



**2015
Public Water Supply
Annual Report**

**City of Brandon
Engineering Services & Water Resources
Brandon, Manitoba**

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1.0 Introduction

The City of Brandon Water Supply System is pleased to present to you this year's Annual Report. This report is to inform you about the quality of water services we deliver to you every day. Our goal is to provide you with a safe and dependable drinking water supply and we want you to understand the efforts we make to continually improve the water supply system.

The City of Brandon (the City) owns and operates its public water supply system and it is regulated by Manitoba Conservation and Water Stewardship to produce potable water under the *Drinking Water Safety Act*. The act and supporting regulations can be viewed at the following website; (<http://www.gov.mb.ca/waterstewardship/odw/reg-info/acts-regs/index.html>). In accordance with the *Drinking Water Safety Act*, our water supply system operates under a provincial licence. The operating licence has a five-year term and prescribes the terms and conditions required in order for the utility to remain in compliance with the Act.

The Senior Regional Drinking Water Officer conducted his 2015 annual compliance audit of our water supply system. The purpose of this audit was to confirm compliance with *The Drinking Water Safety Act*, applicable regulations, and the terms and conditions of our licence.

This annual report will cover all compliance and non-compliance issues within the regulations and will discuss any corrective actions required to bring non-compliance issues within compliance as per the regulations.

2.0 Description of the Water System

The City's Water Supply System provides potable water to over 46,000 residents. The treated water that our water system produces has a defined number of parameters that are used to establish and monitor potable water quality. These parameters are to be in compliance with the Province of Manitoba *Drinking Water Quality Standards Regulation* under the *Drinking Water Safety Act*.

2.1 Water Treatment Source Water Supply

The City's water treatment facility draws its source from the Assiniboine River. The Assiniboine's flow is controlled by the Shellmouth Dam located north of Russell, Manitoba. Major contributories to the Assiniboine River are the Qu'Appelle River from Saskatchewan, and the Little Saskatchewan River from the north with dams at Minnedosa, Rapid City, and Rivers, Manitoba.

Water flows from the Assiniboine River to the intake wells through four gates located in the intake structure on the river bank. From these gates the water flows into two separate intake chambers and then through 1500 mm pipes from each chamber to a central circular well. From the circular well the water flows through a 1500 mm pipe approximately 300 meters to the raw water wells located inside the water treatment facility.

Potassium permanganate and activated carbon are added to the raw water to help reduce taste and odor producing compounds during the spring and summer months.

2.2 Water Treatment Process

Our water treatment facility utilizes a conventional water treatment process. We practice multiple barrier concepts as the guiding principle for providing safe drinking water. Low lift pumps deliver the raw water directly to three solid contact units inside the water plant. These units have a nominal design capacity of 54 Mega liters a day. The two smaller process trains each have a nominal design capacity of 13.6 Mega liters a day. The largest process train has a nominal design capacity of 27.2 Mega liters a day. Each process train combines the functions of solids contacting, mixing, coagulation, flocculation, solids water

separation and sludge removal inside a single tank. Alum and polymers are added at the low lift pumps for flocculation and coagulation. Lime and soda ash are added into the solids contact units to soften the water.

Chemicals are added to the solids contact units by feed pipes from the various chemical feed systems. These pipes extend down into the reaction zone of the solids contact units. The excessive sludge that is formed settles and is removed from the process by blow down valves at the bottom of each of these units. This sludge goes to a receiving station where the heavier particles settle to the bottom and the clear water overflows a weir and goes back to the river. The heavier sludge is pumped to a gravity thickener inside the sludge plant where it is mixed with anionic and cationic polymers, then pumped onto belt presses where the water is separated via the belt presses. The dried sludge from the water treatment facility is transported and used on farmers' fields for soil conditioning purposes. Approximately 45 tonnes of sludge is removed per day.

Following the softening process carbon dioxide is diffused through the water in a re-carbonation basin to control the pH level in the water so that it is suitable for human consumption and provides corrosion control for pipes. The stabilized water from the recarbonation unit flows through 16 rapid sand filters into clearwell storage located inside the water treatment facility. Before the finished water is pumped to the distribution system, chlorine is added to the water for disinfection and fluoride is added for tooth protection. To provide an extra measure of safety, all of our potable water is disinfected with ultraviolet light before it is distributed to our consumers.

2.3 Distribution System

The high lift pumps at the water plant convey water to the distribution system and the 9th Street Reservoir. The pumps at the reservoir force the water into the main distribution system. There are also two transfer pumps inside the water plant that can pump directly to the reservoir, bypassing the distribution system. These pumps also act as a backup for the high lift pumps. The reservoir also acts as a short term water reserve for the city if additional water demand is required. There are four booster stations located on the distribution system which help to maintain constant water pressure throughout the City.

2.4 Groundwater Supply

The City maintains two emergency supply wells along the Assiniboine River Valley. These wells were completed in 1996 in order to provide the City with a short-term emergency back-up source of water supply in the event the Assiniboine River source becomes temporarily interrupted. Although the annual groundwater withdrawal is limited, since 2011, we have been using these wells to blend with the river source during spring runoff and other periods when the river turbidity is high or the quality is poor from elevated organic carbon and hardness.

3.0 Water Quality Standards

In 2015, our City has the following regulatory requirements in regards to monitoring and reporting of the water standards stated in the water supply operating licence.

3.1 List of Water Quality Standards

The Province of Manitoba has adopted a number of health based parameters and we are required to operate our water system in a manner that achieves the water quality/treatment standards specified in Table 1:

Table 1. Water Quality Standards

Parameter	Quality Standard
Total coliform	Less than one total coliform bacteria detectable per 100 mL in all treated and distributed water
E.coli	Less than one E. coli bacteria detectable per 100 mL in all treated and distributed water
Chlorine residual	<ul style="list-style-type: none"> • A free chlorine residual of at least 0.5 mg/L in water entering the distribution system following a minimum contact time of 20 minutes • A free chlorine residual of at least 0.1 mg/L at all times at any point in the water distribution system
Ultraviolet Disinfection	<ul style="list-style-type: none"> • 95% of the volume of water produced per month is disinfected within validated conditions
Turbidity	<ul style="list-style-type: none"> • Less than or equal to 0.3 NTU in 95% of the measurements in a month of the effluent from each operating filter • Not exceed 0.3 NTU for more than 12 consecutive hours of filter operation • Not exceed 1.0 NTU for any continuous measurement
Total trihalomethanes (THMs)	Less than or equal to 0.10 mg/L as locational running annual average of quarterly samples
Arsenic	Less than or equal to 0.01 mg/L
Benzene	Less than or equal to 0.005 mg/L
Fluoride	Less than or equal to 1.5 mg/L
Lead	Less than or equal to 0.01 mg/L in the water distribution system
Nitrate	Less than or equal to 45 mg/L measured as nitrate (10 mg/L measured as nitrogen)
Trichloroethylene	Less than or equal to 0.005 mg/L
Tetrachloroethylene	Less than or equal to 0.03 mg/L
Uranium	Less than or equal to 0.02 mg/L

3.2 Water Quality Standards Results

3.2.1 Bacterial

As indicated in Table 1 the Manitoba Water Stewardship directive on regulatory information for public water systems, requires less than one Escherichia Coli (*E. coli*) per 100 milliliter sample of water and less than one Total Coliform per 100 milliliter sample of water collected on the water distribution system.

Our water treatment staff collects weekly water samples from the Assiniboine River, the laboratory tap in the water treatment facility and 13 separate locations throughout the entire city. In 2015 there were over 676 routine tests performed for total coliform and *E. coli* from the city's water distribution system. There was no presence of bacteria in the test results, which met with the provincial regulation.

3.2.2 Disinfection

On Monthly Disinfection Report forms our water treatment operators must record and report the results of their disinfection monitoring to the Senior Regional Drinking Water Officer. Corrective Action Report forms must also be completed in instances where adequate chlorine residuals are not being met.

The minimum chlorine residual entering the distribution system following at least 20 minutes of contact time at our water treatment facility is 0.5 mg/L. The chlorine residuals at the water treatment facility have been controlled to ensure that we meet this requirement. This is extremely important in order to disinfect our water against bacteria and viruses. Chlorine residuals are also maintained throughout the distribution system to ensure adequate disinfection. It is continuously monitored and controlled by an online analyzer on the treated water leaving the facility to keep enough chlorine in the water to safeguard against viruses and bacteria. Every week our staff tests the water for chlorine residual at each of the sample locations. The utility is required to maintain the distribution free chlorine residual over 0.10 mg/L. With over 780 free chlorine samples collected this monitoring process allows for the chlorine dosage to be optimized. All of the free chlorine sample results were above 0.10 mg/L, which met the provincial chlorine residual standard in 2015.

To guard against an outbreak of *Giardia lamblia* and *Cryptosporidium*, our water treatment facility practices a multi-barrier approach utilizing coagulation/filtration along with chlorination and ultraviolet disinfection of the water before it leaves the facility. The water treatment facility's ultraviolet light (UV) disinfection equipment and controls must be maintained to achieve results greater than or equal to 95% of the water produced per month undergoing UV light disinfection within validated conditions and at a minimum dose of 24 mJ/cm². In 2015, the water treatment plant has been operating and maintaining the ultraviolet disinfection systems as required by our regulators. Regular monthly ultraviolet disinfection reports are submitted to the Office of Drinking Water.

3.2.3 Physical

Our water supply system has to meet specific turbidity standards and insure that appropriate monitoring and reporting programs are in place to demonstrate compliance with the standards. The water treatment facility has 16 rapid sand filters, each with online turbidity instruments that measure the turbidity continuously. These readings are recorded on trend charts and spreadsheets on the computer system every five (5) minutes.

The turbidity standard readings of the water leaving the filters are to be less than or equal to 0.3 turbidity units (NTU) in 95% of the measurements in a month, not to exceed 0.3 turbidity units for more than 12 consecutive hours of filter operation and not to exceed 1.0 NTU for any measurement. All of our water treatment filters met the turbidity water quality standard in 2015. The results of the readings are reported to the Senior Regional Drinking Water Officer on a monthly basis.

3.2.4 Chemistry

The annual audit report indicates chemical results from treated water met the water quality standard with the exception of trihalomethanes (THMs). The 2015 results are summarized in Table 2 and Table 3.

Table 2. Treated Sample Results

Parameter	Water Quality Standard	*Blended Source Water	*Civic Works
Arsenic	Less than or equal to 0.01 mg/L	0.0151 mg/L	0.00506 mg/L
Benzene	Less than or equal to 0.005 mg/L	Less than 0.00050 mg/L	Less than 0.00050 mg/L
Fluoride	Less than or equal to 1.5 mg/L	0.170 mg/L	0.625 mg/L
Lead	Less than or equal to 0.01 mg/L in the water distribution system	0.000694 mg/L	0.000199 mg/L
Nitrate	Less than or equal to 45 mg/L measured as nitrate (10 mg/L measured as nitrogen)	0.885 mg/L	1.21 mg/L
Trichloroethylene	Less than or equal to 0.005 mg/L	Less than 0.00050	Less than 0.0005 mg/L
Tetrachloroethylene	Less than or equal to 0.03 mg/L	Less than 0.00050	Less than 0.0005 mg/L
Uranium	Less than or equal to 0.02 mg/L	0.00276 mg/L	0.00015 mg/L

Note: Results from treated samples at Civic Works location on March 31, 2015 with river source having approximately 44% blend of groundwater.

Table 3. THMs

Date	Sample Location					
	Water Plant (mg/l)	Chalet (mg/l)	Waverly (mg/l)	Civic Works (mg/l)	River Heights (mg/l)	Limit (mg/l)
Feb 4, 2015	0.05	0.07	0.11	0.09	0.10	0.10
May 4, 2015	0.05	0.09	0.11	0.11	0.09	0.10
Aug 6, 2015	0.09	0.14	0.17	0.18	0.15	0.10
Nov 10, 2015	0.07	0.13	0.15	0.14	0.15	0.10
Average	0.07	0.11	0.14	0.13	0.12	0.10

As defined in the operating licence, the THMs quality standard is to be less than or equal to 0.10 mg/L as locational running annual average of quarterly samples. The ODW has identified sample locations and months for collecting samples for THMs for the City.

Based on these results and past reports, we realize that we do not comply with the THM standard stated in the operating licence, therefore a number of steps have been taken to address this issue. As part of our Master Plan, consultants reviewed this information and

identified the water plant upgrades necessary to meet this regulatory requirement. The upgrade is based on a new plant train capable of providing approximately 50% of the City's design year maximum day demand. The balance of water demand would be made up from the existing water plant. The new plant would incorporate membrane technology to remove the raw water organics so when blended with the existing plant treated water the combined water would meet Provincial Standards. Application for funding for this upgrade along with a new raw water intake, a new chemical building, and code and condition improvements of the existing water plant was made in May 2015 through the provincial-territorial infrastructure component of the New Building Canada Fund.

The water plant upgrades and estimated costs are detailed in Table 4. These costs include a new raw water intake, new chemical building, a new membrane treatment train and code and condition improvements for the existing plant.

Table 4. Estimated Water Treatment Plant Upgrades and Cost

Component	Cost
New Raw Water Intake	\$ 6,000,000
New Chemical Building	\$ 10,000,000
New Membrane Treatment Train	\$ 29,000,000
Code and Condition Improvements of Existing Plant	\$ 10,000,000
Subtotal	\$ 55,000,000
Engineering	\$ 5,000,000
Total Project Cost	\$ 60,000,000

Additional information regarding trihalomethanes can be located on the following Government of Manitoba website and Guidelines for Canadian Drinking Water Quality website;

http://www.gov.mb.ca/waterstewardship/odw/public-info/fact_sheets/pdf/factsheet_thm
<http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/trihalomethanes/index-eng.php#t>

All analysis of the City of Brandon's drinking water supply can be viewed by contacting our water treatment facility directly at: Phone 204-729-2190 or 204-729-2274 or Email: b.mcintosh@brandon.ca

4.0 Monitoring Requirements

Our Public Water Supply System has met its regulatory monitoring requirements in 2015.

5.0 Reporting Requirements

In 2015 our Public Water Supply System has met its regulatory reporting requirements.

6.0 2015 Water Supply System Upgrades

6.1 Distribution Main Replacement

The following water mains were replaced in 2015:

- 400-Blk 17th Street-150mm PVC
- 500-Blk 22nd Street-150mm PVC
- Kirkcaldy Drive-from +/-110 meters west of west property line 4th Street to +/- 110 meters east of east property line Paterson Crescent-300mm PVC

These renewals and construction will improve service reliability in the surrounding areas.

6.2 Water Treatment Plant Roof Shoring

Some portions of the water treatment plant area date back to 1905. In the spring of 2015, an inspection of one of the older buildings indicated degradation of the roof structure. A structural engineer recommended shoring be installed as a temporary measure to prevent further degradation of the structure until a permanent solution is determined. The shoring work was completed in the summer of 2015.

7.0 Public Water Supply System Re-Assessment

One of the conditions of our licence was to have an engineering re-assessment of the City's water supply system submitted in 2015. The purpose of the re-assessment is to confirm that our utility is capable of supplying adequate, safe drinking water to our citizens and customers in accordance with regulations under the *Drinking Water Safety Act* and *Public Health Act*. The report was completed and submitted as required by the Office of Drinking Water.

8.0 Water Conservation Plan

In 2013 the City of Brandon Water Conservation Committee released its first formal Water Conservation Plan. One of the steps the Province has taken to protect its water resources is to have shorter licence agreements and for senior water users to have a water conservation plan in place before licence renewal. This ensures the user is mindful of the water source and takes environmental and economic responsibility for its community and others downstream.

The water conservation committee is made up of City staff, residents of the community, and staff from the Province of Manitoba. The committee's mission statement is to "Conserve and protect water use for present and future generations on both a community and corporate level". Over the last ten years our water consumption per capita has declined while maintaining our increase in population. It was determined that the City of Brandon's target is to continue to reduce water consumption while maintaining future growth in population by reducing 10% of the overall water consumption per capita over every 10 years over a 30-year period. The water consumption reduction will be measured on an annual basis to ensure we are on track to meeting our targets.

In 2015, approximately 50 percent of the water we distribute is used for domestic purposes such as washing, food preparation, lawn sprinklers, toilets, and bathing. In addition, industry consumes approximately 25 percent, commercial customers use approximately 15 percent, and the remainder is for schools, government, and churches.

9.0 Closing

We want our customers and citizens to be informed about their utility. If you have any questions about this report or concerning your water utility, please contact us at 204-729-2190 or email b.mcintosh@brandon.ca.