



**2017
Public Water Supply
Annual Report**

**City of Brandon
Development Services / Water Treatment
Brandon, Manitoba**

Table of Contents

1.0 Introduction	3
2.0 Description of the Water System	3
2.1 Water Treatment Source Water Supply	3
2.2 Water Treatment Process	4
2.3 Distribution System	4
2.4 Groundwater Supply.....	4
3.0 Water Quality Standards	5
3.1 List of Water Quality Standards.....	5
3.2 Water Quality Standards Results.....	6
3.2.1 Bacteriological.....	6
3.2.2 Disinfection.....	6
3.2.3 Turbidity	7
3.2.4 Chemical.....	7
Table 2 Treated Sample Results.....	7
Table 3 HAA Sample Results.....	8
Table 4 THM Sample Results.....	8
3.2.5 Lead	9
3.2.6 Fluoride	10
4.0 Operational Requirements.....	10
5.0 Drinking Water Safety Orders and Actions Taken in Response.....	10
6.0 Boil Water Advisories and Action Taken in Response	10
7.0 Warnings Issued or Charges Laid on the Public Water Supply	10
8.0 2017 Water Supply System Upgrades	10
8.1 Distribution Main Replacement	10
8.2 Turtle Crossing Park Well Rehabilitation and Improvements	11
8.3 Licence to Impound Water	11
9.0 Water Use	11
10.0 Closing	11

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 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. In February 2016, the licence was amended specifying that an Advisory Notification Plan be maintained and submitted to the Office of Drinking Water by May 1st of each year. Through the team effort of police, corporate communications, emergency management, and other departments, the City's Water Supply System Public Emergency Notification Plan was developed and submitted prior to the May 1st deadline.

The Senior Regional Drinking Water Officer conducted his 2017 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 49,000 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 riverbank. 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 42-63 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 clear well 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 2017, 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/Treatment Standards

Parameter	Quality Standard
Total coliform	Less than one total coliform bacteria detectable per 100 mL in all treated and distributed water
<i>E.coli</i>	Less than one <i>E. coli</i> 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 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
Total haloacetic acids (HAAs)	Less than or equal to 0.08 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
Toluene	Less than or equal to 0.06 mg/l
Total xylenes	Less than or equal to 0.09 mg/l
Uranium	Less than or equal to 0.02 mg/L

3.2 Water Quality Standards Results

3.2.1 Bacteriological

As indicated in Table 1 the Manitoba Office of Drinking Water 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 2017 there were over 676 routine tests performed for total coliform and *E. coli* from the city's water distribution system. There was no confirmed 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 are to be 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. With over 107,000 online samples taken in 2017, there were no incidents where the residual was less than 0.5 mg/l.

Every week our staff test the water for chlorine residuals at each of the sample locations. The utility is required to maintain at least 0.10 mg/L free chlorine residual in the distribution. With over 780 free chlorine samples collected in 2017, five tests had results lower than 0.10 mg/L. That area of the distribution system was flushed and retested to meet the requirements of the regulation.

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 2017, 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 Turbidity

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 2017. The results of the readings are reported to the Senior Regional Drinking Water Officer on a monthly basis.

3.2.4 Chemical

The annual audit report indicates chemical results from treated water met the water quality standard with the exception of trihalomethanes (THMs). The 2017 results are summarized in Table 2, Table 3, and Table 4.

Table 2. Treated Sample Results

Parameter	Water Quality Standard	Blended Source Water	Civic Works
Arsenic	Less than or equal to 0.01 mg/L	0.00868 mg/l	0.00212 mg/l
Benzene	Less than or equal to 0.005 mg/L	<0.00050 mg/l	<0.00050 mg/l
Fluoride	Less than or equal to 1.5 mg/L	0.155 mg/l	0.590 mg/l
Lead	Less than or equal to 0.01 mg/L in the water distribution system	0.00186 mg/l	0.000366 mg/l
Nitrate	Less than or equal to 45 mg/L measured as nitrate (10 mg/L measured as nitrogen)	0.105 mg/l	0.433 mg/l
Trichloroethylene	Less than or equal to 0.005 mg/L	<0.00050 mg/l	<0.00050 mg/l
Tetrachloroethylene	Less than or equal to 0.03 mg/L	<0.00050 mg/l	<0.00050 mg/l
Toluene	Less than or equal to 0.06 mg/l	<0.00050 mg/l	<0.00050 mg/l
Total xylenes	Less than or equal to 0.09 mg/l	<0.00071 mg/l	<0.00064 mg/l
Uranium	Less than or equal to 0.02 mg/L	0.00482 mg/l	0.00011 mg/l

Raw / Well water blend was 21% at the time of the testing

Table 3. HAAs Sample Results

Date	Sample Location				
	Willowdale 7-11 (mg/L)	Reservoir (mg/L)	Civic Works (mg/L)	1 st Str. Booster Stn (mg/L)	Limit (mg/L)
Feb 21, 2017	0.04	0.06	0.05	0.06	0.08
May 17, 2017	0.05	0.05	0.05	0.06	0.08
Aug 15, 2017	0.04	0.05	0.05	0.05	0.08
Nov 8, 2017	0.04	0.04	0.05	0.04	0.08
Average	0.04	0.05	0.05	0.05	0.08

Note: HAAs results were below the locational running annual average of quarterly samples which are to be less than or equal to 0.08 mg/L, and meet provincial standards.

Table 4. THMs Sample Results

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 21, 2017	0.06	0.09	0.10	0.11	0.09	0.10
May 17, 2017	0.06	0.09	0.10	0.11	0.10	0.10
Aug 15, 2017	0.06	0.12	0.10	0.10	0.10	0.10
Nov 8, 2017	0.03	0.09	0.08	0.08	0.08	0.10
Average	0.05	0.10	0.095	0.10	0.09	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 Office of Drinking Water 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 our water system information and identified the water plant upgrades necessary to meet this regulatory requirement. The upgrade is based on a new UF/RO membrane plant 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 be meet Provincial Standards.

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>

3.2.5 Lead

The City of Brandon continues to address the issue of lead water service connections that exist in certain areas of the municipality's distribution system. The City of Brandon Lead Water Services Strategy was developed to address issues precipitating from a draft provincial study released in 2013, which indicated that in some older Brandon homes where lead water service connections were present, lead concentration levels in tap water were found to be in excess of current national drinking water guidelines of 0.01 milligrams per litre. As part of this strategy, several types of messaging was undertaken by the City of Brandon to stress to residents and the wider public that Brandon's drinking water supply leaving the City's water treatment system meets the provincial standards for lead concentrations, and the issue is strictly that of older individual service hook-ups in specific areas of Brandon.

A major piece of this messaging was the delivery of informational packages to approximately 5,200 properties in Brandon that have the potential to have a lead water service connection (either from the water main to the property line, from the property line to the house, or both), based on the age of the property. The package contained information on how residents could determine if they had a lead water service connection coming into their home, the health risks associated with lead in drinking water, how they could test their drinking water for lead concentrations, and what steps to take if their test results were found to be above the current national drinking water guidelines. All of this information has been made publicly available on the City of Brandon website at <http://www.brandon.ca/water-treatment/lead-water-services-information>

Subsequent to the informational campaign, the City developed and rolled out a 2016 Water Filter Rebate Program, to provide eligible property owners/residents with a cash rebate of up to \$100 to assist with the purchase of water filtration systems and/or filters which meet the NSF/ANSI-53 certification for the removal of lead. This program is being continued through 2017. In the long-term, the City of Brandon hopes to receive funding to evaluate the potential use of orthophosphates in its water treatment process.

3.2.6 Fluoride

Manitoba Health and Healthy Living funds and monitors the fluoridation program. They recommend a fluoride range of 0.5-0.9 mg/L, with 0.7 mg/L as the optimal level in drinking water. We have adjusted the fluoride level in our drinking water to comply with this recommendation.

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: r.smith@brandon.ca

4.0 Operational Requirements

Our Public Water Supply System has met its regulatory monitoring requirements in 2017.

5.0 Drinking Water Safety Orders and Actions Taken in Response

There were no Drinking Water Safety Orders issued for our Public Water Supply System in 2017.

6.0 Boil Water Advisories and Action Taken in Response

In 2017, no Boil Water Advisories were issued for our Public Drinking Water System.

7.0 Warnings Issued or Charges Laid on the Public Water Supply System in Accordance with the *Drinking Water Safety Act*

There were no warnings issued or charges laid on our Public Water Supply System in accordance with the *Drinking Water Safety Act* in 2017.

8.0 2017 Water Supply System Upgrades

8.1 Distribution Main Replacement

Distribution water main replacement for 2017:

- 34th Street- MacTavish to Centennial
- Elmdale Boulevard SE corner to intersection with the west leg of Spruce Drive
- New water main on Russell Street north of Rosser Avenue

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

8.2 Turtle Crossing Park Well Rehabilitation and Improvements

In the spring of 2011, the Turtle Crossing Park Well pump house, received significant water damage due to flooding. Following the repairs and recommissioning of the well pump house, in June 2014, a similar incident took place from heavy rains. This caused the site to receive substantial water damage again. Based on the City's Disaster Financial claim and at the request of Manitoba Emergency Measures Organization, in January 2015, consultants conducted a visual inspection of the well pump house. The damage report denoted the requirement for new electrical and mechanical equipment for the repair of the site.

The threat of future floods led the City to seek to develop an "innovative solution" to prevent a reoccurrence of flood damage to the well and pump house. The decision to raise the pump and structure so that the essential components are above flood levels was determined to be the most viable solution.

Engineering work is currently underway to address the work required to raise the pump house and essential equipment above the flood of record level and returning the well to functional operation in 2018.

8.3 Licence to Impound Water

In order to divert water from the Assiniboine River, the City of Brandon is required to operate under a provincial licence in accordance the provisions of The Water Rights Act. The City's current licence expires in 2022.

9.0 Water Use

In 2017, approximately 50 percent of the water we distributed was used for domestic purposes such as washing, food preparation, lawn sprinklers, toilets, and bathing. In addition, industry consumed approximately 25 percent, commercial customers used approximately 18 percent, and the remainder for schools, government, and churches.

10.0 Closing

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