City of Brantford Water System
2018 DWQMS Management Review
Date: May 14, 2019
A. Background

This report has been prepared in accordance with the terms and requirements set out in Element 20 – Management Review of the Drinking Water Quality Management Standard (DWQMS). Element 20 – Management Review requires the City of Brantford Water System to conduct an annual Management Review of its Quality Management System (QMS). A Management Review evaluates the continuing suitability, adequacy and effectiveness of the QMS. Sixteen items are required by the standard to be reviewed and evaluated which are covered in this report. This management review is for the period of January to December 2018.

1. Follow-up on Action Items from Previous Management Reviews

There were no non-conformances identified during the 2018 Management Review.

2. The Status of Management Action Items Identified Between Reviews

There were no non-conformances identified in preparation for the 2018 Management Review.

3. Incidents of Regulatory Non-Compliance


4. Incidents of Adverse Drinking Water Tests


5. Deviations from Critical Control Limits and Response Actions

The City of Brantford Water System has identified nine (9) Critical Control Points (CCPs), listed below. A CCP is a point in the drinking water system at which control can be applied to prevent, eliminate or mitigate a drinking water health hazard.
City of Brantford Water System CCPs
- Primary Disinfection
- Filter Effluent Turbidity
- Secondary Disinfection
- Primary Coagulant Failure
- Fluoride Residual
- Treatment Chemical Overdose
- Distribution Reservoir Chlorine Residual
- Chlorine in the Distribution System
- System Pressure

For each CCP, a procedure has been developed which outlines how deviations from the critical control limits are monitored, responded to, reported and recorded. To ensure deviations from critical control limits and response actions are monitored, responded to, reported and recorded properly:

- SCADA triggers an alarm when CCPs are outside of the critical control limits
- SCADA data is reviewed by a licensed operator daily (as per O.Reg 170/03) to ensure compliance
- Logbooks are reviewed by a licensed operator within 72 hrs.
- Any non-compliance values are reported immediately to the Brant County Health Unit (BCHU) and Ministry of the Environment Conversation and Parks (MECP) Spills Action Centre (SAC) and the proper corrective actions taken as per O.Reg 170/03.

6. Internal and Third-Party Audit Results

Internal Audit

An internal audit was conducted on May 2 and May 3, 2018 by Acclaims Environmental Inc. The auditor identified no non-conformances with the DWQMS during the audit. The DWQMS requires an internal audit to be conducted annually.

External Audit

A surveillance audit was conducted on September 25, 2018 by SAI Global. The auditor identified no non conformance during the audit. The next re-accreditation audit is required to be conducted in September 2019.

7. Operational Plan Currency, Content and Updates

The Operational Plan is current and up-to-date in preparation for an internal audit to be conducted in May 2019. The Operational Plan was submitted to Council, along with the 2012 Management Review, for commitment and endorsement on May 13, 2013. City staff will seek a recommitment of the Operational Plan from Council in early 2020.
8. The Efficacy of the Risk Assessment Process

The Operational Plan for the City of Brantford Water Systems QMS includes a risk assessment process. During the development of this process, hazard activities that could affect the water system’s ability to deliver safe drinking water were identified. Measures to eliminate and prevent the hazards were also identified.

A full risk assessment of the entire water treatment process from source to tap was conducted on March 4, 2018. Staff representing Water Operations Division, Water Distribution & Wastewater Collection Division and Compliance Division participated in the workshop providing a good cross-section of skills and experiences. Using process control diagrams as a guide, staff reviewed the past risk assessment and brainstormed each step of the treatment & distribution process to identify any new risks. Staff also reviewed the current scoring and control measures based on changes made since the last full risk assessment conducted in 2015.

To summarize the risk assessment outcomes:
- No new CCPs were identified during the risk assessment process.
- Risks related to spills affecting the source, chemical dosing and watermain breaks were re-scored based on redundancy information and frequency of the events occurring.
- The Hazard Event Ranking remained at 8, meaning any risk scoring 8 or above requires a specific SOP to mitigate the risk.

9. Results of Emergency Response Testing

CP100 Simulated Failure

CP100 is an Allen-Bradley Control Logix PLC with a processor that controls and communicates to several WTP processes. A failure of CP100 could result in the inability to process water.

On March 27, 2018 Water Operations staff participated in a simulated failure of CP100. The objective of the failure was to evaluate the WTP process when the CP100 communication card is deactivated. The WTP operator initiated the failure by using the plant production emergency stop key. Water Operation Division staff were assigned key roles throughout the simulation. Plant processes were observed carefully to ensure proper shut down sequence. The process shut down in the correct sequence, no corrective actions were identified in the simulated failure of CP100.
Extended Diesel Generator Run under Load

On October 10, 2018 a primary hydro meter was installed to service the entire site at 324 Grand River Avenue. As a result of the installation, main hydro was disconnected for the work to be completed. To ensure the WTP could continue to process water and maintain adequate storage levels in all system reservoirs, the diesel generators were started under load and all plant processes were started using backup diesel generator power. The WTP continued to run on diesel generator power for the duration of the work (approximately 6 hours). Maintenance staff monitored all diesel generators closely throughout the day to ensure proper function and to ensure sufficient fuel supply was maintained. Operations and Maintenance staff were given specific instruction and monitoring objectives prior to the main hydro being disconnected, Meetings between Water Operations and Brantford Power were held to discuss the work plan and to ensure no major or long term interruptions to plant production would occur.

No corrective actions were identified in the extended diesel generator run under load.

10. The Results of the Infrastructure Review

Vertical Infrastructure – Treatment Plant & Reservoirs

Review of the vertical infrastructure in 2018 revealed a need for the following studies/upgrades:

- Water Treatment Plant light conversion to LED
- Chlorine System Upgrade
- Post Chlorine and Sulphur Dioxide System Upgrade
- Tollgate Diesel Generator Replacement
- Health and Safety Audit
- Structural Assessment of Water Treatment Plant
- Upgrades to Lowlift Pumping Station (MCC, travelling screen)
- Assessment of Water & Wastewater Divisions Maintenance Programs

Horizontal Infrastructure – Distribution System

In 2018, approximately 2,833 metres of watermain was replaced (and/or 1,490 metre of which was new construction) including appurtenances such as valves, hydrants, and service connections. For 2019, the proposed watermain replacement program includes the replacement of approximately 5,800 metres of watermain. Most of the watermains being replaced exhibit a history of failure (breaks, etc.) and operational issues (water quality issues or corrosion). Additionally, roughly 10,531 metres of watermain was incorporated into the City’s distribution system in 2018 as part of the boundary expansion agreement with the County of Brant.
Tutela Heights

On January 1, 2017 the City assumed the Tutela Heights area from the County of Brant. An agreement between the City and Brant County (County) was approved by both municipal Councils in March 2017 (Report PW2017-005 Boundary Expansion Transition - Water Agreement for the Tutela Heights Area). This agreement required the County to own, supply, operate and maintain the Tutela Heights Water System until December 31, 2020. City has requested the County to extend the term of the Water Service Agreement for an additional five years to December 31, 2025 as per City Council’s resolution (Report PW2019-012) approved on April 2, 2019.

On April 2, 2019 City Council approved the 2019 Capital Budget to ensure funding for both the vertical and horizontal infrastructure upgrades.

11. Raw Water Supply and Drinking Water Quality Trends

Raw Water Supply

Figure 1 illustrates the Daily Average Flow compared to the Water Rate from 2002 to 2018. Over this period, the Daily Average Flow at the water treatment plant (WTP) has decreased from over 42 million litres per day (ML/d) to below 32 ML/d. The last 10+ years have been the warmest years ever recorded and aside from 2012 when there was a significant drought, the flows have not returned to pre-2005 levels. The main reason for the decrease is the link among the City’s Water Conservation Program, use of low flow devices as per the Building Code and the water rates. As water rates increased to cover costs of upgrades to the aging water infrastructure, industry and residents began to focus more on conservation in order to mitigate the additional cost. This trend is observed not only in Brantford but all over North America.

Figure 1 – Daily Average Flow Compared to Water Rate 2002 to 2018
Upstream Spills

Spills or bypass events to the Grand River and its tributaries are reported to downstream WTPs by Spills Action Center (SAC) of the Ministry of the Environment, Conservation and Parks (MECP) to allow the appropriate operational decisions and actions to take place in a timely manner. The potential impact of every reported chemical and/or bacteriological spill in the Grand River is thoroughly monitored, investigated and reviewed.

The City of Brantford Water System uses the multi-barrier approach to reduce the risk to public health. The multi-barrier approach is an integrated system of procedures, processes (ozonation, ultraviolet disinfection and chlorination, for example) and tools that collectively prevent or reduce the contamination of drinking water from source to tap. Implementing the multi-barrier approach at the WTP has proven to be very effective in handling upstream spills.

There are two major spill/discharge threats to the City of Brantford Water System. The first is a raw or primary bypass from a large capacity upstream wastewater treatment plant (WWTP); the second is a large fuel spill close to the WTP intake. Without timely notification, these types of spills/discharges would compromise the WTP’s ability to process drinking water. Although a major spill/discharge event has not occurred in many years, protocols are in place to ensure the effect on the WTP should be minimized.

Generally the WTP experiences 30 to 50 upstream spill events in a year. Most of the reported spills/discharges originate from WWTPs and usually occur due to either a heavy rain event or a power failure within their facility. In most cases, the spill/discharge was of small volume or occurred so far upstream in the Grand River that the by-pass was diluted and disintegrated during the long travel time to Brantford.

Figure 2 is a summary of upstream discharges or spills from 2013 to 2018 reported to the City by the MECP Spills Action Centre. “Primary”, “Secondary” & “Tertiary” refer to WWTP treatment processes and are indicative of the level of treatment received; primary being the lowest and tertiary being the highest. In spills reports, the MECP indicates which treatment processes are bypassed thereby indicating its potential strength. The “Other” spill type represents spills not originating from a WWTP and includes many possibilities, from fire water to fuel spills. In 2018, the number of reported spills decreased compared to 2017. This was mainly due to a decrease in heavy rain events that affected upstream WWTP’s. These by-passes had no effect on the drinking water quality.
Figure 2 – Summary of Upstream Spills or Bypasses 2013 to 2018

Controlling Trihalomethanes Formation

During water treatment, chlorine is added for disinfection and to maintain a residual in the distribution system to prevent pathogen regrowth. The chlorination of organic matter, naturally present in Grand River water, generates disinfection byproducts such as Total Trihalomethanes (TTHMs). The Ontario Drinking Water Standards limits TTHMs in drinking water to 100 micrograms per litre (ug/L) expressed as a running annual average. The City monitors TTHMs at the Point of Entry (POE) which is the point at which treated water from the WTP enters the distribution system as well as numerous locations throughout the distribution system.

Figure 3 represents the running annual average of TTHMs at the POE and in the distribution system from 2009 to 2018. TTHMs in the distribution system were above the 100 ug/L limit in 2009 and 2010 due to construction delays and difficulties during the upgrade of the Holmedale WTP.

The upgrades (filtration, ozonation and ultraviolet disinfection) to the WTP were progressively commissioned between the last quarter of 2011 and the second quarter of 2012. The upgrades resulted in step-wise decrease in TTHM of 60% from the peak in 2010 to current levels. Reduction in TTHM resulted in improving the taste of the drinking water.
Figure 3: Running Annual Average of TTHMs at the POE and in the Distribution System 2009 to 2018


12. Consumer Feedback

The City of Brantford currently has 34,375 metered customers. Table 1 is a Summary of Water Quality Inquires from 2009 to 2018. There has been a shift away from inquires related to iron, taste and odour in recent years. This can be attributed to upgrades at the WTP which target taste and odour producing compounds, as well as the replacement of cast iron watermains in the distribution system.

Throughout the years, water quality staff has found that in the vast majority of cases, the inquiries were localized to only one location on a street and not throughout the entire distribution system. Additionally, investigations by Water Compliance Division staff determined that none of the inquiries constituted a health-related risk to the residents.

<table>
<thead>
<tr>
<th>Type of Inquiry</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
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<td>Information Requests</td>
<td>46</td>
<td>8</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>19</td>
<td>18</td>
<td>6</td>
<td>11</td>
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<tr>
<td>Private Plumbing Issue</td>
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<td>26</td>
<td>26</td>
<td>23</td>
<td>50*</td>
<td>32</td>
<td>25</td>
<td>19</td>
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<tr>
<td>Iron</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>2</td>
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<td>2</td>
<td>3</td>
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<td>Cloudy Water</td>
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<td>6</td>
<td>4</td>
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<td>4</td>
<td>6</td>
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<td>2</td>
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<td>2</td>
<td>5</td>
<td>2</td>
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<td>4</td>
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<tr>
<td>Taste &amp; Odour</td>
<td>14</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>8</td>
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<tr>
<td>Chlorine</td>
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<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>94**</td>
<td>47</td>
<td>45</td>
<td>41</td>
<td>36</td>
<td>41</td>
<td>84</td>
<td>59</td>
<td>39</td>
<td>48</td>
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</table>

* Predominantly due to water softeners, water heaters and drain odours
** In 2009 an increase in Information Requests was due to a local media story regarding the sales tactics certain companies were using to sell unnecessary Point of Use treatment systems to residents.

13. Operational Performance

MECP Annual Inspection

The City of Brantford Water System scored 100% on the MECP Annual Inspection conducted in December 2018.

Chemical Usage and Costs

The City of Brantford Water System’s WTP is a complex process requiring the addition of chemicals at various stages. The Actiflo™ process which is the removal of dirt and debris via coagulation, flocculation and sedimentation requires the addition of a coagulant (SternPac) as well as a coagulant aid (Actiflo polymer) to assist in the treatment. For taste & odour control, ozone gas is used which is produced at the WTP from liquid oxygen (LOX).

There is a two-step process for the disinfection of drinking water at the WTP. Primary disinfection is achieved by the addition of chlorine gas to filtered water. After a sufficient amount of contact time to ensure the drinking water has been disinfected, ammonia gas
is then added. The addition of ammonia gas converts the free chlorine residual achieved through the primary disinfection process into monochloramine, which is a more stable form of disinfectant for the City’s distribution system.

A Residue Management Facility (RMF) is used to treat the waste generated during treatment so that it can be disposed in an environmentally sound manner. This treatment consists of concentrating the waste by gravity settler thickeners and belt filter presses. Polymers are added at both steps to assist in the processes. Table 2 outlines the water treatment chemical quantity and cost for 2018.

The total chemical cost per ML of water processed was $50.88 in 2018 which is a decrease of $36,980 or 11.32% from 2017.

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Quantity</th>
<th>Units</th>
<th>Total W/HST (1.76%)</th>
</tr>
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<tbody>
<tr>
<td>Actiflo Polymer</td>
<td>3,000</td>
<td>KGS</td>
<td>$9,616</td>
</tr>
<tr>
<td>Ammonia Gas</td>
<td>10,580</td>
<td>KGS</td>
<td>$61,367</td>
</tr>
<tr>
<td>Belt Press Polymer</td>
<td>2,000</td>
<td>KGS</td>
<td>$7,815</td>
</tr>
<tr>
<td>Chlorine Gas</td>
<td>65,318</td>
<td>KGS</td>
<td>$89,732</td>
</tr>
<tr>
<td>Chlorine Gas, 68 kg Cylinder</td>
<td>272</td>
<td>KGS</td>
<td>$1,373</td>
</tr>
<tr>
<td>Sulphur Dioxide Gas, 68 kg Cylinder</td>
<td>204</td>
<td>KGS</td>
<td>$1,017</td>
</tr>
<tr>
<td>Liquid Oxygen</td>
<td>262,235</td>
<td>M3</td>
<td>$47,685</td>
</tr>
<tr>
<td>Stern Pac</td>
<td>1,237,130</td>
<td>KGS</td>
<td>$426,517</td>
</tr>
<tr>
<td>Thickener Polymer</td>
<td>2,000</td>
<td>KGS</td>
<td>$6,411</td>
</tr>
<tr>
<td>25% Hydrofluorosilic Acid</td>
<td>23,100</td>
<td>L</td>
<td>$24,687</td>
</tr>
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</table>

Table 2: Water Treatment Chemicals Quantity and Cost in 2018

The decrease in chemical cost can be attributed to an operational focus of chemical optimization within the Water Operations Division. Extensive monitoring of all plant processes and adjusting chemical dosages to achieve optimal operational targets within the treatment process was achieved while reducing plant chemical usage.

Figure 4 illustrates that aside from an increase in chemical usage required during the upgrade of the WTP in 2009, the chemical cost per ML produced has steadily declined since 2009. The decrease can be directly related to optimization efforts by WTP staff.
An additional benefit contributed by a decrease in SternPac dosage is the decrease in the amount of sludge produced and required to be treated. Figure 5 represents the amount of sludge produced per ML. Since 2009 the amount of sludge generated has decreased due to the lower SternPac dosage. The City has seen a decrease of sludge disposal cost of over $100,000 from 2009 to 2018 due to the optimization of the SternPac dosage. The additional benefits experienced due to a smaller amount of sludge generated are:

- Decreased usage of RMF Thickener & Belt Press polymer
- RMF belt press required to be operated less frequently
- Reduced cost to haul sludge to the landfill for disposal

Less severe heavy rain events in 2018 contributed to lower turbidity in the raw water supply and a decrease in organic content. As a result of fewer storms and a decrease in bypass/spill events upstream, Stern Pac dose was decreased for removal of turbidity and organics. The decrease in Stern Pac dose combined with the decrease in solids resulted in lower sludge production in the Residue Management Facility in 2018.
Figure 5 – Sludge Produced per ML 2009 to 2018

Electrical Consumption

In early 2018 Water Operations Division engaged Brantford Power to assess its electrical consumption and billing. A work plan was created where 7 electricity meters located at the WTP would be rolled into one account with a primary meter installed at the property line. By installing a primary meter and using more than 10 Megawatt (MW) annually (which the site currently uses) the City would be able to take advantage of a provincial program whereas the City would be charged a Global Adjustment Rate based solely on its contribution to the top 5 peak electrical consumption hours in the province in a year. By changing how the WTP is billed there is potential for significant savings. The City’s WWTP joined this program in 2017 and saved roughly $300,000.

Figure 6 is the Electrical Usage (kwh) and Electrical Cost ($) to treat a Megalitre (ML) of drinking water from 2013 to 2018. In 2018 there was a slight decrease of energy usage over the last 5 years. This mainly can be contributed to the improve process awareness of which process use the most electricity (pumps, ozone, UV) and usage could be curtailed at certain times of day.
Maintenance - Treatment Plant, Reservoirs and Pumping Station

The Avantis work order system is used to monitor the maintenance of the City of Brantford Water Systems’ vertical infrastructure assets. Avantis is a software package used to understand asset utilization, performance, and availability, as well as the scope of the effort and costs incurred over time to maintain assets.

In 2018, 3835 work orders were filed in the Avantis Work Order System, 3523 for Preventative Maintenance (PM) (e.g., oil changes, equipment calibrations etc.) and 197 for Unplanned/Repair Work Orders. The majority of the unplanned work orders consisted of repairs to:

- Online analyzers (chlorine, turbidimeter, pressure sensors, ambient ozone sensors)
- Laboratory equipment (chlorine titrators, field kits)
- UV system
- Belt Presses (replacement of belts and augers)
- HVAC (air handling units, dehumidifiers, air conditioning)
- Ammonia system (sensor failure, pressure gauge replacement)
Table 3 is a summary of Avantis Work Orders from 2012 to 2018. 2012 was selected as a starting point since this was the year when the upgrade to the WTP was completed. The increase in PM work orders since 2012 was due to a better understanding of the maintenance requirements within the WTP process. Aside from a slight increase in 2014, the unplanned work orders make up 1/3 of the total work orders completed in a year. This indicates an effective PM program is in place.

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<td>Completed Work Orders</td>
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<td>2827</td>
<td>3621</td>
<td>3995</td>
<td>3899</td>
<td>4002</td>
<td>3835</td>
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<tr>
<td>Preventative Maintenance</td>
<td>1802</td>
<td>1981</td>
<td>2499</td>
<td>3105</td>
<td>3325</td>
<td>3637</td>
<td>3523</td>
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<tr>
<td>Unplanned/Repair Work</td>
<td>808</td>
<td>846</td>
<td>1122</td>
<td>890</td>
<td>574</td>
<td>365</td>
<td>197</td>
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</table>

Table 3 – Summary of Avantis Work Orders - 2012 to 2018

Distribution System Maintenance

Distribution service operators responded to 4276 service calls and complaints in 2018. Table 4 outlines the Distribution System Maintenance Program activities in 2018.

<table>
<thead>
<tr>
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<td>Main Breaks</td>
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<td>24</td>
<td>10</td>
<td>5</td>
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<td>Service Calls</td>
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<td>1949</td>
<td>2035</td>
<td>1851</td>
<td>1955</td>
<td>2891</td>
<td>3591</td>
<td>3474</td>
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<td>4276</td>
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<tr>
<td>Number of Valves Cycled (PM)</td>
<td>1769</td>
<td>1697</td>
<td>1939</td>
<td>1452</td>
<td>1574</td>
<td>818</td>
<td>1372</td>
<td>1690</td>
<td>1526</td>
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<td>Total Valves in System</td>
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<td>7642</td>
<td>7746</td>
<td>7776</td>
<td>7861</td>
<td>7956</td>
<td>7967</td>
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<td>8288</td>
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<tr>
<td>% Valves Cycled</td>
<td>23</td>
<td>22</td>
<td>25</td>
<td>19</td>
<td>20</td>
<td>10.3</td>
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<td>5</td>
<td>23</td>
<td>12</td>
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<td>Valve Box Replaced</td>
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<td>16</td>
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<td>Fire Hydrant - PM Check</td>
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<td>2629</td>
<td>1959</td>
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<tr>
<td>Total number of City and registered private condo hydrants</td>
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<td>N/A</td>
<td>N/A</td>
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</tr>
</tbody>
</table>

Table 4 – Distribution System Maintenance Program
Hydrant & Valve Maintenance

The Ontario Fire Code requires preventative maintenance to be conducted on each hydrant (total of 2,782) once per year. In 2018, preventative maintenance was conducted on each hydrant within the City of Brantford Water System.

The City of Brantford Water System has an objective to cycle 1200 ±400 valves per year. In 2018, 1,087 valves were cycled, meeting the cities best practice objective.

Water Meter Program

The Water Meter Replacement Program is designed to replace water meters before they start to create issues and maximize the accuracy of the meters in service to prevent loss of revenue. In order to achieve these objectives, most meters (25 mm and smaller) are replaced when they exceed 15 years of service. Additionally, meters with consumption greater than 3,000 cubic meters prior to the 15 years of service replacement, are likewise scheduled for replacement. Table 5 is a breakdown of 2018 service orders.

<table>
<thead>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of service orders</td>
<td>3469</td>
<td>3273</td>
<td>3625</td>
<td>4166</td>
<td>4232</td>
<td>3244</td>
<td>3121</td>
<td>1475</td>
<td>3627</td>
<td>3693</td>
</tr>
<tr>
<td>Total number of Meters in the system</td>
<td>NA</td>
<td>32,096</td>
<td>32,334</td>
<td>32,571</td>
<td>32,896</td>
<td>33,276</td>
<td>33,588</td>
<td>33,897</td>
<td>34,109</td>
<td>34,375</td>
</tr>
<tr>
<td>Total meters replaced</td>
<td>1988</td>
<td>1939</td>
<td>2151</td>
<td>2340</td>
<td>2451</td>
<td>2184</td>
<td>1814</td>
<td>910*</td>
<td>2186</td>
<td>2054</td>
</tr>
<tr>
<td>New installations</td>
<td>282</td>
<td>330</td>
<td>317</td>
<td>440</td>
<td>389</td>
<td>264</td>
<td>337</td>
<td>457</td>
<td>318</td>
<td>295</td>
</tr>
<tr>
<td>Large ICI meters calibrated by 3rd Party</td>
<td>26</td>
<td>28</td>
<td>24</td>
<td>32</td>
<td>36</td>
<td>32</td>
<td>34</td>
<td>43**</td>
<td>43</td>
<td>46</td>
</tr>
</tbody>
</table>

Table 5 - Meter Maintenance Program

** In 2016 large water meters calibration /repair frequency was changed from every 2 years to annually to improve accuracy of meter readings

Summary of Bi-Annual Flushing Program

The Bi-Annual Flushing Program is performed every spring and fall. The program is designed to help reduce biofilm and sediment from watermains, primarily on dead-end mains that experience limited flows under normal operating conditions. Also, during the planning of new watermains and road reconstruction, every effort is made to try and eliminate dead-end watermains, and properly size the mains to help reduce the potential for water quality concerns.

In 2018, 324 locations were flushed. A significant change in 2018 was that all of the field results were compiled electronically in the field rather than completing forms and then being inputted into spreadsheets later. This saved significant time and cut down the
number of data entry errors since conditional formatting was utilized in the data entry spreadsheets.

Summary of Scheduled Flushing Program

Scheduled flushing was performed at 17 locations in the distribution system. Of these, 17 locations have been identified as possible candidates for experiencing problems maintaining acceptable chlorine residuals due to dead-ends or low water usage which could result in a non-compliance report to the BCHU and the MOECC.

All of the 17 locations are checked and tested at least once a month. 1 location is continuously running, 12 locations have automated flushing devices that run at least twice a week, and the remaining 4 locations are manually flushed every week by distribution staff. Automated flushing devices have been found to be the preferred method for handling this problem, but not all locations are suitable candidates. Each location is reviewed annually in an attempt to minimize water loss, as a result of flushing.

Private Lead Water Service Line Replacements

In August 2017, Council approved the City’s Lead Reduction Plan (LRP) eligible property owners can receive a grant of up to $1,000 and a loan of up to $3000 per property to replace their lead water service. In February 2018, the LRP was fully implemented. In 2018, 60 private lead water services were replaced as part of the LRP.

Unaccounted For Water

The % unaccounted for water is the difference between the annual volumes of water produced and the amount of water accounted for through billing, metering and estimation. Sources of unaccounted for water include water losses as the water travels through the distribution system such as watermain and service leaks.

A well-maintained distribution system will have a low percentage, 10% being considered very good in the water industry. Figure 7 represents the % unaccounted water from 2009 to 2018. After two years of being above the industry standard of 10% the % unaccounted water for 2018 has dropped to 8.47%.
14. Staff Suggestions

Emergency Training Exercises

Since emergency situations occur infrequently, staff has recognized a need to have hands-on training. The goal in 2019 will be to continue to provide hands-on training exercises for both treatment and distribution staff.

Shift from Paper to Electronic

Water System staff in both the Water Operations and Water Distribution & Wastewater Collection Divisions has expressed the numerous advantages from shifting from paper to electronic. Ideally, access to SOPs, forms, spreadsheets and eventually work order system via handheld devices (tablets, etc.) would improve efficiency, as well as decrease transcription errors. Water System staff has worked with the City’s IT Division to identify and purchase hardware such as laptops and tablets.

In 2019 the SharePoint site on CityNet will continue to be developed and implemented which will house all DWQMS documentation as well as each Division’s SOPs, forms and work instructions. Electronic access to each Division’s documents will allow staff to easily and quickly access important information as well as the on-call schedule. It is anticipated in late 2019 a new work order system will be implemented for the Water Operations Division and Water Distribution & Wastewater Collection Divisions which will reduce the amount of paper documentation currently required. The Water Operations Division is planning on upgrading its wireless connectivity throughout the WTP so the
use of handheld devices can be utilized for work order completion and data entry by operations and compliance staff.

**Training**

Under O.Reg 128/04, each MECP licensed City of Brantford Water System employee is required to be provided with training hours based on the classification of the system the employee works in. City of Brantford Water System employees working in our Class 4 WTP are required to obtain 150 hours during a 3 year period whereas staff working in our Class 3 Distribution System require only 120 hours.

Staff has suggested that they would like to be able to access personnel training records more readily to ensure they will be able to meet the training requirements under O.Reg 128/04. Also, staff has suggested that they would like more input into the courses in which they are enrolled. To facilitate these requests, each Division has assigned staff to monitor and maintain training records, as well provide staff with information from approved training suppliers. In 2019, the goal will be to develop a more user friendly Training Record database to allow for staff training records to be easily accessed and ensure training records are detailed and accurate.

**15. Changes that Could Affect the QMS**

**DWQMS 2.0 Conformance**

Released in March 2018, DWQMS 2.0 had two major revisions effecting Element 7 – Risk Assessment and Element 21 – Continual Improvement. The changes to Element 7 required the Operational Plan to document a process to evaluate MOECC document “Potential Hazardous Events for Municipal Residential Drinking Water Systems to Consider in the DWQMS Risk Assessment”.

Element 21 was revised to include a review of best management practices from reputable agencies like the MECP or American Water works Association (AWWA) every 36 months. It also required a document process to address non-conformities or potential non-conformities. The 2019 Internal Audit and external audit will evaluate the City’s conformance with DWQMS 2.0 focusing on Elements 7 and 21.

**Completion of New Environmental Services Building on WTP Site**

In early 2019 the Environmental Services Administration Building was completed at the WTP. This building will house the following City departments:

- Environment Services (Technical Services, Wastewater Compliance and the Water Distribution & Wastewater Collection Division)
- Facilities & Asset management
- Engineering (Construction Inspectors/Operators)
With the additional staff being stationed to the site SOPs will be required and staff trained ranging in topics from health & safety to parking and after-hours access to the site. This will be an ongoing process over the next 6 months to 1 year as processes are defined within the building.

16. The Resources Needed to Maintain the QMS

CityNet Site Development

The City of Brantford Water System Information System was created to function primarily at the WTP. This application although being simple needs to be upgraded since it requires significant manual entry and manipulation of information. Since late 2017, staff within the Water Operations and Water Distribution & Wastewater Collection Divisions has been working with IT and Continuous Improvement (CI) to develop a SharePoint site on the City’s internal website – CityNet. When completed, each Division’s site will house QMS and Divisional SOPs and forms along with applicable regulation and reference documents. It is anticipated to have the sites implemented by the end of 2019.

Training Tracking & License Renewal

Currently Water Operations and Water Distribution and Wastewater Collection Division use either a database or excel spreadsheets to track staff training requirements outlined in O.Reg 128/04 and 129/04. Although the system works, it is has its shortcomings. Searching through the system to find when staff last took a course is a manual process. Each staff’s training record has to be manually opened and searched to find the when the course was last taken. This is critical for courses with expiry dates like confined space entry or first aid training. City staff has seen a demo of a software package currently used by the Province of Alberta to track water and wastewater operators training requirements. This software was specially designed to meet the regulatory needs required under O.Reg 128/04 and 129/04. Implementation of this type of software will assist with the development of training matrices for each position as well as assist in the Operator license renewal process.

QMS Representative

In 2018, the Coordinator, Water Operations and the Technical Analyst, Water Distribution and Wastewater Collection were appointed QMS Representatives. Both of these positions have other primary responsibilities which require the majority of their time. Other municipalities of Brantford’s size have dedicated staff working on their DWQMS program and other QMS related tasks. The benefits of expanding aspects of a QMS into other areas of the Environmental Services Department (Solid Waste, Wastewater Treatment, and Technical Services Divisions) would be beneficial. A QMS “champion” for Environmental Services could work with other divisions to develop a program and work with the existing DWQMS to refine and improve the system.