

Annual & Summary Report

For the period of:

January 1, 2017 – December 31, 2017

For:

Guelph Drinking Water System
[Corporation of the City of Guelph]

-And-

Gazer Mooney Subdivision Distribution System
[Township of Guelph/Eramosa]

Prepared by:



Water Services

Environmental Services Department

Revision Date: February 6, 2018

As per the Accessibility for Ontarians with Disabilities Act (AODA), this document is available in an alternate format by e-mailing waterservices@guelph.ca or by calling 519-837-5627.

Executive Summary

The purpose of this report is to provide information to system owners and stakeholders and to satisfy the regulatory requirements of the Safe Drinking Water Act (SDWA) including the Drinking Water Quality Management Standard (DWQMS), and regulatory reporting required under O.Reg. 170/03 (Section 11 and Schedule 22). The report is a compilation of information that helps to demonstrate the ongoing provision of a safe, consistent supply of high quality drinking water to customers located within the City of Guelph and the Gazer Mooney Subdivision (located in the Township of Guelph/Eramosa).

Water Services is a municipally-owned and operated water utility established in 1879. The Guelph Drinking Water System (Guelph DWS) is a Class IV Water Distribution and Supply Subsystem and is composed of water supply and treatment facilities and a water distribution system. The Gazer Mooney Subdivision Distribution System (Gazer Mooney SDS) is a Class I distribution system supplied with water from the Guelph Drinking Water System.

Both the Guelph DWS and the Gazer Mooney SDS are required to comply with the Safe Drinking Water Act (SDWA) and Regulations as well as requirements contained in Permits to Take Water (PTTW), Municipal Drinking Water Licences (MDWL), and Drinking Water Works Permits (DWWP). Having met the quality management system requirements of the SDWA, Guelph Water Services is an accredited Operating Authority with an up-to-date Operational Plan (OP). The OP is available upon request from Guelph Water Services.

The source of Guelph's drinking water is a series of 21 operational groundwater wells and a shallow groundwater collector system; this system consists primarily of true groundwater sources, with some "groundwater under the direct influence of surface water with effective filtration" (GUDI-WEF) sources (Carter Well Field, Arkell 1, Arkell 15 and the Arkell Spring Grounds Collector System).

The City of Guelph has approximately 44,000 fully metered water service connections, 555 kilometres of underground watermains, and a population of approximately 135,000. The Gazer Mooney Subdivision has approximately 70 fully metered water service connections, 2 kilometres of underground watermains, and an approximate population of 200.

There were no incidents of non-compliance associated with the Guelph DWS and the Gazer Mooney SDS in 2017.

As the Operating Authority for both the Guelph DWS and Gazer Mooney SDS, Guelph Water Services is annually inspected by the MOECC for compliance with regulatory requirements. The Guelph DWS received a 100% score for the 2016-2017 inspection period. A score of 100% was also achieved in the 2016-2017 MOECC Annual Inspection Report for the Gazer Mooney SDS.

In 2017, Guelph Water Services reported five Adverse Water Quality Incidents (AWQIs) in the Guelph Drinking Water System – please refer to Section B - Adverse Water Quality Incidents and Table 1 Summary of Guelph Drinking Water System Adverse Water Quality Incidents. There were no AWQI's in the Gazer Mooney Subdivision Distribution System in 2017. In conjunction with Wellington-Dufferin-Guelph Public Health and the MOECC, all appropriate corrective actions and required reporting were completed with no health-based issues.

Water Services' risk assessment updates, emergency response testing, internal and external audits help facilitate continual improvement of **Water Services'** processes and programs through implementation of corrective actions.

The water system is operated to meet daily, seasonal, and other operational demands (including fire demands) with various combinations of supply sources in operation at any given time. A total of 16,921,444 cubic meters (16.9 billion litres) of water was treated and pumped to the system in 2017. The average daily water demand was 46,360 cubic metres (46.3 million litres). The maximum day production of water in 2017 was 54,421 cubic metres (54.4 million litres) and occurred on September 25, 2017. The minimum day production of water in the same time period was 36,821 cubic metres (36.8 million litres) and occurred on July 2, 2017.

All water provided to the Guelph Drinking Water System and the Gazer Mooney Subdivision Distribution System was treated with sodium hypochlorite (for chlorine disinfection) with some sources also using UV treatment. All supplied water was continually tested and met all regulatory standards.

City of Guelph Water Services maintained the drinking water system in a fit state of repair and followed best industry practices during the repair and maintenance of the system.

Details of ongoing and emerging water quality, supply, and distribution initiatives are outlined in Section J of this report and include successful programs related to: water conservation and efficiency, source water protection, and lead reduction.

Water Services continues to implement:

- Recommendations of the 2016 Water Efficiency Strategy.
- Source water protection based on an MOECC-approved Source Water Protection Plan.
- Arkell Springs Forest Stewardship Project investments (to protect the Arkell Wellfield's **source** water quality).
- The Lead Reduction Plan in accordance with the regulatory relief provisions of the SDWA.
- Facility asset management and infrastructure reviews to optimize priority projects.
- A robust backflow prevention program overseeing 2,818 properties with 6,439 backflow prevention devices installed. There were no reported backflow incidents.

The City has completed this Annual & Summary Report to satisfy the regulatory requirements of the Safe Drinking Water Act, O.Reg 170/03 (Section 11 and Schedule 22). For more information please review the online report at guelph.ca/water or contact Guelph Water Services at (519) 837-5627 or waterservices@guelph.ca.

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Introduction

Purpose

The purpose of this report is to provide information to several stakeholders and to satisfy the regulatory requirements of the Safe Drinking Water Act (SDWA) including the Drinking Water Quality Management Standard (DWQMS), and regulatory reporting required under O.Reg. 170/03 (Section 11 and Schedule 22). The report is a compilation of information that helps to demonstrate the ongoing provision of a safe, consistent supply of high quality drinking water to customers located within the City of Guelph and the Gazer Mooney Subdivision (located in the Township of Guelph/Eramosa).

Scope

This Annual & Summary Water Services Report includes information from both the **Guelph Drinking Water System** and the **Gazer Mooney Subdivision Distribution System** for the period of January 1 to December 31, 2017 (unless otherwise noted). The information is required to be reported to the following:

- the Drinking Water System Owners (Guelph City Council, Chief Administrative Officer (CAO) and Deputy CAO – Infrastructure, Development and Enterprise, and the Township of Guelph Eramosa Council and CAO);
- Senior officials of Guelph Water Services and Township of Guelph/Eramosa; and
- the general public and interested stakeholders.

This report satisfies the requirements of both the Safe Drinking Water Act (SDWA) and Ontario Regulation 170/03:

- Section 11, Annual Reports which includes:
 - o a brief description of the drinking water systems;
 - o a list of water treatment chemicals used;
 - o a summary of the most recent water test results required under O. Reg. 170/03 or an approval, Municipal Drinking Water Licence (MDWL) or order;
 - o a summary of adverse test results and other issues reported to the Ministry of the Environment and Climate Change (MOECC) including corrective actions taken;
 - o a description of major expenses incurred to install, repair or replace required equipment;
 - o the locations where this report is available for inspection.

And;

- Schedule 22, Summary Report which includes:
 - o **list the requirements of the Safe Drinking Water Act, the regulations, the system's approval, Drinking Water Works Permit (DWWP), MDWL, and any orders applicable to the system that were not met at any time during the period covered by the report;**
 - o for each requirement that was not met, the duration of the failure and the measures that were taken to correct the failure;
 - o a summary of the quantities and flow rates of the water supplied during the period covered by the report, including monthly average and maximum daily flows; and

- o a comparison of this information to the rated capacity and flow rates approved in the system's approval, DWWP and/or MDWL.

This report satisfies applicable requirements for both the Guelph Drinking Water System and the Gazer Mooney Subdivision Distribution System.

A copy of this report is available for viewing at:

- **F.M. Woods Reception**, 29 Waterworks Place, Guelph;
- **Township of Guelph/Eramosa**, 8348 Wellington Rd. 124, Rockwood; and
- **Online** at guelph.ca/water.

Any inquiries can be made to:

- **City of Guelph Water Services** by e-mailing waterservices@guelph.ca or by calling 519-837-5627.
- **Township of Guelph/Eramosa Public Works – Water / Wastewater** by e-mailing general@get.on.ca or by calling 519-856-9596.

Notice:

Please note that every reasonable effort is made to ensure the accuracy of this report. This report is published with the best available information at the time of publication. In the event that errors or omissions occur, the online report will be updated. Please refer to the online version of the report for the most current version.

Please note that some hyperlinks in the document are linked to Guelph's electronic document management system (EDMS). *Note: EDMS is available for internal use only.*

Systems Overview

Guelph Drinking Water System

The City of Guelph is committed to providing customers with a safe, consistent supply of high quality drinking water while meeting or exceeding, and continually improving on legal, operational and quality management system requirements. Therefore, Water Services strives to provide reliable, cost-effective systems for the safe production and delivery of consistently high quality water and is a municipally-owned and operated water utility established in 1879.

The Guelph Drinking Water System is a Class IV Water Distribution and Supply Subsystem and is composed of water supply and treatment facilities and a water distribution system. As of December 31, 2017 thirty-three team members (23 operators, 1 manager, 4 supervisors, and 5 technical staff) held drinking water certificates to operate and maintain the water systems.

In 2017, Water Services maintained full scope accreditation to the Drinking Water Quality Management Standard after a successful on-site audit, conducted by a third-party accreditation body (NSF International Strategic Registrations). This full accreditation satisfies part of the requirements under the Municipal Drinking Water Licensing Program.

The distribution system (including watermains, valves, fire hydrants, services, and meters) serves a population of approximately 135,000 within the City of Guelph. All new system components meet NSF 61¹ requirements or approved equivalents and are installed and maintained in accordance with approved industry standards. Water system customers are fully metered and billed in accordance with the Water and Wastewater Customer Accounts by-law.

The Guelph Drinking Water System distribution system is comprised of the following infrastructure:

- 6.38 kilometres of 900-1,050 mm diameter water supply aqueduct;
- five underground storage reservoirs with a combined approximate capacity of 48,000 cubic metres (48 million litres);
- three water towers with a combined approximate capacity of 11,200 cubic metres (11.2 million litres);
- 555 kilometres of buried watermain with a diameter < 900 mm;
- 4,263 watermain valves;
- 2,783 fire hydrants; and
- approximately 44,000 water services and water meters.

The source of Guelph's drinking water is a series of 21 operational groundwater wells and a shallow groundwater collector system. The drinking water sources consist primarily of true groundwater, with some "groundwater under the direct influence of surface water with effective filtration" (GUDI-WEF) sources (Carter Well field, Arkell 1, Arkell 15 and the Arkell Springs Collector System). The Guelph

¹ NSF/ANSI Standard 61: Drinking Water System Components -- Health Effects

Drinking Water System uses 12 percent Sodium Hypochlorite (that is NSF 60² certified) for primary disinfection at 10 locations and for multi-barrier primary disinfection at four locations. At four locations, ultraviolet light is also applied as part of multi-barrier primary disinfection. At two locations (Helmar Well and Queensdale Well), NSF 60-certified sodium silicate is used for aesthetic purposes to sequester dissolved iron and manganese. In total, Water Services operates and maintains 31 facilities.

The replacement cost of the entire system (excluding Gazer Mooney Subdivision Distribution System) is estimated to be \$615.5 million or approximately \$4,663 per capita (2016). The Guelph Drinking Water System operations are funded directly from the sale of water, with minor additional funding through government grant programs. Property taxes are not used to fund operation or maintenance of the system.

A total of 16,921,444 cubic meters (16.9 billion litres) of water was treated and pumped to the system in 2017. The average daily water demand was 46,360 cubic metres (46.3 million litres). The maximum day production of water in 2017 was 54,421 cubic metres (54.4 million litres) and occurred on September 25, 2017. The minimum day production of water in the same time period was 36,821 cubic metres (36.8 million litres) and occurred on July 2, 2017.

In 2017, all regulatory microbiological and chemical quality samples were taken by certified operators and tests performed by accredited, licensed laboratories on water samples collected throughout the drinking water system. These tests include both regulatory and operational testing – in most cases only regulatory reporting is included in this report. In all cases, the drinking water supplied to all customers was confirmed safe and the water was of higher quality than all Ontario and Canadian health-related guidelines.

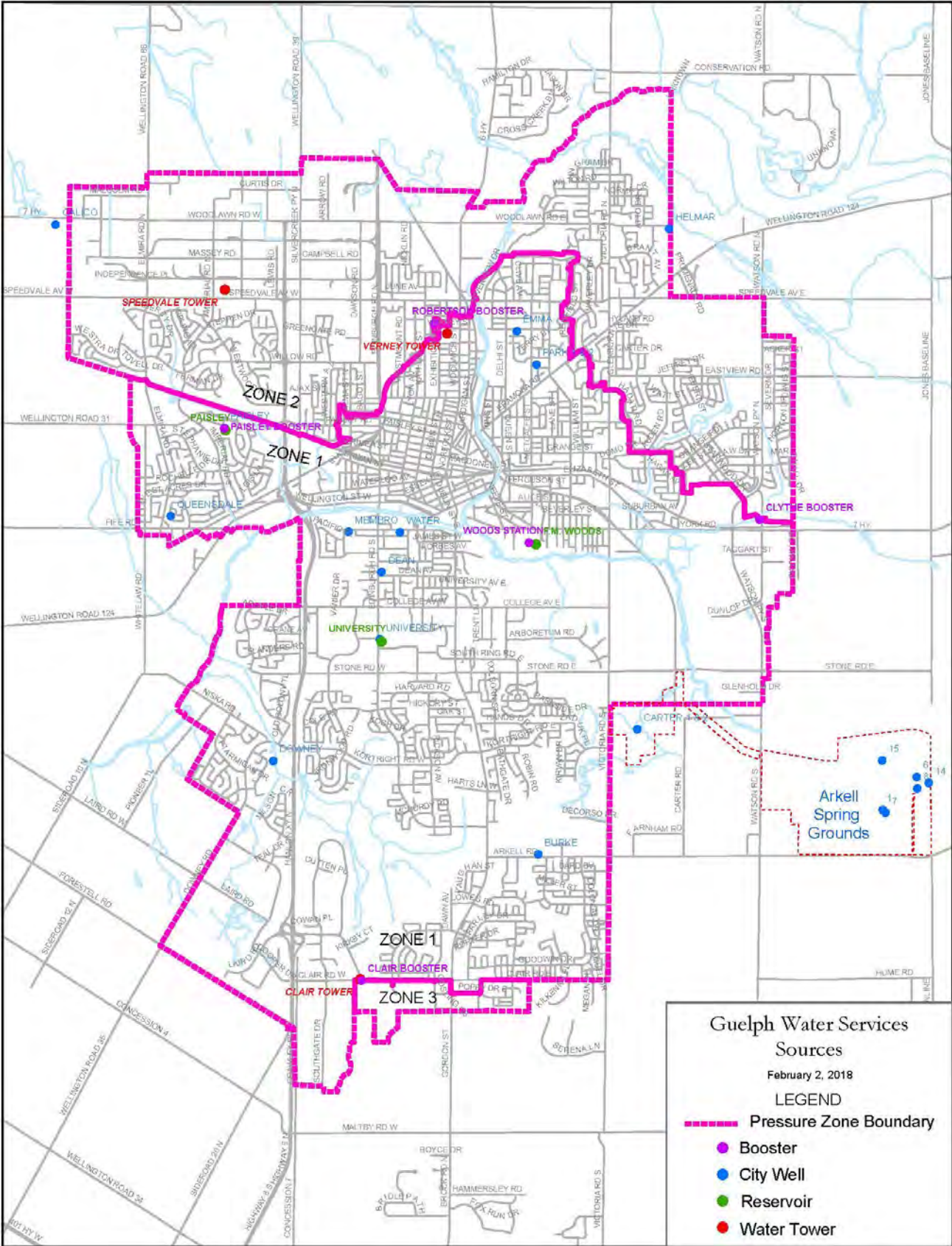
The Guelph Drinking Water System is defined as a large residential system operated under the regulatory requirements of the Safe Drinking Water Act and the Ontario Water Resources Act (accessed at <http://www.e-laws.gov.on.ca>). In 2017, the Guelph Drinking Water System operated under Municipal Drinking Water Licence (MDWL) 017-101 (Issue numbers 9 and 10) and the Drinking Water Works Permit (DWWP) 017-201 (Issue numbers 6 and 7).

The MDWL and the DWWP describe system-specific requirements that are supplementary to provincial regulations and act as licences for water supply and distribution operations. These documents outline specific conditions and requirements regarding operation, maintenance and upgrades that are required by the system and are considered regulatory in nature. These documents are available by request for viewing at 29 Waterworks Place, Guelph, ON.

Figure 1 presents the locations of the Guelph Drinking Water System facilities that were active in 2017.

² NSF/ANSI Standard 60: Drinking Water Treatment Chemicals -- Health Effects

Figure 1: Guelph Drinking Water System Facility Locations



Gazer Mooney Subdivision Distribution System

The Gazer Mooney Subdivision Distribution System is a Class 1 Distribution Subsystem that serves approximately 200 people, and is owned by the Township of Guelph/Eramosa. The system is operated by Water Services through a legal agreement that was last signed by representatives of the City of Guelph and the Township of Guelph/Eramosa on July 30, 2009. The terms of the agreement apply until May 31, 2019. All of the water for the Gazer Mooney Subdivision Distribution System is supplied from the Guelph Drinking Water System. All water is treated to provincial standards in the Guelph Drinking Water System and no further treatment chemicals are added to the Gazer Mooney Subdivision Distribution System.

All new distribution infrastructure components meet NSF 61 requirements or approved equivalents and are installed and maintained in accordance with approved industry standards. The system is fully metered.

The Gazer Mooney Subdivision Distribution System is comprised of the following infrastructure:

- approximately two kilometres of buried watermain with a diameter < 900 mm;
- six watermain valves;
- six fire hydrants; and
- approximately 72 water services and water meters.

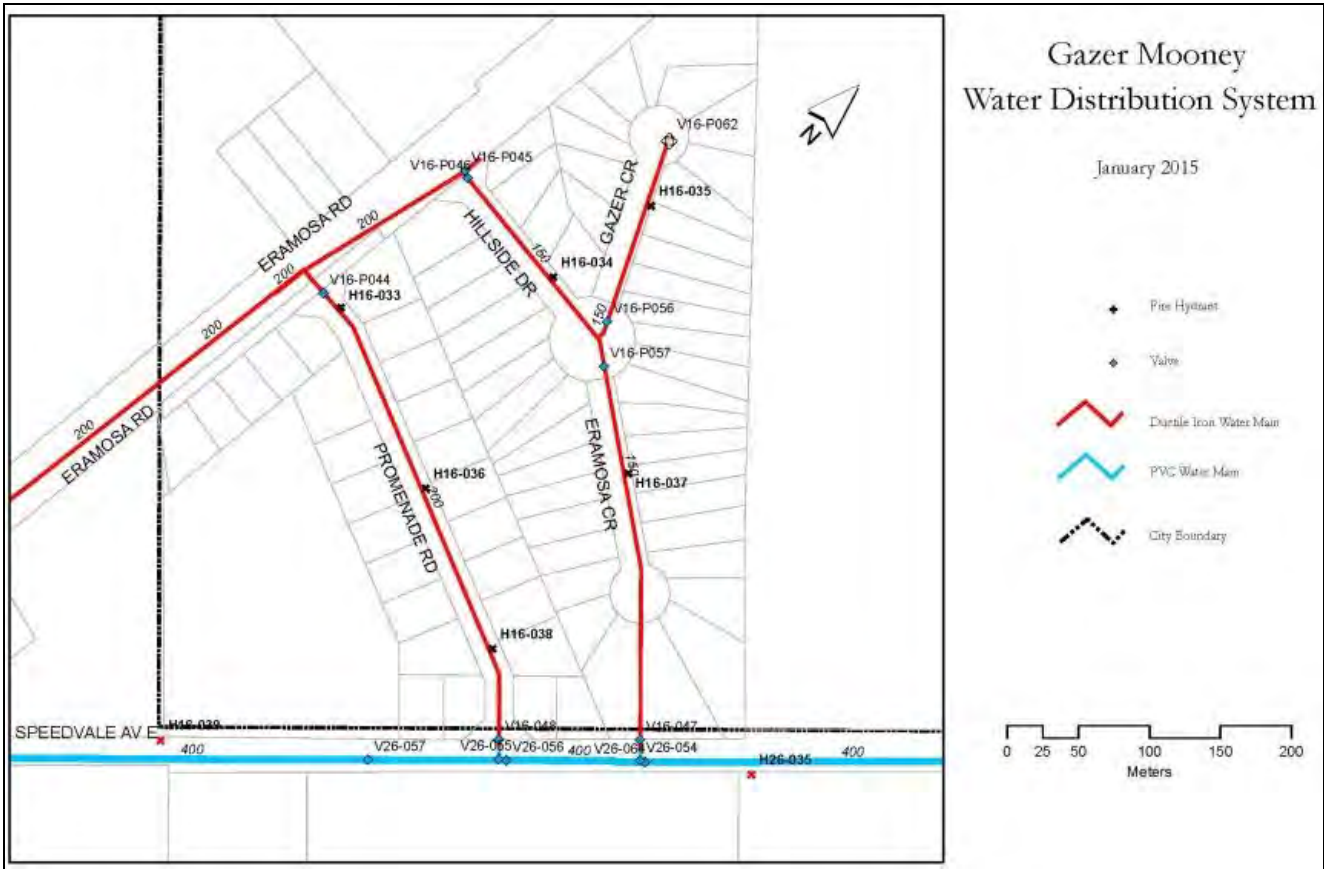
The cost of construction of the Gazer Mooney Subdivision Distribution System was listed as \$197,933 in 1980.

The Gazer Mooney Subdivision Distribution System is considered a small residential system and is operated under the regulatory requirements of the Safe Drinking Water Act and the Ontario Water Resources Act which may be found at <http://www.e-laws.gov.on.ca>.

In 2017, the Gazer Mooney Subdivision Distribution System operated under Municipal Drinking Water Licence No. 104-103 (issue number 2), and Drinking Water Works Permit No. 104-203 (issue number 2). These documents are available by request for viewing at 29 Waterworks Place, Guelph and at the Township of Guelph/Eramosa, 8348 Wellington Rd. 124, Rockwood.

Figure 2 shows the location of the Gazer Mooney Subdivision Distribution System.

Figure 2: Gazer Mooney Subdivision Distribution System



Annual & Summary Water Services Report

a) Incidents of Regulatory Non-Compliance

This section describes all incidents of non-compliance.

Water Services takes a proactive approach to regulatory compliance whereby associated records and processes are audited on an ongoing basis to ensure compliance with necessary standards. Should a non-compliance be identified, such results are communicated to the system owner (Council) and other stakeholders. Corrective actions are undertaken at the time of occurrence to not only fix the issue, but also to support continuous improvement.

Water Services maintains open communication with the Ministry of the Environment and Climate Change and Wellington-Dufferin-Guelph Public Health regarding system operations and compliance. Water Services also actively cooperates with the Ministry through the formal annual drinking water system inspection process. Findings through this inspection process, if any, are communicated to the owner immediately and to the public through this report.

In 2017, Water Services continued to maintain a high level of regulatory compliance and fulfilled its mandate to deliver an adequate and safe supply of drinking water to its customers in the City of Guelph and Guelph/Eramosa Township.

Guelph Drinking Water System

There were no incidents of non-compliance associated with the Guelph Drinking Water System in 2017.

A score of 100% was achieved in the 2016-2017 Ministry of the Environment and Climate Change Annual Inspection Report for the Guelph Drinking Water System.

Gazer Mooney Subdivision Distribution System

There were no incidents of non-compliance associated with the Gazer Mooney Subdivision Distribution System in 2017.

A score of 100% was achieved in the 2016-2017 Ministry of the Environment and Climate Change Annual Inspection Report for the Gazer Mooney Subdivision Distribution System.

b) Adverse Water Quality Incidents

This section describes all "Adverse Water Quality Incidents" (AWQI's). This term refers to any unusual test result from treated water that does not meet a provincial water quality standard, or situation where disinfection of the water may be compromised. An adverse water quality incident indicates that on at least one occasion and at a certain instance in time, a water quality standard was not met. On average, the Guelph Drinking Water System processes four to five **AWQI's annually**.

Many AWQI's have proven to be the result of water sampling and testing problems rather than poor water quality. False positive results can be caused by contaminated sampling containers and equipment,

improper sampling technique, handling and transportation, and sampling analysis errors. In almost all cases, mandatory follow-up sampling and analysis confirms that contaminants are not present in the water provided to customers.

Please note: The City was granted full regulatory relief from Schedule 15.1 of O.Reg. 170/03. Any residential tap lead sample results above 10 µg/L collected as per Lead Reduction Plan (LRP) are tracked and reported separately to Wellington-Dufferin-Guelph Public Health, the Ministry of the Environment and Climate Change (as per MDWL 017-101, Schedule D) and the customer. See Section J for more information.

Guelph Drinking Water System

In 2017, there were five adverse water quality incidents (AWQI's #132381, #132617, #133265, #134654 and #134661) and a summary of these are included in Table 1.

Table 1: Summary of Guelph Drinking Water System Adverse Water Quality Incidents (2017)

#	Date	AWQI #	Location	Description	Corrective Action	Re-sample Results Good	Deviation from Critical Control Point ³
1	Feb. 08	132381	Clair Tower Sample Tap (D005)	Total Coliform (TC) result of 1 at D005	Wellington-Dufferin-Guelph Public Health (WDGPH), MOECC, and Spills Action Centre (SAC) were notified. Re-samples showed non-detect results for Total Coliforms (TC) at D005 plus upstream and downstream locations (S004 and D0250 respectively).	Yes	No
2	Mar. 10	132617	Victory Sample Tap (D0247)	Total Lead result of .088 mg/L at D0247	Wellington-Dufferin-Guelph Public Health (WDGPH), MOECC, and Spills Action Centre (SAC) were notified. Re-sample showed a non-detect result for Lead at D0247.	Yes	No
3	Jun. 06	133265	Paisley Inlet Sample Tap (D0248)	Total Coliform (TC) result of 1 at D0218	Wellington-Dufferin-Guelph Public Health (WDGPH), MOECC, and Spills Action Centre (SAC) were notified. Re-sample showed a non-detect result for Lead at D0218.	Yes	No
4	Jul. 26	134654	Severn Drive Sample Tap (D243)	Total Coliform (TC) result of 25 at D0243	Wellington-Dufferin-Guelph Public Health (WDGPH), MOECC, and Spills Action Centre (SAC) notified. Re-samples showed non-detect results for Total Coliforms (TC) at D0243 plus upstream and downstream locations (S048 and D217 respectively).	Yes	No
5	Jul. 27	134661	Robertson POE (S108)	Total Lead result of .036 mg/L at S108	Wellington-Dufferin-Guelph Public Health (WDGPH), MOECC, and Spills Action Centre (SAC) were notified. Re-sample showed a non-detect result for Lead at S108.	Yes	No

³ Please see section C of this report for a description of "critical control points".

Gazer Mooney Subdivision Distribution System

There were no adverse water quality incidents in the Gazer Mooney Subdivision Distribution System in 2017.

c) Deviations from Critical Control Point (CCP) Limits and Response Actions

This section describes any deviation from essential steps or points in the drinking water system at which control can be applied to prevent or eliminate a drinking water hazard or to reduce it to an acceptable level. These essential steps or points in the system are known as critical control points (CCP). The CCPs are used to identify control measures that are in place to address hazards and hazardous events. These CCPs are in part stipulated by regulation and in part derived through risk assessment of the Drinking Water System.

Water Services' Critical Control Points include: primary disinfection; secondary disinfection; and backflow prevention. Additional information (e.g. critical control limits and response actions) is included in Appendix A - Summary of Critical Control Points and Critical Control Limits.

Deviations from the CCPs are reported to both the Owners and Top Management, and are summarized in the tables included in Section B of this report. There were no deviations from CCP Limits in 2017.

d) The Efficacy of the Risk Assessment Process

This section confirms the occurrence of reviews of the risk assessment process. The risk assessment process determines the effectiveness of identifying and appropriately assessing the risk of hazards and hazardous events. It also identifies the appropriate control measures; critical control points (CCPs); and related critical control limits (CCLs) related to the hazards and hazardous events.

The annual risk assessment review **described in "QMS 07 Risk Assessment"** was conducted by Water Services over several meetings between August 8 and 30, 2017. The updated risk assessment was subsequently approved at a Management Review Meeting on October 12, 2017. The results of the Risk Assessment are not made available to the public, but are made available to internal staff.

Through the risk assessment process, the following Water Services program or process aspects were added:

- Locations of watermains.
 - City-owned watermain break on private property (e.g. easements).
 - Private watermain break on private property.
- Contamination from unauthorized connection to distribution system or inappropriately set up temporary watermains.
- Infrastructure Repairs/Upgrades.
 - Third-party contractor compromises the water treatment or water distribution system.
- Future was defined as less than or equal to 10 years from the date of the risk assessment.

The following Water Services program or process aspects were removed, but were captured elsewhere:

- Negative/low pressure from local water usage (potential for backflow from container/truck).

e) Internal and Third-Party Audit Results

This section describes any of the audit outcomes identified to date that require follow-up actions.

Internal auditing and third-party auditing is performed to fulfill the mandatory requirements of the Drinking Water Quality Management Standard (DWQMS). The internal audit is completed using trained internal staff. The purpose of audits is to evaluate the level of conformance of Water Services to the DWQMS. Audits identify both conformance and non-conformance with the Standard, as well as, opportunities for improvement. **Appendix "B" includes** the past three **years'** internal and external audit plans and the plan for the upcoming year.

The last internal process audits were completed between May 26 to June 2, 2017. No non-conformities were identified during these internal audits. Various opportunities for improvement suggested by staff (such as improved document and records control, training, communications, essential services, staffing levels, move to utilizing more in-field technology, risk assessments, and standard operating procedure creation) were also noted in the internal audit report. Water Services continuously strives to address issues identified in internal audits. The next scheduled internal audit will take place between May 28 and June 1, 2018.

The 2017 third-party external on-site audit was completed between November 15 and November 17, 2017 by NSF International Strategic Registrations. There were two minor nonconformities identified during this audit related to Continual Improvement (QMS 21) and Sampling, Testing and Monitoring (QMS 16). The Corrective Action Report, including the root cause analysis and action plan to address these minor non-conformances was submitted and approved by the auditor on December 2, 2017.

Noted opportunities for improvement by the auditor were related to improving the following processes: Document and Records Control (QMS 5), Drinking Water System (QMS 6), Competencies (QMS 10), Personnel Coverage (QMS 11), Internal Audits (QMS 19), and Continual Improvement (QMS 21). The corrective actions issued and opportunities for improvement will be reviewed by the external auditor at the next on-site audit, scheduled between November 14 and 16, 2018.

f) Results of Emergency Response Testing

Emergency response testing is regularly completed as part of the **Water Services' Quality Management System (QMS)** to ensure that Water Services maintains a reasonable readiness to deal with emergencies and abnormal events. The ability to properly manage emergencies and unplanned failures is critical in demonstrating that Water Services has taken a diligent approach in its operations.

In 2017, Water Services took a proactive approach to emergency planning during the Paisley-Clythe Watermain Project. In conjunction with the contractor working on the project, contingency piping was installed and staff were trained in its operation. This was to ensure consistent water supply in the event

that Water Services could not pump out of the existing pipes from F.M. Woods station, but could use the contingency piping instead.

Water Services' last emergency test exercise involved a scenario where there were excessive rainfall amounts, resulting in water monitoring wells becoming submerged under flood water, thereby causing sudden changes to the raw water quality characteristics. The emergency test exercise was held on December 8, 2017 and included representatives from the MOECC (Inspector and District Office Manager) and Wellington-Dufferin-Guelph Public Health (WDGPH) as well as Water Services and other City staff. All other Water Services' staff participated in sessions that took place between December 13, 2017 and January 26, 2018.

Feedback from emergency testing and from actual events is gathered during debriefing sessions throughout the emergency test exercises and improvement items are incorporated into the Emergency Plan and /or daily operations.

Table 2 includes the dates of Completed Emergency Response Tests for the past three years and planned tests for 2018.

Table 2: Emergency Response Tests

Hazardous Event / Hazard ⁴	2015	2016	2017	2018 (planned)
Long-term impacts of climate change		Summer (drought)	Dec. 8, 13 (test)	Jan. 26 (test)
Source water supply shortfall		Dec. 13 (test)	Jan. 20 (test)	
Extreme weather events (e.g. tornado, ice storm, flood)		Mar. 23-25, 2016 (ice storm)	Dec. 8, 13 (test)	Jan. 26 (test)
Sustained extreme temperatures (e.g. heat wave, deep freeze)	Feb-Apr, 2015 (frozen services)		Dec. 8, 13 (test)	Jan. 26 (test)
Chemical spill impacting source water				
Sustained pressure loss		Jan. 7, 2016 (test)		
Backflow / Cross-connection				December (planned test)
Terrorist threat				
Vandalism				December (planned test)
Sudden changes to raw water characteristics (e.g. turbidity, pH)	Rehabilitation: Membro Well / Carter Wells	Improvements: Membro Well / Carter Wells	Dec. 8, 13 (test)	Jan. 26 (test)
Failure of equipment or process associated with primary disinfection (e.g. UV, chlorination)				
Failure of equipment or process associated with secondary disinfection (e.g. chlorination)				
Loss or contamination of treated water supply		Jan. 7, 2016 (test)		December (planned test)
Loss of monitoring system		Jan. 14, 2016 (fibre network failure)		
City of Guelph Corporate-Level	Nov. 23, 2015	3 dates focusing on	Nov. 23, 2017	September-October

⁴ The Hazardous Event / Hazard list reflects MOECC's mandated "Potential Hazardous Events for Municipal Residential Drinking Water Systems to Consider in the Risk Assessment" document.

Hazardous Event / Hazard ⁴	2015	2016	2017	2018 (planned)
Test by the EOCG	(test)	"recovery" Sep-Oct 2016	(test)	2018 (planned test)

g) Operational Performance and Statistics

The following section describes Operational performance statistics within Water Services that includes:

- 2017 Totalized Pumpages as per the Municipal Drinking Water Licence and Permits to Take Water;
- 2017 Instantaneous Flows as per Permit to Take Water requirements;
- Water Production and Population;
- 2017 Collector Flows; and
- System Maintenance and Updates.

2017 Totalized Pumpages and Instantaneous Flows

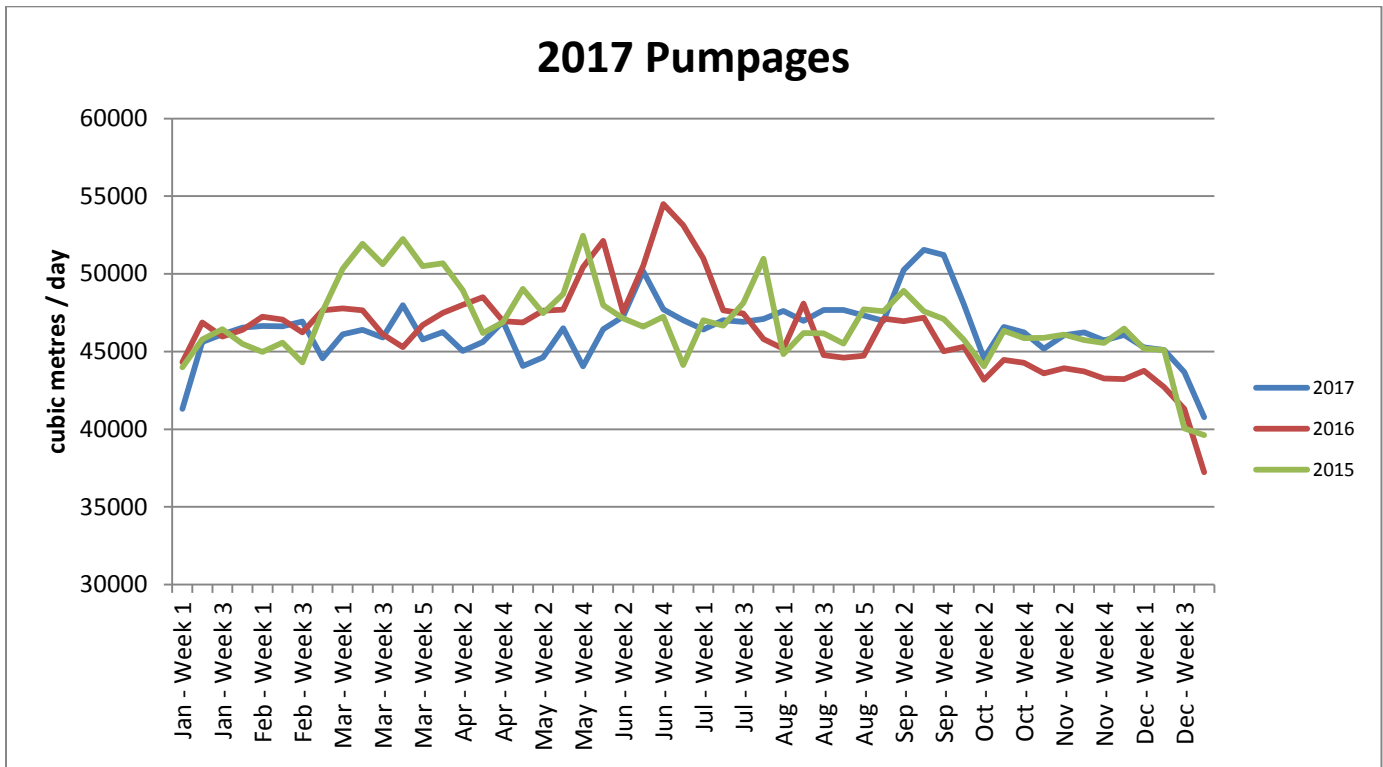
The Safe Drinking Water Act and the Ontario Water Resources Act each require that operating authorities record and report both water takings as governed by Permits-to-Take-Water, and water being supplied to the City of Guelph.

Summaries of total water pumped, instantaneous flows and capacity (flows and volumes compared to rated capacities) by the City of Guelph can be found in Appendix "C" – Total Water Pumped and Instantaneous Flows.

2017 Totalized Pumpages

Figure 3 below, depicts the water pumpage rate in cubic metres per day (m³/day) that is averaged each week.

Figure 3: 2017 Totalized Pumpages



Water Services processed 16,921,444 cubic metres (16.9 billion litres) of water to the distribution system in 2017. This represents 0.11 percent less water being supplied to the distribution system in 2017 as compared to the same time period in 2016 and 1.09 percent less water than in 2015.

The average daily water demand was 46,360 cubic metres (46.3 million litres). The maximum day production of water in 2017 was 54,421 cubic metres (54.4 million litres) and occurred on September 25, 2017. The minimum day production of water in the same time period was 36,821 cubic metres (36.8 million litres) and occurred on July 2, 2017.

Arkell Springs Collector System Source Water

The Arkell Springs Collector System Source Water ("Collectors"), one of Guelph's many water sources, consists of a gravity-fed, under-drain system that collects shallow overburden groundwater. This system has been in use since the early 1900s and can represent as much as 40 percent of the total city-wide daily water production. When the output of this source is reduced, Water Services is required to make up the difference from other water supplies. Throughout the year, the production from this water supply varies from an approximate low of 4,000 cubic metres (4 million litres) up to an approximate high of 20,000 cubic metres (20 million litres) per day.

Seasonally, between April 15 and November 15, the City has a Permit-to-Take-Water that allows water to be pumped from the Eramosa River to a pond and trench-based Recharge System. In the Recharge System, the river water is filtered in-situ through the ground and approximately 50 percent of the flow is captured in the Arkell Springs Collector System. In 2016, the Recharge System was out of service to

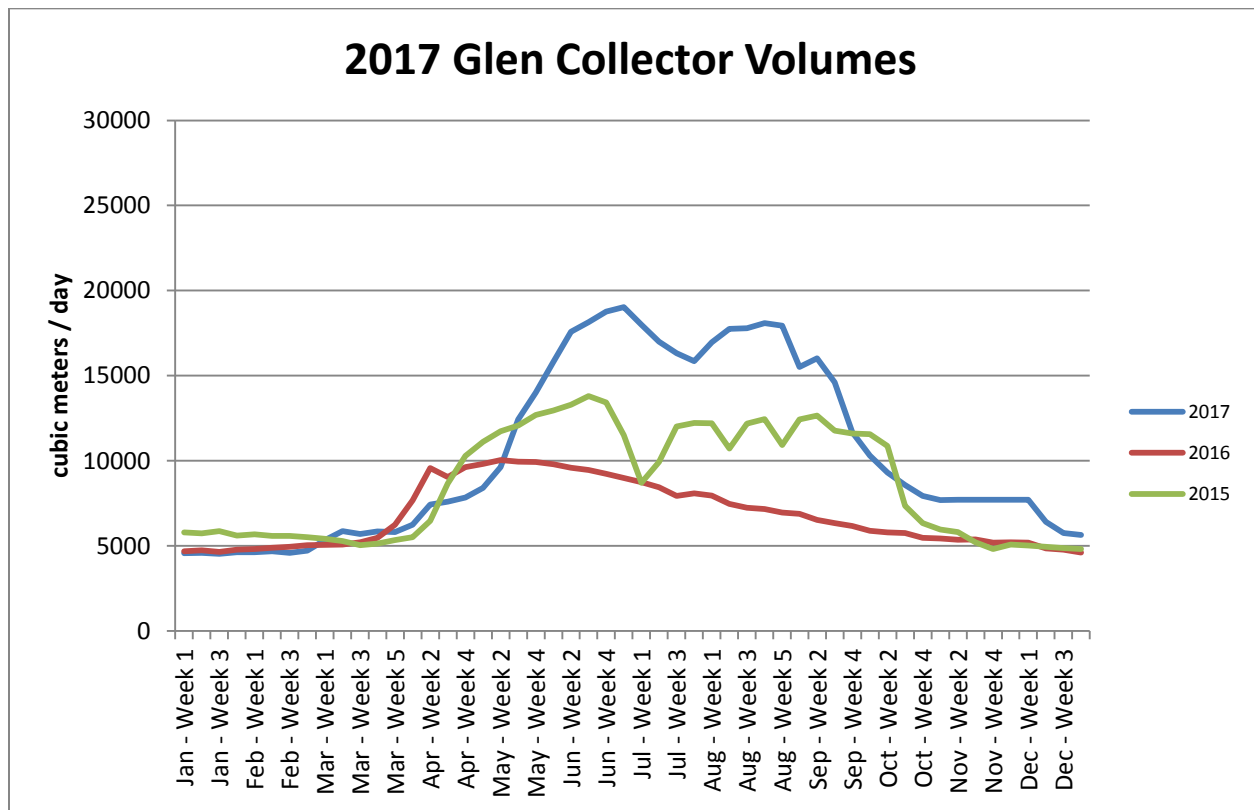
accommodate infrastructure improvements including an extension of the trench system in an effort to capture more water in the Collectors. The Recharge System was returned to service in May 2017. In 2017, Arkell Well 7 contributed 403,872 m³ of raw water (from May through August) to the Recharge System as part of a Collector System capacity test. Approximately half of this volume would have been captured in the Collector system.

The productivity of the Collectors can be used as one of many predictive tools. If the production volume from the Collectors is low, then it can be assumed that other water supplies would be needed to make up the difference. This may alter how regular maintenance is performed as well as the urgency with which repairs are made to supplies that unexpectedly go off-line as they may be needed to supplement overall production for the City when the Collector System is unable to produce a sufficient supply.

The Collectors have produced 3,798,506 cubic metres (3.8 billion litres) of water in 2017. This represents 34.8 percent more water as compared to the same time period in 2016 and 7.4 percent more water than in 2015.

For a visual representation, please refer to Figure 4, which depicts the Arkell Spring Grounds Collector flow rate in cubic metres per day (m³/day) that is averaged each week.

Figure 4: 2017 Arkell Spring Grounds Collector System Volumes



Please note: Arkell Well 7 contributed 403,872 m³ to the Recharge System (from May through August 2017) with approximately half (202,000 m³) captured in the Collector flow post filtration; The Collector flow was not augmented by the addition of recharge water from the Eramosa river in 2016.

System Maintenance and Updates

The tables that follow summarize Water Services' maintenance work – for Distribution (Table 3) and for Water Supply (Table 4).

Table 3: Distribution Maintenance Activity

Job Type	2015 Q1&2	2015 Q3&4	2015 Total	2016 Q1&2	2016 Q3&4	2016 Total	2017 Q1&2	2017 Q3&4	2017 Total
Acoustic Leak – Dry	0	1	1	0	4	4	0	1	1
Blow Off Install	0	0	0	0	0	0	0	0	0
Dig to find leak	1	0	1	1	1	2	0	0	0
Hi/Low Jumper Install	0	0	0	0	0	0	0	0	0
Hydrant Install (WW)	0	0	0	0	0	0	0	0	0
Hydrant Remove	0	0	0	1	0	1	0	0	0
Hydrant Repair	2	7	9	1	29	30	1	34	35
Hydrant Repair Hit	0	0	0	0	1	1	2	0	2
Hydrant Replace (WW)	0	1	1	2	6	8	0	2	2
Hydrant Replace Hit	0	0	0	0	0	0	0	2	2
Main Break	57	14	71	26	27	53	23	24	47
Other (e.g. exploratory excavations, miscellaneous repairs, etc.)	2	2	4	1	2	3	1	1	2
Re-route Watermain	0	0	0	0	0	0	0	0	0
Sample Station Install	0	0	0	0	1	1	0	17	17
Sample Station Replace	0	0	0	0	4	4	0	10	10
Service Cut Off	0	5	5	1	4	5	2	1	3
Service Lowered	0	0	0	0	0	0	0	0	0
Service New Install	0	0	0	0	0	0	0	0	0
Service Repair	54	45	99	58	86	144	48	43	91
Service Replace Lead (City-side)	1	1	2	0	0	0	1	1	2
Service Replace Non-Lead	9	16	25	8	8	16	2	3	5
Trench Repair	-	-	-	1	0	1	0	0	0
Valve Install (WW)	0	6	6	0	0	0	0	1	1
Valve Remove	0	0	0	0	0	0	0	0	0
Valve Repair	1	4	5	3	5	8	2	5	7
Valve Replace (WW)	9	5	14	1	7	8	7	15	22
Meters New	141	412	553	336	277	613	233	254	487
Meters Exchanged	202	423	625	286	246	532	458	254	712
Hydrants new/replaced by Engineering	-	-	52	-	-	39	-	-	26

Job Type	2015 Q1&2	2015 Q3&4	2015 Total	2016 Q1&2	2016 Q3&4	2016 Total	2017 Q1&2	2017 Q3&4	2017 Total
Total City Hydrants	-	-	2,745	-	-	2,763	-	-	2,783
Valves new/replaced by Engineering	-	-	122	-	-	57	-	-	93
Total City Main Valves	-	-	4,135	-	-	4,184	-	-	4263
Watermains new/replaced by Eng. (km)	-	-	9.13	-	-	3.93	-	-	4.68
Total Watermains Excluding Aqueduct (km)	-	-	548.5	-	-	550.8	-	-	555.4
Watermains Cleaned (km)	-	-	107.1	-	-	231.4	-	-	150.65
Watermains Re-lined (m)	-	-	0	-	-	0	-	-	171

The next table includes Water Supply-related maintenance activities and expenditures (may include programs that have a series of projects).

Table 4: Water Supply Maintenance Activity

Maintenance Activity	Location
Booster 2 & 3 Discharge Train Replacements	F.M. Woods
Booster Pump Motor Replacement	Arkell Recharge River Pump
Fencing and Security Upgrades	Various Sites
Flow Meter and Chamber Installation	Glen Diversion Chamber
Flow Meter Replacements	Arkell Well 7 Burke Well Clythe Booster Membro Well Queensdale Well Water St. Well
Mixer Installation	Water St. Well
Electrical and Instrumentation Upgrades	Various Sites
Facility Repairs and Maintenance	Various Sites
Process and Monitoring Equipment Upgrades	Various Sites
Physical Inventory of Process and Monitoring Assets	All Sites
Pressure Transmitter Installations	Calico Well Carter Well 1 Clair Tower Clythe Well Downey Well Helmar Well Paisley Well Park Well 2 Robertson Booster University Well Water St. Well
Process Piping Upgrades	Calico Well Helmar Well

Maintenance Activity	Location
	F.M. Woods
Refurbishment of Speedvale Elevated Tank	Speedvale
Standby Power Generator – new	Downey Well Arnell Well 15
Transformer Installation	F.M. Woods Administration Trailer
Well Rehabilitation, Liner, Installation and Pump Replacement	Water St. Well

SCADA System Improvements

The Supervisory Control and Data Acquisitions (SCADA) system is the computerized control system that looks after the monitoring and automatic control of the pumps, valves, water towers and online instrumentation at the 21 water facilities located throughout the City and 6 water facilities located in the Arnell Springs well field. The SCADA system also performs the vital role of monitoring/logging process data to ensure regulatory compliance and providing tools to the Operations team that enables them to run the City's water system in a consistent manner.

In early 2017, the SCADA system was upgraded to include fully redundant backup network links to all sites. The SCADA system had an uptime of approximately 99.95 percent in 2017. Since the installation of the fully redundant backup network, the SCADA uptime has increased by ten times in 2017, as compared to the 2016 value of 99.5 percent. This improvement has significantly improved the reliability of the SCADA system for both operational and compliance requirements.

The following table provides a summary of improvements to SCADA and Security:

Table 5: SCADA/Security Maintenance and Improvement Activities

SCADA / Security Maintenance & Improvement Activities	Well Site(s)
Process flow diagrams and piping & instrumentation diagrams (P&ID's) update	Various Sites
SCADA hardware and software inventory update	Various Sites
SCADA network architecture and configuration documentation update	Various Sites
SCADA network connectivity monitoring server updates	Various Sites
SCADA network redundancy (with secondary back-up connections)	Various Sites
SCADA software code update (multi-year program)	Various Sites
SCADA software code revision control software	Various Sites
Security systems upgrades	Various Sites
SCADA Input / Output Lists and standardized connection diagram updates	Various Sites
Additional SCADA data-logging redundancy (with secondary data-loggers)	Various Sites
Additional Operator interface terminal displays and SCADA view nodes	Various Sites
Installation of secondary motorized gate for vehicles	F.M. Woods
Enhancements of security patrols	F.M. Woods

Water Distribution Locates

In 2014, The City of Guelph registered its utility infrastructure with ON1Call, as mandated by the Ontario Underground Infrastructure Notification System Act, 2012.

Since registering, the City experienced a significant increase in locate request volumes. This increase in volume ensures that Water Services is notified of and attends all locate requests for every excavation in proximity to water infrastructure. This prevents damage to City infrastructure and protects the City's water quality and quantity.

In order to provide efficient locate services across the corporation, the City has transitioned all infrastructure locates into one corporate group which is housed at Water Services. This includes water, sanitary and storm sewers, traffic signals, and fibre optics. In 2017, one additional full time utility locator was hired, and the peak season is supplemented with temporary utility locators. Utility locators now locate all infrastructure in one site visit rather than each department individually. Table 6 includes all water locate requests received and responded to in 2017 with a year to year comparison below.

Table 6: Water Distribution Locates Requested and Responded to in 2017

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
294	243	628	1,037	1,070	1,029	957	1,112	819	711	538	184

Historical locate requests received	
Year	Total
2017	8,622
2016	7,979 ⁵
2015	9,255
2014	8,943
2013	7,884

Form 1s and Form 2s

These forms are required to document significant changes to the drinking water system. Engineering Services staff complete "Form 1 – Record of Watermains Authorized as a Future Alteration" and retain copies in applicable project files and Water Services staff complete "Form 2- Record of Minor Modification or Replacements to the Drinking Water System" that are retained by the Water Services Compliance Coordinator.

Table 7 provides a summary of Form 1's and Form 2's completed over the course of 2017.

⁵ Volume reduction in 2016 is attributed to an increase in larger more complex excavation projects submitted as 1 single ticket rather than broken into multiple tickets via streets or street segments as in the past.

Table 7: Summary of 2017 Form 1s and Form 2s

Form Type	Total Number of Completed Forms
Form 1 – Record of Watermains Authorized as a Future Alteration	5
Form 2 – Record of Minor Modification or Replacements to the Drinking Water System	49

h) Raw and Treated Water Quality – Guelph Drinking Water System

This section describes the water quality monitoring, both regulatory and operational, that has been completed in 2017.

Water Quality Review – Guelph Drinking Water System

Under the Safe Drinking Water Act, municipalities are required to monitor both the raw and treated quality of the source water supplied. This monitoring is performed for both regulatory compliance and due diligence and is expected to identify any changes within the treated water, as well as, in raw source waters.

A note about all tables included in this section:

1. All regulated chemicals **detected in the City of Guelph’s treated water sources** that are above the **lab’s MDL (minimum detection limit)** are underlined indicating a hyperlink to an Excel Workbook in **Guelph’s** electronic document management system (EDMS). The workbook contains a definition of the parameter and an Excel worksheet for each treated source where the parameter has been detected with values for all sample results from January 1, 2007 to December 31, 2017. This database is used to closely track the instances of the identified chemical parameters and therefore provide time for planning / budgeting if treatment or an alternative supply is eventually required due to the presence of a given parameter. The database is updated annually.
2. Tabulated data is from the best available information at the time of table creation.
3. **If sampling for a particular schedule’s parameters (e.g. Schedule 23 and 24) did not occur within the calendar year of the report, then the most recent values are included in the report for reference.**
4. All acronyms and initialisms included in tables are described in **Appendix “I” – Glossary.**

The following section summarizes daily Distribution free chlorine residual test results required by O. Reg. 170/03 Schedule 7-2 where secondary disinfection is provided for the period of January 1 to December 31, 2017. The Verney Tower sample point is used to represent the water quality provided by the Zone One distribution system pressure; the Speedvale Tower sample point represents the water quality in Zone Two and the chlorine analyzer at Clair Booster Station monitors the water quality in Zone 3 for the purposes of the regulation. Please note that the City of Guelph takes additional operational daily Distribution samples and tests for free chlorine residual in order to better monitor the free residual in the Distribution System and respond accordingly. There was no instance of an adverse result in 2017 associated with these sampling sites, as presented in Table 8.

Table 8: O. Reg. 170/03 Schedule 7-2, City of Guelph - Distribution Manual Free Chlorine Residual Summary (2017)

Parameter	ODWQS Criteria	Total Analyses	Total Samples above Detection Limit	Total Outside ODWQS Criteria	Range	Units
Free Chlorine Residual – Zone One	0.05 – 4.0	365	365	0	0.52 – 1.08	mg/L
Free Chlorine Residual – Zone Two	0.05 – 4.0	365	365	0	0.22 – 1.13	mg/L
Free Chlorine Residual – Zone Three	0.05 – 4.0	SCADA	n/a	0	0.34 – 1.50	mg/L

Table 9 summarizes raw bacteriological sampling and test results required by O. Reg. 170/03 Schedule 10-4 including investigative re-sampling for the period of January 1 to December 31, 2017. There were a total of 1,097 raw samples taken and 3,291 raw analyses conducted.

Table 9: O. Reg. 170/03 Schedule 10-4, City of Guelph - Raw Bacteriological Sampling Summary (2017)

Parameter	ODWQS Criteria	Total Analyses	Total Outside ODWQS Criteria	Range	Units
Raw - E. coli	n/a	1097	n/a	0 - 1	cfu/100 mL
Raw - Total Coliform	n/a	1097	n/a	0 - 14	cfu/100 mL
Raw - Background	n/a	1097	n/a	0 – 760	cfu/100 mL

Table 10 summarizes treated bacteriological sampling and test results required by O. Reg. 170/03 Schedule 10-3 and 6-3 including investigative re-sampling for 2017.

- Number of POE⁶ samples taken: 607
- Number of POE analyses: 3,035
- Number of Distribution samples taken: 1,621
- Number of Distribution analyses: 7,728

Table 10: O. Reg. 170/03 Schedule 10-2, 10-3 and 6-3, City of Guelph - Treated Bacteriological Sampling Summary

Parameter	ODWQS Criteria	Total Analyses	Total Outside ODWQS Criteria	Range	Units
POE - E. coli	0	607	0	0	cfu /100 mL
POE - Total Coliform	0	607	0	0	cfu /100 mL
POE – HPC	n/a	607	n/a	0 - 25	cfu /mL
POE – Background	n/a	607	n/a	0 - 680	cfu /100 mL

⁶ Point of Entry; the point at or near which treated water enters the distribution system.

Parameter	ODWQS Criteria	Total Analyses	Total Outside ODWQS Criteria	Range	Units
POE – Free Chlorine Residual	0.05 to 4.0	603 ⁷	0	0.60 – 1.85	mg/L
Distribution - E. coli	0	1,621	0	0	cfu /100 mL
Distribution - Total Coliform	0	1,621	3 ⁸	0 - 25	cfu /100 mL
Distribution – HPC	n/a	766	n/a	0 – 150	cfu /mL
Distribution – Background	n/a	1,621	n/a	0 – 720	cfu /100 mL
Distribution – Free Chlorine Residual	0.05 to 4.0	2,099	0	0.29 – 1.31	mg/L

Table 11 summarizes raw source turbidity sampling and test results required by O. Reg. 170/03 Schedule 7-3 for the period of January 1 to December 31, 2017. Schedule 7-3 requires a “Monthly” sampling schedule, the City of Guelph samples all raw sources and tests for turbidity on a weekly basis to better monitor this aspect of raw water quality.

Table 11: O. Reg. 170/03 Schedule 7-3, City of Guelph - Raw Source Turbidity Sampling Summary (2017)

Parameter	ODWQS Criteria	Total Analyses	Total Samples above Detection Limit	Total Outside ODWQS Criteria	Range	Units
Raw Source Turbidity	n/a	1007	1007	n/a	0.03– 0.37	ntu

Table 12 summarizes raw source Ultraviolet Transmittance sampling and test results required by the city’s Municipal Drinking Water Licence (MDWL), where UV for primary disinfection is used and for the period of January 1 to December 31, 2017. The MDWL requires a test to be conducted and recorded on a “weekly” sampling schedule.

Table 12: O. Reg. 170/03 Schedule 7-3, City of Guelph - Raw Ultraviolet Transmittance Sampling Summary (2017)

Parameter	MDWL Criteria	Total Analyses	Total Samples above Detection Limit	Total Outside MDWL Criteria	Range	Units
Raw UVT F.M. Woods Station	93.5%	SCADA	n/a	0	93.4 - 99.8	% uvt
Raw UVT Emma Well	90.0%	51	51	0	91.0 – 97.2	% uvt
Raw UVT Membro Well	90.0%	48	48	0	90.1 – 100.0	% uvt
Raw UVT Water St. Well	87.0%	26	26	0	90.8 – 100.0	% uvt

⁷ Total number of samples used specifically to satisfy the requirements of O.Reg. 170/03 Schedule 10-3 and 6-3 (Treated Source samples taken for Operational purposes are not included).

⁸ Reported as AWQI #132381; #133265; 134654 and described in Table 1 of this document.

Microparticulate and Laser Particle Counting Sampling

As a part of the Guelph Drinking Water System's Municipal Drinking Water Licence, Guelph Water Services is required, twice annually, to assess the Arkell Collector System which is groundwater under the influence of surface water with effective in situ filtration (GUDI-WEF). The purpose of the assessment is to ensure that the source continues to meet the GUDI-WEF source water characteristics as outlined by the MOECC. Sampling was performed on this water source in the spring and fall of 2017. The source continues to meet the GUDI-WEF source water characteristics.

Treated Water Quality Statistics – O. Reg. 170/03 Schedule 6-5 - "Continuous Monitoring" Results Summary

Water Services utilises over twenty regulatory and operational continuous monitoring devices to measure water quality. Each regulatory device has controls associated with it such that in the event that the device detects that a measured value is outside the acceptable parameters for that location, the device causes an alarm to be sent to an Operator for immediate response (24 hours per day, seven days per week) and either automatically shuts down the station or activates a second alarm for immediate Operator response. Both the minimum allowable levels (if applicable) and the target values for Water Services regulatory continuous monitoring devices are listed in Table 13. The target values represent a safety margin to ensure that regulatory requirements are satisfied at all times. Please note that, continuous monitoring values all fell within acceptable regulatory standards in 2017.

Table 13: O. Reg. 170/03 Schedule 6-5, "Continuous Monitoring" Results Summary (2017)

Parameter	ODWQS or Regulatory Minimum	Target Range	Units
Point of Entry Free Chlorine Residual	0.05 mg/L	Greater than 0.4	mg/L
UV Dose F.M. Woods Station	24 mJ/cm ²	Greater than 40	mJ/cm ²
UV Dose Emma and Water St. Wells	40 mJ/cm ²	Greater than 45	mJ/cm ²
UV Dose Membro Well	20 mJ/cm ²	Greater than 40	mJ/cm ²

Treated Water Quality Statistics – O. Reg. 170/03 Schedule 13-6 and 13-7, "Three Month" Sampling Results Summary

In 2017, all operational Treated Sources were sampled and analyzed for Schedule 13-6, 13-16.1 and 13-7 parameters as per O. Reg. 170/03.

Regulation 170/03, Schedule 13-6 requires a minimum of one distribution sample taken from the **Distribution System where THM's (trihalomethanes) are most likely to develop (locations with high retention times)**. Water Services uses Speedvale Tower, Clair Tower, Verney Tower and Paisley Reservoir for this purpose in the Guelph Drinking Water System. The Maximum Allowable Concentration (MAC) for THM's is 0.1 mg/L. However, for this parameter, the MAC uses a running annual average of quarterly samples.

The results of the running annual average value for THMs for all related Distribution System samples in each quarter of 2017 (Jan. 01 to Dec. 31) is below the half of the maximum allowable concentration (½ MAC): Q1 = 0.0350 mg/L; Q2 = 0.0357 mg/L; Q3 = 0.0347 mg/L and Q4 = 0.0347 mg/L.

Regulation 170/03, Schedule 13-6.1 requires a minimum of one distribution sample taken from the Distribution System where HAAs (haloacetic acids) are most likely to develop. Water Services uses Speedvale Tower, Clair Tower, Verney Tower and Paisley Reservoir for this purpose in the Guelph Drinking Water System. The Maximum Allowable Concentration (MAC) for HAAs is 0.08 mg/L. However, for this parameter, the MAC uses a running annual average of quarterly samples.

The results of the running annual average value for HAAs for all related Distribution System samples in each quarter of 2017 (Jan. 01 to Dec. 31) is below the half of the maximum allowable concentration ($\frac{1}{2}$ MAC): Q1 = 0.0057 mg/L; Q2 = 0.0053 mg/L; Q3 = 0.0062 mg/L and Q4 = 0.0060 mg/L.

All operational Treated Sources were sampled and analyzed for Nitrates and Nitrites as per Regulation 170/03, Schedule 13-7. There was no instance of an adverse result in 2017. Raw sampling results are also presented in Table 14.

Table 14: O. Reg. 170/03 Schedule 13-6 and 13-7, City of Guelph - "Three Month" Sampling Results Summary (2017)

Parameter	ODWQS MAC	$\frac{1}{2}$ MAC	Total Samples	Samples Above MDL	Total Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average ⁹ (mg/L)
<u>Trihalomethanes</u>	0.100 ¹⁰	n/a	17	17	0	0.0212	0.0613	0.0339
Haloacetic Acids	0.08 ¹⁰	n/a	16	4	0	< 0.05	.032	0.032
<u>Nitrate + Nitrite (as nitrogen)</u>	10	5	54	40	0	< 0.10	3.03	1.00
<u>Nitrate + Nitrite (as nitrogen) – Woods' Raw Sources (Operational Sampling)</u>	n/a	n/a	41	40	n/a	<0.10	6.78	2.14
<u>Nitrate + Nitrite (as nitrogen) – University Raw Source (MDWL Sampling)</u>	10	5	5	5	0	0.22	0.76	0.49
<u>Nitrate + Nitrite (as nitrogen) – Paisley Raw Source (MDWL Sampling)</u>	10	5	5	5	0	1.83	2.14	2.03

Treated Water Quality Statistics – Operational VOC Scan Results Summary

Please note that Schedule 13-6, 13-6.1 and Schedule 24 parameters are also part of the "Operational VOC Sampling Regime" and therefore the values in the "Operational VOC Scan Results Summary" in Appendix "D" include a repetition of the relevant data from the Schedule 13-6, 13-6.1 and Schedule 24 tables. The "Operational VOC Scan Results Summary" lists the total number of samples analyzed for these parameters in 2017 (January 1 to December 31, 2017). Table 15 (below), highlights specific VOC

⁹ This is the average of values above the lab detection limit.

¹⁰ This standard is expressed as a running annual average.

parameters due to their presence / significance within the water supply. There was no instance of an adverse result in 2017.

Table 15: City of Guelph Operational VOC Scan Selected Results Summary (2017)

Parameter	ODWQS MAC	½ MAC	Total Samples	Samples Above MDL	Total Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
<u>Trichloroethylene</u>	0.005	0.0025	176	66	0	< 0.0001	0.00194	0.00081
<u>Trihalomethanes (TTHMs)</u>	0.100 ^B	n/a	178	68	0	< 0.0002	0.0613	0.0115

Treated Water Quality Statistics – O. Reg. 170/03 Schedule 23 Results Summary

In 2016, all operational “Treated Sources” were sampled and analyzed for Schedule 23 parameters as per O. Reg. 170/03. All of the City of Guelph’s treated ground water sources are on a three year sampling schedule. F.M. Woods’ Station is the exception and is sampled on the annual surface water schedule due to the fact that five of the nine sources that supply F.M. Woods are GUDI-WEF sources (the Carter Well field, Arkell 1, Arkell 15 and the Arkell Glen Collectors).

The results of the Schedule 23 inorganic parameter analysis in 2016 were all under the half of the maximum allowable concentration (½ MAC) and the majority were under the laboratory’s MDL (minimum detection level). Please refer to the section titled “O. Reg. 170/03 Schedule 23 Results Summary” included in Appendix “D” for more information.

The next scheduled “Three Year” Schedule 23 sampling event takes place in the third quarter of 2019.

The results of the Annual Schedule 23 inorganic parameter analysis in 2017 for F.M. Woods’ Station and Dean Well (not operational in 2016) were all under the ½ MAC and the majority were under the laboratory’s MDL (minimum detection level) as presented in Table 16.

Table 16: O. Reg. 170/03 Schedule 23, 13-2a, City of Guelph - Annual Schedule 23 Sampling Results Summary (2017)

Parameter	ODWQS MAC	½ MAC	Total Samples	Samples Above MDL	Total Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
<u>Antimony</u>	0.014	0.007	3	0	0	< 0.0005	< 0.0005	n/a
<u>Arsenic</u>	0.025	0.0125	3	0	0	< 0.001	< 0.001	n/a
<u>Barium</u>	1.0	0.5	3	2	0	0.054	0.097	0.078
<u>Boron</u>	5.0	2.5	3	2	0	< 0.01	0.035	0.031
<u>Cadmium</u>	0.005	0.0025	3	1	0	< 0.00010	0.00011	0.00011
<u>Chromium</u>	0.05	0.025	3	0	0	< 0.005	< 0.005	n/a
<u>Mercury</u>	0.001	0.0005	2	0	0	< 0.0001	< 0.0001	n/a
<u>Selenium</u>	0.01	0.005	3	0	0	< 0.002	< 0.002	n/a
<u>Uranium</u>	0.02	0.01	3	3	0	0.00054	0.0019	0.00138

Treated Water Quality Statistics – O. Reg. 170/03 Schedule 24 Results Summary

In 2016, all operational “Treated Sources” were sampled and analyzed for Schedule 24 parameters as per O. Reg. 170/03. All of the City of Guelph’s treated ground water sources are on a three year sampling schedule. F.M. Woods’ Station is the exception and is sampled on the annual surface water schedule due to the fact that five of the nine sources that supply F.M. Woods’ are GUDI-WEF sources (the Carter Well field, Arkell 1, Arkell 14 and the Glen Collectors).

The results of the Schedule 24 organic parameter analysis in 2016 were all under half of the maximum allowable concentration ($\frac{1}{2}$ MAC) and the majority were under the laboratory’s MDL (minimum detection level). Please refer to the section entitled “O. Reg. 170/03 Schedule 24 Results Summary” included in Appendix “D” for more information.

It should be noted that, before 2012, values for TCE (trichloroethylene) at Membro and Emma occasionally crested the $\frac{1}{2}$ MAC value of 0.0025 mg/L and as a result Water Services moved to an “Increased Frequency Sampling Plan” as required by Regulation 170/03 - 13-5 which requires that sampling for this parameter be sampled every “three months” until two consecutive sample results are below the $\frac{1}{2}$ MAC value. As a precautionary measure, Water Services samples both raw and treated water sources on a monthly schedule at Membro and Emma wells. All other sources, both raw and treated, are sampled annually (minimally) for VOC’s (Volatile Organic Carbons) through a “Guelph VOC Scan” in order to better track parameters such as TCE via more data. Currently, TCE is above the MDL but below the $\frac{1}{2}$ MAC at Membro, Water Street and Park treated water samples.

The next scheduled “Three Year” Schedule 24 sampling event takes place in 2019.

The results of the Annual Schedule 24 organic parameter analysis in 2017 for F.M. Woods Station and Dean Well (not operational in 2016) were all under the half of the maximum allowable concentration ($\frac{1}{2}$ MAC) and the laboratory’s MDL (minimum detection level), as presented in Table 17.

Table 17: O. Reg. 170/03 Schedule 24, 13-4a, City of Guelph - Annual Schedule 24 Sampling Results Summary (2017)

Parameter	ODWQS MAC	$\frac{1}{2}$ MAC	Total Samples	Samples Above MDL	Total Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Alachlor	0.005	0.0025	2	0	0	< 0.0005	< 0.0005	n/a
Atrazine + N-dealkylated metabolites	0.005	0.0025	2	0	0	< 0.001	< 0.001	n/a
Azinphos-methyl	0.02	0.01	2	0	0	< 0.002	< 0.002	n/a
Benzene	0.005	0.0025	11	0	0	< 0.0001	< 0.0001	n/a
Benzo(a)pyrene	0.00001	0.000005	2	0	0	< 0.000009	< 0.000009	n/a
Bromoxynil	0.005	0.0025	2	0	0	< 0.0005	< 0.0005	n/a
Carbaryl	0.09	0.045	2	0	0	< 0.005	< 0.005	n/a
Carbofuran	0.09	0.045	2	0	0	< 0.005	< 0.005	n/a
Carbon Tetrachloride	0.005	0.0025	11	0	0	< 0.0001	< 0.0001	n/a
Chlorpyrifos	0.09	0.045	2	0	0	< 0.0001	< 0.0001	n/a

Parameter	ODWQS MAC	½ MAC	Total Samples	Samples Above MDL	Total Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Diazinon	0.02	0.01	2	0	0	< 0.001	< 0.001	n/a
Dicamba	0.12	0.06	2	0	0	< 0.001	< 0.001	n/a
1,2-Dichlorobenzene	0.2	0.1	11	0	0	< 0.0002	< 0.0002	n/a
1,4-Dichlorobenzene	0.005	0.0025	11	0	0	< 0.0002	< 0.0002	n/a
1,2-Dichloroethane	0.005	0.0025	11	0	0	< 0.0002	< 0.0002	n/a
1,1-Dichloroethylene (vinylidene chloride)	0.014	0.007	11	0	0	< 0.0001	< 0.0001	n/a
<u>Dichloromethane</u>	0.05	0.025	11	0	0	< 0.0005	< 0.0005	n/a
2,4-Dichlorophenol	0.9	0.45	2	0	0	< 0.00025	< 0.00025	n/a
2,4-Dichlorophenoxy acetic acid (2,4-D)	0.1	0.05	2	0	0	< 0.0001	< 0.0001	n/a
Diclofop-methyl	0.009	0.0045	2	0	0	< 0.0009	< 0.0009	n/a
Dimethoate	0.02	0.01	2	0	0	< 0.0025	< 0.0025	n/a
Diquat	0.07	0.0035	2	0	0	< 0.007	< 0.007	n/a
Diuron	0.15	0.075	2	0	0	< 0.01	< 0.01	n/a
Glyphosate	0.28	0.14	2	0	0	< 0.01	< 0.01	n/a
Malathion	0.19	0.095	2	0	0	< 0.005	< 0.005	n/a
2-Methyl-4-chlorophenoxyacetic acid	0.1	0.05	2	0	0	< 0.00012	< 0.00012	n/a
Metolachlor	0.05	0.025	2	0	0	< 0.0005	< 0.0005	n/a
Metribuzin	0.08	0.04	2	0	0	< 0.005	< 0.005	n/a
Chlorobenzene	0.08	0.04	11	0	0	< 0.0001	< 0.0001	n/a
Paraquat	0.01	0.005	2	0	0	< 0.001	< 0.001	n/a
Pentachlorophenol (PCP)	0.06	0.03	2	0	0	< 0.0005	< 0.0005	n/a
Phorate	0.002	0.001	2	0	0	< 0.0005	< 0.0005	n/a
Picloram	0.19	0.095	2	0	0	< 0.005	< 0.005	n/a
Polychlorinated Biphenyls (PCB)	0.003	0.0015	2	0	0	< 0.00005	< 0.00005	n/a
Prometryn	0.001	0.0005	2	0	0	< 0.00025	< 0.00025	n/a
Simazine	0.01	0.005	2	0	0	< 0.001	< 0.001	n/a
Terbufos	0.001	0.0005	2	0	0	< 0.0005	< 0.0005	n/a
<u>Tetrachloroethylene (PCE)</u>	0.03	0.015	11	0	0	< 0.0001	< 0.0001	n/a
2,3,4,6-Tetrachlorophenol	0.1	0.05	2	0	0	< 0.0005	< 0.0005	n/a
Triallate	0.23	0.115	2	0	0	< 0.001	< 0.001	n/a
<u>Trichloroethylene</u>	0.005	0.0025	11	0	0	< 0.0001	< 0.0001	n/a
2,4,6-Trichlorophenol	0.005	0.0025	2	0	0	< 0.0005	< 0.0005	n/a
Trifluralin	0.045	0.0225	2	0	0	< 0.001	< 0.001	n/a
Vinyl Chloride	0.002	0.001	11	0	0	< 0.0002	< 0.0002	n/a

Treated Water Quality Statistics – O. Reg. 170/03 Schedule 13-8 and 13-9, “Five Year” Sampling Results Summary

In 2014, all operational “Treated Sources” were sampled and analyzed for the Schedule 13-9 Fluoride parameter as per O. Reg. 170/03. In 2014, Fluoride (naturally present and not added as part of the treatment process) was detected at all treated sources; the analytical results were all under the maximum allowable concentration (MAC). The values in Table 18 reflect the 2014, Schedule 13-9 sampling regime. Sodium, however, is sampled on a more frequent basis (annually) than the Schedule 13-8 requirement. Due to the fact that at every treated source, sodium levels are above the lower reportable limit of 20 mg/L.

The increased frequency of sampling provides more data in order to better establish sodium value trends. Sodium results for 2014 can be referenced in Table 18. This data is provided to Wellington-Dufferin-Guelph Public Health, as required.

Table 18: O. Reg. 170/03 Schedule 13-8 and 13-9, City of Guelph - “Five Year” Sampling Results Summary

Parameter	ODWQS MAC	½ MAC	Total Samples	Samples Above MDL	Total Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Sodium	20 and 200 ¹¹	n/a	27	27	27	24	150	73.6
Fluoride	1.5 and 2.4 ¹²	n/a	20	20	0	0.13	0.77	0.292

Treated Water Quality Statistics – General Chemistry Results Summary

Water Services has initiated an “Annual General Chemistry” sampling event through RCap (Rapid Chemical Analysis Package). This body of data can be used to answer customer inquiries, as well as, inquiries from Water Services staff and consultants in terms of treatment upgrades.

Please note that Schedule 23 parameters are also part of the “Annual General Chemistry Sampling Regime” and therefore the values in the “General Chemistry Results Summary” section in Appendix “D” include a repetition of the relevant data from the Schedule 23 Table. The “General Chemistry Results Summary” lists the total number of samples analyzed for these parameters in 2017.

In 2017, all operational “Treated Sources” were sampled and analyzed for general chemistry parameters. Please refer to the “General Chemistry Results Summary” in Appendix “D” for the full list of parameters.

Table 19 highlights specific parameters due to their presence / significance within the water supply.

¹¹ The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.

¹² Where supplies contain naturally occurring fluoride at levels higher than 1.5 mg/L but less than 2.4 mg/L, the Ministry of Health and Long Term Care recommends an approach through local boards of health to raise public and professional awareness to control excessive exposure to fluoride from other sources.

Table 19: City of Guelph General Chemistry Selected Results Summary (2017)

Parameter	ODWQS MAC	ODWQS AO	ODWQS OG	Total Samples	Samples Above MDL	Total Above Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Ammonia-N	n/a	n/a	n/a	13	2	n/a	< 0.05	0.18	0.14
<u>Chloride</u>	n/a	250	n/a	13	13	0	37	280	150
<u>Hardness (Calculated as CaCO₃)</u>	n/a	n/a	80-100	13	13	13	320	550	441
<u>Iron</u>	n/a	0.3	n/a	14	3	1	< 0.1	0.49	0.31
Lead	0.01	n/a	n/a	14	2	0	<0.0005	0.0013	0.00099
<u>Manganese</u>	n/a	0.05	n/a	14	11	1	<0.002	0.065	0.0143
<u>Sodium</u>	n/a	20 and 200	n/a	14	14	14	20	160	84

i) Treated Water Quality – Gazer Mooney Subdivision Distribution System

This section describes the Regulatory water quality monitoring that has been collected in the Gazer Mooney Subdivision Distribution System in 2017. For regulatory sampling schedules that do not occur in 2017 related to the Gazer Mooney System, the most recent historical data is listed.

Water Quality Review - Gazer Mooney Subdivision Distribution System

Under the Safe Drinking Water Act, municipalities are required to monitor both the raw and treated quality of the source water supplied. This monitoring is performed for both regulatory compliance and due diligence and is expected to identify any changes within the treated water as well as in the raw source waters.

A note about all tables included in this section:

1. All regulated chemical parameters where values above the lab's MDL (minimum detection limit) have been detected in the City of Guelph's treated water sources are underlined indicating a hyperlink to an Excel Workbook in Guelph's EDMS. The workbook contains a definition of the parameter, an Excel worksheet for each treated source where the parameter has been detected with values for all sample results from January 1, 2007 to December 31, 2017. This database is used to closely track the instances of the identified chemical parameters and therefore provide time for planning / budgeting if treatment or an alternative supply is eventually required due to the presence of a given parameter. The database is updated quarterly.
2. Tabulated values are from best available information at the time of table creation. While the values above satisfy the regulatory minimum regulatory requirements, Water Services performs many additional operational tests not listed in this report.
3. All acronyms and initialisms included in tables are described in Appendix "I" – Glossary.

Table 20 summarizes daily Distribution free chlorine residual test results required by O. Reg. 170/03 Schedule 7-2 for the period of January 1 to December 31, 2017. There was no instance of an adverse result in 2017.

Table 20: O. Reg. 170/03 Schedule 7-2, Gazer Mooney - Distribution Manual Free Chlorine Residual Summary (2017)

Parameter	ODWQS Range	Total Samples	Total Samples Outside of ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)	Units
Free Chlorine Residual	0.05 – 4.0	365	0	0.27	1.24	0.88	mg/L

Table 21 summarizes bacteriological sampling and test results required by O. Reg. 170/03 Schedule 10 for the period of January 1 to December 31, 2017. There was no instance of an exceedance for a Regulatory microbiological parameter in 2017. There were 52 Distribution samples taken and 573 Distribution analyses completed in 2017.

Table 21: O. Reg. 170/03 Schedule 10-2, Gazer Mooney Treated Bacteriological Sampling Summary (2017)

Parameter	ODWQS Criteria	Total Analyses	Total Outside ODWQS Criteria	Range	Units
Distribution - E. coli	0	52	0	0	cfu/100 mL
Distribution - Total Coliform	0	52	0	0	cfu/100 mL
Distribution – HPC	n/a	51	n/a	0 - 2	cfu/mL
Distribution – Background	n/a	52	n/a	0 - 4	cfu/100 mL
Distribution– Free Chlorine Residual	0.05 – 4.0	365	0	0.27 – 1.24	mg/L

Treated Water Quality Statistics – O. Reg. 170/03 Schedule 13-6, “Three Month” Sampling Results Summary

In 2017, Gazer Mooney Subdivision Distribution System was sampled and analyzed for Schedule 13-6 and 13-6.1 parameters as per O. Reg. 170/03. Regulation 170/03, Schedule 13-6 requires a minimum of one distribution sample taken from the Distribution System where THMs (trihalomethanes) are most likely to develop (points with high retention times). The MAC for THMs is 0.1 mg/L. However, for this parameter the MAC uses a running annual average of quarterly samples. These results are presented in Table 22.

The results of the running annual average value for THMs in the Gazer Mooney Subdivision Distribution System samples in 2017 is below the half maximum allowable concentration ($\frac{1}{2}$ MAC): Q1 = 0.0251 mg/L; Q2 = 0.0287 mg/L; Q3 = 0.0285 mg/L and Q4 = 0.0174 mg/L.

Regulation 170/03, Schedule 13-6.1 requires a minimum of one distribution sample taken from the Distribution System where HAAs (haloacetic acids) are most likely to develop. The MAC for HAAs is 0.08 mg/L. However, for this parameter the MAC uses a running annual average of quarterly samples.

The results of the running annual average value for HAAs in the Gazer Mooney Subdivision Distribution System samples in 2017 is below the half maximum allowable concentration ($\frac{1}{2}$ MAC): Q1 = 0.0014 mg/L; Q2 = 0.0014 mg/L; Q3 = 0.0014 mg/L and Q4 = not detected.

Table 22: O. Reg. 170/03 Schedule 13-6, Gazer Mooney - "Three Month" Sampling Results Summary (2017)

Parameter	ODWQS MAC mg/L	1/2 MAC mg/L	Total Samples	Samples Above MDL	# Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Trihalomethanes	0.100 ¹³	n/a	4	4	0	0.0143	0.0533	0.0202
Haloacetic Acids	0.08 ¹³	n/a	4	0	0	<0.005	<0.005	n/a

Treated Water Quality Statistics – General Chemistry Results Summary

In addition to the regulatory sampling and analysis required for the operation of the Gazer Mooney Subdivision, Water Services samples for parameters as listed in Table 23 in order to gather additional data and answer common inquiries from the public.

Table 23: Gazer Mooney General Chemistry Results Summary (2017)

Parameter	ODWQS MAC mg/L	ODWQS AO	1/2 MAC mg/L	Total Samples	Samples Above MDL	Total Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Sodium	20 and 200 ¹⁴	n/a	n/a	1	1	1	21	21	21
Chloride	n/a	250	n/a	1	1	0	41	41	41

j) Status of Ongoing and Emerging Water Quality, Supply and Distribution Initiatives

This includes summaries and updates related to the implementation of the:

- 2016 Water Efficiency Strategy;
- Source Water Protection Plan; and
- Lead Reduction Plan.

Water Conservation and Efficiency

The City of Guelph strives to be a leader in water conservation and efficiency. As one of Canada's largest communities reliant on a finite groundwater source for our drinking water needs, our ability to reclaim precious water and wastewater serving capacity through conservation and efficiency initiatives offers numerous benefits to our community and local ecosystem. Water Services continues to promote the ongoing sustainability of our finite water resources through active water conservation and efficiency programming to meet the water reduction targets as outlined in the 2014 Water Supply Master Plan.

¹³ This standard is expressed as a running annual average.

¹⁴ The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.

Appendix "H" includes a highlight of the progress made for the period of January 1 to December 31, 2017 in the implementation of the 2016 Water Efficiency Strategy.

Source Water Protection Plan

The Grand River Source Protection Plan was approved by the Minister of the Environment and Climate Change on November 26, 2015 with an effective date of July 1, 2016. Council has appointed risk management staff, including a Risk Management Official (RMO) and a Risk Management Inspector (RMI) to **protect Guelph's Drinking Water**, as per the Clean Drinking Water Act, 2016.

Source Water Protection staff will continue to carry out on-site inspections of businesses that were originally flagged as significant drinking water threats in the Grand River Approved Assessment Report (2012). A desktop review was conducted in 2010 to provide an initial inventory of potential significant drinking water threats and was conservative in the approach taken to enumerate the threats. Staff will be carrying out on-site inspections on a **priority basis with properties closest to the City's municipal wells** being addressed first to confirm the details from the initial inventory. It is expected that the total number of significant drinking water threats will be reduced as a result of the field confirmations that will take place in 2018 and beyond.

The Risk Management Official will continue to negotiate Risk Management Plans that are required under the Clean Water Act. This will be prioritized during the development application and building permit stages for new development, and as identified during the ongoing on-site field confirmation program noted above.

Source Water Protection Program staff are working with the Source Protection Authority and the County of Wellington to advance the development of water quantity policies using priority rankings, risk management measures, stakeholder consultations and public communications with the goal of submitting draft policies to the MOECC at the end of 2018. The policies, once approved by the Minister will form the final part of the Source Protection Plan.

Source Water Protection Program staff, in conjunction with Water Services and Communication staff, will also undertake the development of the various education and outreach programs that are required under the Grand River Source Protection Plan in 2018. The objective of this part of the program is to raise awareness of the importance of protecting our drinking water sources and to educate the public on drinking water threats and ways they can contribute to protecting our water resources.

For more information on Guelph's Source Water Protection Program visit: guelph.ca/sourcewater.

Arkeil Springs Forest Stewardship Project

Another source water protection initiative is carried out through the Arkeil Springs Forest Stewardship Project. The Arkeil Spring Grounds cover an area of 804 acres. The area is comprised of old and new forested areas. The objective of the Arkeil Springs Forest Stewardship Project has been to protect the drinking water aquifer by managing past tree plantings, monitor general forest health and enhance fallow areas with new plantings.

Delicate forest stands require continued maintenance and observation to ensure the prevention of any unnecessary and undesired losses. The many benefits of the project include: the creation of a diverse and

functioning forest cover; maintenance and re-generation of older forested areas on the property; protection and recharge of **underground aquifers which supply our City's water**; prevention of undesirable surface water runoff and flooding into local waterways; and regulation of the flow of water. This multiple barrier approach results in the highest possible quality of water to supply **Guelph's drinking water system**. Forest systems also extend the longevity of the existing snow pack by stabilizing the temperature of the ground and limiting the evaporative impact of the sun. This ensures that surface water source recharges the underlying aquifer rather than contributing to damaging runoff and flooding.

At the beginning of December 2016, a commercial thinning harvest was started on the Arkell site. Commercial thinning is a silviculture treatment that 'thins' out an overstocked plantation stand by removing trees that are large enough to be sold for products such as poles or fence posts. It is carried out to improve the health and growth rate of the remaining crop trees. Commercial thinning is an intermediate harvest where the merchantable wood removed should cover part or all of the cost of harvesting. The thinning of a red pine plantation was completed in January 2017. About 10,000 red pine trees (1,150 cords of wood) were removed.

To further enhance the site's fallow farm fields, a tree planting program has been ongoing since 2007. On a volunteer basis, the Community Environmental Leadership Program (CELP) has planted 24,500 trees on 18 acres, and Bartram Woodlands (on-site contractor) has planted 35,790 trees on another 16 acres. This number includes 9,550 trees that were planted into the rows removed from the recent commercial harvest.

Lead Reduction Plan

The City of Guelph's Lead Reduction Plan (LRP) was developed in lieu of a Corrosion Control Plan (as outlined in Ontario Regulation 170/03 Schedule 15.1) and was formally approved by the Ministry of the Environment and Climate Change (MOECC) on March 21, 2012. The LRP focuses on physical lead service line replacement through verification sampling, financial incentives and public outreach.

As per the City of Guelph MDWL 017-101, Schedule D issued April 21, 2017, the City is required to submit all lead sampling data every 6 months and an annual Evaluation Report to assess the effectiveness of the Lead Reduction Plan. The following table presents summary results for lead sampling in the Guelph Drinking Water System as per Schedule D for the period of January 1 to December 31, 2017.

Table 24: Lead Reduction Plan Lead Sampling – Guelph Drinking Water System 2017¹⁵

Number of Locations	Location Type	Number of Samples	Lead Range (mg/L)
56	Plumbing that Serves Private Property	92	0.0000 – 0.11
17	Distribution System	41	0.0000 - 0.088

In the Gazer Mooney Subdivision Distribution System, all samples were below the Ontario Drinking Water Standard for lead of 0.01 mg/L, as presented in the following table.

¹⁵ Includes all samples as required by the MDWL or Lead Reduction Plan.

Table 25: Lead Reduction Plan – Gazer Mooney Subdivision Distribution System 2017

Number of Locations	Location Type	Number of Samples	Lead Range (mg/L)	pH Range	Alkalinity Range (mg/L)
2	Distribution	3	0.0000 – 0.0021	7.8 – 8.11	260 - 270

Lead Sampling

Lead sampling is conducted to identify the presence of lead service lines (LSL) and to monitor lead levels following a LSL replacement. For the period of January 1 to December 31, 2017, 41 private plumbing locations were sampled for the purposes of verifying the presence of a LSL. Of these locations, 9 locations were above 5 micrograms per litre ($\mu\text{g/L}$) indicating presence of a lead service line and 6 also exceeded the ODWQS of 10 $\mu\text{g/L}$. Lead samples are collected before and after a LSL replacement has been undertaken. There were 15 locations resampled in order to monitor lead levels post-replacement. Based on sample results to date, regulatory compliance is expected at individual sites that have undergone a full LSL replacement or where there is no lead remaining in the service line.

Lead Service Line Replacements

There were 24 LSL replacements undertaken in the City between January 1 to December 31, 2017. These replacements include the following situations: i) Full LSL Replacement where both the City- and private-side of the LSL is replaced, ii) Partial LSL Replacement where only the City-side of the service is replaced and connected back to lead or a non-lead material on the private-side, and iii) Private LSL Replacement where the private-side of the service is replaced and the City-side is known to be copper. The next table presents a summary of all LSL replacements in the Guelph Drinking Water system for 2017 up to December 31.

Table 26: Lead Service Line Replacements 2017

Type of Replacement	#
Full (City and Private sides replaced): Lead Free	1
Partial (City side replaced and connected to copper or iron on Private side): Lead Free	1
Partial (City side replaced and connected to lead or unknown material on Private side): Lead Remaining	5
Private LSL Replacement (Funded under Grant Program¹⁶ or by private contractor): Lead Free	17
TOTAL	24

Privately Owned Lead Service Line Replacements

Since 2010, the City initiated financial incentive programs to encourage replacement of privately-owned LSL by reducing the financial burden to property owners. The grants cover 70 to 100 percent of the LSL

¹⁶ The LSL Replacement Grant Program provides eligible property owners funding to off-set the cost of replacing an LSL on private property.

replacement cost for homeowners. From 2010 to Dec. 31, 2017, 213 privately owned lead service lines were replaced through the grant program, as presented in Table 27.

Table 27: Private Lead Service Line Replacement Grant Programs (2010 – Dec. 31, 2017)

Grant Program	2010	2011	2012	2013	2014	2015	2016	2017
Yearly Total	60	62	31	20	9	12	7	13
Cumulative Total	60	122	153	173	182	194	200	213

Targeted outreach regarding the Grant Programs is directed at all properties with known or suspected privately-owned LSLs. The main barriers to privately owned LSL replacement for homeowners include financial costs, disruption to property, rental properties and people who are unconcerned about the health risks of lead in drinking water. Direct communications continued to be tailored to address these barriers.

k) Expected Future Changes That Could Affect the DWS or the QMS

Appendix "E" Legal & Other Requirements includes a summary of legislative and regulatory updates from January 1 to December 31, 2017.

Changes Affecting the Drinking Water System (DWS) / Licence Approvals / Amendments

Carter Monitoring Program – Operational Testing

The Permit to Take Water for Carter Well requires that the Carter Wells be operated at increased levels in conjunction with monitoring in the Torrence Creek Subwatershed. The purpose of the monitoring is to quantify impacts within this subwatershed.

Municipal Drinking Water Licence Renewal

The current Municipal Drinking Water Licence expires in 2019. Table 28, below includes Licence documents' dates of issue and expiry.

Table 28: Municipal Drinking Water Licensing Documents

Document (hyperlinked)	Issue Date (yyyy-mm-dd)	Expiry (yyyy-mm-dd)
<u>Municipal Drinking Water Licence (#017-101)</u>	2017-04-21	2019-08-17
<u>Drinking Water Works Permit (#017-201)</u>	2017-04-21	2019-08-17
<u>Drinking Water Works Permit (#017-201) - Schedule C</u>	2016-03-24	2019-08-17
<u>Municipal Long Range Financial Plan (#017-301)</u>	2014-02-25	2019-08-17
<u>DWOMS Certificate of Registration - Guelph Drinking Water System (017-OA1)</u>	2016-08-04	2019-07-27
<u>Operational Plan Re-endorsement Guelph Drinking Water System (resolution)</u>	2015-10-26	2019-10-31

Document (hyperlinked)	Issue Date (yyyy-mm-dd)	Expiry (yyyy-mm-dd)
<u>Agreement Regarding Water Services for the Gazer-Mooney Subdivision</u>	2009-06-01	2019-05-31
<u>Municipal Drinking Water Licence (#104-103)</u>	2016-01-28	2021-01-26
<u>Drinking Water Works Permit (#017-203)</u>	2016-01-28	2021-01-26
<u>Operational Plan Re-endorsement Gazer Mooney Sub. Dist. System (resolution)</u>	2015-07-14	2019-10-31
<u>DWQMS Certificate of Registration - Gazer Mooney (104-OA2)</u>	2016-08-04	2019-07-27

Sentry Monitoring Wells

In order to help predict future TCE concentrations in our source water and allow for planning for the possible need for further treatment, sentry wells have been constructed in the vicinity of Emma and Membro Wells. TCE source sampling analysis indicates that TCE concentrations are stable or decreasing.

Permits to Take Water (PTTW) Renewals

The [Water St. Wellfield \(Water, Dean, University, Membro\) PTTW](#) (exp. 2016 -10-31) is still in the active renewal process and rests with the MOECC. For the time period between the expiry date of a PTTW and the receipt of a renewal, the requirements of the last PTTW remain in force.

Two PTTWs are scheduled for renewal in 2018:

1. [Calico PTTW](#) (exp. 2018-04-30)
2. [Eramosa River PTTW](#) (exp. 2018-11-30)

Staff Certification

The following tables (Table 29, Table 30 and Table 31) describes all staff (Operators, Management, and other Technical staff) with various classes of provincial Drinking Water Operator Certificates and **years'** experience, as of December 31, 2017.

Table 29: Water Services Staff with Drinking Water Operator Certificates

Certificate Class	Number of Certified Employees		
	2015	2016	2017
Operator-In-Training	4	2	3
Class I	1	2	0
Class II	3	3	3
Class III	12	12	8
Class IV	10	12	19
Total Certified Employees	30	31	33

Table 30: Competency & Years’ Experience of Certified Management Staff

Role	Minimum Competency Required ¹⁷	Competency Achieved	Years’ Experience
Manager of Operations / ORO -Overall Responsible Operator	Class IV Certificate	Class IV Certificate	30+
Supervisor of Distribution / Construction	Class I Certificate or higher	Class IV Certificate	21+
Supervisor of Distribution / Metering	Class I Certificate or higher	Class IV Certificate	17+
Supervisor of Water Supply Operations	Class I Certificate or higher	Class IV Certificate	14+
Supervisor of Water Supply Maintenance	Class 1 Certificate or higher	Class IV Certificate	9+

Table 31: Years’ Experience of Certified Staff

Role	<5 years	5-9 years	10-14 years	15-19 years	20-24 years	25+ years
Distribution Operators	2	6	3	2	0	2
Supply Operators	1	0	4	2	0	1
Technical Services Staff	1	2	1	0	1	0

Changes Affecting the Quality Management System (QMS)

Results of the Management Review, the identified deficiencies, decisions and action items:

A Management Review meeting was held on February 1, 2017 and January 30, 2018. The following is a summary of results of the management review. **Appendix “F”** includes the action items from the meeting; items 1-15 are from the February 1, 2017 Management Review meeting and items 16-28 are from the January 30, 2018 Management Review Meeting. The summary includes identified deficiencies, decisions and action items below:

Deficiencies:

- There were not any identified non-compliance issues in 2017.
- 5 AWQI’s occurred in 2017 (two related to lead, three related to TC).
- 2 minor non-conformities from the last external audit re: Sampling, Testing and Monitoring and Continual Improvement.

¹⁷ Minimum competency includes the certification requirements listed here, plus the completion of ongoing training requirements of O. Reg. 128/04.

Decisions:

- Refer to section d) regarding decisions made in the Risk Assessment process on October 12, 2017.
- Install a sample station in Zone 3, as soon as reasonably possible.
- For the 2017 Annual and Summary Report:
 - Include more defined Pressure Zone boundaries in Figure 1.
 - Include emergency preparations that were done at F.M. Woods prior to work on the Paisley-Clythe Feedermain.
 - Include the sampling stations that were installed by contractors through the DMA Program in Table 4.
 - Create a table that identifies the UVT values at the stations that provide UV treatment.
 - Add information regarding the Paisley-Clythe Feedermain project to the Infrastructure Review section.
- For the 2018 Annual and Summary Report:
 - Include the total number of lead replacements, including those done through capital reconstruction projects in the 2018 Annual & Summary Report.

Ontario's updated Drinking Water Quality Management Standard (DWQMS)

Guelph Water Services has implemented the updated DWQMS (Version 2.0 - February 2017) in its quality management system. Most significant edits to the DWQMS are:

- Throughout: added "once every **Calendar Year**" where applicable in place of "once every year" or "once every 12 months".
- QMS 07: includes consideration of potential hazardous events and associated hazards identified by the **ministry. These hazardous events are identified in the document titled "Potential Hazardous Events for Municipal Residential Drinking Water Systems."**
- QMS 12: suppliers of essential supplies and services identified by Guelph Water Services are considered in the procedure for communications. This document will further describe this statement.
- QMS 14: Outcomes of the risk assessment documented under QMS 08 will be considered in the procedure for reviewing the adequacy of the infrastructure necessary to operate and maintain the drinking water system.
- QMS 15: Long-term forecast of major infrastructure maintenance, rehabilitation and renewal activities is already included as part of QMS 14 (but will elaborate the procedure to include this statement).
- QMS 21: includes consideration of **BMP's** (when available from the MOECC) in continual improvement; a documented process for identification & management of continual improvement reports (that are continual improvement items, corrective actions or preventive actions, where applicable).

I) Consumer Feedback

The table below represents the number of all customer calls received, but do not necessarily reflect the number of individual issues (as more than one call could relate to a single issue):

Table 32: Customer Calls Received

Type	# Calls 2015	# Calls 2016	# Calls 2017
Discoloured Water	160	185	106
Distribution	72	77	54
Flushing	27	33	13
Frozen	695	5	3
Hydrant - Accident Report	2	3	5
Hydrant - Investigation	38	39	35
Hydrant Out-of-Service	65	108	137
Leak	52	88	83
Meter	36	11	8
Other	127	53	33
Pressure	95	104	92
Private Issue	18	23	5
Service Box Repairs	254	205	194
Swabbing	47	59	16
Trench Investigation	9	6	4
Valve	27	46	19
Water Quality / Appearance	47	55	39
Watermain	67	5	6
Watermain Break Investigation	54	90	96
Well Interference Inquiries	2	4	3

m) The Resources Needed to Maintain the DWS and QMS

Water Services currently has one full-time Quality Assurance Coordinator, who is also the Quality Management System Representative; a Compliance Coordinator; access to five Water Services Technicians; and a Customer Service Clerk for reporting and documentation requirements of the QMS.

Operational challenges in the drinking water system continue to drive the need for additional resources, such as:

- A changing staff profile, with experienced staff that have retired or are due to retire in the next few years;
- Aging city infrastructure requiring increased capital budget considerations;
- Potential source water supply shortfall (e.g. current supplies not meeting future demand, drought, contamination, demands of future growth);

- Distribution system issues (e.g. frozen city-side infrastructure, larger infrastructure failures or hits; Locates Program, Metering Program); and
- Private property issues.

n) The Results of Infrastructure Review

The identification of water infrastructure requirements are achieved by reviewing the needs of existing and new infrastructure through the completion of asset management plans both at Water Services and corporately.

Distribution Infrastructure Needs

Distribution infrastructure needs are outlined in the corporate asset management plan, which is developed using industry best management practices and completed by the Engineering & Capital Infrastructure Services (Engineering Services) Asset Management department. This linear plan is reviewed by Water Services who then assists in developing a priority sequence for project completion. In 2017, Water Services also completed a review of the distribution system with respect to fire flows to aid in this discussion.

During the annual budget preparation process, Engineering Services and Water Services review infrastructure conditions, inventory age, CAPS (capital asset prioritisation system), and system criticality. From this evaluation, Engineering and Water Services finalize the list of priority projects that also considers the priorities of wastewater and road reconstruction projects so that these projects can share the costs of excavation and rehabilitation. New linear infrastructure reviews are primarily driven by Engineering Services.

Annual summaries of road reconstruction, sewer and watermain projects are identified on an infrastructure map that is released early spring each year.

Supply & Facilities Infrastructure Needs

On July 28, 2014 Guelph City Council unanimously approved the Water Supply Master Plan update, defining preferred water supply servicing alternatives in meeting the needs of existing customers and future community growth.

In concert with the Water Supply Master Plan Update, the City's Engineering Services completed an update to the linear water distribution network model as part of the 2014 Development Charges Background Study to define water distribution improvements needed for growth servicing.

As part of the above mentioned studies, a number of system upgrades have been identified including, additional water supply sources, new pumping stations, storage facilities and new water distribution mains. To help integrate these complex works, the City completed the Pressure Zone 1 and 2 studies in 2015 and 2017, respectively. These studies support the implementation of capital projects as outlined in the Water and Wastewater Capital Budget deliberations.

In 2017, Water Services completed the Water Facility and Property Asset Management Plan. This Plan identifies and prioritizes capital projects and land acquisitions required to maintain and renew its existing

facility assets and associated operations over a 25 year planning horizon in accordance with asset management industry best management practices as well as current codes, guidelines and standards. A 10 year capital forecast for Facility and Plant Upgrades was presented to and endorsed by Council as part of the 2018 Capital Budget deliberations to address a backlog in infrastructure investment required to **sustain operation of the City's critical water supply facilities and processes**. This 10 year capital plan seeks to invest \$48.8 million in water supply asset renewal and maintenance between 2017 and 2026, an increase of just over \$26 million over prior planned investment over this period in comparison to planned Water Services Facility Upgrades defined through the 2016 Capital budget.

As a result of the above noted studies, key capital projects have been initiated/ completed in 2017. The following provides the project name with a brief description of these key projects.

Burke Well Station Upgrades: Manganese concentrations in water from the Burke Well appear to be **gradually increasing and are slightly above the MOECC's Aesthetic Objective** for manganese (0.05 mg/L). Upgrades to the Burke Well Station to improve the aesthetic quality (iron and manganese) of water from the Burke Well have been planned for a number of years. The upgrades will include construction of a building to house a pressure filtration system. In 2016 the Building Permit for the project was received and the capital budget approved. Construction of the upgrades began in 2017 and the new treatment facility is expected to be in operation by the fall of 2018. The upgrades are expected to result in the Burke Well Station being classified as a Water Treatment Subsystem.

Clythe Well Treatment Upgrades – Environmental Assessment: The Environmental Assessment (EA) was completed for the Clythe Well station in 2017, to be filed in early 2018.

F.M. Woods Station Pump Discharge Replacement: Woods pump 2 and 3 discharge replacement was completed in the summer of 2016 to ensure the efficient operation of the pumping station.

Speedvale Tower Upgrades and Recoating: The Speedvale elevated tank recoating and upgrades were initiated in the spring of 2017 and completed in the fall of 2017. These key upgrades included ensuring the asset life of the elevated tank is sustained as well as provided key operational upgrades.

York Trunk Sewer and Paisley-Clythe Watermain: In 2017, Water Services provided assistance during the last stages of the York Trunk Sewer & Paisley-Clythe Watermain - Phase 2A Construction project. This contract included installation of new watermains, valve chambers and instrumentation at the Woods Pumping station requiring **direct tie-ins to the City's existing water distribution system**. An emergency backup water system was implemented as a contingency measure during critical pieces of this work. The Phase 1 and 2A portions of the Paisley-Clythe watermain were disinfected, commissioned and put into service in fall 2017.

Backflow Prevention Program

Preservation of drinking water quality within Guelph's infrastructure is supported by the City of Guelph's Building Services and Guelph's Backflow Prevention Regulations ("By-law", Number (2016) - 20028). As per the By-law, "**Backflow**" means the flowing back of or reversal of the normal direction of flow of water. The By-law requires that no connections are made to the City's water supply without the installation of a backflow prevention device to isolate premises, sources, and zones to prevent cross-connections in every building or structure where a City water supply or other potable water supply exists.

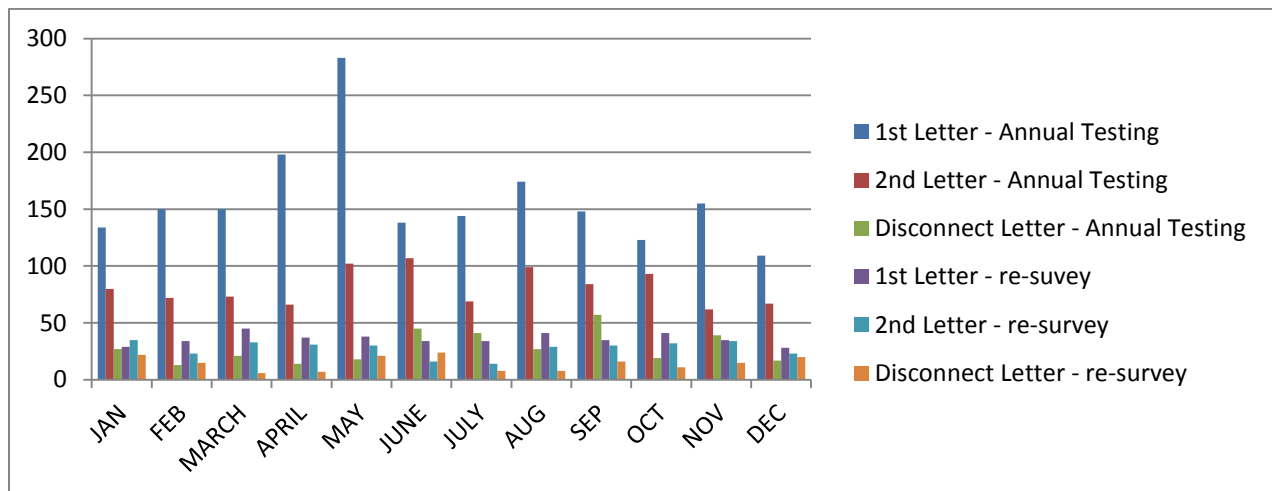
On a regular basis, Building Services provides the following “Backflow Report” included in the table below that tracks the number of letters sent out regarding annual testing and re-surveying requirements of the By-law.

As presented in Table 33 and Figure 5, the City of Guelph has a total of 2,818 properties (2,688 active and 130 inactive properties) that have a total of 6,495 backflow prevention devices installed. Of the total, 1,926 buildings have premise isolation and 990 buildings are without premise isolation (e.g. residential irrigation systems, plaza facility – plaza owner has premise isolation). New properties from January 1 to December 31, 2017: 14 with premise and 31 without premise isolation.

Table 33: 2017 Backflow Report - Number of Letters Sent out for Annual Testing and Re-survey

Letter Type	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Annual Testing – 1 st Letter	134	150	150	198	283	138	144	174	148	123	155	109	1906
Annual Testing – 2 nd Letter	80	72	73	66	102	107	69	99	84	93	62	67	974
Annual Testing – Disconnect Letter	27	13	21	14	18	45	41	27	57	19	39	17	338
Re-survey – 1 st Letter	29	34	45	37	38	34	34	41	35	41	35	28	431
Re-survey – 2 nd Letter	35	23	33	31	30	16	14	29	30	32	34	23	330
Re-survey – Disconnect Letter	22	15	6	7	21	24	8	8	16	11	15	20	173
Water Service Disconnected	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of new devices installed													206

Figure 5: Annual Backflow Prevention Device Re-Survey and Testing Letters from Building Services to Customers in 2017



o) Operational Plan Currency, Content and Updates

On an ongoing basis, the Operational Plan is updated by the Quality Assurance Coordinator with the help of additional Water Services Staff. Updates to the Operational Plan were communicated to management at an update meeting on September 13, 2017. Notable updates include:

- Redesign of the Water Quality Policy Poster with Corporate Communications and posting it in prominent locations, such as at City Hall and around Water Services.
- QMS 06 Drinking Water System: updated to include information regarding UV treatment at Membro Well and to include the newly added Zone 3 pressure system.
- QMS 08 Risk Assessment Outcomes: updated after the risk assessment was completed.
- QMS 09 Organizational Chart: updated when changes are made to staff assignments.
- QMS 21 Continual Improvement: updated to define a more robust Continual Improvement Procedure for Water Services.

See section k) "Expected Future Changes That Could Affect the DWS or the QMS" for additional Operational Plan updates.

p) Staff Suggestions

Staff suggestions are discussed during staff and operational meetings and taken into account during annual budget processes. **Appendix "G"** Summary of Staff Suggestions includes a listing of various improvement items that were presented by staff from January 1 to December 31, 2017.

q) New or Other Business

This section provides an update on new or other items of business beyond the scope of this report. There are no updates in 2017.

r) Next Meeting Dates

The Management Review Meeting scheduled to review the updated 2017 Annual & Summary Water Services Report was held on January 30, 2018. Review of the Internal Audit findings will take place in June 2018, review of the Risk Assessment outcomes in September 2018 and review of the External Audit findings in November 2018. Monthly QMS updates are scheduled with the management team and the Quality Assurance Coordinator.

Appendix "A" – Summary of Critical Control Points and Critical Control Limits

Critical Control Point (CCP)	Hazard Description	Critical Control Limit (CCL)	Monitoring Process & / or Procedures	Response Procedures
Multi-Barrier Primary Disinfection <i>To remove or inactivate pathogens potentially present in the source water.</i>	Low Chlorine Dosage <ul style="list-style-type: none"> - Chlorination system failure (e.g. pump, line, fitting, power, PLC, flow meter) - Failure of analyzers (POE or process) to alarm - Poor chemical quality Inadequate UV Dosage <ul style="list-style-type: none"> - UV Treatment system failure (e.g. UV and Turbidity analyzers, high flow, reactor, PLC, power, flow meters) 	<u>Free Chlorine</u> <ul style="list-style-type: none"> - 0.05-4.0 mg/L (PDDW¹⁸, SDWA, O. Reg. 170/03) - 0.2 mg/L (PDDW recommended optimal) <u>UV dose</u> <ul style="list-style-type: none"> - at FM Wood: 24 mJ/cm² (Drinking Water Works Permit, DWWP) - at Emma and Water Street wells: 40 mJ/cm² (DWWP) - at Membro well: 20 mJ/cm² (DWWP) 	<ul style="list-style-type: none"> - Certified and competent operators - Daily operational sampling, testing and monitoring of control limits, as applicable - Redundancy of system components (including equipment) & monitoring (operators, instruments), stand-by power - Monitoring and alarming of control limits - Calibration, maintenance and preventive maintenance - equipment - Robust communication systems - Receiving process for chemicals – Certificates of Analysis required for essential chemicals 	<ul style="list-style-type: none"> - Supply Standard Operating Procedures - Water Services Emergency Plan procedures
Secondary Disinfection <i>To ensure the maintenance of a disinfectant residual throughout the distribution system</i>	Deterioration of chlorine residual, from: <ul style="list-style-type: none"> - Reduced water flows - Occurrence of dead ends - Increased water temperature (causing low chlorine residual) 	<u>Free Chlorine</u> <ul style="list-style-type: none"> - 0.05-4.0 mg/L (PDDW, SDWA, O. Reg. 170/03) - 0.2 mg/L (PDDW recommended optimal) <u>pH</u> <ul style="list-style-type: none"> - 6.5-8.5 (operational criteria) <u>Turbidity</u> <ul style="list-style-type: none"> - 5 NTU (operational criteria) 	<ul style="list-style-type: none"> - Certified and competent operators - Sampling, testing and monitoring of control limits, as applicable - Main flushing programs - Installation of blow-offs in dead ends - Regular samples taken and analyzed for chlorine residual and temperature 	<ul style="list-style-type: none"> - Distribution Standard Operating Procedures - Response to customer calls - Repair and system rehabilitation - Use of appropriately certified and competent contractors and suppliers
Backflow Prevention <i>To prevent cross-contamination that can result from the flowing back of or reversal of the normal direction of flow of water.</i>	System contamination from negative or reduced pressure <ul style="list-style-type: none"> - Lack of backflow prevention device - Main breaks or blow-outs - Large services - Temporary connections - Firefighting drawdown - Depressurization from residential usage - Pipe failure (deterioration) 	<u>System pressure</u> <ul style="list-style-type: none"> - 275-550 kPa (industry standard for operating pressure) <u>Consumer complaints</u> <ul style="list-style-type: none"> - Related to system pressure or water characteristics (odour, colour, taste other). 	<ul style="list-style-type: none"> - Backflow Prevention program - Where possible, implementation of backflow prevention devices and small mains - Proactive Watermain and substandard service replacement program 	<ul style="list-style-type: none"> - Distribution Standard Operating Procedures - Response to customer calls - Water Services Emergency Plan procedures

¹⁸ PDDW – Procedure for Disinfection of Drinking Water in Ontario as adopted by reference by O. Reg. 170/03 under the Safe Drinking Water Act.

Appendix "B" – Internal and External Audit Plans

Guelph Water Services Process or Program	2016 Audit Plan		2017 Audit Plan		2018 Audit Plan	
	Internal	External	Internal	External	Internal	External
Source Water – Source Water Protection (Engineering)				X		
Source Water – Tap Water Promotion, Education & Outreach			X		X	X
Source Water – Water Conservation (incl. Leak Detection and Water Loss Management)		X			X	X
Supply – Source & Treated Water Sampling, Testing, Monitoring		X	X	X	X	X
Supply – Operational Control: Disinfection, Minimum Storage, SCADA / Security, DMA's		X	X	X	X	X
Supply – Instrumentation Calibration / Verification		X	X	X	X	X
Supply – Supply Maintenance		X	X	X	X	X
Supply – Infrastructure (facility and tower) Inspections Program		X	X		X	X
Distribution – Watermain Maintenance and Service Connections Improvement		X	X	X	X	X
Distribution – Appurtenance Maintenance (valves, hydrants, meters)		X	X	X	X	X
Distribution – Backflow Prevention (Building Services)	X			X	X	
Distribution – Watermain Flushing & Swabbing		X	X	X	X	X
Distribution – Infrastructure Locates		X	X	X		
Distribution – Temporary Connections	X	X			X	X
Major Works & New Infrastructure – Engineering / Water: Review of Infrastructure (Specifications and Design)	X			X		
Major Works & New Infrastructure – Engineering: Infrastructure Reconstruction and Replacement	X	X			X	X
Major Works & New Infrastructure – Engineering: New Construction (new subdivisions, major facility upgrades)		X	X			X
Engineering Tech Services: Field Verification of Specifications			X	X		
Management – Owner (Council & CAO) Standard of Care	X	X		X		X
Management – Customer Service (Administration, Distribution, Supply)	X	X		X	X	X
Management – Risk & Emergency Management (incl. Water Advisory, EPO Response)	X	X		X	X	X
Management – Human Resources (incl. Operator Certification) & Supplier Management	X	X		X	X	X
Management – Communications	X	X		X	X	X
Management – Continual Improvement	X	X		X	X	X

Appendix "C" – Total Water Pumped and Instantaneous Flows

Note on Capacity:

Capacity is calculated by comparing the average pumped or flow value against the MDWL allowable volume or PTTW flow. Capacity is representative of the conditions of pumping for that year which may be influenced by other testing programs, maintenance or special operational conditions. Additionally, the actual capacity of the source may not be achievable with current infrastructure. Optimization efforts are included as a component of the Water Supply Master Plan with the intent to match the actual capacity of the water source with the appropriate infrastructure.

City of Guelph Water Services – Pumpage to System – January 1 – December 31, 2017

Facility		Burke Discharge	Calico Discharge	Dean Discharge	Downey Discharge	Emma Street Discharge	Helmar Discharge	Membro Discharge	Paisley Net Discharge	Park Discharge	Queensdale Discharge	University Net Discharge	Water Street Discharge	F.M. Woods Discharge	Total System Discharge
Units		m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³
Month	Regulatory Limit	6,546	5,237	2,300	5,237	3,100	3,273	6,050	13,738	10,300	5,273	5,108	3,400	65,000	n/a
January	Maximum	3,829	939	0	4,691	2,502	1,088	3,137	929	5,940	1,168	1,928	2,063	27,635	49,417
	Average	3,492	875	0	4,654	2,232	869	3,035	915	2,459	1,158	1,236	613	23,493	45,030
	Total	108,261	27,140	0	144,271	69,179	26,935	94,075	28,351	76,221	35,898	38,317	18,992	728,290	1,395,930
February	Maximum	5,396	943	1,489	4,665	2,492	840	3,117	928	6,451	1,192	1,810	1,961	26,968	51,808
	Average	3,643	906	91	4,414	2,364	787	3,038	922	2,755	1,141	1,608	555	23,879	46,103
	Total	101,997	25,374	2,535	123,585	66,187	22,022	85,066	25,824	77,135	31,956	45,035	15,542	668,624	1,290,882
March	Maximum	3,813	873	1,510	4,693	2,516	992	3,116	927	5,226	1,209	1,826	1,977	29,672	54,188
	Average	3,247	752	1,485	4,502	2,457	969	3,037	875	2,129	1,081	1,649	408	24,040	46,632
	Total	100,668	23,297	46,040	139,576	76,158	30,032	94,162	27,116	66,013	33,525	51,107	12,634	745,253	1,445,582
April	Maximum	3,824	881	1,516	4,761	2,513	942	3,136	873	7,255	1,173	2,139	2,126	26,412	53,683
	Average	2,978	798	1,175	4,692	2,246	928	3,032	796	3,704	1,067	1,423	659	22,209	45,707
	Total	89,329	23,932	35,250	140,761	67,394	27,843	90,950	23,890	111,134	32,002	42,688	19,760	666,267	1,371,201
May	Maximum	3,750	906	1,513	4,664	2,530	970	3,190	866	7,506	1,185	1,889	2,128	28,716	50,271
	Average	2,891	862	535	4,513	2,491	937	2,966	857	2,285	944	964	993	23,812	45,049
	Total	89,621	26,718	16,579	139,889	77,227	29,037	91,953	26,579	70,833	29,272	29,872	30,773	738,164	1,396,517
June	Maximum	4,772	834	0	4,564	2,534	1,015	3,196	885	5,325	1,122	1,866	1,924	39,112	53,964
	Average	3,489	788	0	4,467	928	926	2,399	867	1,669	881	474	807	30,303	47,998
	Total	104,662	23,645	0	134,013	27,842	27,786	71,979	26,018	50,063	26,417	14,208	24,219	909,099	1,439,952
July	Maximum	5,154	830	0	4,666	2,529	995	3,094	884	4,007	1,037	1,850	0	36,422	51,743
	Average	3,915	784	0	4,595	2,142	988	2,431	879	1,640	1,027	198	0	28,175	46,771
	Total	121,365	24,296	0	142,446	66,387	30,614	75,358	27,236	50,826	31,827	6,143	0	873,412	1,449,910
August	Maximum	5,109	792	0	4,632	2,529	1,020	3,063	878	7,197	1,023	1,869	0	27,476	52,283
	Average	4,934	722	0	4,430	2,490	965	1,690	870	1,869	1,016	967	0	27,553	47,430
	Total	152,960	22,377	0	137,316	77,204	29,915	52,401	26,958	57,951	31,509	29,982	0	851,752	1,470,326
September	Maximum	5,068	812	1,507	4,674	2,524	1,022	3,006	867	8,761	1,021	1,843	0	31,742	54,421
	Average	4,678	774	876	4,545	2,400	537	2,886	848	2,958	360	1,059	0	27,855	49,776
	Total	140,351	23,216	26,289	136,356	71,985	16,117	86,583	25,439	88,725	10,805	31,778	0	835,646	1,493,291
October	Maximum	4,888	859	1,510	4,312	2,540	1,001	2,964	867	5,433	0	1,911	0	30,666	50,666
	Average	4,504	820	1,265	4,276	2,467	969	2,656	859	2,063	0	739	0	25,634	46,253
	Total	139,624	25,422	39,220	132,553	76,477	30,046	82,349	26,618	63,958	0	22,901	0	794,661	1,433,831

Facility		Burke Discharge	Calico Discharge	Dean Discharge	Downey Discharge	Emma Street Discharge	Helmar Discharge	Membro Discharge	Paisley Net Discharge	Park Discharge	Queensdale Discharge	University Net Discharge	Water Street Discharge	F.M. Woods Discharge	Total System Discharge
Units		m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³
Month	Regulatory Limit	6,546	5,237	2,300	5,237	3,100	3,273	6,050	13,738	10,300	5,273	5,108	3,400	65,000	n/a
November	Maximum	4,923	863	1,551	4,427	2,619	958	2,906	886	7,584	0	2,005	0	26,226	50,484
	Average	4,441	829	1,455	4,240	2,289	665	2,553	799	4,630	0	814	0	23,316	46,031
	Total	133,226	24,881	43,660	127,211	68,676	19,949	76,599	23,957	138,907	0	24,405	0	699,472	1,380,943
December	Maximum	4,744	901	1,503	4,422	2,504	876	3,653	860	5,831	0	2,086	0	28,540	47,037
	Average	4,051	809	1,488	4,194	2,366	680	1,178	817	2,217	0	944	0	24,905	43,648
	Total	125,574	25,065	46,118	130,002	73,359	21,071	36,512	25,336	68,717	0	29,270	0	772,057	1,353,081
2017 Year	Maximum	5,154	1,503	4,422	4,692	2,619	3,653	3,094	1,052	8,761	2,086	2,005	28,540	47,037	54,421
	Average	4,326	843	926	4,526	2,437	888	2,690	873	4,423	788	1,348	1,015	27,990	49,437
	Total	1,407,638	295,362	255,691	1,627,979	818,076	311,367	937,987	313,321	920,485	263,213	365,707	121,921	9,282,698	16,921,444
	Average Capacity	59%	15%	30%	85%	72%	26%	42%	n/a	24%	14%	n/a	10%	39%	n/a

City of Guelph Water Services – Permit to Take Water Pumpages – January 1 – December 31, 2017

Facility		Admiral Well	Arkell Well #1	Arkell Well #6	Arkell Well #7	Arkell Well #8	Arkell Well #14	Arkell Well #15	Arkell Wellfield (#6,7,8,14,15) Total	Arkell - Recharge Pump	Arkell Glen Collector System	Burke Well	Calico Well	Carter Wells #1 and #2	Clythe Well	Dean Well	Downey Well	Edinburgh Well	Emma Street Well	Helmar Well	Membro Well	Paisley Well	Park Wells #1 and #2	Queensdale Well	Sacco Well	Smallfield Well	University of Guelph Well	Water Street Well
Units		m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	
Month	Regulatory Limit	N/O¹⁹	3,273	9,600	9,600	9,600	9,600	9,600	28,800	9,092	25,000	6,546	5,237	6,547	N/O	2,300	5,273	N/O	3,100	3,273	6,050	3,200	10,300	5,237	N/O	N/O	3,300	3,400
January	Maximum	N/O	153	6,829	7,008	5,692	7,546	5,731	23,086	0	4,910	3,773	947	0	N/O	0	4,779	N/O	2,502	1,084	3,098	929	5,876	1,218	N/O	N/O	2,113	2,063
	Average	N/O	20	4,783	4,335	972	6,936	1,876	18,900	0	4,578	3,448	874	0	N/O	0	4,741	N/O	2,232	850	2,985	915	2,430	1,150	N/O	N/O	702	613
	Total	N/O	609	148,249	134,376	30,122	215,003	58,145	585,905	0	141,920	106,893	27,090	0	N/O	0	146,972	N/O	69,179	26,538	92,526	28,351	75,337	35,653	N/O	N/O	21,756	18,992
February	Maximum	N/O	165	7,347	6,880	6,912	7,458	7,159	22,363	0	5,284	5,338	944	0	N/O	1,470	4,753	N/O	2,492	836	3,076	928	6,415	1,241	N/O	N/O	1,852	1,961
	Average	N/O	14	4,218	4,818	1,369	5,270	3,535	19,211	0	4,704	3,588	907	0	N/O	96	4,497	N/O	2,364	769	2,993	922	2,730	1,137	N/O	N/O	1,400	555
	Total	N/O	390	118,098	134,918	38,331	147,558	98,990	537,894	0	131,700	100,456	25,388	0	N/O	2,698	125,909	N/O	66,187	21,538	83,813	25,824	76,434	31,842	N/O	N/O	39,199	15,542
March	Maximum	N/O	694	7,418	6,921	5,896	7,426	7,395	23,866	0	6,252	3,731	890	5,111	N/O	1,510	4,779	N/O	2,516	986	3,076	927	5,049	1,235	N/O	N/O	2,116	1,977
	Average	N/O	53	5,201	3,605	732	4,950	3,710	18,198	0	5,778	3,192	763	562	N/O	1,448	4,587	N/O	2,457	949	2,993	875	2,102	1,090	N/O	N/O	1,484	408
	Total	N/O	1,636	161,238	111,746	22,682	153,460	115,022	564,148	0	179,122	98,952	23,646	17,408	N/O	44,879	142,192	N/O	76,158	29,427	92,784	27,116	65,162	33,775	N/O	N/O	46,017	12,634
April	Maximum	N/O	140	7,340	6,829	6,156	7,529	4,015	22,573	650	8,101	3,735	887	5,105	N/O	1,490	4,855	N/O	2,513	941	3,094	873	7,326	1,178	N/O	N/O	2,139	2,126
	Average	N/O	11	4,937	2,493	1,646	7,272	666	17,014	22	7,238	2,937	790	3,093	N/O	1,146	4,781	N/O	2,246	909	2,988	796	3,662	1,074	N/O	N/O	1,423	658
	Total	N/O	332	148,101	74,797	49,378	218,153	19,988	510,417	650	217,136	88,119	23,699	92,795	N/O	34,366	143,442	N/O	67,394	27,259	89,629	23,890	109,852	32,230	N/O	N/O	42,688	19,752
May	Maximum	N/O	297	6,984	4,810	992	7,579	3,859	23,172	8,662	16,074	3,728	920	4,567	N/O	1,516	4,756	N/O	2,530	964	3,146	866	7,404	1,196	N/O	N/O	1,889	2,128
	Average	N/O	44	2,780	2,488	169	6,500	1,080	13,018	5,948	11,745	2,856	861	3,717	N/O	523	4,600	N/O	2,491	917	2,923	857	2,246	938	N/O	N/O	964	993
	Total	N/O	1,354	86,190	77,132	5,235	201,505	33,494	403,556	184,383	364,110	88,545	26,694	115,240	N/O	16,220	142,608	N/O	77,227	28,426	90,627	26,579	69,620	29,071	N/O	N/O	29,872	30,773
June	Maximum	N/O	331	7,406	6,793	2,300	7,325	4,425	23,160	8,467	19,328	4,654	832	3,049	N/O	0	4,653	N/O	2,534	998	3,151	885	5,153	1,120	N/O	N/O	1,866	1,924
	Average	N/O	26	4,930	6,197	375	4,958	1,706	18,166	8,145	18,168	3,438	786	2,956	N/O	0	4,556	N/O	928	908	2,187	867	1,638	864	N/O	N/O	474	807
	Total	N/O	780	147,885	185,916	11,237	148,740	51,187	544,966	244,343	545,033	103,139	23,584	88,668	N/O	0	136,682	N/O	27,842	27,228	65,067	26,018	49,144	25,928	N/O	N/O	14,208	24,219
July	Maximum	N/O	332	7,472	7,348	6,292	7,354	5,253	22,862	8,106	19,334	5,100	833	4,984	N/O	0	4,761	N/O	2,529	991	3,035	884	4,102	1,063	N/O	N/O	1,850	0
	Average	N/O	17	5,580	2,145	738	3,140	1,281	12,884	7,899	16,842	3,880	783	3,278	N/O	0	4,688	N/O	2,142	968	2,390	879	1,633	982	N/O	N/O	198	0
	Total	N/O	513	172,981	66,493	22,866	97,351	39,716	399,407	244,875	522,100	120,279	24,287	101,629	N/O	0	145,328	N/O	66,387	29,999	74,099	27,236	50,619	30,429	N/O	N/O	6,143	0
August	Maximum	N/O	293	7,367	6,682	6,757	7,222	6,877	28,619	7,770	18,894	5,089	810	4,972	N/O	0	4,727	N/O	2,529	1,001	3,107	878	7,122	982	N/O	N/O	1,869	0
	Average	N/O	21	3,225	6,152	820	5,518	1,491	17,207	7,647	17,831	4,858	718	4,955	N/O	0	4,520	N/O	2,490	945	1,666	870	1,844	860	N/O	N/O	967	0
	Total	N/O	648	99,967	190,725	25,429	171,060	46,230	533,411	237,061	552,763	150,597	22,272	153,598	N/O	0	140,112	N/O	77,204	29,291	51,633	26,958	57,155	26,647	N/O	N/O	29,982	0

¹⁹ N/O – not operational

Facility		Admiral Well	Arkell Well #1	Arkell Well #6	Arkell Well #7	Arkell Well #8	Arkell Well #14	Arkell Well #15	Arkell Wellfield (#6,7,8,14,15) Total	Arkell - Recharge Pump	Arkell Glen Collector System	Burke Well	Calico Well	Carter Wells #1 and #2	Clythe Well	Dean Well	Downey Well	Edinburgh Well	Emma Street Well	Helmar Well	Membro Well	Paisley Well	Park Wells #1 and #2	Queensdale Well	Sacco Well	Smallfield Well	University of Guelph Well	Water Street Well
Units		m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	
Month	Regulatory Limit	N/O¹⁹	3,273	9,600	9,600	9,600	9,600	9,600	28,800	9,092	25,000	6,546	5,237	6,547	N/O	2,300	5,273	N/O	3,100	3,273	6,050	3,200	10,300	5,237	N/O	N/O	3,300	3,400
September	Maximum	N/O	332	5,060	7,310	6,917	7,401	1,693	19,158	7,609	17,331	5,021	817	4,922	N/O	1,517	4,777	N/O	2,524	1,001	2,966	867	8,614	833	N/O	N/O	1,843	0
	Average	N/O	29	730	4,740	2,038	5,153	495	13,156	5,488	14,631	4646	772	4,887	N/O	865	4,639	N/O	2,400	529	2,845	848	2,909	282	N/O	N/O	1,509	0
	Total	N/O	875	21,914	142,189	61,134	154,591	14,861	394,689	164,653	438,915	139,373	23,146	146,612	N/O	25,953	139,166	N/O	71,985	15,858	85,335	25,439	87,282	8,458	N/O	N/O	31,778	0
October	Maximum	N/O	243	1,201	7,174	6,894	7,170	5,411	20,563	4,183	10,555	4,869	873	6,411	N/O	1,497	4,402	N/O	2,540	980	2,940	867	5,357	0	N/O	N/O	1,911	0
	Average	N/O	26	53	3,945	5,500	6,406	909	16,812	228	8,889	4,489	824	6,088	N/O	1,233	4,366	N/O	2,467	947	2,619	859	2,032	0	N/O	N/O	739	0
	Total	N/O	808	1,638	122,291	170,501	198,581	28,164	521,176	7,079	275,546	139,167	25,548	188,738	N/O	38,237	135,345	N/O	76,477	29,343	81,182	26,618	62,992	0	N/O	N/O	22,901	0
November	Maximum	N/O	406	6,951	7,242	6,631	7,146	6,269	26,053	0	7,911	4,904	862	6,547	N/O	1,537	4,522	N/O	2,619	950	2,866	886	7,405	0	N/O	N/O	2,005	0
	Average	N/O	43	5,700	6,460	3,578	5,774	1,154	22,666	0	7,704	4,415	825	1,348	N/O	1,435	4,333	N/O	2,289	650	2,516	799	4,575	0	N/O	N/O	814	0
	Total	N/O	1,293	171,013	193,785	107,349	173,223	34,605	679,975	0	231,122	132,452	24,753	40,443	N/O	43,058	129,980	N/O	68,676	19,498	75,491	23,957	137,241	0	N/O	N/O	24,405	0
December	Maximum	N/O	204	6,961	6,971	6,720	6,997	5,273	24,364	0	7,700	4,702	890	0	N/O	1,512	4,519	N/O	2,504	873	3,598	860	5,737	0	N/O	N/O	2,086	0
	Average	N/O	14	5,221	5,573	3,304	6,474	585	21,157	0	6,421	3,976	802	0	N/O	1,472	4,295	N/O	2,366	668	1,161	817	2,172	0	N/O	N/O	944	0
	Total	N/O	407	161,861	172,760	102,432	200,693	18,135	655,881	0	123,258	123,258	24,877	0	N/O	45,636	133,159	N/O	73,359	20,714	35,992	25,336	67,318	0	N/O	N/O	29,270	0
2016 Year	Maximum	N/O	406	7,472	7,348	6,917	7,401	6,877	28,619	8,467	19,334	5,100	907	6,547	N/O	1,537	4,781	N/O	2,619	1,001	3,598	922	8,614	1,150	N/O	N/O	2,086	1,924
	Average	N/O	135	5,113	5,638	3,500	6,247	2,982	19,759	3,227	10,925	4,167	842	3,191	N/O	916	4,610	N/O	2,303	869	2,573	872	4,073	755	N/O	N/O	1,275	922
	Total	N/O	9,646	1,439,146	1,607,130	646,694	2,079,918	558,537	6,331,425	1,083,044	3,722,725	1,391,230	294,985	945,132	N/O	251,047	1,660,895	N/O	818,076	304,939	918,717	313,321	908,157	254,033	N/O	N/O	338,219	121,913
	Average Pumped	N/O	1%	41%	46%	18%	59%	16%	60%	29%	41%	58%	15%	40%	N/O	30%	87%	N/O	72%	26%	42%	27%	24%	13%	N/O	N/O	28%	10%

City of Guelph Water Services – Instantaneous Flows Summary (PTTW) – January 1 – December 31, 2017

Facility		Admiral Well	Arkell Well #1	Arkell Well #6	Arkell Well #7	Arkell Well #8	Arkell Well #14	Arkell Well #15	Arkell Wellfield (#6,7,8,14,15)	Arkell -Recharge System	Arkell Glen Collector System	Burke Well	Calico Well	Carter Wells	Clythe Well	Dean Well	Downey Well	Edinburgh Well	Emma Street Well	Helmar Well	Membro Well	Paisley Well	Park Wells	Queensdale Well	Sacco Well	Smallfield Well	University of Guelph Well	Water Street Well
Units		L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s
Month	Regulatory Limit	n/a	37.9	111.0	111.0	111.0	111.0	111.0	n/a	157.8	290.0	83.7	60.6	90.9	n/a	39.9	90.9	n/a	40.9	37.9	105.0	42.0	127.2	60.6	n/a	n/a	57.3	59.0
January	Maximum	N/O	12.6	85.9	85.5	81.4	89.6	87.2	429.6	0.0	56.8	65.6	13.2	0.0	N/O	0.0	58.3	N/O	29.7	15.7	44.6	11.3	123.9	16.1	N/O	N/O	25.8	33.4
	Average	N/O	0.2	55.3	50.3	11.2	80.3	21.7	218.8	0.0	53.0	40.0	10.1	0.0	N/O	0.0	55.6	N/O	25.9	9.9	34.6	10.6	28.2	13.4	N/O	N/O	8.1	7.1
February	Maximum	N/O	12.6	82.5	82.5	82.4	90.2	87.6	425.3	0.0	61.2	65.6	12.6	0.0	N/O	20.8	64.9	N/O	30.3	12.4	42.3	11.5	124.0	14.9	N/O	N/O	26.1	40.5
	Average	N/O	0.2	55.9	55.9	15.9	61.0	40.9	229.5	0.0	54.4	41.6	10.5	0.0	N/O	1.1	48.9	N/O	27.4	9.0	34.6	10.7	31.5	13.2	N/O	N/O	16.2	6.4
March	Maximum	N/O	12.5	91.3	81.9	81.5	90.4	88.1	433.3	0.0	72.4	66.7	14.5	61.0	N/O	21.2	59.4	N/O	29.9	12.6	42.9	11.6	124.6	14.9	N/O	N/O	25.2	32.1
	Average	N/O	0.6	59.8	41.9	8.5	57.4	43.0	210.6	0.0	66.9	37.0	8.7	6.5	N/O	16.9	54.0	N/O	28.4	11.1	34.7	10.1	24.4	12.6	N/O	N/O	17.2	4.7
April	Maximum	N/O	12.6	86.6	82.7	87.8	89.6	89.3	436.0	106.3	93.8	71.1	13.1	59.3	N/O	22.1	59.1	N/O	30.3	13.7	41.8	11.0	122.2	15.5	N/O	N/O	26.8	35.9
	Average	N/O	0.1	56.9	28.8	18.0	84.2	7.8	196.7	0.2	83.8	34.0	9.2	35.8	N/O	13.4	56.2	N/O	26.0	10.7	34.6	9.2	42.4	12.4	N/O	N/O	16.5	7.6
May	Maximum	N/O	13.2	87.2	85.3	81.8	89.7	90.3	434.4	106.3	186.0	96.7	12.8	34.8	N/O	21.4	59.2	N/O	29.8	14.3	42.4	10.9	123.8	15.2	N/O	N/O	22.9	33.8
	Average	N/O	0.5	28.8	32.2	1.9	75.2	12.5	150.7	71.4	135.9	33.1	9.9	34.6	N/O	6.1	54.0	N/O	28.7	10.7	33.8	0.2	26.0	10.9	N/O	N/O	11.2	11.5
June	Maximum	N/O	28.0	87.3	85.1	80.9	87.8	88.5	429.7	98.8	223.7	64.8	13.5	64.1	N/O	0.0	55.8	N/O	30.8	14.8	44.1	10.3	124.4	15.1	N/O	N/O	22.6	40.4
	Average	N/O	0.3	56.8	71.7	4.3	57.4	19.8	209.9	94.4	210.3	40.0	9.1	34.2	N/O	0.0	53.5	N/O	10.8	10.6	25.3	10.0	19.0	9.4	N/O	N/O	5.5	8.7
July	Maximum	N/O	27.9	88.5	86.8	82.1	88.0	89.3	434.6	94.5	223.8	64.7	13.4	63.9	N/O	0.0	60.1	N/O	31.8	14.7	46.2	10.4	109.3	15.9	N/O	N/O	22.3	0.0
	Average	N/O	0.2	64.7	24.9	8.6	36.4	14.8	149.3	91.4	194.9	45.1	9.2	38.0	N/O	0.0	55.1	N/O	24.6	11.3	27.7	10.2	18.9	11.3	N/O	N/O	2.3	0.0
August	Maximum	N/O	12.6	86.4	82.6	81.1	86.3	86.0	422.4	89.9	218.7	67.5	13.3	57.8	N/O	0.0	61.7	N/O	29.7	14.7	39.9	11.1	109.0	16.3	N/O	N/O	22.5	0.0
	Average	N/O	0.2	38.4	71.0	9.5	65.2	17.2	201.3	88.5	206.4	56.4	8.3	57.3	N/O	0.0	53.2	N/O	28.6	11.1	19.3	10.1	21.3	9.9	N/O	N/O	11.2	0.0
September	Maximum	N/O	12.5	87.9	87.5	81.9	88.1	88.4	433.8	88.9	201.0	65.2	13.4	57.1	N/O	21.4	56.7	N/O	30.8	20.8	40.5	10.9	110.6	18.3	N/O	N/O	24.0	0.0
	Average	N/O	0.3	8.5	54.4	23.3	59.5	5.7	151.5	63.5	169.0	53.2	8.9	56.3	N/O	9.9	54.4	N/O	27.6	6.2	32.8	9.8	33.7	3.3	N/O	N/O	12.2	0.0
October	Maximum	N/O	12.4	84.8	85.8	82.5	85.6	87.2	426.0	88.6	122.0	64.0	13.2	76.1	N/O	35.0	57.0	N/O	30.5	14.8	40.4	10.9	111.5	0.0	N/O	N/O	24.3	0.0
	Average	N/O	0.3	0.6	45.8	63.9	74.1	10.5	194.9	2.6	103.0	51.5	9.5	70.5	N/O	14.4	51.4	N/O	28.5	11.1	30.3	9.9	23.5	0.0	N/O	N/O	8.5	0.0
November	Maximum	N/O	12.3	84.2	86.2	80.7	84.2	86.0	421.4	0.0	92.0	75.0	16.3	74.6	N/O	20.3	54.4	N/O	29.8	15.4	42.5	10.5	111.3	0.0	N/O	N/O	24.2	0.0
	Average	N/O	0.2	65.7	74.5	41.5	66.5	13.3	261.4	0.0	89.0	50.6	9.5	15.5	N/O	16.5	51.0	N/O	26.5	7.6	29.0	9.2	52.9	0.0	N/O	N/O	9.4	0.0
December	Maximum	N/O	12.1	120.0	81.0	81.0	84.0	90.0	492.0	0.0	89.1	62.4	13.2	0.0	N/O	20.9	59.3	N/O	29.8	13.6	49.2	10.8	111.3	0.0	N/O	N/O	25.8	0.0
	Average	N/O	0.2	74.9	38.2	38.2	74.9	6.8	233.0	0.0	74.3	46.2	9.3	0.0	N/O	16.9	50.6	N/O	27.9	7.8	13.4	9.5	25.2	0.0	N/O	N/O	10.9	0.0

Appendix "D" – Treated Water Quality Statistics

O. Reg. 170/03 Schedule 23, 13-2b – "Three Year" Results Summary

(Jan. 1 – Dec. 31, 2016)

Parameter	ODWQS MAC mg/L	½ MAC mg/L	Total Samples	Samples Above MDL	# Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Antimony	0.014	0.007	26	10	0	< 0.0005	0.0013	0.00085
Arsenic	0.025	0.0125	26	6	0	< 0.001	0.0033	0.0022
Barium	1.0	0.5	26	26	0	0.035	0.096	0.066
Boron	5.0	2.5	26	26	0	0.013	0.048	0.030
Cadmium	0.005	0.0025	26	6	0	< 0.0001	0.00016	0.00013
Chromium	0.05	0.025	26	0	0	< 0.005	< 0.005	n/a
Mercury	0.001	0.0005	13	0	0	< 0.0001	< 0.0001	n/a
Selenium	0.01	0.005	26	0	0	< 0.002	< 0.002	n/a
Uranium	0.02	0.01	26	24	0	< 0.0001	0.0024	0.00124

O. Reg. 170/03 Schedule 24, 13-4b – "Three Year" Results Summary

(Jan. 1 – Dec. 31, 2016)

Parameter	ODWQS MAC mg/L	½ MAC mg/L	Total Samples	Samples Above MDL	# Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Alachlor	0.005	0.0025	13	0	0	< 0.0005	< 0.0005	n/a
Atrazine + N-dealkylated metabolites	0.005	0.0025	13	0	0	< 0.001	< 0.001	n/a
Azinphos-methyl	0.02	0.01	13	0	0	< 0.002	< 0.002	n/a
Benzene	0.005	0.0025	71	0	0	< 0.0001	< 0.0001	n/a
Benzo(a)pyrene	0.00001	0.000005	13	0	0	< 0.000009	< 0.000009	n/a
Bromoxynil	0.005	0.0025	13	0	0	< 0.0005	< 0.0005	n/a
Carbaryl	0.09	0.045	13	0	0	< 0.005	< 0.005	n/a
Carbofuran	0.09	0.045	13	0	0	< 0.005	< 0.005	n/a
Carbon Tetrachloride	0.005	0.0025	71	0	0	< 0.0001	< 0.0001	n/a
Chlorobenzene	0.08	0.04	71	0	0	< 0.0001	< 0.0001	n/a
Chlorpyrifos	0.09	0.045	13	0	0	< 0.001	< 0.001	n/a
Diazinon	0.02	0.01	13	0	0	< 0.001	< 0.001	n/a
Dicamba	0.12	0.06	13	0	0	< 0.001	< 0.001	n/a
1,2-Dichlorobenzene	0.2	0.1	71	0	0	< 0.0002	< 0.0002	n/a
1,4-Dichlorobenzene	0.005	0.0025	71	0	0	< 0.0002	< 0.0002	n/a
1,2-Dichloroethane	0.005	0.0025	71	0	0	< 0.0002	< 0.0002	n/a
1,1-Dichloroethylene (vinylidene chloride)	0.014	0.007	71	0	0	< 0.0001	< 0.0001	n/a

Parameter	ODWQS MAC mg/L	1/2 MAC mg/L	Total Sample s	Samples Above MDL	# Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Dichloromethane	0.05	0.025	71	0	0	< 0.0005	< 0.0005	n/a
2,4-Dichlorophenol	0.9	0.45	13	0	0	< 0.0005	< 0.0005	n/a
2,4-Dichlorophenoxy acetic acid (2,4-D)	0.1	0.05	13	0	0	< 0.001	< 0.001	n/a
Diclofop-methyl	0.009	0.0045	13	0	0	< 0.0009	< 0.0009	n/a
Dimethoate	0.02	0.01	13	0	0	< 0.003	< 0.003	n/a
Diquat	0.07	0.0035	14	0	0	< 0.007	< 0.007	n/a
Diuron	0.15	0.075	13	0	0	< 0.01	< 0.01	n/a
Glyphosate	0.28	0.14	13	0	0	< 0.002	< 0.002	n/a
Malathion	0.19	0.095	13	0	0	< 0.005	< 0.005	n/a
MCPA	0.05	0.025	13	0	0	< 0.00012	< 0.00012	n/a
Metolachlor	0.05	0.025	13	0	0	< 0.0005	< 0.0005	n/a
Metribuzin	0.08	0.04	13	0	0	< 0.005	< 0.005	n/a
Paraquat	0.01	0.005	14	0	0	< 0.001	< 0.001	n/a
Pentachlorophenol	0.06	0.03	13	0	0	< 0.0005	< 0.0005	n/a
Phorate	0.002	0.001	13	0	0	< 0.0005	< 0.0005	n/a
Picloram	0.19	0.095	13	0	0	< 0.005	< 0.005	n/a
Polychlorinated Biphenyls (PCB)	0.003	0.0015	13	0	0	< 0.00005	< 0.00005	n/a
Prometryne	0.001	0.0005	13	0	0	< 0.0003	< 0.0003	n/a
Simazine	0.01	0.005	13	0	0	< 0.001	< 0.001	n/a
Terbufos	0.001	0.0005	13	0	0	< 0.0005	< 0.0005	n/a
<u>Tetrachloroethylene (perchloroethylene)</u>	0.03	0.015	71	2	0	< 0.0001	0.00011	0.00011
2,3,4,6-Tetrachlorophenol	0.1	0.05	13	0	0	< 0.0005	< 0.0005	n/a
Triallate	0.23	0.115	13	0	0	< 0.001	< 0.001	n/a
<u>Trichloroethylene</u>	0.005	0.0025	71	30	0	< 0.0001	0.00137	0.00055
2,4,6-Trichlorophenol	0.005	0.0025	13	0	0	< 0.0005	< 0.0005	n/a
Trifluralin	0.045	0.0225	13	0	0	< 0.001	< 0.001	n/a
Vinyl Chloride	0.002	0.001	71	0	0	< 0.0002	< 0.0002	n/a

Operational VOC Scan Results Summary

(Jan. 1 – Dec. 31, 2017)

Parameter	ODWQS MAC mg/L	½ MAC mg/L	Total Samples	Samples Above MDL	# Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
1,1-Dichloroethane	n/a	n/a	171	0	n/a	< 0.0001	< 0.0001	n/a
1,1-Dichloroethylene	0.014	0.007	176	0	0	< 0.0001	< 0.0001	n/a
1,1,1-Trichloroethane	n/a	n/a	171	0	n/a	< 0.0001	< 0.0001	n/a
1,1,2-Trichloroethane	n/a	n/a	171	0	n/a	< 0.0002	< 0.0002	n/a
1,1,2,2-Tetrachloroethane	n/a	n/a	171	0	n/a	< 0.0001	< 0.0001	n/a
Ethylene Dibromide	n/a	n/a	171	0	n/a	< 0.0002	< 0.0002	n/a
1,2-Dichlorobenzene	0.2	0.1	176	0	0	< 0.0002	< 0.0002	n/a
Cis-1,2-Dichloroethylene	n/a	n/a	171	72	n/a	< 0.0001	0.00394	0.00178
Trans-1,2-Dichloroethylene	n/a	n/a	171	2	n/a	< 0.0001	0.00018	0.00016
1,2-Dichloropropane	n/a	n/a	171	0	n/a	< 0.0001	< 0.0001	n/a
1,3-Dichlorobenzene	n/a	n/a	171	0	n/a	< 0.0002	< 0.0002	n/a
1,4-Dichlorobenzene	0.005	0.0025	176	0	0	< 0.0002	< 0.0002	n/a
Acetone	n/a	n/a	171	0	n/a	< 0.01	< 0.01	n/a
Benzene	0.005	0.0025	176	0	0	< 0.0001	< 0.0001	n/a
Bromodichloromethane	0.1	0.05	178	52	0	< 0.0001	0.0188	0.0049
Bromoform	0.1	0.05	178	50	0	< 0.0002	0.00412	0.00145
Carbon Tetrachloride	0.005	0.0025	176	0	0	< 0.0001	< 0.0001	n/a
Chloroethane	n/a	n/a	171	0	n/a	< 0.0002	< 0.0002	n/a
Chloroform	0.1	0.05	178	85	0	< 0.0001	0.0341	0.00266
Dibromochloromethane	0.1	0.05	178	54	0	< 0.0002	0.0119	0.00469
Dichloromethane	0.05	0.025	176	0	0	< 0.0005	< 0.0005	n/a
Ethylbenzene	0.0024	n/a	175	1	0	< 0.0001	< 0.00049	0.00049
Methyl Ethyl Ketone	n/a	n/a	171	0	n/a	< 0.0005	< 0.0005	n/a
Styrene	n/a	n/a	171	0	n/a	< 0.0002	< 0.0002	n/a
<u>Tetrachloroethylene (perchloroethylene)</u>	0.03	0.015	176	6	0	< 0.0001	0.00014	0.00011
Toluene	0.024	n/a	176	0	0	< 0.0002	< 0.0002	n/a
<u>Trichloroethylene</u>	0.005	0.0025	176	66	0	< 0.0001	0.00194	0.00081
Trichlorofluoromethane	n/a	n/a	171	0	0	< 0.0002	< 0.0002	n/a
Vinyl Chloride	n/a	n/a	176	0	0	< 0.0002	< 0.0002	n/a
o-Xylene	n/a	n/a	175	1	0	< 0.0001	0.00135	0.00135
m- + p- Xylene	n/a	n/a	175	1	0	< 0.0001	0.00314	0.00314
Total Xylene	0.3	n/a	175	1	0	< 0.0001	0.00448	0.00448
<u>Trihalomethanes</u>	0.100	n/a	178	68	0	< 0.0002	0.0613	0.0115

General Chemistry Results Summary

(Jan. 1 – Dec. 31, 2017)

Parameter	ODWQS MAC	ODWQS AO	ODWQS OG	Total Samples	Samples Above MDL	# Above Criteri a	Min (mg/L)	Max (mg/L)	Average (mg/L)
Aluminum	n/a	n/a	0.1	14	0	0	< 0.005	< 0.005	n/a
Alkalinity (as CaCO ₃)	n/a	n/a	30-500	13	13	0	250	340	291
Ammonia-N	n/a	n/a	n/a	13	2	n/a	< 0.05	0.18	0.14
Anion Sum	n/a	n/a	n/a	13	13	n/a	7.02 ²⁰	17.5 ²⁰	12.35 ²⁰
<u>Antimony</u>	0.014	n/a	n/a	14	3	0	< 0.0005	0.00091	0.0007
<u>Arsenic</u>	0.025	n/a	n/a	14	2	0	< 0.001	0.0025	0.0018
<u>Barium</u>	1.0	n/a	n/a	14	14	0	0.030	0.097	0.068
Beryllium	n/a	n/a	n/a	14	0	n/a	<0.0005	<0.0005	n/a
<u>Boron</u>	5.0	n/a	n/a	14	13	0	< 0.01	0.066	0.034
<u>Cadmium</u>	0.005	n/a	n/a	14	3	0	< 0.0001	0.00026	0.00017
Calcium	n/a	n/a	n/a	14	14	n/a	87	160	118.5
Cation Sum	n/a	n/a	n/a	13	13	n/a	7.35 ²⁰	17.6 ²⁰	12.4 ²⁰
<u>Chloride</u>	n/a	250	n/a	13	13	0	37	280	150
Chromium	0.05	n/a	n/a	14	0	0	< 0.005	< 0.005	n/a
Cobalt	n/a	n/a	n/a	14	5	n/a	< 0.0005	0.0035	0.0024
Copper	n/a	1	n/a	14	8	0	< 0.001	0.0071	0.0025
Dissolved Organic Carbon (DOC)	n/a	5	n/a	14	14	0	0.56	2.9	1.32
<u>1,4 Dioxane</u>	n/a	n/a	n/a	5	0	n/a	<0.0001	<0.0001	n/a
<u>Hardness (Calculated as CaCO₃)</u>	n/a	n/a	80-100	13	13	13	320	550	441
Ion Balance (% difference)	n/a	n/a	n/a	13	13	n/a	0.05 ²¹	2.28 ²¹	0.8454 ²¹
<u>Iron</u>	n/a	0.3	n/a	14	3	1	< 0.1	0.49	0.31
<u>Langalier's Index at 4°C</u>	n/a	n/a	n/a	13	13	n/a	0.471 ²²	0.882 ²²	0.698 ²²
<u>Langalier's Index at 20°C</u>	n/a	n/a	n/a	13	13	n/a	0.718 ²²	1.13 ²²	0.945 ²²
Lead	0.01	n/a	n/a	14	2	0	<0.0005	0.0013	0.00099
Magnesium	n/a	n/a	n/a	14	14	n/a	26	43	36
<u>Manganese</u>	n/a	0.05	n/a	14	11	1	<0.002	0.065	0.0143
Molybdenum	n/a	n/a	n/a	14	12	n/a	<0.0005	0.0051	0.00225
Nickel	n/a	n/a	n/a	14	13	n/a	<0.001	0.014	0.0056
o-Phosphate	n/a	n/a	n/a	13	0	n/a	<0.01	<0.01	n/a

²⁰ Units in mEq/L²¹ Units in %²² Units in Langalier's Index

Parameter	ODWQS MAC	ODWQS AO	ODWQS OG	Total Samples	Samples Above MDL	# Above Criteri a	Min (mg/L)	Max (mg/L)	Average (mg/L)
pH	n/a	n/a	6.5-8.5	13	13	0	7.77	8.13	7.92
Phosphorus	n/a	n/a	n/a	14	0	n/a	<0.1	<0.1	n/a
Potassium	n/a	n/a	n/a	14	14	n/a	1.4	3.3	2.143
Saturation pH at 4°C	n/a	n/a	n/a	13	13	n/a	7.13	7.34	7.22
Saturation pH at 20°C	n/a	n/a	n/a	13	13	n/a	6.88	7.09	6.97
Selenium	0.01	n/a	n/a	14	0	0	<0.002	< 0.002	n/a
Silicon	n/a	n/a	n/a	14	14	n/a	3.7	8.8	5.2
Silver	n/a	n/a	n/a	14	0	n/a	<0.0001	<0.0001	n/a
<u>Sodium</u>	n/a	20 and 200	n/a	14	14	14	20	160	84
Strontium	n/a	n/a	n/a	14	14	n/a	0.15	5.3	2.573
Sulphate	n/a	550	n/a	13	13	0	38	250	106
Thallium	n/a	n/a	n/a	14	7	n/a	< 0.00005	0.0002	0.000084
Titanium	n/a	n/a	n/a	14	0	n/a	<0.005	<0.005	n/a
Total Dissolved Solids	n/a	n/a	n/a	13	13	n/a	380	1000	686
<u>Uranium</u>	0.02	n/a	n/a	14	13	0	<0.0001	0.0044	0.00143
Vanadium	n/a	n/a	n/a	14	0	n/a	<0.0005	<0.0005	n/a
Zinc	n/a	5	n/a	14	13	0	<0.005	0.31	0.0849

Appendix “E” – Legal and Other Requirements Update

Date - 2017	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Jan. 14	OMWA newswire	<p><u>Drinking Water Committee Reports on Lead in Drinking Water</u> The Government of Canada’s Federal-Provincial-Territorial Committee on Drinking Water has released a report for public consultation on lead in drinking water for the purposes of updating the drinking water guideline. The report has recommended that the maximum acceptable concentration (MAC) be changed from 0.01 mg/L of weekly intake, as per the World Health Organization standard, to the MAC of 0.005mg/L.</p>	No action required.
Jan. 18	Canadian Environmental Law Association Blog	<p><u>Source Water Protection 2.0: Strengthening Ontario’s Drinking Water Safety Net</u> The <u>Auditor General of Ontario</u> notes that: “An estimated 1.6 million people in Ontario rely on private wells for their drinking water supply. For them, protecting source water is the only line of defence. In 2013, over a third of the water samples from private wells tested positive for bacteria, including E. coli.” Accordingly, the Auditor General recommended in 2014 that “to strengthen source water protection, the Ministry of the Environment and Climate Change should consider the feasibility of requiring source protection plans to identify and address threats to sources of water that supply private wells and intakes.” However, in her 2016 report, the Auditor General found that the provincial government has made “little or no progress” on this important recommendation.</p>	Risk Management Official forwarded to Water Technical staff for review
Jan. 19	MOECC e-mail	<p><u>Ontario Taking Next Step to Protect Water Resources</u> As part of Ontario’s plan to protect water resources, the province is proposing a new fee for water bottling companies that take groundwater. Currently, water bottlers are charged \$3.71 for every million litres of groundwater they take. Ontario is proposing water bottlers pay an additional \$500 fee, which would bring the cost up to \$503.71 for every million litres of groundwater taken. People across Ontario are encouraged to provide their input on the proposed new fee for water bottlers through the <u>Environmental Registry</u>, available until March 20, 2017</p>	GM Environmental Services followed up with an Alert to council re: Water Bottling Charge. City technical comments are planned before the deadline.
Jan. 23	OMWA newswire	<p><u>Town of Ingersoll fined \$80K for violating water law</u> The town of Ingersoll has been slapped with an \$80,000 fine after pleading guilty to violating the Ontario Water Resources Act. The town failed to comply with the terms contained in a ministry issued permit. In the spring of 2014, sediment was discharged into a storm sewer that flows into Whiting Creek, and town officials failed to notify the ministry.</p>	No action required. Quality Assurance Coordinator shared story with top management and Technical staff.
Feb. 8	Ontario News	<p><u>Toronto Business fined \$120,000 for Ontario Water Resources Act Violations in Eastern Region</u> Aecon Construction and Materials Ltd. pleaded guilty to two offences and was fined \$120,000 for discharging a material into water that may impair the quality of the water and failing to report the</p>	No action required.

Date - 2017	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update								
		discharge, contrary to the Ontario Water Resources Act (OWRA). The company was also issued a Court Order requiring that a fish habitat embayment is constructed within the Rideau River watershed.									
Feb. 17	MOECC Email	The <u>2016/17 Winter Operator Certification Bulletin</u> has just been launched.	Email forwarded to the Training Coordinator.								
Feb. 27	OMWA newswire	<u>Pilot Programs Announced As Guelph Wraps First Round of Civic Accelerator</u> Alert Labs' "Flowie" water sensor kit will be included on a trial basis in the City's Water Efficiency Rebate program.	No action required.								
Mar. 6	OMWA newswire	<u>Guelph firms to be inspected for water threats</u> City hall is getting ready to do on-site inspections of businesses that have been flagged as significant threats to Guelph's drinking water supply. A list of such potential threats in Guelph was initially compiled in 2010 during a "desktop review," says a city staff report.	No action required.								
Mar. 28	Guelph City News	<u>Council endorses Guelph's first asset management plan</u> Council unanimously endorsed the City's <u>Corporate Asset Management Plan</u> and <u>Asset Management Policy</u> at <u>last night's Council meeting</u> . The City's first asset management plan outlines the processes and practices the City is undertaking to ensure its assets and services offer maximum value to the Guelph community.	No action required.								
Mar. 31	Guelph City News	<u>Federal infrastructure funding projects</u> The City has secured federal funding for the reconstruction of a 1.2 kilometre stretch of Metcalfe Street from Speedvale Avenue to Eramosa Road to improve municipal water supply to citizens and businesses in the north end of Guelph, alleviate historical flooding and replace aging underground infrastructure (water, wastewater and storm). <table border="1" data-bbox="396 1304 1222 1520"> <thead> <tr> <th>Funding source</th> <th>Amount approved</th> </tr> </thead> <tbody> <tr> <td>Clean Water Wastewater Fund</td> <td>\$1,797,890</td> </tr> <tr> <td>Province of Ontario</td> <td>\$898,945</td> </tr> <tr> <td>City</td> <td>\$898,945</td> </tr> </tbody> </table>	Funding source	Amount approved	Clean Water Wastewater Fund	\$1,797,890	Province of Ontario	\$898,945	City	\$898,945	No action required.
Funding source	Amount approved										
Clean Water Wastewater Fund	\$1,797,890										
Province of Ontario	\$898,945										
City	\$898,945										
Apr. 3	OMWA newswire	<u>Flint residents were poisoned. Now, they're being billed for it</u> Flint is invoicing people for lead-contaminated water. Says one: "We just don't want to pay to have ourselves killed." These same state departments also told Flint residents their water was fine when it was actually poison. Their trust in government is gone now, maybe forever.	No action required.								
Apr. 4	Guelph City News	<u>City's continued focus on water efficiency to be led by new Water Services division manager</u> Wayne Galliher is the successful candidate for the division manager of Water Services position. Galliher, who has worked for the City since 2007, has been acting in the role since August 2016.	No action required.								

Date - 2017	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Apr. 10	Guelph Today	<p><u>Results of Guelph and Guelph/Eramosa Tier 3 Water Budget and Local Area Risk Assessment study released</u></p> <p>The Lake Erie Source Protection Region released the results of the Guelph and Guelph/Eramosa Tier 3 Water Budget and Local Area Risk Assessment study at the Lake Erie Region Source Protection Committee meeting on April 6th. The Tier 3 Study began in 2008, and the County and Townships' participation began in 2014 after the Grand River Conservation Authority and the City of Guelph identified to the County that the Wellhead Protection Area, with respect to quantity (WHPA-Q), would likely extend past the City of Guelph boundaries.</p>	Email sent by Manager of Technical Services to Technical Staff. No action required.
Apr. 21	EBR	<p><u>Bottled Water Technical Guidance Document</u></p> <p>The guidance document is intended to provide guidance for renewal applications of existing permits that authorize the taking of groundwater for the purpose of producing bottled water from the same location, for the same purpose, and for the same or lesser amount as currently permitted, all in accordance with the requirements imposed by O. Reg. 463/16 (Taking Groundwater to Produce Bottled Water), made under the <i>Ontario Water Resources Act</i>. A decision has been made to proceed with the policy proposal; the guidance document has been updated to reflect the considerations of comments received during public consultation.</p>	No action required.
Apr. 21	OMWA newswire	<p><u>Wellington expresses concern over drinking water study that urges expanded protection of wellheads</u></p> <p>Wellington County officials are expressing concern about possible impacts of a major technical study into protecting Guelph's drinking water supply. The townships of Puslinch and Guelph/Eramosa and the Town of Erin "all have considerable area and employment land contained within" the wellhead protection area that has been identified to ensure Guelph has an adequate quantity of water into the future, says a county news release.</p>	No action required.
Apr. 21	OMWA newswire	<p><u>Erin council votes to accept Nestlé Waters' voluntary levy</u></p> <p>ERIN - Council here has voted 4-1 in favour of accepting an annual contribution from Nestlé Waters Canada, despite strong opposition from many at the meeting. Nestlé Waters proposed in February an annual voluntary levy of \$0.50 per 1,000 litres, with a minimum payment of \$25,000 per year.</p>	No action required.
Apr. 21	OMWA newswire	<p><u>North Battleford tainted water victims get settlement in class action</u></p> <p>People who were children and got sick from a parasite in a Saskatchewan city's drinking water 16 years ago are getting compensation. A law firm says Saskatchewan Court of Queen's Bench has approved a \$3.3-million settlement for anyone who was younger than 18 during the tainted water scandal in North Battleford.</p>	No action required.
Apr. 27	MOECC email	<p><u>Revisions to Ontario's Drinking Water Quality Management Standard</u></p> <p>The Minister of the Environment and Climate Change has approved</p>	Sent to Compliance Coordinator, QA Coordinator and Manager

Date - 2017	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
		<p>the revisions to Ontario's Drinking Water Quality Management Standard (DWQMS). The revisions are based largely on feedback received from stakeholders and extensive stakeholder consultation was undertaken to both identify and validate the changes. A policy decision notice with the final <i>Drinking Water Quality Management Standard</i> and supplementary document, <i>Potential Hazardous Events for Municipal Residential Drinking Water Systems</i>, was posted to the Environmental Registry as registry number 012-5530 on Thursday April 6th 2017.</p>	<p>of Technical Services. Discussed with Top Management at Meeting on May 24. The 2016 Risk Assessment included the impacts of Climate Change.</p>
May 10	Guelph City News	<p>City wins two Ontario Water Works Association awards The Ontario Water Works Association (OWWA) has recognized Guelph's leadership in water conservation with a 2017 Award of Excellence in Water Efficiency for its updated water efficiency strategy in the Public Sector & Utilities Award category. The City was also recognized for its water-based youth education programming with the H2Awesome event that won in the category of Public Education & Awareness.</p>	No action required.
May 15	OMWA newswire	<p>In Flint, Overdue Bills for Unsafe Water Could Lead to Foreclosures Following a water crisis that saw sky-high levels of lead contamination in Flint, Mich., many homes in the city still do not have access to safe tap water. The city has mailed 8,002 letters to residents in an effort to collect about \$5.8 million in unpaid bills for water and sewer services. If homeowners do not pay by May 19, property liens are transferred to tax bills, which begins a process that can end with residents losing their homes unless they pay their outstanding bills before March 2018.</p>	No action required.
May 19	MOECC Email	<p>A NEW Notice of Adverse Tests Results and Issues Resolution Form (Schedule 16), formally the Notice of Adverse Test Results and Other Problems and Notice of Issue Resolution at Drinking Water Systems, is available to help make adverse drinking water quality incident reporting easier and faster. The form can be completed and submitted electronically.</p>	<p>Emailed by GM - Environmental Services to Water Services' Top Management, Compliance Coordinator and QA Coordinator. Compliance Coordinator created a revised SOP to include the new form and sent it to management.</p>
May 24	OMWA newswire	<p>Markham water bandits steal liquid gold from fire hydrants in broad daylight Nearly \$30,000 in water was stolen from the City of Markham in 2016 by thieves in trucks who simply drive up to one of Markham's nearly 8,600 fire hydrants, often in the middle of the day, hook up their hoses and fill up their trucks, then drive away. City employees descended on the crescent where they applied locking mechanisms to multiple hydrants to deter the thieves from repeating their brazen deeds. The city said the tamper-proof devices attached to fire hydrants are only used in high-risk areas because "they can slow</p>	No action required.

Date - 2017	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
		down a fire response" in the event of an emergency. A company caught stealing water in King Township last year was fined \$1,000 in Newmarket Court for the offence but fines can range up to \$50,000 for offenders.	
May 25	EBR	<u>Proposed Municipal Asset Management Regulation</u> The purpose of the proposed regulation is to implement best practices throughout the municipal sector and provide a degree of consistency to support collaboration between municipalities, and among municipalities and the province. The regulation would balance valuable consistency with appropriate flexibility, and would include phased implementation. The regulation would provide certainty around future provincial asset management planning requirements, and would be supported by the collection of selected data to capture the key aspects of municipal asset management: resilience and sustainability. 60 Day comment period, until July 24/17.	QA Coordinator sent link to Supervisor of Maintenance and Water Supply Maintenance Technician.
May 29	Guelph City News	Outside Water Use is Level 0 – Blue. Blue indicates there are no serious storage, rainfall or stream flow issues. In Level 0 Blue, outside water use restrictions are enforced with a focus on education.	No further action required.
June 2	Ontario News	<u>Cheese Manufacturer fined \$13,000 for Ontario Water Resource Act Violations</u> Barrie - Silani Sweet Cheese Limited pleaded guilty to one offence and was fined \$13,000 for failing to ensure that every Operator holds a license applicable to that type of wastewater treatment facility, contrary to the Ontario Water Resources Act (OWRA).	No action required.
June 6	Guelph City News	<u>Notice of collection: water and wastewater billing focus group recruitment survey</u> The City of Guelph is conducting a residential telephone call survey to gather information about residents' attitudes toward and awareness of current water and wastewater billing policies. Metroline Research Group Inc. is contacting 100 households in the City of Guelph. Results of the survey will be used by City staff to recruit focus group participants to provide opinions and feedback on possible water and wastewater billing policy changes.	No action required.
June 8	Ontario News	<u>Province Charging New Water Bottling Fee to Better Protect Water for Future Generations</u> As part of the province's plan to strengthen groundwater protection for future generations, Ontario will be charging water bottling companies an additional \$500 fee to take groundwater. Beginning Aug. 1, 2017, water bottlers will pay \$503.71 for every million litres of groundwater taken. The new fee will help recover costs associated with managing groundwater taken by water bottlers, including supporting scientific research on the environmental impacts as well as enhanced data analysis on groundwater taken for water bottling.	QA Coordinator forwarded email to Top Management. No further action required.
June 13	MOECC Email	New guidance for changes to O. Reg 243/07 effective July 1, 2017 The changes will require child care centres and schools to sample for lead all fixtures used to provide drinking water and/or prepare food or	QA Coordinator forwarded email to Top Management and Compliance Coordinator.

Date - 2017	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
		drink for children under 18.	No further action required.
June 16	Ontario News	<u>Excavation Company fined \$50,000 for Ontario Water Resources Act (OWRA) Violations</u> J-AAR Excavating pleaded guilty to one charge and was fined \$50,000 for discharging sediment into a municipal storm sewer, which proceeded to enter Whiting Creek and impaired the waters, contrary to the Ontario Water Resources Act (OWRA).	No action required.
June 21	OMWA newswire	<u>Michigan Officials Charged With Manslaughter For Role In Flint Crisis</u> Michigan Attorney General Bill Schuette announced last week that he has charged five public officials with involuntary manslaughter related to their alleged failure to act in the Flint water crisis. The charge is punishable by up to 15 years in prison.	QA Coordinator forwarded to Top Management.
June 22	Ontario News	<u>The Kinsmen Club fined \$2,000 for Safe Drinking Water Act Violations</u> The Kinsmen Club of Stratford Incorporated pleaded guilty to one offence and was fined \$2,000 for failing to ensure that no drinking water was supplied after a shutdown period of seven or more consecutive days until samples were taken and tested, contrary to the Safe Drinking Water Act (SDWA).	No action required.
June 22	Ontario News	<u>Golf Course fined \$6,000 for Water Resources Act Violations</u> Caradoc Sands Golf Course Ltd. pleaded guilty to one offence and was fined \$6,000 for taking greater than 50,000 litres of water per day without a Permit to Take Water (PTTW), contrary to the Ontario Water Resources Act. The company operates a golf course located on Saxton Road in Strathroy.	No action required.
June 23	Guelph City News	<u>City's rainwater harvesting bus wash wins national award</u> The City of Guelph has won a <u>Water's Next Award</u> for its innovative rainwater harvesting bus wash system in the category of Projects and Technology. Since 2014, the City has saved more than 1 million litres of drinking water in the process of washing its buses—enough to fill four Olympic-sized swimming pools. In 2016, the City saved 548,000 litres of water by using rain water for bus washing, for a water cost savings of almost \$2,000, on top of the savings achieved from the water-efficient spray nozzles (3,150,000 litres: 1.25 Olympic-sized swimming pools of water), and savings from the reduction in pumping and treatment of the drinking water supply.	No action required.
June 24	Ontario Gazette	<u>ONTARIO REGULATION 176/17 made under the ONTARIO WATER RESOURCES ACT</u> O. Reg. 176/17: CHARGES FOR TAKING GROUND WATER TO PRODUCE BOTTLED WATER The purpose of this Regulation is to recover the costs the Government of Ontario incurs to, (a) regulate water bottling facilities under the Act; (b) study the impact water bottling facilities have on the ground water resources in watersheds from which a water bottling facility	No action required.

Date - 2017	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
		takes water; and (c) review the regulatory framework that governs ground water takings related to water bottling facilities.	
July 5	OMWA newswire	<u>Door-to-Door Water Treatment Sales Venture Leads to Conviction</u> An Ontario Government news release last week reports a Guelph man pleaded guilty and was convicted of one count under the Consumer Protection Act for misleading consumers in relation to door-to-door sales of water treatment equipment in Kingston. Danny Shamon was ordered to pay a fine of \$4,000, placed on probation for two years and ordered to pay a \$1,000 victim fine surcharge. He was also required to pay approximately \$11,000 in restitution to three consumers, including some seniors.	No action required.
July 10	OMWA Newswire	<u>Flint Sued For Failure To Approve Water Source</u> Flint is coming under legal fire from the state of Michigan for delaying a decision on its drinking water source. "The Michigan Department of Environmental Quality [DEQ] sued the City of Flint over the city council's foot-dragging in approving Detroit's Great Lakes Water Authority (GLWA) as its long-term drinking water source," the Detroit Free Press reported.	No action required.
July 14	MOECC Email	<u>Federal Discussion Paper Released on Review of Environmental Regulatory Processes</u> The Government is considering a new approach to Environmental Assessments, among other changes.	QA Coordinator forwarded email and link to the report to Top Management.
July 14	OMWA Newswire	<u>Their water poisoned, fed up residents demand answers about toxic fire foam</u> More than eight months after fire destroyed a flea market near Smiths Falls, Ont., the wells of a dozen nearby residents were poisoned with dangerous toxins, and questions still swirl about the regulation of firefighting foam commonly used to smother flames. The medical officer of health advised that residents "not consume their well water and not to use their well water in ways that it may be aerosolised and inhaled".	No action required.
July 14	MOECC email	In support of Ontario's commitment to <u>Open Government</u> and belief in transparency, the Ministry of the Environment and Climate Change (MOECC) is expanding data sets available on the <u>Drinking Water Quality and Enforcement</u> page of the <u>Open Data Catalogue</u> to include more detailed drinking water data. Since 2015, drinking water inspection summary data has been posted to the Catalogue. For the first time, raw data including names of regulated drinking water systems (under O. Reg. 170/03), will be posted. Expanded data sets will be available for: <ul style="list-style-type: none"> · Adverse water quality incidents; · Test result data (includes lead and pesticides); · Inspections; · Laboratory inspections; · Orders; 	QA Coordinator forwarded email to Management, Technicians and Compliance Coordinator.

Date - 2017	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
		<ul style="list-style-type: none"> · Laboratory orders; and, · Microcystin. 	
July 26	OWMA Newswire	<p><u>Lead levels in Little Italy home's tap water test nearly 5 times the acceptable limit</u> Lead service lines were used in homes built before the mid-1950s.</p>	QA Coordinator sent news story to Supply Technician.
Aug. 1	Guelph Mercury	<p><u>Construction site theft leads to water overflow on Guelph street</u> Water was flowing on to Ontario Street, near Neeve Street, last week after a curb stop valve was stolen from the exposed pipe. The project manager for the construction there says theft is a common problem for construction sites in Guelph.</p>	No action required.
Aug. 2	Guelph City News	<p><u>Guelph among select municipalities to oversee and apply greater rigour to development in vulnerable source water areas</u> The City of Guelph has improved its review process for sanitary sewer infrastructure projects to better protect our community's vulnerable source water. The revised process allows the City of Guelph to complete the review process for the Ministry of the Environment and Climate Change's (MOECC) environmental compliance approval (ECA) applications internally.</p>	No action required.
Aug. 25	Guelph City News	<p><u>Speedvale Tower</u> The Speedvale water tower is back in service. It has been out of service since February for an inspection, painting and other maintenance.</p>	No action required.
Sept. 18	Guelph City News	<p><u>Fire Hydrant Testing</u> The City is testing over 2,700 fire hydrants starting Monday, October 2, 2017. Fire hydrant testing will start in the north end of Guelph and progress towards the south end. All testing should be complete by the end of October.</p>	No action required.
Oct. 5	Guelph City News	<p><u>Schedule 'B' Class Environmental Assessment for Clythe Well treatment upgrades</u> The City of Guelph is initiating a Municipal Class Environmental Assessment (EA) for proposed treatment upgrades to bring the Clythe well back into service. The City's Water Supply Master Plan (2014) identifies the need for additional water sources to support future demand. A study conducted in 2011 concluded that water from the Clythe well can be successfully treated with existing technologies.</p>	Information presented to staff at full staff-meeting. No further action required.
Oct. 6	MOECC email	<p><u>Chief Drinking Water Inspector Annual Report</u> The 2016-2017 annual drinking water report for Ontario highlights efforts to keep our drinking water clean and among the best protected in the world. Ontario uses a multi-barrier approach of strong legislation, stringent health-based standards, regular and reliable testing, highly trained operators, regular inspections and a source water protection program to protect the province's drinking water.</p>	Division Manager forwarded email to all of Water Services.
Oct. 9	Guelph City News	<p><u>Watermain Cleaning</u> The City will begin fall water main cleaning in selected areas of</p>	No action required.

Date - 2017	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
		Guelph on Monday, October 23. The City expects to complete the cleaning by the end of November.	
Oct. 10	Guelph City News	<u>Telephone Survey</u> The City of Guelph is conducting a residential telephone call survey to gather residents' opinions on water use practices and communications for water programs. The survey is being conducted October 12 through November 10, 2017.	No action required.
Oct. 12	MOECC	New Organizational chart issued by the MOECC.	Copy of the new chart was sent to Managers, Compliance Coordinator, QMS Rep, Project Managers and Technicians who work with the MOECC.
Oct. 13	Guelph Today	<u>Five area schools found to have higher than acceptable levels of lead in the water</u> More than 640 Ontario schools and daycares found lead levels in drinking water that failed to meet the provincial standard over the past two years.	No action required.
Oct. 16	Ontario News	<u>Laboratory fined \$15,000 for Failing to Report Adverse Drinking Water Results</u> SGS Canada Inc. was convicted of one offence under the Safe Drinking Water Act (SDWA), was fined \$15,000 plus a victim fine surcharge of \$3,750 and was given 120 days to pay the fine.	No action required.
Oct. 23	Ontario News	<u>Unlicensed Well Driller fined \$2,000 for Drilling Wells without a Licence</u> Allan Charlebois was convicted of two offences under the Ontario Water Resources Act (OWRA), was fined \$2,000 plus a victim fine surcharge of \$250 and paid the fine on the date of conviction.	No action required.
Oct. 31	Ontario News	<u>Drinking Water System Owner fined \$2,000 For Submitting False Information to the Ministry</u> Carl Douglas Dressel was convicted of one offence under the Safe Drinking Water Act (SDWA), was fined \$2,000 plus a victim fine surcharge (VFS) of \$500 and was given 30 days to pay the fine.	No action required.
Nov. 2	Guelph City News	<u>Council Approves 2018 Non-Tax Supported Operating Budget and 2018 Capital Budget</u> In this budget, Council approved an increase to the stormwater, water and wastewater service rates and fees that increases the average annual residential bill by \$23.40 over 2017 rates.	No action required.
Nov. 8	OWMA Newswire	<u>Welland, Ont. Incentivizes Purchase of Real-Time Water Sensors</u> The City of Welland, Ontario is assisting consumers with water conservation and leak detection by offering a \$100 incentive for the purchase of Alert Labs real-time water sensors.	Forwarded article to Supervisor of Water Efficiency and Manager of Technical Services.
Nov. 22	MOECC	<u>Minister of the Environment and Climate Change Annual Report on Drinking Water 2017</u>	Emailed Report to Top Management and

Date - 2017	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
			Compliance Coordinator.
Dec. 8	Ontario News	<p><u>Water Testing Laboratory and Owners fined \$246,500 plus VFS for Safe Drinking Water Act Violations</u> Central Ontario Analytical Laboratory Inc. (COAL), 2293560 Ontario Inc., Lesley and Teresa Johnston were charged and convicted under the Safe Drinking Water Act (SDWA). The convictions relate to offering or providing a drinking water testing service without authority or not in accordance with a drinking water testing licence.</p>	No action required.
Dec. 14	MOECC Email	<p><u>Reminder that amendments to drinking water regulations will come into force on January 1, 2018.</u></p>	Forwarded email to Compliance Coordinator, Top Management and Water Supply Technician.
Dec. 14	Contained in an Email from DCAO Office	<p><u>MOECC Policy Decision Notice: Consideration of Climate Change in Environmental Assessment in Ontario</u></p>	Copy of the email was sent to Top Management, the Compliance Coordinator, QA Coordinator and the Hydrogeologist.
Dec. 19	Guelph City News	<p><u>City's 2018 rates and fees released</u> As part of the 2018 budget, City Council approved a series of <u>rate and fee</u> increases to ensure that the City is able to continue delivering programs and services that meet the community's expectations.</p>	No action required.
Dec. 22	MOECC Email	<p><u>Proposed Amendments to a regulation under the Clean Water Act and establish a new regulation under the Safe Drinking Water Act have been posted on the Environmental Registry</u></p>	Forwarded email to Source Water Protection staff, Division Manager, Manager of Technical Services and Compliance Coordinator.

Appendix "F" Management Review Action Items

ITEM #	STATUS	DESCRIPTION
1	CIR #398	Check-in EDMS SOP's for A&S Report preparation and MOECC Inspection preparation.
2	CIR #400 Plan for 2018/2019	Water Services should update Water By-law to better address water use at hydrants; water theft and prevention of cross connections at hydrants.
3	CIR #402 Closed 2017-05-25	Consider moving Paisley and University raw water sampling to 5-year sampling (with F.M. Woods, Burkes, Downey, Queensdale, Helmar and Calico) since 1,4 Dioxane has never been detected at these wells (Paisley & University)
4	CIR #403	Consider reducing the frequency of sampling to once per year of treated sources only for sites not located in industrial / commercial areas and where VOC's have never been detected (prior to seeking Council approval of the VOC Management Plan).
5	CIR #409 Closed 2017-05-25	Follow-up with an analysis of past years' Glen Collector flows (compare wet seasons vs. "normal" seasons and collector flows – any correlations?)
6	CIR #412 Closed 2017-05-25	Note any changes that affect data results (e.g. improving the accuracy of sample results by choosing a more representative sample location – which may change the trend of data results).
7	CIR #415 Closed 2017-05-25	Schedule annual Water Quality Monitoring Schedule (WQMS) meeting with Water Supply Supervisors.
8	CIR #422 Closed 2017-02-14	Schedule annual meeting with Building Services regarding the Backflow Prevention Program.
9	CIR #503 Closed 2017-01-31	For 2016 A&S Report, add the following to the report: - % compliance to Locates section - valve turning - hydrant repair - swabbing / flushing - service box repairs
10	CIR #504 Closed 2017-01-30	For 2016 A&S Report, add SCADA section of the report, including % uptime, categories of SCADA maintenance, etc.
11	CIR #505	For 2016 A&S Report, explain water pumpages section of the report.
12	CIR #506 Closed 2017-01-31	In A&S Report, verify source of service repair stats
13	CIR #554 Closed 2017-02-01	Consider separating microbiological and chemical sampling contracts (e.g. use IDEXX at ALS, which is simpler and less potential for error). Also consider potential to carry-out this (IDEXX) methodology internally.
14	CIR #556	Form 1's and Form 2's should more immediately be completed and submitted to the Compliance Coordinator.
15	CIR #595	Consider discontinuing the report card version of the Annual and Summary Report to reduce redundancy.

ITEM #	STATUS	DESCRIPTION
16	CIR #734 Closed 2018-02-01	For the A&S Report: The notice about EDMS being internal in the introductory section is all that is required. Remove this statement from other places in the document.
17	CIR #735 Closed 2018-01-30	For the A&S Report: Figure 1 – update to better show Zone Boundaries.
18	CIR #736 Closed 2018-02-01	For the A&S Report: Emergency Response Testing: Need to add a section re: emergency preparations that were done before the Paisley-Clythe Feedermain work at Woods Station.
19	CIR #737 Closed 2018-01-30	For the A&S Report: Table 4: include number of sample stations installed through DMA Program.
20	CIR #738	For the A&S Report: Table 4: Should Locate information be included in this table, instead of its own section? Review the necessity of including the Locate section next year because Locates is a Corporate Initiative, not just Water Services.
21	CIR #739 Closed 2018-01-31	For the A&S Report: Need more information on SCADA uptime improvements.
22	CIR #732 Closed 2018-01-31	For the A&S Report: Add Zone 3 chlorine residuals to Table 9.
23	CIR #741	Arrange for the installation of a sample station in Zone 3.
24	CIR #742 Closed 2018-01-31	For the A&S Report: Add UVT values to Table 13, or create a new table.
25	CIR #743 Closed 2018-01-31	For the A&S Report: Clarification on the Water St. Wellfield PTTW application is needed.
26	CIR #744	For the A&S Report: Need to capture the total number of Lead Replacements (done by City staff and Contractors) in the 2018 report.
27	CIR #745 Closed 2018-02-01	For the A&S Report: Update Management Review Section, as per today's meeting.
28	CIR #746 Closed 2018-02-01	For the A&S Report: Infrastructure Review: Add information on the York Trunk Project to the A&S Report.

Appendix "G" Summary of Staff Suggestions

CIR #	Suggestion Title	Description of Staff Suggestion
576	EOC Preparation – Electronic Records	Future EOC preparation - work with ITS to establish improved electronic records management tool for use from minute 1 for future EOC activations.
577	Removal of Duplication	SOPs/work instructions should be removed from T:\ drive once filed to EDMS for better document control. Can be ambiguous (when filed on the T:\) as to which version is most recent.
578, 603	Document Control System Training	Consider refresher EDMS training and document and records control training for staff.
579	Internal Audit Process Improvement	Consider either a full group audit (in order to gain information from each Admin area) OR consider a focused rotational audit of each functional area of admin customer service (e.g. full internal audit of meter process - starting at the beginning in Admin and following the process in Meter area then finishing back at Admin - for example).
580	Printed Emergency Contact Lists	Consider having a printed copy of emergency contact list in case of network issues experienced recently. Also consider consolidated emergency contact list for all divisions.
581	Document Control	With Backflow Prevention (in Building Services) - SOP's / work instructions / documents should be created for: - the Backflow process in AMANDA - how to deal with a situation where a backflow device failed or a backflow event occurred. Who would be informed, what information would be required, how best to respond to the situation. - documenting a process either through email or Amanda where a water shutoff/turn on would trigger a response from Backflow to ensure that when the water is turned on a cross connection is not created.
582	Emergency Test Members and Training	Backflow Prevention staff have not received emergency response training. They should be included in the next training exercise (especially if it's related to a chemical contamination related to a backflow event).
583	New Program Data Management	As a plethora of data is available through district metered areas - investing in 2017 to better tracking and understanding of data (e.g. SCADA Watch).
584	New Program Resources	Future operational staff resources required for operations & maintenance (O&M) phase of leak detection program.
585	New Program Document Control	Leak Detection Program O&M documentation to be developed: o standard operating procedures, o annual inspection / verification program description and templates, o work orders / instructions (for scheduling inspections and equipment calibrations / verifications)
586	Internal Audit Plan Improvement	Add Engineering's Technical Services (related to surveys and inspections) to future internal / external audits – to review how specifications are verified in the field
587-588	Contractor / Consultant Review Improvements	With Engineering (Construction): The Contractor Review Form used to conduct a monthly contractor review currently has a maximum 3/5 score given to any contractor, which is often perceived as unacceptable by contractors (when they sign-off). Engineering is considering improvements to this form to better represent quality of work and improved ratings (with removal of unachievable 4-5 scores). Establishment of a Consultant Review Form - need to consider that consulting teams would be evaluated rather than the consulting firm.
589, 657	Min/Max Inventory Workaround	Consider a way to manage min/max parts system in interim (as related to instrument calibration / verification) while WAM being sorted out.
590-591	Annual Records Filing	For records that are created on an annual basis (Annual and Summary Report, Internal Audit Report) they should have their own document location in EDMS based on the year. 2015 internal audit report to be filed in EDMS.
592	Back-up Training Certificates	Scanned certificates and database should be placed in a shared location on T:\ drive for back-up access. [Should test visibility of linked certificates when other Technical Services staff have access.]

CIR #	Suggestion Title	Description of Staff Suggestion
593	Training Data Reporting	Consider reporting cost / loss stats to individual employees.
594	Training Provider Improvements	Consider developing internal trainers and topics to satisfy some of the annual 50 hours required for operators.
595-596	Compliance Reporting Improvements	How are we ensuring we don't miss the PTTW reporting requirement in the future? (the one non-compliance issue in 2016). Also presence of VOC's at low levels in source water and a description of what we are doing to manage this water quality risk.
597	Annual Report Formats	Consider discontinuing the report card version of the A&S Report to reduce redundancy. To be evaluated at next management Review.
598	Sampling and Testing	Add to the Temporary Lines work instruction procedures on how to sample/test/read results, etc.
600	Quality Management System	Determine how frequently SOPs should be reviewed and determine the process for SOP approval by top management.
605	Emergency Tests	Consider including Engineering staff in the Emergency Test Exercises, as applicable.
616-617	Hydrant Program	Ensure adequate resources are allocated to the hydrant inspection program. Create a better date field on the maps for the hydrant inspections.
618, 653, 698	In-field Technology	Would be beneficial to have more in-field technology to use with the hydrant inspection collector app. Look at moving towards electronic job sheet forms. Consider using electronic logbooks.
607-615	District Metered Areas	Consider adding DMAs to the next risk assessment. Investigate if there are training opportunities for DMAs. Create a DMA SOP/Operations Manual for staff. Clarify the roles and responsibilities associated with the DMA program.
629, 630, 642, 645	Standard Operating Procedures	Complete the SOPs for the meter shop and enter them into EDMS. Create a leak response SOP for staff, including what needs to be documented. Complete the valve exercising program SOP. Review and update the existing locate SOPs; including a procedure for locate investigations.
634	Valve Program	Develop a plan that schedules valve turning based on a pre-determined priority order. Consider creating a work instruction or reaction plan for critical valves in advance of exercising.
635	Work Completion Documentation	Consider colour coding the valves turned by the year they were exercised in the GIS database.
647	Flushing Program	Look at implementing a weekly (or as needed) flushing program for known dead ends in the City.
655	Communications	Look at creating a communications plan or media blitz to educate people on the unauthorized use of hydrants and ask members of the public to report it when they see it.
675-677	Tap Water Promotion	Look at replacing the Blue W branding with Bring! Fill! Drink! Create tap water promotion signage for use at events where the Water Wagon is not available to attend. Revisit the event qualifications for attendees for future Water Wagon events.
681, 682	Water Sampling and Monitoring	Consider a formal procedure to confirm sample results after a well or storage facility has been taken out of service. Consider standardizing all monitoring equipment.
730	Audits	Consider adding administration staff to the flushing and swabbing audit, as they deal with a lot of the communications for the program.
731, 732	Quality Management System	Add Form 2 and Schedule C to the Reference Document List in QMS 06 – Drinking Water System. Consider adding DMA information and maps as well. Also, add the chart for the number of hydrants, valves, etc. that is currently in the A&S Report.

Appendix “H” – Water Conservation & Efficiency Program – 2017 Annual Progress Report (updated annually)

Background:

The City of Guelph strives to be a leader in water conservation and efficiency. As one of Canada’s largest communities reliant on a finite groundwater supply for our drinking water needs, our ability to reclaim precious water and wastewater serving capacity through conservation initiatives offers numerous benefits to our community and local ecosystem.

Between 2006 and 2016, 9,520 cubic meters per day (m³/d) of average day water/wastewater capacity has been reclaimed as a result of the successful uptake of the City’s 2009 Water Conservation and Efficiency Strategy, allowing the City to delay the need for over \$41 million in additional water and wastewater infrastructure with an investment of approximately \$11.3 million in water conservation programming. Further, the reduction in water use across the city has resulted in a cumulative daily operational savings of over \$625,000 per year in electricity and treatment chemical costs, creating a significant financial benefit to our rate payers. As a result of such **efforts, the City’s water and wastewater rates remain close to the median of Council approved Ontario comparator municipalities responsible for the provision of water and wastewater services.**

In July 2014, Guelph City Council endorsed the update to the Water Supply Master Plan. Through this update, servicing capacity reclaimed through water conservation and efficiency continued to be a top priority in achieving a sustainable and cost effective community water supply, with a new reduction target of 9,147 cubic meters (m³) **in average daily production set through this plan to guide the City’s Water Conservation Programming for the planning period of 2015 to 2038.**

In April 2015, an update to the 2009 Water Conservation and Efficiency Strategy commenced. After multiple opportunities for public engagement, including the utilization of the long-standing Water Conservation and Efficiency Public Advisory Committee, feedback on the proposed measures to help to achieve the water reduction goal, as outlined in the 2014 Water Supply Master Plan, was used to inform the program and service improvements. Thus, the Council-approved 2016 Water Efficiency Strategy update defines the programs, policies and resources that will help Guelph meet its reduction targets while ensuring the City continues to offer effective programs that provide value for the community.

In 2017, the City of Guelph was pleased to be the recipients of three industry leader awards. The Ontario Water Works Association presented the City an award for an outstanding leader in water efficiency in both the Public Sector and Utilities category for the 2016 Water Efficiency Strategy and the Public Education **and Awareness category for the annual H2Awesome youth program. Further, at the annual Water’s Next Awards** associated with the Canadian Water Summit in June, the City of Guelph was honoured in the category of Projects and Technology—Stormwater for the innovative rainwater harvesting bus-wash system at Guelph Transit.

The following sections provide an update of the water conservation and efficiency program activities and successes as they relate to the 2016 Water Efficiency Strategy from January 1 to December 31, 2017. For **more information on the City’s Water Conservation Program and individual program resources please visit:** guelph.ca/ourstoconserve.

Water Reduction Target Progress:

The 2016 water savings target of 6,659 m³/d outlined in the 2009 Water Conservation and Efficiency Strategy have been surpassed through the **implementation of the City's innovative water conservation programs**. From 2010 to 2016 an estimated total water savings of 8,155 m³/d is attributed to community **participation in the City's** water conservation and leak detection programs.

The 2016 Water Efficiency Strategy includes a 10 year water savings goal of 6,265 m³/d by 2026. This exceeds the 2027 target set by the 2014 Water Supply Master Plan. With the recent completion of the strategy late in 2016, 2017 was spent phasing out some previous programs, developing new programs and optimizing current programs. As such, the total water savings achieved for 2017 that can be attributed to community participation in water conservation and efficiency programming is 34,281 m³, or 96 m³/d.

As outlined in the 2016 Water Efficiency Strategy, enhanced and new programming will be rolling out in Q1 2018 for:

- the previously unexplored multi-residential sector;
- a more robust incentive program for the industrial, commercial and institutional sector;
- an enhanced outreach and education platform; and
- commencing data collection through District Metered Area leak detection program.

Water Conservation and Efficiency Public Advisory Committee:

The Water Conservation and Efficiency Public Advisory Committee (WCEPAC) of Council was formed in 2009 and was re-established in 2016 through Council approval following the Water Efficiency Strategy. This committee provides a forum for community input and guidance throughout the **City's** implementation of the Water Efficiency Strategy. The WCEPAC met four times in 2017. The WCEPAC continues to provide valued insights on opportunities for continued optimization of current and developing water conservation programming and policy, as well as, the enhancement of **Guelph's** education, engagement and outreach resources. In alignment **with Council reporting requirements outlined in the committee's Terms of Reference**, the following Annual Report details activities of this Water Conservation and Efficiency Public Advisory Committee within 2017. In 2017 WCEPAC contributions included the following:

- Feedback on various water efficiency programs that have been discontinued, updated or developed as directed through the 2016 WESU, including Water Smart Business, Multi-residential Audit Program, and the Residential Sub-meter Rebate Program.
- Comment on various innovative research, study and pilots including the Alternative Water Softening Technology Market Research Study, Billing Exemption Study Results, and the Civic Accelerator Water Use Challenge.
- Consultation during the development of the updated Public Education and Communication Strategy Update.
- **Engagement in learning opportunities to support member's role on the committee, including tours of City owned rainwater harvesting systems.**

A full list of the WCEPAC members, meeting minutes and agendas can be found at <http://guelph.ca/city-hall/council-and-committees/advisory-committees/water-conservation-and-efficiency-public-advisory-committee/>.

The WCEPAC possesses no annual budget. **Funding for the City's Water Conservation and Efficiency Program** is provided within the approved 2017 Non-Tax Supported Water and Wastewater Services Capital and Operating Budgets as well as Development Charges.

In 2018, the WCEPAC will continue to be engaged to solicit input throughout detailed design and implementation of the 2016 Water Efficiency Strategy recommendations and associated public and stakeholder engagement campaigns, including but not limited to the finalization of the **Public Education and Communications Strategy, outreach and engagement strategies for City of Guelph's conservation programming and tap water promotion, redesign of the Blue Built Home program, business case development for wastewater reuse pilot project, the rate review, and kick-off of the energy-water nexus study.**

Leak Detection Program:

The City's leak detection program started in the spring of 2011 and aims to reduce the amount of water lost between the time of production and end delivery to customers. Since the onset of this program to year-end 2016, the total volume of water saved equates to 1,177,710 m³ (*please note: this is not a cumulative value*).

The 2017 Leak Detection Program was launched in July. This program included sounding and correlation of all 345 kilometers of metallic watermains and 193 kilometres of PVC **watermains within City's distribution system**, encompassing a total of 538 kilometres of linear infrastructure. In total, 5 watermain and service leaks were identified through this survey. The average daily volume of servicing capacity reclaimed through the location and remediation of these leaks equate to approximately 25 m³/d, with a total volume of 9,620 m³ in 2017.

The 2017 Leak Detection Program also included the continued detailed design of district metered areas (DMA). In recognition of benefits offered through this proactive water loss management approach, Water Services will be working to implement 29 DMAs over the period of 2016 to 2018 with funding provided through government funding, local development charges and local user rates. The objective of the DMA program is to reclaim and sustain 1,500 m³/d in water servicing capacity. To date, 26 DMAs have been installed with an additional 3 scheduled for the future. The outstanding installations are suspended due to challenges with existing infrastructure. Although water savings were noted in the Water Efficiency Strategy, the DMA program was not implemented in 2017.

The overall Water Loss Management savings goal of 192 m³/d for 2017 was not achieved, largely due to the delay in execution of the DMA program. The program is scheduled for 2018; thusly 25 m³/d associated with the sounding and correlation work are the only savings to be attributed to this program at this time.

Residential Water Conservation Rebate Programs:

During 2017, a total number of 951 **rebate applications were processed via the City's residential rebate programs**. Through the Water Efficiency Strategy, Council approved changes in direction and planning of the Royal Flush Toilet and Smart Wash Washing Machine rebate programs. These changes were due primarily to changes in the marketplace, updates to the building code and improvements in technology.

Royal Flush Toilet Rebate Program:

In line with changes to rebate structure noted in the Water Efficiency Strategy, the Royal Flush Toilet Rebate was adjusted in early 2017 moving from a \$75 rebate to a \$50 rebate, effective the first of the year. It was further broadened to the replacement of 6L toilets instead of only 13L toilets. A total of 876 toilet rebates claimed in 2017, achieved an in-year water savings of 34 m³/d. This surpasses the Strategy's 2017 goal of 30 m³/d.

Smart Wash Washing Machine Rebate Program:

In line with changes to rebate structure noted in the Water Efficiency Strategy, the Smart Wash Washing Machine Rebate was discontinued effective the first of the year. However, those washers purchased in 2016 were eligible to be claimed until March 31, 2017. As such, an additional 75 rebates were claimed in 2017, achieving an in-year water savings of 6 m³/d.

Further to routine promotion of the City's water conservation retrofit programs, Water Services also continued to implement customized engagement within local business sectors in 2017 to increase awareness of program resources and potential water use efficiencies specific to the sector. This included a multi-residential marketing campaign for building owners comparing individual building unit water consumption to multi-residential sector averages, as well as, anticipated utility savings and return on investment for buildings pursuing mass retrofit of inefficient toilets.

Water Use Home Visit and Audit Program:

Identified as a unique opportunity for engaging with Guelph residents in the 2016 Water Efficiency Strategy, a water use home visit and audit program was identified as a means to verify water using plumbing, fixtures and behaviour, which may help modify an occupant's water use. For the last several years, the eMERGE home-tune up has been offered to Guelph residents. This program is an innovative collaboration between the City of Guelph, Guelph Hydro Electric Systems Inc., Union Gas, Transition Guelph and other local partners. This service offers a free 1 hour home audit by trained advisors, a complimentary retrofit of common home water use fixtures (such as water efficient showerheads and faucet aerators), with the option to purchase a flapper and have it installed on-site if leaks are found. The service also includes the development of a household-specific action plan, providing information to residents on how to further reduce home resource use and directing homeowners to further resources and tools to assist with the implementation of recommended improvements.

In verifying the household water consumption data, the City has concluded that on average, the home owner who receives the visit will reduce their water consumption by up to 10 percent depending on the retrofit measures taken. To date, eMERGE home visits have engaged 1242 households with a home audit. The eMERGE Home Visit service continued engaging 302 households in 2017, achieving an estimated in-year savings of 7 m³/d. This value is down from the 13 m³/d goal outlined in the Strategy. However, this **year's home visit program focused a great deal on multi-residential units**, which often offer lower savings expected from single family homes. There will be a renewed effort for this program to focus on the single-family home in 2018.

Blue Built Home Water Efficiency Standards and Rebate Program:

The Blue Built Home (BBH) Water Efficiency Standards and Rebate Program is a voluntary construction standard designed to outperform the plumbing and water-using fixture requirements of the Ontario Building Code (OBC). The original intent of this certification program for new homes was to increase the installation of more water efficient technologies and contribute to reduced water use in single-family detached homes. Residents with Certified Blue Built Homes could save water and reduce water and wastewater utility bills by 15 to 62 percent. From launch in 2010 until year-end 2017, a total of 50 local new homes have been BBH certified (44 Bronze, 4 Silver and 2 Gold).

The Water Efficiency Strategy Update identified the BBH program as a program that would continue to be enhanced and implemented over the next 10 years due to the potential water savings it could generate. The Strategy details a plan to transition this program from a three-tier (bronze, silver and gold certification) to a single-tier program. BBH certification and associated rebates are to be made available to both existing and new homes and the multi-residential community. The BBH program update was initiated in 2017 and will continue into 2018. The revised program is anticipated to launch May 1, 2018.

In absence of the anticipated program update, 3 homes were built and certified in 2017 with a total water savings of 0.25 m³/d. This is lower than the anticipated goal of 3 m³/d. However, this program has yet to be revised as per the Strategy to include that of retrofit single family homes and multi-residential buildings.

Water use monitoring at the four Net Zero Homes, constructed by Reid's Heritage Homes', continued throughout 2017. Net Zero Homes aim to have each home produce as much energy as it consumes on an annual basis using technologies available to the average builder. To date, 3 reports on household water consumption have been submitted to Reid's Heritage Homes. Data is not considered statistically significant, but three of the four Homes exhibit water savings when compared to modelling of a home built to Ontario Building Code standards. The annual water savings in these BBH ranges from -0.5 and 106 m³ when compared to a home of equal size built to the Ontario Building Code standard.

For more information on the Blue Built Home program visit: bluebuilthome.ca.

Multi-Residential Water Audit Program:

Multi-residential buildings, both new and existing, pose the potential of significant water savings up to 10 percent and the top 5 percent of high density multi-residential accounts are using 23 percent of the water demand. The Water Efficiency Strategy endorsed the development of a Multi-Residential Water Audit Program as a measure to assist in reducing Guelph's daily water production. The overall program savings goal of 14 m³/d for 2017 was not achieved, due to late approval of the Water Efficiency Strategy and the year spent in program design and development.

The Audit program, set to launch in Q1 2018, offers participants a no-cost water audit completed by a third party consultant, outlining the building's daily water demand pattern to determine an estimation of potential water savings related to installing efficient plumbing fixtures and defining the presence of leaks in the building. Through the audit, a proportionate number of units per multi-residential building (with 7 units or greater) will be assessed to identify water saving opportunities. The audit also includes the completion of flow monitoring and a 24-48 hour data logging of the building's main municipal water meter and on specific water using processes, such as pools and irrigation systems.

After the multi-residential audit, property owners/condo boards can move forward down several paths including a full retrofit of fixtures under the Blue Built Home Rebate program, Residential Sub-metering of their building or, if capital infrastructure needs to be replaced or upgraded, incentives through the Water Smart Business program.

The 2017 development of the Multi-Residential Audit Program included development of a stream-lined application process and rebate tracking system, development of program terms and conditions, request for tender (RFT) process, contractor selection, and creating a marketing plan with communication materials including program website and other promotion collateral.

Residential Sub-Metering Program:

Sub-metering creates awareness of water use for property owners (i.e. homeowners, landlords, property managers) and when effectively communicated everyone is equally aware of what they pay. Sub-meters, and in some cases their associated smart phone applications, can provide specific and measurable conservation challenges and goals for property owners and tenants. These services offer significant opportunities for motivating behaviour change since a knowledge gap often exists in regards to how much water residents actually use.

It is because of this that Water Services staff, supported through the Civic Accelerator program, explored a pilot rebate with the AlertLab technology **"Flowie", a strap-on sub-meter for a household's water billing meter**. Through a smart phone application, a homeowner can receive time of use information on their water using behaviour. Twenty-nine Guelph households purchased a Flowie and received a rebate. The overall program savings goal of 1 cubic meter per day for 2017 cannot be confirmed, as the pilot has yet to determine whether program participation equates to the anticipated savings. Further, the year has been spent in program design and development.

With the moderate success of the sub-meter pilot rebate, and as a further recommendation in the Strategy, staff spent 2017 in design and development of a more robust Residential Sub-metering Rebate Program. Through this program, the City of Guelph will rebate up to half of the cost of the meter to a maximum of \$125 per permanent sub-meter installed and \$100 for an add-on sub-meter with smart technology (e.g. a strap-on sub-meter). The rebate will be provided directly to the property owner/manager or to a third-party agent of the property owner/manager.

The 2017 development of the Residential Sub-Metering Rebate Program included:

- development of a stream-lined application process and rebate tracking system;
- development of the program terms and conditions;
- creation of a marketing plan; and
- the creation of communication materials, including full design of the program website and other promotion collateral.

For more information on the City's water conservation rebate programs please visit: guelph.ca/rebates.

Water Smart Business Program (formerly the Industrial, Commercial and Institutional Capacity Buyback Program):

Since 2007, the City has successfully reclaimed an annual average daily savings of 1,590 m³/d in water/wastewater servicing capacity through participation in the Industrial, Commercial and Institutional Capacity Buyback Program – a program to assist local businesses reduce their ongoing operational utility costs and decrease their demand on municipal supply.

Through the 2016 Water Efficiency Strategy Update, several changes were identified to enhance the program and increase uptake. The Strategy recommended an increased incentive for capital projects permanently offsetting reliance on municipal supply, effectively buying back water servicing capacity. Further, through consultation, it was identified that streamlining the process to offer financial assistance and incentives to local industrial, commercial and institutional clients to complete water efficiency process audits and capital retrofits that reduce water demand, required more dedicated staff resources to support this water-using sector of the community.

During the 2017 budget approval, an expansion was approved to hire a new Water Smart Business Program Coordinator to administer the program recognizing the benefits associated with an enhanced program.

Throughout the course of 2017, staff was hired, trained, and consulted with internal and external stakeholders in an effort to redesign the former ICI capacity buyback program to best meet the needs of **Guelph's water**-using business community. Staff redesigned and developed administrative and legal processes, communication marketing strategies and collateral, and began network building to facilitate the soft launch of the Water Smart Business on January 1, 2018. A firm launch event is scheduled to occur in the spring of 2018. As such, the overall program savings goal of 150 m³/d for 2017 was not achieved, due to the year spent in program design and development.

Three kick-off meetings with prospective clients, including walk-throughs of their facilities occurred late in 2017. These preliminary meetings inform the 2017 program redevelopment and offer a high probability of early program success in 2018.

This work is intended to support the program's ambitious 2018 goal of conserving 150 m³/d and completing 15 water efficiency process audits and/or reviews in partnership with industrial, commercial and institutional clients in Guelph.

Municipal Facility Water Efficiency Upgrades:

The City aims to lead by example by increasing water efficiency and environmental/cost savings in our own operations and we made significant progress in 2017. Staff provided expertise and input during the initial design meetings for the new construction of the South End Recreation Centre, in order that the building and operations support optimal water efficiency.

In support of the recommendation through the 2016 Water Efficiency Strategy, the need for a new corporate policy was identified in relation to water use within City-owned facilities. Staff initiated and completed internal consultations with multiple departments including Facilities Management, Engineering and Capital Infrastructure Services in order to draft a new policy and education program for best municipal building practices for both new asset construction and asset renewal/upgrades. Once finalized in 2018,

this process policy will ensure the City is using the best municipal practices in regard to water efficiency across its corporate assets.

For measurable water savings in 2017, staff were responsible in identifying a deficient water softener at Water Services that was using 25 m³/d. Replacement of the softener saved an annual 21.75 m³/d, making the program only 250 litres per day short of the 2017 water savings goal of 22 m³/d. Annual achievements for this program can be variable due to capital investments and asset replacement schedules. Staff are connecting with internal stakeholders across the organization to support water efficient practices and infrastructure upgrades.

In June 2017, the City of Guelph won the national Water's Next Award for the innovative rainwater harvesting bus-wash system. The award, won in the category of Projects and Technology—Stormwater, celebrated the high-profile Rainwater Harvesting project in partnership with Guelph Transit. Further, data monitoring and project coordination to maintain optimal functionality of the Rainwater Harvesting system continued through 2017. The total volume of water savings yielded by this project in 2017 equates to 300 m³ of municipal water — another success story to share with prospective clients in 2018 as we expand the Water Smart Business Program and build towards even greater water efficiency and conservation. The Transit bus wash rainwater harvesting system has further prompted other City departments to investigate the installation of similar auxiliary water systems to help offset municipal water use and other fit-for-use applications.

Public Education and Communications Strategy Update:

The Water Efficiency Strategy recognized public education as a municipal best practice for water efficiency programming. The development of this complimentary Strategy to determine the best platform(s) in which to engage the various sectors of the community commenced in August 2017. As an industry leader in municipal water efficiency, it is important Guelph evaluate the best tactics and messaging to resonate with a community aware of the conservation message. In 2017, two pieces were completed: a literature review of best practices of municipal tap water and conservation programming in both grey and academic literature; and quantitative/qualitative research through market research using telephone survey and focus groups. With this information, a final strategy is to be provided that will identify current and proposed program constraints, opportunities, recommend communication goals and messages, define audiences and suggest target groups, identify outreach and communication strategies, tactics and tools to meet the recommended communication goals and water efficiency targets. The Strategy is anticipated to be complete in early 2018.

Youth and Public Education:

The City's curriculum based, Grade 2, Grade 8, and High School in-class water conservation programming continues to be a popular resource for local educators in both the Upper Grand District School Board and the Wellington Catholic District School Board. In 2017, Water Conservation Staff provided 60 interactive school presentations to 1,442 students. Since the inception of this in-class, curriculum-linked program educational initiative six years ago, the City has provided a total of 315 school presentations to over 11,942 students.

In partnership with the Grand River Conservation Authority's Guelph Lake Nature Centre, a total of 696 local Grade 8 and high school students and their chaperones participated in guided educational tours of the City's Water Services facility in 2017.

Civic Museum Exhibit and Education Program - A Ripple Effect:

2016 and 2017 brought a new partnership with Water Services and the Guelph Civic Museum. Staff assisted in funding and resourcing the 'Water Above and Water Below- **Guelph's Groundwater System**' exhibit at the Civic Museum as part of an agreement with the City of London's Civic museum called: A Ripple Effect. This local water-focused exhibit, with content generated with assistance from Water Services and Wastewater Services, was open to the public and a special educational program was developed specifically tailored to local grade 2 students from both school boards. With content directly related to the curriculum, students were able to explore the history of water through many hands-on events, gallery exploration, and interactive activities. City staff led the learning while students were able to explore the **story of Guelph's water from the ground** up. The exhibit was available from January 27 to September 10, 2017 with a total of 500 Grade 2 students in attendance between February and June.

H2Awesome:

On October 25, 2017, approximately 350 Grade 8 students from the Upper Grand District School Board and the Wellington Catholic District School Board participated in the fourth annual, award-winning H2Awesome event. This day-long learning event held at Lakeside Church is an opportunity to celebrate water, encourage conservation of this precious resource, and provide focus to the importance of water in our daily lives. The event featured 3 key note guest speakers from our First Nations communities. These speakers included Doug Pawis, Debora Stanger, and Jan Sherman. Both Doug Pawis and Debora Stanger are Ojibwa elders that focus their teachings on traditional medicines and healing circles. Jan Sherman is an Anishinaabe Metis woman that shares her traditional teachings about water through music and song. Key to the event was a variety of 16 different curriculum-linked workshops on various themes, including arts, science, and technology, enabling students to pick their own specific learning venue and challenged them to complete a year-long project. A small group of students who participated are expected to present the culminating efforts of their project to Council in spring of 2018.

The successful event was made possible through collaborative partnership of the Wellington Water Watchers, the Upper Grand District School Board, and the Wellington Catholic District School Board.

Planet Protectors:

In 2016, Water Services partnered with the Office of Climate Change, Transportation and Infrastructure Departments to offer a curriculum focused, interactive and activity based online program called Planet Protectors. This program helps students understand the importance of water conservation by helping them make personal commitments and sharing them with their family members, such as shortening shower time. During the 2016/17 school-year, this program has reached over 1600 elementary students in both the Upper Grand District School Board and the Wellington Catholic District School Board and was offered in 76 Grade 3, 4, 5 and 6 classrooms. The Planet Protector program has further expanded the water awareness and education **component of the program and Water Conservation staff's input helped improve** the program in 2017. This included new ways to measure success and additional ways to encourage more water conservation efforts both in the classroom and at home with students and their families.

Canada Water Week:

The City of Guelph celebrated Canada Water Week with the fifth annual H2O Go Festival, a community celebration of water. Collaborating with community partners, H2O Go welcomed the contributions of local businesses, **community organizations, experts, performers and families.** **This year's event, offered in partnership with the eMERGE Guelph's Ecomarket, attracted over 4,000 participants of all ages to Old Quebec Street Mall for water-themed presentations, live performances, interactive exhibits, games about water, and artistic children's activities.**

Waterloo Wellington Children's Groundwater Festival:

This long-standing festival was held from May 26 to June 1 and celebrated its 22nd year in 2017. Water Services is proud to be an ongoing partner, sponsor, contributor and organizer of the Festival. The Festival annually educates 5,000 Grades 2 through 5 City of Guelph, Wellington County, and Region of Waterloo students. Since 1996, over 90,000 students have participated in the Festival which features fun and interactive activities designed to inform students of the importance of water protection and conservation in their daily lives. In partnership with **Guelph's** school boards, staff have worked to increase local awareness and participation in this Festival with upwards of 900 students participating from Guelph on an annual basis.

Guelph Water Wagon:

In support of the City's Public Promotion Action Plan for City Drinking Water Consumption, the Guelph Water Wagon has been providing tap water to attendees of large, outdoor community events during the summer months for five years. The Water Wagon provides access to tap water where water fountains or taps are not readily available. Continually growing in demand year-after-year, the Water Wagon attended 32 events in 2017 and provided 19,312 litres of water to event attendees. The Water Wagon continues to provide staff an excellent opportunity to engage with the public. Staff engage with Guelph residents about:

- the importance of water for the City of Guelph;
- the need for water conservation;
- address any questions and concerns regarding municipal tap water;
- promote tap water consumption over other beverages; and
- staff promote the awareness of, and solicit public involvement in Water Services based public processes, programs and studies.

Peak Season Water Demand Management:

Reduction of peak season water demands continues to be a **primary objective of the City's** water conservation programming. The ability to reduce variations in seasonal water use limits the impact on our finite groundwater supply during times of environmental stress and creates operational efficiencies by reducing capital and operational investment to service our community for only a few days a year. Since **2002, the City's Outside Water Use Program** has helped to manage peak season water use via regulatory controls with complementary programs, such as Healthy Landscapes, working to proactively manage potential peak demands by assisting residents and local businesses in establishing low outdoor water use environments. The following activities were completed as part of this program in 2017.

- The Outdoor Water Use Program (OWUP) was in Level 0 Blue all season due to the cooler, wetter summer conditions. This required minimal additional staff report beyond that of the weekly condition reporting, liaising with internal and external partners in monitoring water use, water production patterns and working with the Grand River Conservation Authority. Advertisements were kept minimally, but still maintained to encourage customers to maintain their efficient water using behaviour, including through that of the Healthy Landscapes Program.
- In working to proactively manage peak season demand, the Healthy Landscapes Program offered various public resources throughout 2017. The annual Healthy Landscapes Workshop/Seminar Series featured numerous free talks on time-of-year appropriate outdoor water conservation topics including water efficient landscape design, plant selection, and proactive maintenance best practices to manage the impact of drought and common turf pests. It is estimated over 350 Guelph residents took part in this Landscape and Seminar series.
- The successful annual rain barrel truckload sale in May of 2017 was held at Exhibition Arena and yielded the sale of over 380 rain barrels sold. Rain barrels offer homeowners the benefit of capturing free volumes of water for outside use but also assist in managing stormwater impacts on private property. The sale of rain barrels are a net zero service to the City as the barrels are sold at the bulk rate attained through a rain barrel tender process.
- The Healthy Landscapes Program continues to be a popular resource with 406 free 1-hour visits completed by trained staff in 2017. This service offers a complementary site-based consultation aiming to educate residents on garden design and maintenance practices to significantly curb outdoor water demand at their home.

Peak season water demand research:

Staff continue to pursue collaborative research opportunities where resources can be leveraged to garner greater products. Included in **2017 research in is the City's** participation in:

- **Alliance for Water Efficiency's Outdoor Water Savings Research Initiative**, which seeks to explore the reasons and rationale and water demand impact of landscape changes and the components necessary to achieve reliable and persistent water savings long-term. This project is to be completed in 2018.
- Groundcover research project, which sought to explore more drought tolerant species to enhance lawn aesthetic performance for the duration of two-years by inter-seeding clover species and trefoil into residential turf. The project site was compromised for second growing season and the project could not be completed. However, after one year, **the percentage of bird's** foot trefoil and clover was very minimal and indicated that the inter-seeding of those species was not successful at the rates and date of seeding (September 27, 2016) in this study.
- University of Waterloo Outdoor Water Use Bylaw Study, which is assessing how well outdoor water applications reflect water application out of habit; or based on soil moisture needs and the effectiveness on water use bylaws across Canada. The study is being undertaken by a PhD student at the University of Waterloo as part of her research. This ongoing study is expected to be completed in the summer of 2018.

Water efficiency studies completed in other Ontario communities have shown a net result of 74 litres per day per household during peak season as a result of similar water efficiency-based landscape consultant

services. For more information on the Healthy Landscapes Program please visit: guelph.ca/healthylandscapes.

Watr - water conservation mobile app:

In alignment with the open government objectives of the City's 2012 Strategic Plan, Water Services has completed a pilot on a mobile-based app to increase customer accessibility to information about household water use. The app, developed by a local technology start-up company, uses customer water account information to provide users with suggestions for conserving water and reducing bills, and view customized information based on known attributes of their household. This application can be downloaded from either the Apple or Google app stores.

Water Conservation and Rebound Effects Study:

Commenced in August 2017, staff directed the research into the effects of water conservation on infrastructure that supply water and return wastewater. This study is investigating (a) the effects of water conservation and plumbing and municipal water/wastewater infrastructure, and (b) the possibility for a rebound in water use should conservation technologies degrade in performance or land uses (such as intensification) change over time. The analysis will assist the program in informing the knowledge gap that does exist in residential customer water billing data for a variety of residential applications (i.e. multi-residential unit demand), outdoor and general demands related to change in behaviour or practice (including automatic irrigation systems), and impact on water demands associated with change in undeveloped or developing land use. This study will inform current programming and is considered to influence redesign in water demand analysis. This study will be completed in Q1 of 2018.

Water Softener Alternatives Testing and Market Research:

With high levels of naturally occurring hardness in the City's groundwater source, the use of residential ion exchange water softener technologies is quite common amongst Guelph households. It is estimated that approximately 77 per cent of local households, as part of a 2009 residential call survey, use a water softener. The Region of Waterloo and the City of Guelph financed ground-breaking research in 2015 to assess the performance of an alternative to ion exchange water softening technology (salt based) that treats hard water without the need for salt and recharge water. This technology referred to as salt and water free technology through the use of: media induced crystallization (nucleation assisted crystallization (NAC) and template assisted crystallization (TAC)); or electromagnetic water treatment (MWT); or chemical conditioning with complexing or chelating agents. Salt and water free technology employs a combination of processes to effectively prevent scale buildup in household water heaters and appliances. However, these technologies do not allow for the same lathering effect as salt based water softeners provide.

It was recommended through the 2016 Water Efficiency Strategy Update to continue to collaborate with the Region of Waterloo on the various project deliverables to determine if salt and water free water softening technologies are viable in Guelph to support a reduction in water use and improve wastewater quality overall. In June 2017, the City of Guelph again partnered with the Region of Waterloo to continue the research, trialling the NAC/TAC technology in real life scenarios. The aim of this study is to assess the field performance and user benefits associated with salt and water free residential water softener treatment technology.

Through this study, social research in both communities was completed (phone surveys, focus groups) to generate a technology test group, a participant list of 18 homes, to install a single technology in their home for testing for user experience.

As of December 2017, all participating homes have the technology installed. Use of the systems will continue for a complete calendar year. Monitoring through online conversations boards, focus groups, and actual energy/water use of the homes will occur over the course of 2018. The final report is scheduled to be delivered February 2019.

The depersonalized results of this Water Conditioner Study will be posted to the joint website, watersoftenerfacts.ca.

Appendix "I" – Glossary

Included below is an index of terms used throughout this report.

Term	Description
<	Less than (used in reference: less than lower detection limit shown)
µg/L	Micrograms per litre = 1 part per billion
½ MAC	half of the maximum allowable concentration
Above Detection Limit	Means the result can be detected using the current level of technology.
AMP	Adaptive Management Plan
AO	Aesthetic Objective
AODA	Accessibility for Ontarians with Disabilities Act
A&S	Annual and Summary
AWQI	Adverse Water Quality Incident
Background	Indicator bacteria group used to monitor general water quality (non -regulatory)
BBH	Blue Built Home program
CAO	Chief Administrative Officer
CAPS	Capital Asset Prioritization System
cfu	colony forming unit
CCL	Critical Control Limit
CCP	Critical Control Point
CELP	Community Environmental Leadership Program
Cubic metres	Cubic metres = 1,000 litres water
Distribution Samples	Samples taken within the distribution system, post primary disinfection
DMA	District Metered Area
DWQMS	Drinking Water Quality Management Standard
DWS	Drinking Water System
DWWP	Drinking Water Works Permit
EC	E. coli (Escherichia coli)
E. coli	Escherichia coli, indicator bacteria used to determine the presence of fecal contamination
EDMS	Electronic Document Management System
EHV	Efficient Home Visit
Eng.	Engineering Services
EOCG	Emergency Operations Control Group
EPA	Environmental Protection Act
Form 1	Form 1 – Record of Watermains Authorized as a Future Alteration
Form 2	Form 2 – Record of Minor Modification or Replacements to the Drinking Water System

Term	Description
GUDI-WEF	Groundwater Under the Direct Influence of surface water – With Effective Filtration
HPC	Heterotrophic Plate Count, indicator bacteria group used to monitor general water quality (non-regulatory)
ICI	Industrial, Commercial, Institutional
In-situ filtration	Refers to the filtration achieved as river water migrates through the ground and into the Glen Collector System
km	Kilometre
LESP	Lake Erie Source Protection
LRP	Lead Reduction Plan
LSL	Lead Service Lines
L/s	Litres per second
m	Metres
m ³	Cubic metres = 1,000 litres water
m ³ /day	Cubic metres per day = 1,000 litres per day
MAC	Maximum Allowable Concentration
MCC	Motor Control Centre
MDL	Minimum Detection Limit
MDWL	Municipal Drinking Water Licence
mg/L	Milligrams per litre = 1 part per million
MOECC	Ontario Ministry of the Environment and Climate Change
n/a	Not Applicable
NDOG	Non-Detect Overgrown
NSF 60	NSF/ANSI Standard 60: Drinking Water Treatment Chemicals -- Health Effects
NSF 61	NSF/ANSI Standard 61: Drinking Water System Components -- Health Effects
ntu	nephelometric turbidity unit
O. Reg. 170/03	Ontario Regulation 170/03 Drinking Water Systems
OA	Operating Authority
ODWQS	O. Reg. 169/03 Ontario Drinking Water Quality Standards
ODWSP	Ontario Drinking Water Stewardship Program
OG	Operational Guideline
OIC	Operator-in-Charge
OP	Operational Plan
ORO	Overall Responsible Operator
OTP	Operational Testing Plan
OWRA	Ontario Water Resources Act
OWUP	Outside Water Use Program
OWWCO	Ontario Water Wastewater Certification Office
Pb	Lead

Term	Description
PDDW	Procedure for Disinfection of Drinking Water in Ontario
PLC	Programmable Logic Controller
POE	Point of Entry, the point at or near which treated water enters the distribution system
ppm	Parts per million (mg/L)
ppb	Parts per billion (µg/L)
PTTW	Permit to Take Water
Q1	Quarter One (aka first quarter), Q2 (second quarter), etc.
QMS	Quality Management System
Raw	Refers to samples that have not yet received disinfection
RCAp	Rapid Chemical Analysis Package
RCMP	Reliability-Centered Maintenance Program
SAC	Spills Action Centre
SAN	Storage Area Network
SCADA	Supervisory Control and Data Acquisition
SDS	Subdivision Distribution System (as in Gazer Mooney SDS)
SDWA	Safe Drinking Water Act, 2002
TC	Total Coliform, indicator bacteria group used to determine presence of contamination
TCE	Trichloroethylene
THM	Trihalomethane
TOMRMS	The Ontario Municipal Records Management System
Total Coliform	Indicator bacteria group used to determine presence of contamination
Treated	Refers to samples that have received disinfection
UGDSB	Upper Grand District School Board
UV	Ultraviolet
VOC	volatile organic compound
WCDSB	Wellington Catholic District School Board
WCES	Water Conservation and Efficiency Strategy
WCWC	Walkerton Clean Water Centre
WDGPH	Wellington-Dufferin-Guelph Public Health
WSMP	Water Supply Master Plan