municipality complied with these requirements, typically collecting six distribution samples each week (approximately 24 each month), in order to comply with, and exceed, the regulatory requirement. Each of those samples were tested for E.Coli., total coliform, and at least 25 percent of the samples collected were tested for general bacteria populations expressed as colony counts on a heterotrophic plate count.

WATER QUALITY MONITORING

* **All microbiological water quality monitoring requirements for treated samples were being met.**

Section 10-3 of Schedule 10, O.Reg.170/03 requires the Municipality to ensure samples are collected at least once every week from the system's treated water at the point of entry into the distribution system. The samples collected are required to be tested for E.Coli and total coliform, and general bacteria populations expressed as colony counts on a heterotrophic plate count.

Records reviewed in the course of this inspection indicate that the Municipality complied with these requirements.

* **All inorganic water quality monitoring requirements prescribed by legislation were conducted within the required frequency.**

Section 13-2 of Schedule 13, O.Reg.170/03 requires the Owner and the operating authority to ensure that at least one water sample is taken every 12 months if the system obtains water from a raw water supply that is surface water, and have those samples tested for every inorganic parameter set out in Schedule 23, O.Reg.170/03.

Complying with these requirements, the Municipality last conducted inorganic sampling on May 19, 2015. Prior to that, this sampling was conducted on May 5, 2014. There were no concerns identified with the results obtained.

* **All organic water quality monitoring requirements prescribed by legislation were conducted within the required frequency.**

Section 13-4 of Schedule 13, O.Reg.170/03 requires the Owner and the operating authority to ensure that at least one water sample is taken every 12 months if the system obtains water from a raw water supply that is surface water, and have those samples tested for every organic parameter set out in Schedule 24, O.Reg.170/03.

Complying with these requirements, the Municipality last conducted this sampling on May 19, 2015. Prior to that, this sampling was conducted on May 5, 2014. There were no concerns identified with the results obtained.

The Municipality is also aware of the regulatory amendments made to Schedule 24, O.Reg.170/03, which came into force on January 1, 2016 and included the addition of 2-Methyl-4-chlorophenoxyacetic acid (MCPA) to the list of inorganic parameters required to be tested in accordance with Schedule 13, O.Reg.170/03. The Municipality has submitted a Laboratory Services Notification (LSN) to the Ministry advising that SGS Lakefield has been retained to perform the MCPA analysis. The LSN submission made on December 29, 2015 also advised the Ministry that SGS Lakefield had been retained to perform sample analysis for Haloacetic Acid (HAA), Microcystin, chlorate and chlorite.

In addition to their legislated sampling requirements, the Municipality also participates in the Ministry's voluntary Drinking Water Surveillance Program (DWSP). The prime objectives of DWSP are to:

-support drinking water standards development;

-examine trends and identify emerging contaminants;

-provide comprehensive background information for remedial action;

-provide a framework for surveying and assessing emerging contaminants;

-help monitor the efficiency of water treatment plant processes; and,

- provide technical assistance to municipalities.

As part of DWSP, the Municipality collects quarterly samples (raw, treated and distribution) and submits the samples to the Ministry's Laboratory Services Branch (LaSB) for the analysis of various parameters. One of the DWSP parameters that is analyzed is the organic parameter N-

WATER QUALITY MONITORING

Nitrosodimethylamine (NDMA). NDMA, although not a parameter that is required to be tested under O.Reg.170/03 requirements, does have a maximum acceptable concentration of 0.000009mg/L established in the "Ontario Drinking Water Quality Standards" (ODWQS).

As discussed in more detail in a later section of this inspection report, and as has been identified in previous Ministry inspection reports, the DWSP samples analyzed by the Ministry's LaSB for the Gravenhurst (Muskoka Beach) drinking water system have, on several occasions, indicated NDMA levels exceeding the ODWQS, and were subsequently reported as adverse water quality incidents (AWQI). However, resamples collected and analyzed by private laboratories in response to each of the NDMA related AWQI's did not confirm or indicate elevated NDMA levels. In early 2015, the Ministry's LaSB was asked to review the discrepancies being identified, and it was concluded that significant levels of NDMA are not being formed in the actual Gravenhurst water treatment process or upon standing in the distribution pipes, and that the NDMA formation issue was an analytical problem occurring during the sample extraction process at the Ministry's Lab. Measures have reportedly been put in place at the Ministry's lab to ensure the organic sample results are indicative of the true water quality, and the Municipality continues to participate in DWSP.

* **All trihalomethanes water quality monitoring requirements prescribed by legislation were conducted within the required frequency.**

Section 13-6 of Schedule 13, O.Reg.170/03 requires the Owner and the operating authority to ensure that at least one distribution sample is taken every 3 months from a point in the drinking water system's distribution system, or in plumbing that is connected to the drinking water system, that is likely to have an elevated potential for the formation of Trihalomethanes (THMs), and tested for THMs. Section 6-1.1 of Schedule 6, O.Reg.170/03 requires that these samples be taken at least 60 days, and not more than 120 days, after a sample was taken for that purpose in the previous three month period.

Complying with these requirements, the Owner conducted this quarterly sampling February 9, 2015; May 19, 2015; August 11, 2015 and November 12, 2015. In addition, THM sampling is currently being conducted every month at the Beaver Creek (Reay Road) Reservoir and Fairview Elevated Tower. This additional monitoring is being conducted in conjunction with changes which have been made with water levels and turnover rates at the elevated towers and reservoirs, in efforts of reducing THM formation through the treatment process and throughout the distribution system. THM results during this inspection review period ranged between 35 to 82 micrograms per Litre (ug/L). The running annual average of the four most recent samples collected is 70.75ug/L, below the Ontario Drinking Water Quality Standard of 100ug/L.

* **All nitrate/nitrite water quality monitoring requirements prescribed by legislation were conducted within the required frequency for the DWS.**

Section 13-7 of Schedule 13, O.Reg.170/03 requires the Owner and the operating authority to ensure that at least one water sample is taken every three months and tested for nitrates and nitrites. Section 6-1.1 of Schedule 6, O.Reg.170/03 requires that these samples be taken at least 60 days, and not more than 120 days, after a sample was taken for that purpose in the previous three month period. Complying with these requirements, the Municipality conducted this sampling on February 9, 2015; May 19, 2015; August 11, 2015 and November 12, 2015. There were no concerns identified with the results obtained.

* **All sodium water quality monitoring requirements prescribed by legislation were conducted within the required frequency.**

Section 13-8 of Schedule 13, O.Reg.170/03 requires that the owner of a municipal residential drinking-water system ensure that a treated water sample is taken every 60 months and is tested for sodium. Records, provided by the Municipality and reviewed during the course of this inspection, indicate that the Municipality conducted sampling for sodium on May 19, 2015. Prior to that, sampling for sodium had been undertaken May 5, 2014. There were no concerns identified with the results obtained.

WATER QUALITY MONITORING

- **The required daily samples were being taken at the end of the fluoridation process.**

Fluoridation is achieved through the addition of Hydrofluosilicic Acid into the high-lift pump discharge header, prior to the water entering the distribution system. As fluoridation is practiced, section 7-4 of Schedule 7, O.Reg.170/03 requires the owner to ensure that a water sample is taken at the end of the fluoridation process at least once every day and is tested for fluoride. Where fluoride is added to drinking water, it is recommended that the concentration be adjusted to 0.5 - 0.8 mg/L, the optimum level for the control of tooth decay. A result indicating that the concentration of fluoride exceeds 1.5mg/L is considered an adverse drinking water test, and is required to be reported the Ministry and the Simcoe Muskoka District Health Unit.

Complying with the fluoride monitoring requirements, the Municipality has ensured fluoride concentrations are measured using a continuous analyser which is provided with samples of drinking water from the high-lift pump discharge header.

The continuous analyzer is linked to the SCADA system for continuous monitoring, trending and alarming purposes. To ensure fluoride levels remain within the optimal range, the analyzer, through SCADA is configured to initiate an alarm notification if fluoride levels rise above 0.90mg/L, or fall below 0.45mg/L. Should fluoride levels increase above 1.00mg/L, the highlift pumps, and subsequently the flow paced fluoridation system, are configured to shut down. Fluoride measurements are trended on SCADA every 10 seconds.

Records reviewed, indicate that fluoride concentrations were typically maintained between 0.5 and 0.6mg/L during this inspection review period.

- **All water quality monitoring requirements imposed by the Permit and Licence or Approval issued under Part V of the SDWA were being met.**

The Gravenhurst (Muskoka Beach) water treatment plant is capable of recycling a portion of the supernatant from the backwash wastewater settling process back to the head of the plant for re-treatment. Operation of the supernatant recycling process is subject to conditions set out in Condition 7.1, Schedule B of the Permit and Conditions 1.6 and 1.7, Schedule C of the Licence. Specifically, Condition 7.1, Schedule B of the Permit requires the Municipality, if they choose to recycle the supernatant, to ensure that the rate at which the supernatant is recycled back into the treatment process does not exceed 20 percent of the raw water intake flow, and that the recycled supernatant turbidity is less than or equal to 10 NTU. To comply with this condition, the Municipality has installed a magnetic flow meter and a continuous turbidity analyzer on the supernatant recirculation system. Both the flow meter and turbidity analyzer are linked to SCADA for trending, control and alarming purposes. Through SCADA the supernatant recycling system is configured to trigger an alarm should the supernatant turbidity exceed 5.0NTU and the supernatant recycling system will shut down should the flow rate exceed 20% of the raw intake flow and/or supernatant turbidity exceed 9.0NTU. Should the supernatant system be forced to shut down, all of the backwash wastewater, including the supernatant, is then pumped from the wastewater holding tanks to the sanitary sewer.

In addition to the monitoring and operational conditions required by the Permit, Conditions 1.6 and 1.7, Schedule C of the Licence requires that the backwash supernatant, subject to recycling, be sampled and analyzed for suspended solids, free chlorine residual, E.Coli., pH, and Aluminum on a weekly basis, and that manganese and trihalomethanes be analyzed on a quarterly basis. The weekly and quarterly samples are to consist of a composite sample made up of three grab samples, one collected at the start of the discharge, one at the discharge mid-point, and one immediately before the end of the discharge. The Municipality has installed a composite sampler to satisfy the sample collection requirements.

Records reviewed, indicate that the Municipality complied with the operational conditions and monitoring/sampling requirements associated with the supernatant recycling process during this inspection review period.

WATER QUALITY MONITORING

Supernatant is typically recycled back into the treatment process prior to the start of the automated filter backwash process. This programming is intended to ensure that at least one of the backwash settling tanks are empty, prior to the start of a backwash.

The supernatant recycling process is automated, and allows time for the backwash wastewater to settle. Condition 7.1, Schedule B of the Permit requires the backwash wastewater to have settled for at least 30 minutes before supernatant decant occurs. Since the addition of polymer commenced in 2013, it is reported that the backwash wastewater must settle for several hours before supernatant turbidity is within the required range for recycling to occur. This has presented some potential impacts on the production capabilities of the direct filtration plant, and is an issue that is discussed in more detail in the "Summary of Recommendations and Best Practice Issues" section of this inspection report.

In 2015, approximately 35194 m3 of supernatant was reportedly recycled, with a maximum of 385m3 being recycled on July 30, 2015, equating to approximately 8.5 percent of the raw water intake flow on the same day. On the days supernatant recycling occurred in 2015, it was done at an average rate equating to 3.3 percent of the same day raw water intake flow.

During 2015, the supernatant that was recycled back into the treatment process had a measured turbidity of less than 10NTU, with results ranging between 0.32NTU and 6.36NTU. There were a few occasions when the supernatant turbidity was above 9.0NTU, however in each of those instances the alarm sequence was triggered and the supernatant recycling process ceased.

Total suspended solid concentrations in the recycled supernatant ranged between 2.0and 16mg/L, free chlorine residual ranged between 0.00 and 0.09mg/L, pH ranged between 6.79 and 7.74, aluminium concentrations ranged between 0.02 and 3.0mg/L, manganese concentrations ranged between 0.003 and 0.006mg/L; and, trihalomethanes ranged between 27 and 47ug/L.

On an emergency basis, supernatant may also be directed to the plant outfall chamber and subsequently to Lake Muskoka. Should this emergency overflow be used, Condition 4.4, Schedule C of the Licence requires the Municipality to conduct sampling for suspended solids and free chlorine residual during each event, and Condition 1.5, Schedule C of the Licence only permits such discharges if the suspended solids concentration is less than 25mg/L and the free chlorine residual is 0mg/L. No emergency overflow discharges occurred during this inspection review period. Supernatant that is not recycled, is directed to the sanitary sewers along with the backwash wastewater/settled sludge.

- **All sampling requirements for lead prescribed by schedule 15.1 of O. Reg. 170/03 were being met.**

Based on the results of historical lead sampling, the Municipality is exempt from the requirement to sample lead within the plumbing of the private residences in the Gravenhurst community. Instead, the Municipality must ensure to test for total alkalinity and pH during each of the prescribed sampling periods (December 15 to April 15 and June 15 and October 15), and must ensure lead is sampled within the distribution system in each of the prescribed sampling periods in every third 12 month period. Based on the estimated population (7400) of the Gravenhurst community, the Municipality is required to ensure this sampling is conducted from three locations within the distribution system. The first round of the three year sampling was determined to be completed with the December 15, 2013-April 15, 2014, and June 15, 2014 to October 15, 2014 sampling period. Sampling records provided by the owner demonstrates that three distribution samples were obtained in both March, 2014 and September, 2014 in order to comply with the regulatory requirement.

During this inspection review period, a single sample was collected for Lead at the Beaver Creek (Reay Road) Reservoir on May 19, 2015.

WATER QUALITY MONITORING

Alkalinity and pH sampling is also undertaken at four locations within the distribution system on a weekly basis as part of the Langelier Saturation Index (LSI) sampling implemented by the Municipality. Sodium Hydroxide is added to the drinking water at the WTP for pH adjustment and corrosion control purposes.

During this inspection review period, the Lead result was 0.01ug/L, well within the Ontario Drinking Water Quality Standard of 10ug/L. Alkalinity results ranged between 46 and 62.9mg/L and pH ranged between 7.18 and 8.14.

* **Records confirmed that chlorine residual tests were being conducted at the same time and at the same location that microbiological samples were obtained.**

Subsection 6-3 (1) of Schedule 6 of O.Reg.170/03 prescribes that if a microbiological sample required by the regulation is taken, that another sample must be taken at the same time from the same location and tested immediately for free chlorine residual. Records reviewed during the course of this inspection indicate that the Municipality ensured that the free chlorine residual was tested at the time of all microbiological samples. Operational staff recorded the free available chlorine residual tests directly on the Laboratory Sample Submission / Chain of Custody Form at the same time that microbiological samples were obtained. The chlorine residuals associated with microbiological sample were then included by the laboratory on the analytical report associated with results of the microbiological test.

WATER QUALITY ASSESSMENT

* **The audit samples collected by the inspector met the applicable Ontario Drinking Water Quality Standards and/or the aesthetic objectives or operation guidelines. The results of the audit sampling are summarized as follows:**

On the date of this inspection, the free available chlorine residual within the distribution system, was found to be acceptable with a concentration of 0.71mg/L being measured at the Wapaska public tap; a concentration of 1.49mg/L being measured at the Beach Road Elevated Tower; a concentration of 1.12mg/L being measured at the Fairview Elevated Tower; and, a concentration of 1.27mg/L being measured at the Beaver Creek Reservoir, Booster Station and Rechlorination Facility.

Microbiological and chemical audit samples were not collected as part of this inspection.

* **Records show that all water sample results taken during the review period met the Ontario Drinking Water Quality Standards (O. Reg. 169/03).**

The standards for drinking water quality in Ontario are prescribed in O.Reg.169/03 "Ontario Drinking Water Quality Standards" (ODWQS). Background and supporting information for each of the standards can be found in the Ministry's "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines".

With the exception of the NDMA discussion below, results of sampling conducted during this inspection review period met the microbiological and chemical requirements of the ODWQS.

As previously discussed, samples collected as part of the Municipalities involvement in the Ministry's Drinking Water Surveillance Program (DWSP) did initially indicate elevated levels of N-Nitrosodimethylamine (NDMA) during this and previous Ministry inspection periods. NDMA, although not a parameter that is required to be tested under O.Reg.170/03 requirements, does have a maximum acceptable concentration of 0.000009mg/L established in the ODWQS. In response to each of the initial NDMA detections made by the Ministry's Laboratory Services Branch (LaSB), resampling was undertaken by the Municipality, and resamples were analyzed by the Municipality's retained private laboratory. In each instance, the resamples collected did not confirm the elevated NDMA results when analyzed by the private lab. In early 2015, the Ministry's LaSB was asked to review the discrepancies being identified, and it was concluded that significant levels of NDMA are not being formed in the actual Gravenhurst water treatment process or upon standing in the distribution pipes, and that the NDMA formation issue was an analytical problem occurring during the sample extraction process at the Ministry's lab. Measures have reportedly been put in

WATER QUALITY ASSESSMENT

place at the Ministry's lab to ensure the organic sample results are indicative of the true water quality, and the Municipality continues to participate in DWSP.

To put closure to the NDMA issue, the following is a summary of the Adverse Water Quality Incidents (AWQI) notifications that were made and responded to accordingly by the Municipality. Based on the conclusions reached by the Ministry's LaSB, each of these AWQI's are considered fully resolved.

On January 28, 2014, the Ministry's LaSB reported (AWQI115884) NDMA concentration exceedances in the treated and distribution water samples collected January 21, 2014. Appropriate notifications were made to both the Ministry and the Simcoe Muskoka District Health Unit. Resamples of the raw, treated and distribution water collected on January 29, 2014 and submitted to SGS Lakefield showed no indication of adverse water quality.

On January 27, 2015, the Ministry's LaSB reported (AWQI122402) NDMA concentration exceedances in the treated and distribution water samples collected January 20, 2015. Appropriate notifications were made to both the Ministry and the Simcoe Muskoka District Health Unit. Resamples of the raw, treated and distribution water collected on January 28, 2015 and submitted to SGS Lakefield showed no indication of adverse water quality.

On February 2, 2015, concurrent samples were collected by the Municipality, and submitted to both the Ministry's LaSB and SGS Lakefield. On February 10, 2015 the Ministry's LaSB reported (AWQI122484) a NDMA concentration exceedance in the distribution sample, however the analysis by SGS Lakefield showed no indication of adverse water quality.

On February 17, 2015, an additional set of concurrent samples were collected, and submitted to both the Ministry's LaSB and SGS Lakefield. On February 19, 2015 the Ministry's LaSB reported (AWQI122572) NDMA concentration exceedances in the treated and distribution water samples, however the analysis by SGS Lakefield once again showed no indication of adverse water quality.

Additional sampling was subsequently undertaken following the last occurrence, and as previously identified, the Ministry's LaSB has confirmed that NDMA formation issues which gave rise to the adverse test results was the result of an analytical problem occurring during the sample extraction process, and that significant levels of NDMA are not being formed in the actual Gravenhurst water treatment process or upon standing in the distribution pipes.

REPORTING & CORRECTIVE ACTIONS

- **Corrective actions (as per Schedule 17) had been taken to address adverse conditions, including any other steps that were directed by the Medical Officer of Health.**

In addition to the notifications and corrective actions that were appropriately made by the Municipality in response to the NDMA issues discussed above, the Municipality also proactively made a notification (AWQI#127263) on November 5, 2015 when, as a result of a power failure and a corresponding emergency generator failure, trending of continuous filter effluent turbidity monitoring did not occur for approximately 35 minutes. When the utility power had gone out, each filter was filtering with a filter effluent turbidity of around 0.08NTU being trended on SCADA. The generator failed to start, and trending ceased on SCADA. Operational staff responded to the incident in a timely manner and manually closed the filter effluent valves, until the power could be restored and trending restored. When utility power and trending was restored, and prior to re-opening the filter effluent valves, confirmation was made that filter turbidity remained consistent at 0.08NTU. Confirmation was also made that the issue did not have any impact on the downstream disinfection process, with chlorine residuals within each of the chlorine contact tanks remaining consistently above 2.0mg/L during the occurrence. The issues with the emergency generator were

REPORTING & CORRECTIVE ACTIONS

likewise investigated and addressed in a timely manner, and the generator continues to be tested on a weekly basis. There is no indication that an adverse condition resulted during or as a result of this trending issue. The Owner is also considering the possibilities of installing of additional Uninterruptible Power Supplies (UPS) units to prevent similar incidents from occurring in the future. All appropriate notifications were made to the Ministry and the Simcoe Muskoka District Health Unit, in response to the issue.

* **All required notifications of adverse water quality incidents were immediately provided as per O. Reg. 170/03 16-6.**

* **Where required continuous monitoring equipment used for the monitoring of chlorine residual and/or turbidity triggered an alarm or an automatic shut-off, a qualified person responded in a timely manner and took appropriate actions.**

A review of the continuous monitoring data and the log books was performed for any alarm conditions and actions taken by operators in response to incidents at the water treatment plant. Any after hours alarm calls appear to have been responded to in a timely fashion by the utility operators and notes have been entered in the log book of their actions taken for each instance. Explanations appear to have been consistently provided for power interruptions, maintenance activities, process operation alarm calls, and any communication errors that triggered alarms.

OTHER INSPECTION FINDINGS

* **The following issues were also noted during the inspection:**

NON-COMPLIANCE WITH REGULATORY REQUIREMENTS AND ACTIONS REQUIRED

This section provides a summary of all non-compliance with regulatory requirements identified during the inspection period, as well as actions required to address these issues. Further details pertaining to these items can be found in the body of the inspection report.

Not Applicable

SUMMARY OF RECOMMENDATIONS AND BEST PRACTICE ISSUES

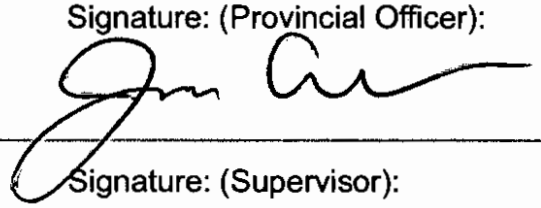
This section provides a summary of all recommendations and best practice issues identified during the inspection period. Details pertaining to these items can be found in the body of the inspection report. In the interest of continuous improvement in the interim, it is recommended that owners and operators develop an awareness of the following issues and consider measures to address them.

1. **The following issues were also noted during the inspection:**

   Although, the addition of polymer has aided in the flocculation development, resulted in longer filter run times, and, has lessened the volumes of backwash wastewater being generated, the polymer addition has also presented issues with respect to the supernatant recycling process on occasion. As discussed within the body of this inspection report, the facility under condition 7.1, Schedule B of the Permit, is allowed to recycle supernatant from the backwash wastewater settling process back to the head of the plant for re-treatment, at a rate of up to 20 percent of the raw water intake flows, if the supernatant turbidity is below 10NTU. Section 7.1, Schedule B of the Permit, requires that the process residues (filter backwash) be allowed to settle for at least 30 minutes before supernatant decant occurs. With the addition of polymer, operational staff has indicated that a longer settling period is necessary for the supernatant turbidity to fall within the required range. As supernatant decant occurs prior to the remainder of the respective backwash wastewater holding tank contents being pumped out to the sanitary sewer, the additional time necessary for supernatant settling, does restrict the filter production capabilities; in that, a filter requiring a backwash may have to go-offline and wait for one of the backwash wastewater holding tanks to be empty, before backwashing can commence, and the filter can ultimately return to production. In efforts of addressing this, Operational staff, regularly adjust/stagger filter run times, etc., to account for the supernatant settling/recycling and backwash process. Supernatant recycling has also impacted on the coagulant process, as residual calcium hydroxide (hydrated lime) imparted from the supernatant, has, on occasion, resulted in the pH and alkalinity being adjusted outside out of the coagulant's optimal range. In these instances, pH alarms are usually triggered and operational staff are required to intervene.

   Recommendation:
   Although the Municipality is complying with the supernatant recycling requirements, and appears to be making the appropriate adjustments/responses to account for the supernatant recycling process, considerations should be made with respect to the feasibility of continuing to operate the supernatant recycling system on a regular basis, as it does appear to present production capability issues.

SIGNATURES

Inspected By:	Signature: (Provincial Officer):
James Crumbie	
Reviewed & Approved By:	Signature: (Supervisor):
Craig Seabrook	Craig E. Seabrook
Review & Approval Date:	2016 - 02 - 12

Note: This inspection does not in any way suggest that there is or has been compliance with applicable legislation and regulations as they apply or may apply to this facility. It is, and remains, the responsibility of the owner and/or operating authority to ensure compliance with all applicable legislative and regulatory requirements.

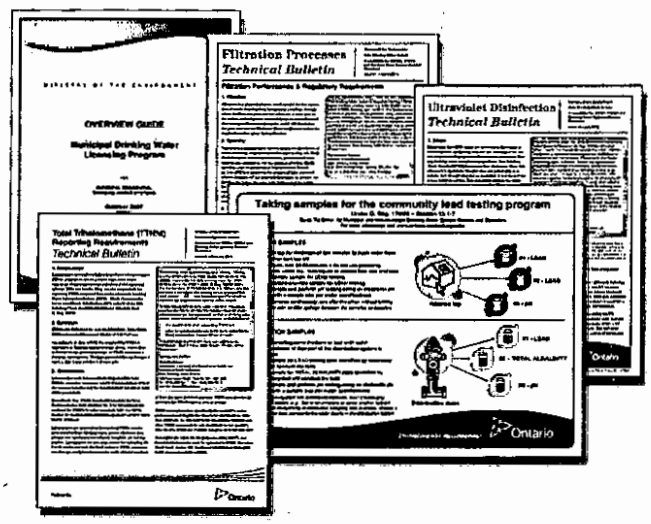
Stakeholder Appendix

Key Reference and Guidance Material for Municipal Residential Drinking Water Systems

Many useful materials are posted on the Ministry of the Environment's **Drinking Water Ontario** website at **www.ontario.ca/drinkingwater** to help in the operation of your drinking water system.

Below is a list of key materials frequently used by owners and operators of municipal drinking water systems. To read or download these materials, go to **Drinking Water Ontario** and search in the **Resources** section by **Publication Number**.

Visit **Drinking Water Ontario** for more useful materials. Contact the Public Information Centre if you need assistance or have questions at 1-800-565-4923/416-325-4000 or **picemail.moe@ontario.ca**.

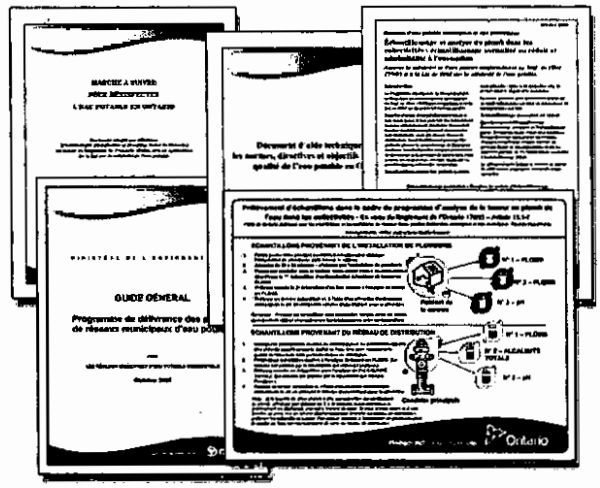


PUBLICATION NUMBER	PUBLICATION TITLE
4448e01	Procedure for Disinfection of Drinking Water in Ontario
7152e	Strategies for Minimizing the Disinfection Products Trihalomethanes and Haloacetic Acids
7467	Filtration Processes Technical Bulletin
7685	Ultraviolet Disinfection Technical Bulletin
8215	Total Trihalomethane (TTHM) Reporting Requirements Technical Bulletin (February 2011)
2601e	Overview Guide: Municipal Drinking Water Licensing Program
0000	Municipal Drinking Water Licensing Program Bulletin, Issue 1, January 2011
0000	Certification Guide for Operators and Water Quality Analysts
6560e	Taking Samples for the Community Lead Testing Program
7423e	Community Sampling and Testing for Lead: Standard and Reduced Sampling and Eligibility for Exemption
7128e	Drinking Water System Contact List
4449e01	Technical Support Document for Ontario Drinking Water Quality Standards

PIBS 8990b

Ontario

Principaux guides et documents de référence sur les réseaux résidentiels municipaux d'eau potable



Beaucoup de documentation sur le fonctionnement d'un réseau d'eau potable se trouve sur le site Web du **ministère de l'Environnement**.

Vous trouverez ci-dessous la liste des principaux documents que les propriétaires et les exploitants de réseaux municipaux d'eau potable utilisent fréquemment. Pour lire ou télécharger ces documents, allez sur le site Web du Ministère, et effectuez une recherche par numéro de publication dans la section RESSOURCES.

Consultez le site d'**Eau potable Ontario** pour obtenir d'autre documentation. Communiquez avec le Centre d'information du public au 1 800 565-4923 ou au 416 325-4000, ou encore à **picemail.moe@ontario.ca** si vous avez des questions ou besoin d'aide.

NUMÉRO DE PUBLICATION	TITRE DE LA PUBLICATION
4448f01	Marche à suivre pour désinfecter l'eau portable en Ontario
7152e	Strategies for Minimizing the Disinfection Products Trihalomethanes and Haloacetic Acids (en anglais seulement)
7467	Filtration Processes Technical Bulletin (en anglais seulement)
7685	Ultraviolet Disinfection Technical Bulletin (en anglais seulement)
8215	Total Trihalomethane (TTHM) Reporting Requirements Technical Bulletin (février 2011) (en anglais seulement)
2601f	Guide général - Programme de délivrance des permis de réseaux municipaux d'eau potable
0000	Bulletin du Programme des permis de réseaux municipaux d'eau potable, numéro 1, janvier 2011
0000	Guide sur l'accréditation des exploitants de réseaux d'eau potable et des analystes de la qualité de l'eau de réseaux d'eau potable
6560f	Prélèvement d'échantillons dans le cadre du programme d'analyse de la teneur en plomb de l'eau dans les collectivités
7423f	Échantillonnage et analyse du plomb dans les collectivités : échantillonnage normalisé ou réduit et admissibilité à l'exemption
7128f	Liste des personnes-ressources du réseau d'eau potable
4449f01	Document d'aide technique pour les normes, directives et objectifs associés à la qualité de l'eau potable en Ontario

ontario.ca/drinkingwater

PIBS 8990b

Ontario

MOE Audit Sample Results

Not Applicable

Provincial Officer's Report & Order

Not Applicable

Inspection Rating Record

Ministry of the Environment - Inspection Summary Rating Record (Reporting Year - 2015-2016)

DWS Name:	GRAVENHURST (MUSKOKA BEACH) DRINKING WATER SYSTEM
DWS Number:	220002100
DWS Owner:	Muskoka, The Corporation Of The District Municipality Of
Municipal Location:	Gravenhurst
Regulation:	O.REG 170/03
Category:	Large Municipal Residential System
Type Of Inspection:	Focused
Inspection Date:	February 5, 2016
Ministry Office:	Barrie District

Maximum Question Rating: 500

Inspection Module	Non-Compliance Rating
Capacity Assessment	0 / 30
Treatment Processes	0 / 77
Operations Manuals	0 / 28
Logbooks	0 / 14
Certification and Training	0 / 28
Water Quality Monitoring	0 / 124
Reporting & Corrective Actions	0 / 66
Treatment Process Monitoring	0 / 133
TOTAL	**0 / 500**

Inspection Risk Rating	**0.00%**

FINAL INSPECTION RATING:	**100.00%**

Inspection Rating Record Generated On 12-FEB-16 (Inspection ID: 1-BYLI7).

Ministry of the Environment - Detailed Inspection Rating Record (Reporting Year - 2015-2016)

DWS Name:	GRAVENHURST (MUSKOKA BEACH) DRINKING WATER SYSTEM
DWS Number:	220002100
DWS Owner:	Muskoka, The Corporation Of The District Municipality Of
Municipal Location:	Gravenhurst
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Type Of Inspection:	Focused
Inspection Date:	February 5, 2016
Ministry Office:	Barrie District

Maximum Question Rating: 500

Inspection Risk Rating	**0.00%**
FINAL INSPECTION RATING:	**100.00%**

Inspection Rating Record Generated On 12-FEB-16 (Inspection ID: 1-BYLI7).