Lemieux Island Water Purification Plant

The following report summarizes drinking water quality results, adverse water quality notifications, and other operating information related to the **Lemieux Island Water Purification Plant** (waterworks #220003207) for the period January 1 to December 31 2017. It was prepared in accordance with Section 11 of O.Reg.170/03 under the Safe Drinking Water Act (SDWA, 2002).

The Annual Report for each municipal water system operated by the City of Ottawa is posted on the web site: www.ottawa.ca. Copies of each Annual Report and Summary Report prepared in accordance with Schedule 22 of O.Reg.170/03, are available to the public at 951 Clyde Avenue (telephone 3-1-1), the Britannia Water Purification Plant (2731 Cassels Street), and the Lemieux Island Water Purification Plant (1 Onigam Street).

A copy of this report is also provided to the Township of Russell (waterworks #260092014) which receives its drinking water from the City of Ottawa water supply.

Description of Drinking Water System

The City of Ottawa operates two treatment plants to supply drinking water – Lemieux Island Water Purification Plant (capacity: 400 ML/d; constructed 1931) and Britannia Water Purification Plant (capacity: 360 ML/d; constructed 1961). The source water for both plants is the Ottawa River. Both plants use identical water treatment processes and have undergone significant expansion and modernization over the years.

Raw water enters the treatment plants through large intake pipes that extend into the main flow of the river. The treatment process makes use of the “multiple barrier” principle. A series of treatment steps successively remove undesirable substances such as colour, suspended particles, algae, bacteria, and viruses from the water. The purification process in Ottawa consists of the following steps:

- coagulation
- flocculation
- sedimentation
- filtration
- primary disinfection

- pH adjustment
- secondary disinfection
- fluoridation

During the final treatment step, fluoride is added for prevention of dental cavities, and chloramine (mixture of chlorine and ammonia) is added to preserve water quality as it travels through the vast water distribution system. Finally, the pH level is adjusted to 9.2 – 9.4 in order to minimize corrosion effects in the water distribution system.

After the treatment process, water is pumped through the distribution network of watermains (over 3000 km of watermain piping) to reach water customers over an area roughly 25 km by 50 km. Treated water from both the Britannia and Lemieux Island water plants is blended as it travels through a common distribution system. Pressure and storage requirements are met through the operation of 25 pumping stations and reservoirs located throughout the system. The total volume of water stored in reservoirs is 275 Million Litres, which is roughly equivalent to the daily amount of water produced. All treatment, pumping, and storage systems are controlled by a dedicated computer control system and monitored by Ministry of Environment and Climate Change (MOECC) certified Water Treatment Operators 24 hours per day.

The water treatment chemicals used over this reporting period are listed below:

- Aluminum Sulphate (liquid – 48.8%)
- Sulphuric Acid (liquid – 93%)
- Sodium Silicate (liquid – 29%)
- Sodium Hypochlorite (liquid – 12%)
- Hydrofluorosilicic Acid (liquid – 24%)
- Sodium Hydroxide (liquid – 50%)
- Aqueous Ammonia (liquid – 25%)

Monetary expenses incurred during the reporting period

In order to maintain the safe and efficient operation of the waterworks, maintenance and capital projects are undertaken from time to time. All major repairs or upgrade projects that took place during the reporting period are described below.

Chemical System Upgrades: ($610,000): A project to modify 5 chemical feed systems at the Britannia and Lemieux Island Water Treatment Plants to ensure compliance with TSSA regulation, improve reliability and redundancy, update control systems and instrumentation, upgrade piping and replace pumps. The chemical systems being modified at Britannia are ammonium hydroxide and sodium silicate. At Lemieux Island the ammonium hydroxide, sodium silicate and aluminum sulphate chemical feed systems are being upgraded. The design was completed in 2016 with construction to be completed in 2018.

Lemieux WPP Intake Functional Design Project ($8.2 million): This project has been initiated in 2016 as a solution to the winter frazil ice restricting Lemieux intake. The Functional Design was completed in 2017 with approvals, detailed design and construction to follow.

Fleet Street Covered Aqueduct Structural Rehabilitation ($3 million): This project was initiated in 2016, with minor civil works completed in the spring of 2017.

Generator (G1) Repairs ($108,000): This project was to repair and load test Lemieux Island's Diesel Standby Generator G1. The work was successfully completed by in-house trade staff despite the engine manufacturer being out of business.

Filter Underdrains Rehabilitation Project: ($180,000): In 2017, 5 out of 18 Lemieux WPP Filter Underdrains were rehabilitated, thus completing the planned rehabilitation for 2017.

Diesel Engine Exhaust Improvements ($520,000): This project was completed to address compliance issues with a number of diesel engines, generators and pump exhaust systems at both Britannia and Lemieux.

Water Quality test results

The Ontario Drinking Water System Regulation O.Reg.170/03 defines water quality sampling and testing requirements based on the nature of the analysis performed: microbiological, operational, inorganic, and organic test parameters. The sections below describe the 2017 test results for samples required by O.Reg.170/03. In addition to the required tests, the City of Ottawa analyzes its drinking water for numerous other trace substances and parameters in order to ensure the safety of the water supply. A complete listing of water quality testing results is available on the City website www.ottawa.ca.

Microbiological

Total Coliform and E.coli bacteria tests are performed on the raw, treated and distributed drinking water. These types of bacteria are considered to be "indicator" organisms since they themselves don't cause disease, but their presence indicates the potential for other pathogenic organisms to be present.

Raw: "Raw" water refers to the untreated water that is drawn into the plant directly from the Ottawa River. Raw water is tested to give an indication of what level of bacteria are coming into the plant and to see how it changes seasonally. During 2017, the concentration of Total Coliform bacteria in the raw water ranged from 16 to 14136 (cfu/100mL) and the E.coli bacteria levels ranged from 0 – 771 (cfu/100mL). These levels were comparable to previous years and were easily handled by the treatment plant.

Treated: Treated water is tested 4 times per day as it leaves the plant and enters the distribution system. During 2017, none of the 1445 bacteriological samples taken indicated the presence of Total Coliform bacteria.

Distribution: Routine bacteriological samples are taken at over 60 locations to verify water quality throughout the supply network. Samples are also taken to monitor water quality during watermain construction and repair activities. During 2017, 2 out of 5103 routine distribution samples indicated the presence of Total Coliform bacteria. In both cases, E.coli bacteria were not detected, and follow up samples taken from the affected site as well as upstream and downstream locations were clear. It should be noted that Total Coliform bacteria can colonize on pipe surfaces and tap fixtures resulting in a positive test result, even if the "bulk" water is free from bacteria.

The treated and distribution water microbiological results for Total Coliform and E.coli bacteria are summarized in the table below.

Table 1a Summary of the Total Coliform and E.coli test results for Lemieux Island WPP treated and distributed water samples taken during 2017

Parameter	Number of treated water samples taken	Number of positive test results	Number of distribution samples taken	Number of positive test results
Total coliform bacteria (cfu/100mL)	1445	0	5103	2
E.coli bacteria (cfu/100mL)	1445	0	5103	0

cfu=colony forming units

HPC (heterotrophic plate count) bacteria represent a broad spectrum of environmental aerobic bacteria that indicate biological growth. They are not harmful to humans, and are therefore not considered to represent adverse drinking water quality. However, they are useful as operational indicators for the presence of biological (ie. biofilm) growth on the inside surface of a pipe or watermain. An operational limit of 500 (cfu/mL) has been established as a target for drinking water systems in Ontario. During 2017, there were 7 out of 2930 distribution samples that were above the HPC operational target of 500 (cfu/mL). This level of HPC bacteria occurrence is considered to be quite low for a large water distribution system and the test results were similar to previous years.

The treated and distribution water microbiological results for HPC bacteria are summarized in the table below.

Table 1b Summary of the heterotrophic plate count (HPC) bacteria test results for Lemieux Island WPP treated and distributed water samples taken during 2017

Parameter	Number of treated water samples taken	Range of test results	Number of distribution samples taken	Range of test results
HPC bacteria (cfu/mL)	200	<10 – 100	2930	<10 – 3000

cfu=colony forming units

Operational: Operational tests are conducted by treatment plant operators to evaluate process conditions and to make adjustments to the process. Continuous on-line analyzers measure and record many of the operational tests through a computer control (SCADA) system 24 hours per day. The Lemieux Island WPP has approximately 40 such analyzers in operation. In addition, Process Operators conduct routine laboratory tests during each 12-hour shift to verify water quality at each stage of the treatment process. The test results for turbidity, chlorine, and fluoride are summarized in the table below. During 2017, all operational tests of treated water complied with safe drinking water standards.

Table 2 Summary of operational testing performed for Lemieux Island treated water during 2017

Parameter	Average value	Range of values (min - max)	Number of samples
Turbidity	0.05	0.04 – 0.11	724
Total Chlorine	1.80	1.54 – 2.35	724

Parameter	Average value	Range of values (min - max)	Number of samples
Fluoride	0.69	0.66 – 0.75	724

Inorganics: Inorganic substances include heavy metals and dissolved minerals that may be present in treated drinking water. Inorganic substances are tested monthly except for fluoride which is monitored continuously by analyzer and tested by lab analysis twice daily. The table below summarizes the 2017 test results, expressed as annual average concentrations in mg/L. All inorganic test results during 2017 were well within the Ontario Drinking Water Standards, shown in the right column.

Table 3 Summary of the inorganic parameters tested in Lemieux Island WPP treated water during 2017.

Parameter	Unit of Measure	Result	Ontario Drinking Water Standard
Antimony	mg/L	0.0002	0.006
Arsenic	mg/L	0.0002	0.025
Barium	mg/L	0.014	1.0
Boron	mg/L	0.006	5.0
Cadmium	mg/L	0	0.005
Chromium	mg/L	0.0002	0.05

Parameter	Unit of Measure	Result	Ontario Drinking Water Standard
Lead	mg/L	0	0.01
Mercury	mg/L	0	0.001
Selenium	mg/L	0	0.05
Uranium	mg/L	0	0.02
Sodium	mg/L	19.4	20.0*
Fluoride	mg/L	0.69	1.5
Nitrate	mg/L	0.18	10.0
Nitrite	mg/L	0	1.0

0 denotes that the chemical was not detected

*NOTE: Sodium health advisory level of 20 mg/L for people on sodium-restricted diets only.

Organics: Trace organic substances include: volatile organic compounds, pesticides, herbicides, industrial solvents, and disinfection by-products. Trace organic substances are tested quarterly, and the table below shows the 2017 test results, expressed as average concentrations in treated water. None of the trace organic substances were detected with the exception of Trihalomethanes (THM) and Haloacetic Acids (HAA). THMs and HAAs are organic compounds that form during the treatment process when chlorine reacts with natural organic matter dissolved in the water. During 2017, all organic test results were within safe drinking water standards.

Table 4 Summary of 2017 trace organic test results for Lemieux Island WPP treated water

Parameter	Units	Result	Ontario Drinking Water Standard
Alachlor	mg/L	0	0.005
Atrazine + N-dealkylated metobolites	mg/L	0	0.005
Azinphos-methyl	mg/L	0	0.02
Benzene	mg/L	0	0.001
Benzo(a)pyrene	mg/L	0	0.00001
Bromoxynil	mg/L	0	0.005
Carbaryl	mg/L	0	0.09
Carbofuran	mg/L	0	0.09
Carbon Tetrachloride	mg/L	0	0.002
Chlorpyrifos	mg/L	0	0.09
Diazinon	mg/L	0	0.02
Dicamba	mg/L	0	0.12

Parameter	Units	Result	Ontario Drinking Water Standard
1,2-Dichlorobenzene	mg/L	0	0.2
1,4-Dichlorobenzene	mg/L	0	0.005
1,2-Dichloroethane	mg/L	0	0.005
1,1-Dichloroethylene	mg/L	0	0.014
Dichloromethane	mg/L	0	0.05
2-4 Dichlorophenol	mg/L	0	0.9
2,4-Dichlorophenoxy acetic acid (2,4D)	mg/L	0	0.1
Diclofop-methyl	mg/L	0	0.009
Dimethoate	mg/L	0	0.02
Diquat	mg/L	0	0.07
Diuron	mg/L	0	0.15
Glyphosate	mg/L	0	0.28
Haloacetic Acids*	mg/L	0.034	0.080

Parameter	Units	Result	Ontario Drinking Water Standard
Malathion	mg/L	0	0.19
2-Methyl-4-chlorophenoxyacetic Acid (MCPA)	mg/L	0	0.10
Metolachlor	mg/L	0	0.05
Metribuzin	mg/L	0	0.08
Monochlorobenzene	mg/L	0	0.08
Paraquat	mg/L	0	0.007
Pentachlorophenol	mg/L	0	0.06
Phorate	mg/L	0	0.002
Picloram	mg/L	0	0.19
Polychlorinated Biphenyls(PCB)	mg/L	0	0.003
Prometryne	mg/L	0	0.001
Simazine	mg/L	0	0.01
Terbufos	mg/L	0	0.001

Parameter	Units	Result	Ontario Drinking Water Standard
Tetrachloroethylene	mg/L	0	0.01
Tetrachloroethylene	mg/L	0	0.03
2,3,4,6-Tetrachlorophenol	mg/L	0	0.1
Triallate	mg/L	0	0.23
Trichloroethylene	mg/L	0	0.005
2,4,6-Trichlorophenol	mg/L	0	0.005
Trifluralin	mg/L	0	0.045
Trihalomethanes*	mg/L	0.039	0.1
Vinyl Chloride	mg/L	0	0.001

0 denotes the chemical was below the analytical detection limit

NOTE*: The reported THM and HAA results represent the average concentration measured in the distribution system

Adverse Water Quality Incidents (AWQI) Requiring Notification

The drinking water regulations identify several "Indicators of Adverse Water Quality" for which the waterworks must immediately notify health officials and the Ministry. These refer to any test result from treated or distributed drinking water that does not meet a provincial water quality standard or a situation where disinfection of the water may be compromised. For each Adverse Water Quality Incident (AWQI), City of Ottawa staff immediately notify the Ottawa Public Health Department and the Ministry of Environment and Climate Change (MOECC) as required by regulations. Corrective actions, re-sampling, and reporting are required in each case.

During 2017, there were no AWQI events for Lemieux Island WPP treated water and 4 AWQI events reported for the distribution system. The events are summarized in the table below including the adverse result, corrective actions taken, and date of resolution.

Table 5 Adverse Water Quality Incidents for the distribution system

Incident Date	Test Parameter and Location	Result	Unit of Measure	Corrective Action	Date of Resolution
9-Jan-17 AWQI# 132181	**Improperly disinfected water directed to users**: Watermain break on Cordova St., stagnant water released into the system prior to repair	N/A		Flushed and sampled affected area of distribution system	11-Jan-17
23-Feb-17 AWQI# 132472	**Total Coliform bacteria >0** at St. Clare School	Positive	cfu/100 mL	Flush and resample	24-Feb-17

Incident Date	Test Parameter and Location	Result	Unit of Measure	Corrective Action	Date of Resolution
03-Apr-17 AWQI# 132778	**Improperly disinfected water directed to users**: Backflow of concrete additive chemical into water supply of Rideau Center	N/A		Drinking water advisory (Do not drink) until building plumbing system was flushed and tested	08-Apr-17
08-Jul-17 AWQI# 133892	**Total Coliform bacteria >0** at Des Sentiers School	Positive	cfu/100 mL	Flush and resample	11-Jul-17

cfu=colony forming units

Community Lead Testing Program

The treated water produced by the Lemieux Island Water Purification Plant is lead-free. However, trace amounts of lead can potentially be dissolved in the water as the water travels through a lead service line or as it comes in contact with household plumbing components such as lead solder and brass fittings. The standard for lead in drinking water has been established at 10 ppb (parts per billion) or below.

In 2007, a new provincial regulation (amendment to O.Reg.170/03) was initiated in response to concerns about potential lead levels in provincial water supplies. The Community Lead Testing Program requires each water system to conduct extensive lead testing in homes with lead service pipes. The testing is conducted during winter and summer periods to represent any seasonal changes in water quality.

Ottawa's water quality has consistently passed the MOECC Community Lead Testing criteria for drinking water. In order to meet compliance standards, 90% of the tap water samples must have a lead concentration below 10 ppb (which is equivalent to 10 µg/L), following a 30-minute period of stagnation in the plumbing system.

Combining results for all twenty rounds of testing during 2007 – 2017, the average lead concentrations from homes with lead service pipes are 2.7 (ppb) in Litre-1 and 2.7 (ppb) in Litre-2. The 90th percentile concentrations are 4.3 (ppb) in Litre-1 and 5.5 (ppb) in Litre-2. During all rounds of testing including 2017, the City of Ottawa results have been well within the provincial and federal standard of 10 (ppb). Overall, excellent results have been observed in Ottawa due to the optimized corrosion control strategy of pH adjustment being applied at both water purification plants. The table below summarizes the lead testing results for 2017.

Table 6 Summary of the in-home lead testing results for winter and summer sampling sessions during 2017

Location Type	Range of lead concentrations measured (ppb)	Average lead concentration (ppb)	Number of samples with lead concentration above 10 ppb	Total number of samples
Customer taps (plumbing)	<0.05 – 271.9*	5.1	3	226
Watermains (distribution)	<0.05 – 0.40	0.08	0	20

*NOTE: The high lead concentration of 271.9 ppb that was observed at one test site was due to a tiny piece of pipe scale or particulate matter that was released from within the plumbing system during sampling. A set of re-samples were taken and the follow up lead concentration was 8 ppb, which was within the 10 ppb standard.

Summary

The results demonstrate that the quality of drinking water treated and distributed from the Lemieux Island Water Purification Plant remained high during 2017 and met provincial standards and federal guidelines for drinking water quality.

If you have any questions or concerns regarding the quality of your drinking water please contact the City of Ottawa at 3-1-1 or email at info-water@ottawa.ca.

For more information on the City of Ottawa drinking water please visit us at www.ottawa.ca.