CITY OF ST. CATHARINES

February 2015

WATER DISTRIBUTION SYSTEM
2014 SUMMARY REPORT

Waterworks #260003279

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ST. CATHARINES WATER DISTRIBUTION SYSTEM SUMMARY REPORT

Introduction

The Safe Drinking Water Act, requires Municipal Council members be provided with a summary report for the drinking water system that falls under their municipal responsibility. The report must list any time the City was unable to meet the requirements of the Act, the regulations, the system's approval, drinking water works permit, municipal drinking water licence or any order issued by the Ministry of the Environment and Climate Change. Each failure must specify the duration and measures taken to correct the failure. The report must also list a summary of the quantities and flow rates of the water supplied.

Waterworks Description

The City of St. Catharines water distribution system is classified by the Ministry of the Environment and Climate Change (MOE) as a Class II system. The City's waterworks consists of over 600 kilometres of watermains serving the local street network. This watermain network is one of several municipal networks supplied by the Decew Water Treatment Plant operated by the Regional Municipality of Niagara. The source of water for this plant is surface water, from Lake Erie via an intake from the Welland Canal located approximately six kilometers from the treatment plant, near Allanburg. The water is diverted to Decew's own 5.4 kilometre long open supply channel which flows by gravity directly to the treatment plant. The Decew Water Treatment Plant is a conventional surface water treatment plant which incorporates zebra mussel control, screening, chemically assisted flocculation, coagulation, sedimentation, filtration and disinfection using sodium hypochlorite and ultraviolet light. Further information on the supply of water by the Decew Water Treatment Plant can be obtained from the Region's website at www.niagararegion.ca.

Municipal Drinking Water Licencing Program

The Municipal Drinking Water Licencing Program was originally recommended by Justice O'Connor in the Walkerton Inquiry, as part of the approvals framework for municipal drinking water systems. This program requires municipalities to obtain a licence to operate their water distribution system and to incorporate the concept of quality management into their operations. There are four components to the licence that are applicable to St. Catharines including the requirement for a Drinking Water Works Permit, a Drinking Water Quality Management System, system accreditation and a financial plan.

On October 30, 2009, the City received its first Drinking Water Works Permit (Permit) and Drinking Water Licence (Licence) from the MOE. The Permit allows for the establishment and alteration of the water distribution system. It replaces the existing Certificate of Approval process and results in a single permit for the entire system. The Permit does not expire, while the Licence expires and must be renewed every five years.

The Drinking Water Quality Management System (DWQMS) is a Quality Management System for the City's Water Distribution System. The DWQMS implements a systematic "continuous improvement" approach to planning, operations, corrective actions and management review to allow an organization to demonstrate sound system performance. The success of a DWQMS depends on the commitment

from all levels and functions of an organization including operational staff and top management. The DWQMS is documented through the Operational Plan. DWQMS awareness training is provided to staff on an annual basis. The Operational Plan is regularly reviewed and continually improves.

The preparation of a Financial Plan is a requirement specified in Regulation 453/07 and intended to demonstrate that the municipality had considered all of the financial impacts of the drinking water system. A new Financial Plan must be submitted to Council and the Ministry of Municipal Affairs and Housing (MMAH) prior to each Licence renewal. Council's Resolution confirming approval of the Financial Plan must be included in the Licence renewal documents.

Prior to Licence renewal, an external Verification Audit must be conducted. This audit was conducted by NSF – International Strategic Registrations in September 2014. No non-conformances were found and the City's new Municipal Drinking Water License was issued on October 15, 2014. This Licence will expire on October 14, 2019.

The Drinking Water Quality Management System Policy

The City of St. Catharines is committed to:

- **Ensuring a consistent supply of safe, high quality drinking water;**
- **Maintaining and continuously improving its Quality Management System; and**
- **Meeting or surpassing applicable legislation and regulations.**

Actions Taken to Comply with the Safe Drinking Water Act

- To comply with the legislation, the City is required to take a minimum of 114 samples each month from a representative cross-section of its watermain network and to test these samples for microbiological indications of contamination. Testing for the free chlorine residual content is also a requirement. The chlorine residual must be sampled at the same time and location as the microbiological sample.

- The City's drinking water is sampled every three months at points within the distribution system where there is a likelihood for the potential of elevation formations of trihalomethanes (THM's).

- The City must undertake a Community Wide Lead Testing Program. The volunteer based sampling program requires samples be taken from 50 residential homes, 5 non-residential buildings and 10 samples taken directly from the distribution system twice each year.

- Anyone who conducts sampling from within the water distribution system must hold an Ontario Water Wastewater Certification Office (OWWCO) Water Quality Analyst licence or a Water Distribution Operator's licence. These licences must be updated every three years and require continuing education for renewal.

- All laboratory analysis must be carried out by an accredited laboratory. The City of St. Catharines currently uses a number of accredited laboratories. Accreditation ensures acceptable laboratory protocols and test methods are in place. It also requires the laboratory to provide evidence and assurances of the proficiency of the analysts performing the test methods. Laboratories are audited by the Canadian Association for Laboratories Accreditation (CALA) and accredited by the Standards Council of Canada (SCC).

- All drinking water sample results are available to the public. Annual reports are available at City Hall, the Lake Street Service Centre and on the City's website, www.stcatharines.ca. The daily sample records are also available at the Lake Street Service Centre for the public to view.

- Notification is given to the MOE, the Regional Public Health Department and Decew Water Treatment Plant of all incidents of regular sampling which exceed the bacteriological limits of zero colonies per 100 mL for *Escherichia* coli (E. coli) or Total Coliforms and free chlorine residual measurements of less than 0.05 mg/L. Notifications are also given for THM's which exceed 0.10 mg/L and lead analyses which exceed 0.010 mg/L.

WATER QUALITY TEST RESULTS

Summary of Results

In 2014, over 5,100 samples were taken throughout the City and analyzed for microbiological parameters, chlorine residual and chemicals analyses as part of the drinking water surveillance program and follow-up watermain break sampling program. Of these, eight were found to exceed the Ontario Drinking Water Quality Standards. **Table 1** summarizes each parameter tested and it gives the number of samples analyzed, and the range of results.

Table 1: Summary of Water Quality Test Results, 2014

Parameter		MAC	Number of Samples	Results Range	Comments
Microbiological Analysis					
Escherichia coli (E. coli) CFU/100 mL		ND	1744	0	Indicates presence of fecal matter
Total Coliforms CFU/100 mL		ND	1744	0 - 27	Indicates the possible presence of fecal contamination
Background Count CFU/100 mL		NA	1744	0 - >200	Indication of water quality deterioration
Heterotrophic Plate Count (HPC) CFU/1 mL		NA	901	0 - 96	Indication of overall water quality
Chemical Analysis					
Trihalomethanes mg/L		0.10 mg/L	33	Based on a four quarter moving annual average 0.0637	By-product of chlorination; reaction of chlorine with organic matter
Lead mg/L	Residential	0.010 mg/L	125	<0.001 – 0.045	Lead water service connections may be found in homes built prior to 1955. No lead piping was used in the distribution system.
	Non-Residential	0.010 mg/L	10	<0.001 – 0.002	
	Distribution	0.010 mg/L	19	<0.001	
Alkalinity		NA	19	79-106	The capacity for neutralizing an acid solution
pH		NA	154	6.2-8.4	Indicates the acidity of the water
Disinfectant					
Chlorine Residual mg/L		Must be between 0.05 mg/L & 4.0 mg/L	3014	0.00 – 2.05	Level of disinfectant present

ND – None Detected NA – Not Applicable CFU – Colony Forming Units

Summary of Adverse Water Quality Incidents

After each adverse water quality incident, a series of actions are required to ensure the safety of the water and compliance with provincial legislation. The City's Standard Operating Procedures provide clear and detailed instruction for follow up actions. This involves flushing hydrants located in the area of the adverse incident, taking additional water samples from the original location and locations around the adverse incident. It also involves notifying the Niagara MOE office, the Spills Action Centre (SAC) and the Public Health Department both verbally and in writing. **Table 2** summarizes all adverse water quality incidents throughout the City of St. Catharines in 2014 and the corrective action taken.

Table 2: Summary of Adverse Water Quality Incidents, 2014

Incident Date	Location	Adverse Parameter	Result	Corrective Action	Corrective Action Date
March 6, 2014	360 Ontario Street	Total coliform	20 CFU	Flushed, resampled	March 7 & 8, 2014
July 8, 2014	460 Linwell Road	Free Chlorine	0.01 mg/L	Flushed, resampled	July 8, 2014
July 28, 2014	Yale Cres at Eastchester Ave	Free Chlorine	0.02 mg/L	Flushed, resampled	July 28, 2014
September 9, 2014	Hydrant - 9 Runcorn	Free Chlorine	0.00 mg/L	Flushed, resampled	September 9, 2014
October 9, 2014	83 Spring Garden Blvd	Free Chlorine	0.03 mg/L	Flushed, resampled	October 9, 2014
October 15, 2014	1 Monck Street	Total Coliform	27 CFU	Flushed, resampled	October 16 & 17, 2014
November 3, 2014	33 Old Coach Road	Free Chlorine	0.00 mg/L	Flushed, resampled	November 3, 2014
November 14, 2014	8 Keefer Road	Free Chlorine	0.00 mg/L	Flushed, resampled	November 14, 2014

An adverse water quality incident does not mean the drinking water supply is unsafe.
An adverse incident simply indicates on that one occasion,
a drinking water quality standard was exceeded.

Lead Exceedances

As part of the Community Wide Lead Testing Program, the City is required to take samples from within private properties. The results are not indicative of the quality of the water throughout the distribution system. When sampling for lead, the results simply represent the water sampled from within that residence. Potential lead sources include: older lead water service lines, usually built prior to the 1950's; internal plumbing, used mainly in the early 1900's; and older brass or bronze fittings and fixtures. When a lead exceedance occurs, both the Public Health Department and the MOE are notified. The affected resident is also immediately notified and a package containing the results and informational fact sheets detailing what options are available to the resident are delivered. In 2014, there were three lead exceedances found in private properties.

Percentages of Samples Meeting Ontario Drinking Water Quality Standards

Table 3 shows the percentage of drinking water samples that met the Ministry of Environment's Drinking Water Quality Standards in the last three years.

Table 3: Percentage Meeting Ministry of Environment Standards

Parameter	2012	2013	2014
E. coli	100%	100%	100%
Total Coliforms	99.73%	99.71%	99.89%
Background Count	100%	100%	100%
HPC	100%	100%	100%
Chlorine Residual	99.97%	99.92%	99.80%
Lead	100%	100%	100%
Trihalomethanes	100%	100%	100%

OPERATIONAL ACTIVITIES

Watermain Repairs

In 2014, there were 132 watermain breaks. Following a watermain break repair, the City samples from locations both upstream and downstream from where the break occurred. The samples are analyzed for microbiological parameters and chlorine residual.

When a new watermain is installed, the City is required to sample for microbiological parameters and chlorine residual. In 2014, 144 samples were taken to test the new watermains before being put into service. If any bacteria are present, the new watermains are flushed, rechlorinated and sampled again until no bacterial contamination is found before being put into service. All of the watermains must also meet the required standard for chlorine residual.

Maintenance Costs

The total budget for the 2014 Water Improvement Program amounted to $5.5 million. The total budget allowed for the replacement of approximately 5,885 metres of existing watermains and the installation of approximately 485 meters of new watermain.

When a lead water service is found, for example, during a new watermain construction job or when repairing a water service leak the City will replace the portion of the service on public property at the City's expense. The City will replace the public property side of a lead service when a lead exceedance is found and also whenever the property owner first replaces the private portion of the lead service line. Lead lines were replaced with either copper or plastic service lines.

Water Flows

Table 4 lists the monthly water flows from the Decew Water Treatment Plant to the City of St. Catharines (source: Regional Municipality of Niagara). More detailed flow data can be found the Decew Water Treatment Plant's 2014 Summary Report, available at www.niagararegion.ca.

Table 4: Summary of Monthly Water Flows (in MegaLitres), 2014

Month	Quantity (ML)
January	1255.78
February	1166.54
March	1317.93
April	1402.74
May	1533.82
June	1392.23
July	1398.14
August	1329.98
September	1258.36
October	1133.34
November	1091.93
December	1021.80
Total	15302.59
Monthly Average	1275.22
Daily Average	41.92

Note: 1 MegaLitre = 1,000,000 Litres

DEFINITIONS

MAC – Maximum Acceptable Concentration - this is a health-related standard established for parameters which, when present above a certain concentration, have known or suspected adverse health effects. The length of time the MAC can be exceeded without injury to health will depend on the nature and concentration of the parameter. (Ontario Drinking Water Standards. Ministry of the Environment. Revised June 2006. PIBS 4449e01. Page 02.)

Microbiological parameters (i.e. bacteria) – the source of bacteria may come from wastewater treatment plants, livestock operations, septic systems and wildlife. Microbiological analysis is the most important aspect of drinking water quality due to its association with dangerous water-borne diseases. (Ontario Drinking Water Standards. Ministry of the Environment.)

Total Coliforms – the group of bacteria most commonly used as an indicator of water quality. The presence of these bacteria in a water sample indicates inadequate filtration and/or disinfection. (Ontario Drinking Water Standards. Ministry of the Environment.)

***Escherichia* coli (E. coli)** – a sub-group of Coliform bacteria, it is a fecal Coliform. It is most frequently associated with recent fecal pollution. The presence of E. coli in drinking water may be an indication of sewage contamination. (Ontario Drinking Water Standards. Ministry of the Environment.)

Background Count – the bacterial content in water which can be used to measure water quality deterioration in distribution systems. (Ministry of the Environment. Method MFMICRO-E3371.)

Heterotrophic Plate Count (HPC) – indicates the overall water quality in drinking water systems. Increases in HPC can indicate a problem with drinking water treatment. (Ontario Drinking Water Standards. Ministry of the Environment.)

Trihalomethanes (THM's) – disinfection by-products which are produced when chlorine reacts with naturally occurring organics left in the water after filtration.
(Ontario Drinking Water Standards. Ministry of the Environment.)

Lead – present as a result of corrosion of lead solder, lead containing brass fittings or lead water service pipes. (Ontario Drinking Water Standards. Ministry of the Environment.)

OPTIONAL ANNUAL REPORT TEMPLATE

Drinking-Water System Number:	**260003279**
Drinking-Water System Name:	City of St. Catharines Distribution System
Drinking-Water System Owner:	Corporation of the City of St. Catharines
Drinking-Water System Category:	Large Municipal Residential (pop. 130,000)
Period being reported:	January 1, 2014 – December 31, 2014

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

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

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.

Lake Street Service Centre
383 Lake Street, St. Catharines, ON
L2N 4H5 -and-
City Hall
50 Church Street, St. Catharines, ON
L2R 7C2

Complete for all other Categories.

Number of Designated Facilities served:

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 [ ]

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

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

Drinking Water System Name	Drinking Water System Number
n/a	

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

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
[ ] Public access/notice via a newspaper
[X] Public access/notice via Public Request
[ ] Public access/notice via a Public Library
[X] Public access/notice via other method-Reports are available at various Public Education Displays

Describe your Drinking-Water System

The City of St. Catharines owns and operates a Class II stand-alone residential water distribution system. The City receives its drinking water from the Regional Municipality of Niagara Decew Water Treatment Plant. The source water is surface water from Lake Erie via an intake from the Welland Canal.

List all water treatment chemicals used over this reporting period

n/a

Were any significant expenses incurred to?

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

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

The 2014 water improvement program budget was $5,500,000. This budget allowed for the replacement or upgrade of 5,885 m of existing watermain and the installation of 485 m of new watermain.

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
March 6, 2014	Total Coliform	20	cfu/100mL	Flush, resample	March 7/8, 2014
July 8, 2014	Free Chlorine	0.01	mg/L	Flush, resample	July 8, 2014
July 28, 2014	Free Chlorine	0.02	mg/L	Flush, resample	July 28, 2014
September 9, 2014	Free Chlorine	0.00	mg/L	Flush, resample	September 9, 2014
October 9, 2014	Free Chlorine	0.03	mg/L	Flush, resample	October 9, 2014
October 15, 2014	Total Coliform	27	cfu/100mL	Flush, resample	October 16/17, 2014
November 3, 2014	Free Chlorine	0.00	mg/L	Flush, resample	November 3, 2014
November 14, 2014	Free Chlorine	0.00	mg/L	Flush, resample	November 14, 2014

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

	Number of Samples	Range of E.Coli Or Fecal Results (min #)-(max #)	Range of Total Coliform Results (min #)-(max #)	Number of HPC Samples	Range of HPC Results (min #)-(max #)
Raw					
Treated					
Distribution	1744	0	0-27	901	0-96

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

	Number of Grab Samples	Range of Results (min #)-(max #)	Unit of Measure
Turbidity			
Chlorine	3014	0.00-2.05	mg/L
Fluoride (If the DWS provides fluoridation)			

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

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

Date of legal instrument issued	Parameter	Date Sampled	Result	Unit of Measure
n/a				

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

Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
Antimony				
Arsenic				
Barium				
Boron				
Cadmium				
Chromium				
***Lead**				
Mercury				
Selenium				
Sodium				
Uranium				
Fluoride				
Nitrite				
Nitrate				

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

Summary of lead testing under Schedule 15.1 during this reporting period

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

Location Type	Number of Samples	Range of Lead Results (min#) – (max #)	Unit of Measure	Number of Exceedances
Plumbing	135	<0.001-0.045	mg/L	3
Distribution	19	<0.001	mg/L	0

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

Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
Alachlor				
Aldicarb				
Aldrin + Dieldrin				
Atrazine + N-dealkylated metobolites				
Azinphos-methyl				
Bendiocarb				
Benzene				
Benzo(a)pyrene				
Bromoxynil				
Carbaryl				
Carbofuran				
Carbon Tetrachloride				
Chlordane (Total)				
Chlorpyrifos				
Cyanazine				
Diazinon				
Dicamba				
1,2-Dichlorobenzene				
1,4-Dichlorobenzene				
Dichlorodiphenyltrichloroethane (DDT) + metabolites				
1,2-Dichloroethane				
1,1-Dichloroethylene (vinylidene chloride)				
Dichloromethane				
2-4 Dichlorophenol				
2,4-Dichlorophenoxy acetic acid (2,4-D)				
Diclofop-methyl				
Dimethoate				
Dinoseb				

Diquat				
Diuron				
Glyphosate				
Heptachlor + Heptachlor Epoxide				
Lindane (Total)				
Malathion				
Methoxychlor				
Metolachlor				
Metribuzin				
Monochlorobenzene				
Paraquat				
Parathion				
Pentachlorophenol				
Phorate				
Picloram				
Polychlorinated Biphenyls(PCB)				
Prometryne				
Simazine				
THM (NOTE: show latest annual average)	January – December	0.0637	mg/L	0
Temephos				
Terbufos				
Tetrachloroethylene				
2,3,4,6-Tetrachlorophenol				
Triallate				
Trichloroethylene				
2,4,6-Trichlorophenol				
2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)				
Trifluralin				
Vinyl Chloride				

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
THM	0.0543	mg/L	April 11, 2014
THM	0.0557	mg/L	April 11, 2014
THM	0.0515	mg/L	April 11, 2014
THM	0.0532	mg/L	April 11, 2014
THM	0.0504	mg/L	April 11, 2014
THM	0.0818	mg/L	July 4, 2014
THM	0.0719	mg/L	July 4, 2014
THM	0.0633	mg/L	July 4, 2014
THM	0.0658	mg/L	July 4, 2014

THM	0.0635	mg/L	July 4, 2014
THM	0.0680	mg/L	July 4, 2014
THM	0.0654	mg/L	July 4, 2014
THM	0.0744	mg/L	July 4, 2014
THM	0.0596	mg/L	October 9, 2014
THM	0.0566	mg/L	October 9, 2014
THM	0.0527	mg/L	October 9, 2014
THM	0.0587	mg/L	October 9, 2014
THM	0.0693	mg/L	October 9, 2014
THM	0.0508	mg/L	October 9, 2014
THM	0.0567	mg/L	October 9, 2014
THM	0.0586	mg/L	October 9, 2014