
TO: GENERAL COMMITTEE

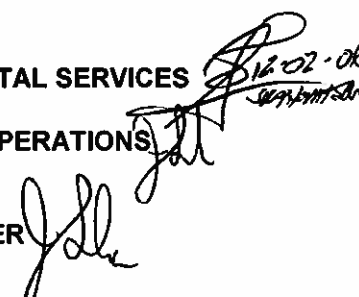
SUBJECT: 2011 WATER OPERATIONS BRANCH ANNUAL REPORT, SUMMARY REPORT AND MANAGEMENT REVIEWS

PREPARED BY AND KEY CONTACT: S. BRUNET, B.SC., MANAGER OF WATER OPERATIONS EXTENSION 4866

SUBMITTED BY: J. THOMPSON, P.ENG., DIRECTOR OF ENVIRONMENTAL SERVICES

GENERAL MANAGER APPROVAL: JIM SALES, GENERAL MANAGER OF COMMUNITY OPERATIONS

CHIEF ADMINISTRATIVE OFFICER APPROVAL: JIM SALES, ACTING CHIEF ADMINISTRATIVE OFFICER



Handwritten signatures and initials are present on the right side of the document, including a signature that appears to be 'J. Thompson' and another that appears to be 'Jim Sales'. There are also some handwritten notes and dates, such as '2/27/12' and '06'.

RECOMMENDED MOTION

1. That Staff Report ENV0003-12 concerning the 2011 Municipal Summary Report and Annual Drinking Water System Report regarding the City of Barrie's Drinking Water system be received for information purposes.
2. That the Water Operations Branch Annual Report for 2011 be received for information purposes.
3. That the Water Operations Branch Management Reviews, dated December 6, 2011 and December 21, 2011 be received for information purposes.

PURPOSE & BACKGROUND

4. The purpose of this Staff Report is to apprise Council of the operational and compliance status for the 2011 reporting year of the City of Barrie Drinking Water System and to solicit from Council an acknowledgement of their receipt and understanding of this Report.
5. There are 2 specific reporting requirements related to the Drinking Water Systems Regulation (O.Reg. 170/03) under the Safe Drinking Water Act (SDWA).
 - a) Section 11 requires an annual drinking water system report be prepared not later than February 28th of each year. This Report provides a brief description of: the drinking water system; chemicals used; a breakdown of monetary expenses related to required equipment; a summary of all test results; and a summary of adverse reports and corrective actions taken. In addition, this report entitled '2011 Drinking Water System Report' must be available to the public upon request and be posted on the City of Barrie website.
 - b) Schedule 22 requires a Municipal Summary Report be prepared not later than March 31st of each year and a copy forwarded to members of Municipal Council. This report lists the non-compliances in respect to the SDWA, the Drinking Water System Regulation, the Municipal Drinking Water License, Drinking Water Works Permit and orders applicable to the drinking water system received and the corrective measures that were taken in respect to the non-compliances. In addition, it summarizes the quantities and flow rates of the water supplied during the reporting year, including monthly average and maximum daily flows along with a comparison to rated capacities.
6. In addition, under the Drinking Water Quality Management Standard, there is an obligation for the Operating Authority to communicate the results of Management Reviews, the adequacy of the

infrastructure necessary to operate and maintain the drinking water system, and infrastructure maintenance programs to the Owner.

7. The Municipal Summary Report and Annual Drinking Water System Report, and details regarding Management Review, infrastructure adequacy and maintenance programs are components of a larger more comprehensive report entitled the Water Operations Branch Annual Report, a copy of which can be found in the Councilors' Lounge for review. A copy of the Executive Summary found in the Water Operations Branch Annual Report is attached as Appendix A of this staff report.

ANALYSIS

8. The City of Barrie drinking water system consists of a new Surface Water Treatment Plant (SWTP) and associated Low Lift Pumping Station (LLPS), 12 ground water wells, 2 in-ground storage facilities, 3 elevated storage reservoirs and 6 booster stations, distribution water mains and associated hydrants and valves in 5 pressure zones throughout the city.
9. Source water from the SWTP is drawn from a depth of approximately 22m from Kempenfelt Bay. The intake is situated on the south west side of Lake Simcoe, where lake water is conveyed through the LLPS and pumped up to the plant for treatment. Water is supplied from ground water system relies on wells drilled into a deep aquifer that is not under the direct influence of surface water.
10. The new Surface Water Treatment Plant provides water to Barrie's south end. Its regulatory approved treatment process employs primary screening, flocculation, ultra-membrane filtration and granular activated carbon contactors (for taste and odour control) followed by disinfection using chlorine gas. Treatment at each of the well stations consists of iron sequestration by addition of sodium silicate and disinfection with chlorine gas (and in one case, ultraviolet disinfection). The two systems effectively operated as separate entities with provision for emergency backup augmentation. Key processes within the water supply, treatment and storage facilities are continually monitored, recorded and alarmed through the SCADA (Supervisory Control and Data Acquisition) system.
11. The distribution grid consists of approximately 3660 hydrants and approximately 620 km of water main and transmission main ranging from 150mm to 1200mm in size serving approximately 43,000 services providing water to approximately 140,000 customers.
12. The total annual production volume for 2011 was 14,446,937 m³ with an average day flow of 39,580 m³ and a maximum day flow of 65,180 m³ in the month of July.
13. The Ministry of the Environment (MOE) inspection, conducted yearly, has been conducted in January/February 2012 for the 2011 operational year. The primary focus of this inspection is to confirm compliance with the MOE legislation and control documents as well as conformance with the MOE drinking water related policies for the inspection period.
14. The 2010 MOE inspection identified 2 non-compliances; the lack of maintenance of distribution chlorine residuals to regulatory limits and missing turbidity's for monthly grab samples for 4 wells. Corrective actions included modifying the existing Flushing Program and altering the turbidity sample points to better reflect system samples.
15. Under the Water Operations Branch Quality Management System (QMS) Top Management (Water Operations Branch Management Team) is responsible for ensuring that a Management Review is conducted at least once every twelve months. This continual improvement process is a requirement under the Drinking Water Quality Management Standard (DWQMS) with the objective of identifying deficiencies and establishing action plans to address those deficiencies.

16. Management Reviews were conducted December 6, 2011 and December 21, 2011. The following results are based on data up to and including December 21, 2011.
- i. The alterations made as a result of the 2010 MOE Inspection Report has reduced turbidity measurement levels by approximately 40% and low chlorine residual events by approximately 76%.
 - ii. With respect to infrastructure, in 2011, the Surface Water Treatment Plant (SWTP) and Automated Meter Reading Infrastructure (AMI) were commissioned in August 2011 and October 2011 respectively; Heritage Well #11 upgrades were completed with the well being commissioned in November; Perry Street Well #4A design was completed; and the Sunnidale Reservoir design was completed and the construction project was awarded.
 - iii. Under the Swabbing and Flushing Programs the total system was flushed as per the maintenance schedule and to prepare for the change over from ground water to surface water. This resulted in less customer complaints and water quality issues than originally anticipated and demonstrated a 28% reduction from 2010.
 - iv. There were twelve (12) Adverse Water Quality Incidents; the result of mechanical and communications failures, sampling error, and the inadequate quality of newly installed infrastructure.
 - v. Raw water and drinking water quality trending revealed no major changes from 2010. The SWTP requires a full year with seasonal changes in order to establish baseline patterns and trends with respect to raw water quality. The addition of surface water to the south end has reduced concentrations of a number of parameters that will assist in maintaining regulatory compliance and customer satisfaction in that service area.
 - vi. There were no Permit to Take Water exceedences. The SWTP treated versus raw volume averaged 97.6% efficiency for water drawn and should meet the 98% design target as operating time increases.
 - vii. With 8,958 ground water system scheduled maintenance events (308% of 2011 target) being realized, the number of unscheduled repairs met the reduced target at approximately 507 events.
 - viii. There has been a 38% increase in main breaks over 2010 with potential causes being temperature fluxuations, contractor work as well as aging infrastructure. Curb box and valve maintenance and repairs achieved only 26% of the 2011 target as a result of staff resource shortfalls.
 - ix. Four (4) backflow events were identified through the Automated Meter Reading Program (AMI) however, when investigated it was determined that it was related to meter alignment only.
 - x. Meter reading data for 2011 was a combination of billing contractor data to September 30th and AMI data from October 1st. In the months of June to September the billing contractor had estimated the meter readings which introduced inaccuracies to the water loss statistics. 2011 analysis showed an estimated 6.3% water loss from the system (ie unaccounted for water). This is well below the industry allowable standard of 10% water loss. In 2012, the AMI Program should assist with improving this accuracy and confidence level.
 - xi. Administrative staff resolved 586 customer complaints over the phone while an additional 369 required further action. This equates to an average of approximately 31 customer complaints per month (requiring service calls) demonstrating an unanticipated decrease of 29.2% from 2010.
 - xii. The addition of the SWTP to the drinking water system required a more comprehensive Risk Assessment to be conducted in September, October and November of 2011.
 - xiii. An emergency mock scenario was conducted in December of 2011. The test scenario mimicked an Infrastructure Failure leading to an Adverse Water Quality Incident. The scenario had the infrastructure failure occur concurrently with a fire fighting event and a report of an unconfirmed backflow incident. The resulting debrief yielded seven (7) recommendations that are currently being addressed.

- xiv. Three (3) Internal Audits were conducted yielding six (6) Non-Conformance Reports (NCR's) and two (2) Corrective Action Reports (CAR's). These numbers have decreased from the 2010 audit year where 13 non-conformances and 4 corrective actions were issued. The Operational Plan submission, as required for the 2011 Surveillance Audit, was submitted to the External Auditor on September 2, 2011. Despite further requests for information, there has been no report issued from the External Auditor to date.
 - xv. Through the audit process it was identified that a corrective actions, including NCR's and CAR's, were not being addressed in a timely fashion. The QMS Program Work Plan demonstrates the need for three (3) fulltime staff solely to maintain the QMS Program. With no staff resource requested increases being approved and the additional projects in 2011, a number of QMS items did not get completed including actions required to close NCR's and CAR's. The QMS Program work flow and work plans will be monitored and adjusted accordingly in 2012 to ensure that improvements are realized or to identify required resources.
 - xvi. Through the staff suggestion box, crew meetings and General Staff Meetings, staff suggested ways to improve communications within and between the Sections of the Branch; provided ideas for health and wellness opportunities; and requested an explanation for the term QA/QC and how it relates to the Water Operations Branch day to day work.
17. Copies of the Ontario Drinking Water Systems Regulation 170/03; the City of Barrie Municipal Drinking Water License, Drinking Water Works Permit and Permit to Take Water; the 2011 Drinking Water System Report and the 2011 Municipal Summary Report; the Water Operations Branch Management Review meeting minutes and a copy of this Staff Report have been attached as Appendices to the Water Operations Branch Annual Report to be presented to Council.

ENVIRONMENTAL MATTERS

18. There are no environmental matters related to the recommendation other than regulatory compliance.

ALTERNATIVES

19. As this Report is being presented for information purposes only, no alternatives are presented.

FINANCIAL

20. There are no direct financial implications associated with the recommended motions.

LINKAGE TO COUNCIL STRATEGIC PRIORITIES

21. The recommendation included in this Staff Report is not specifically related to any of City Council's Strategic Priorities but is a requirement of ongoing service delivery.

APPENDIX "A"

Executive Summary

In 2011, 14,446,937m³ of drinking water was produced and distributed so the City of Barrie residents could turn on their faucets to drink, bathe, cook, wash their clothes and water their lawns. Using the average volume of a household swimming pool to be 20,000 gallons, this amounts to approximately 189,000 swimming pools full of water that the Water Operations Branch pumped, treated and distributed in 2011.

Notwithstanding the operational and maintenance work required to produce this volume of potable water, the 60 fulltime staff of the Water Operations Branch were able to commission the Surface Water Treatment Plant and Automated Meter Reading Infrastructure in August 2011 and October 2011 respectively; commission Heritage Well #11 in November 2011; move staff, supplies and equipment from the Operations Centre on Ferndale Drive to their new home at 20 Royal Parkside Drive in June 2011, all while maintaining compliance and conformance with the various regulations that drinking water systems are subject to.

The City of Barrie Drinking Water System is comprised of the Surface Water Treatment Plant (SWTP) and associated Low Lift Pumping Station (LLPS), 12 ground water wells, 2 in-ground storage facilities, 3 elevated storage reservoirs and 6 booster stations that provide treatment, storage and pressures for firefighting purposes. 620 km of water main deliver water through 5 pressure zones to 43,075 services that provide water to approximately 140,000 customers whose consumption is monitored by water meters.

The total annual production for 2011 was 14,446,937 m³, a negligible decrease from 2010 with the average daily flow being 39,580 m³ and a peak day flow of 65,180 m³ in the month of July. It has been estimated that, of the total water produced, 5.74% was used for non-metered functions.

As of November 2011, the total cost to operate the City of Barrie Municipal Drinking Water System was approximately \$1000.00/ML with 82.7% of the projected budget being spent and 95.1% of the projected rate revenues being collected. This allowed for the transfer of approximately \$3, 644,150 to the Water Rate Reserve Fund.** This amount is down from 2010 due to the change in Corporate Overhead expense tracking.

As expected, the 2011 operating budget for the Surface Water Supply Section was under spent as the major expenses (hydro and chemical costs) associated with running a treatment plant of this size are directly related to the operation of the plant which only operated for over 4 months of 2011. Approximately 45% of the budget was spent which coincides well with the amount of time running for 2011 of approximately 35%. The additional 10% can be attributed to the time spent commissioning as the plant ran regularly at a significantly reduced flow rate.

The Ground Water Supply Section spent 95% of its budget. Over expenditures in equipment repairs and external rental costs were associated with the increased preventative maintenance performed in 2011. With 8,958 ground water system scheduled maintenance events (308% of 2011 target) completed, the number of unscheduled repairs met the reduced target at approximately 507 events. Overtime expenditures were associated with preparing the system for the change over from ground water to surface water. A total system flushing occurred during normal working hours and after hours resulting in 28% less customer complaints and water quality issues than originally anticipated. Utilities and hydro over expenditures were associated to the late commissioning of the SWTP.

Distribution crews repaired 52 main breaks, representing a 38% increase from 2010, at an average cost of \$4550.00 per main break and to protect against subsurface infrastructure damage 8064 locates were performed representing an increase of 10.5% from 2010. The maintenance demands of the distribution system resulted in 123% expenditure to forecasted budget outcome. The increase in main breaks (including a \$250,000 break on the largest transmission main), the commissioning of linear infrastructure, aging infrastructure and staffing shortages contributed to overtime, asphalt sand & gravel, field supplies and contractor over expenditures.

Water Customer Services completed the implementation of the new AMI (Automated Meter Infrastructure) Program in 2011. The tight timelines and large amount of work required to complete this project lead to a 105.8% expenditure to forecast result. The majority of the expenditure occurred in overtime spending as staff installed and programmed over 2,500 SmartPoint transmitters in ICI applications as well as responded to troubleshooting requests associated with the 40,000+ residential installations completed by City contractors. Staff completed 4561 service calls representing a 16.3% increase from 2010.

Approximately 2505 samples were taken for analysis and used to assess system performance and develop corrective actions. 99.9% of all samples met regulatory compliance.

Twelve (12) non-compliances were logged that were centered around the consequences of equipment failures, procedures and process breakdown, inadequate quality of newly installed infrastructure and SCADA communications failures.

The Operational Plan submission, as required for the 2011 Surveillance Audit, was submitted to the External Auditor for re-accreditation on September 2, 2011. Staff have incorporated the SWTP into the Operational Plan, are trained and are ready for the next site audit. Staff have dedicated a significant amount of time and effort into achieving this higher level of standard and are well prepared to handle the challenges ahead in continually improving upon this standard.

Management Reviews are a requirement of the Quality Management System and assist in identifying deficiencies and establishing action plans. Management Reviews were conducted in December of 2011, the results of which can be reviewed in the *Year in Review* Section of this report.

At the time of the writing of this report, the annual Ministry of the Environment (MOE) inspection was being conducted and hence the final inspection rating for 2011 is not available.

The development, implementation and continual improvement of processes and projects within the Water Operations Branch are driven by the following 5 priorities:

1. ***To ensure the delivery of Safe Drinking Water that meets or exceeds regulatory requirements.***
2. ***To ensure the delivery of Safe Drinking Water that meets or exceeds expectations and promotes customer confidence.***
3. ***To employ and retain a respectful, competent, motivated and adaptive workforce that is dedicated to teamwork, continual learning and improvement for the long term.***
4. ***To continually improve operational performance in a timely, sustainable and cost effective manner.***
5. ***To maintain an effective balance between expenditures and revenues.***

A review of these priorities and associated programs and projects completed in 2011 can be found in the *Year in Review* Section of this report.

****References to budget are based on budget values as presented in the November 2011 Summary Operating Reports.**