

**NORTH BATTLEFORD**

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# **DRINKING WATER QUALITY**

## **2013 ANNUAL REPORT**

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**North  
Battleford**



## Executive Summary

This report provides an analysis of the Drinking Water Quality of the water produced in the City of North Battleford and the results of the Monitoring of the Distribution System.

The highlights of 2013 are as follows:

- 342 samples were submitted for bacteriological testing in 2013 as part of the routine monitoring of the distribution system. None tested positive for Coliforms.
- One of the samples at one location was below minimum guidelines for chlorine residuals. The water lines were flushed and chlorine retested.
- The average for samples submitted for Trihalomethanes were below the Maximum Acceptable Concentration of 100 µg/L.
- The average monthly turbidity for Water Treatment Plant #1 ranged from 0.032NTU to 0.343 NTU, thus meeting the guideline of less than 1 NTU for 95% of readings.
- Average monthly turbidity for Water Treatment Plant #2 filters ranged from 0.029 – 0.073 NTU, 0.029 – 0.080 NTU, 0.031 – 0.049 NTU, and 0.022 – 0.034 NTU. These are below the guideline of less than 0.3 NTU for 95% of readings.
- Monthly free chlorine readings were above the minimum guideline of 0.2 mg/L entering the distribution system. The monthly average readings ranged from 0.80 mg/L to 1.17 mg/L at Water Treatment Plant #1 and 0.97 mg/l to 1.41 mg/l at Water Treatment Plant #2.
- Average monthly iron levels from Water Treatment Plant #1 were below the aesthetic guidelines of 0.3 mg/L.
- Average monthly manganese levels from Water Treatment Plant #1 were below the aesthetic guidelines of 0.05 mg/L.
- Water Treatment Plant #1 produced over 1.39 million m<sup>3</sup>.
- Water Treatment Plant #2 produced over 0.49 million m<sup>3</sup>.
- Together, the Water Treatment Plants produced over 1.88 million m<sup>3</sup>.
- In 2013, Filters 1 and 2 at Water Treatment Plant # 2 were repaired and put back into service.

In conclusion, the North Battleford water treatment plants provided potable water that met the Water Security Agency guidelines. .



CITY OF NORTH BATTLEFORD

DRINKING WATER QUALITY

2013 REPORT

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CITY OF NORTH BATTLEFORD

DEPARTMENT OF PUBLIC WORKS AND UTILITIES

ENGINEERING SECTION

2013



# Safe Drinking Water Policy

## **POLICY STATEMENT**

The City of North Battleford Council and Administration are committed to provide the community with good quality and safe drinking water through the City distribution system.

## **KEY INDICATORS**

Good and safe drinking water quality will be demonstrated by:

Water that is free of pathogenic organisms and of any harmful concentrations of chemicals or other substances as may be identified in provincial drinking water requirements, guidelines, objectives, or recommendations.

Water that is adequately disinfected.

Water that is aesthetically acceptable.

## **PRIORITY MEASURES**

The following essential measures are undertaken to ensure the provision of good and safe drinking water:

Protection of Water Sources and Watersheds within the City's Jurisdiction and Influence.

Quality Control, Quality Assurance and Continuous Improvement Programs.

Water Treatment, Transmission and Distribution System Maintenance and Renewal.

Staff Training, Certification and Ongoing Learning.

Regular and timely reporting to City Council.

Water Quality Monitoring with Public Accountability for Verifying Quality Results.





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## Introduction

The City of North Battleford Annual Drinking Water report is designed to provide information to the public, government organizations, and internal management. Data that is represented in this report is collected from the water treatment plants and distribution system within the City of North Battleford.

## Background

The City of North Battleford water supply system is comprised of two water treatment facilities, three reservoirs, one booster station, approximately 117 kilometres of water main, 580 fire hydrants and many thousands of valves.

Approximately 4,600 residential, commercial, industrial and institutional customers utilize the North Battleford distribution system.

Between January 1, 2013 and December 31, 2013 the City of North Battleford water plants produced over 1.88 million m<sup>3</sup> of water. Tables, along with a graph showing water production per month, can be viewed in the results section of the report.

## Water Treatment Plants

The City of North Battleford waterworks consists of two water treatment plants; Water Treatment Plant #1 (WTP#1) and Water Treatment Plant #2 (WTP#2), also known as F.E. Holliday. The WTPs utilize two sources of water to meet the demand of residents.

Water Treatment Plant #1 (Figure 1) is currently designated as a Level 2 Water Treatment Facility. However, WTP #1 is undergoing an evaluation by the WSA and may be upgraded to a level 3 or potentially level 4 due to the addition and upgrades completed in 2012. The plant draws water from a well field located in the river valley south west of the city. The water treatment process in WTP#1 consists of 'Train A' which utilizes four pressure filters and 'Train B' which utilizes two open filters. All of the filters use green sand media to aid in the removal of the manganese and iron. Chlorine gas is the main disinfection method used at this plant. A liquid form of chlorine is used in pre-treatment. The 'Train B' expansion officially came online in September 2012. With this expansion, the treatment capacity of WTP#1 increased from 180 m<sup>3</sup>/h to approximately 320 m<sup>3</sup>/h. The production capability of this plant is limited by the well field.

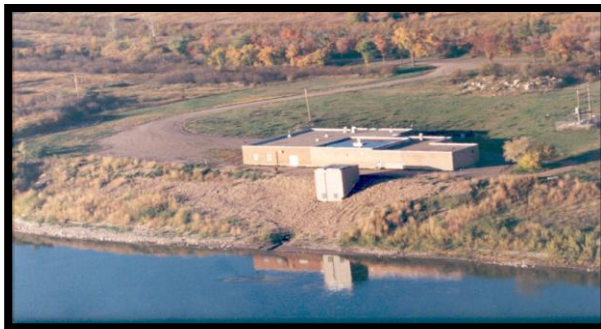


Figure 1 WTP#2



Figure 2 WTP#1

WTP #2 (FIGURE 2) is also designated as a Level 3 Water Treatment Facility. The plant takes raw water directly from the North Saskatchewan River. Water is drawn from the river, sand is removed, and then the water is treated for inorganic and organic constituents and filtered. Chlorine gas is used as the primary disinfectant with ultraviolet energy (UV) providing additional disinfection. The production capability of this plant is affected by the turbidity of the North Saskatchewan River.

The untreated and treated water are monitored and tested daily at each WTP when they are operating to ensure that the finished product meets the standards set by the WSA. A summary of plant operations for each Water Treatment Plant can be found in the results section.

## **Distribution System**

The City of North Battleford has over 117 km of water mains. These mains are a combination of asbestos concrete (58.9 km), cast iron (23.7 km), PVC (32.6 km), HDPE (2.5 km), copper (0.026 km), and steel (0.048 km). In 2013, there were 9 water main breaks detected and repaired. Work was done on 90 hydrants. This work included repairing leaks, replacing damaged parts of the hydrants or the entire hydrant, or thawing the hydrant.

Water in the distribution system is regularly tested at 7 monitoring locations per week throughout the City. A map showing the division of the city into 12 sampling zones can be found in **Appendix A**. Each monitoring location is sampled weekly or biweekly. The Permit to Operate a Waterworks only requires 3 samples be taken per week. In 2013, 342 routine monitoring samples were submitted. 'Other' samples collected from new services, complaints about taste or odour, or following water main repairs are not considered 'routine' samples but do undergo the same tests. Each sample submitted for coliform testing is also tested for free chlorine, total chlorine, and turbidity. A summary of 'routine' and 'other' sampling can be found in the results section.

## **Tested Parameters**

The City of North Battleford performs testing as required by the Permit to Operate a Waterworks and as directed by the Water Security Agency (WSA). Additional testing may be done at the discretion of the City in advance of proposed changes to Drinking Water Quality Guidelines to determine the effect of potential changes on the treatment processes. Tested parameters may or may not be subject to a guideline limit. These limits can be health based, Maximum Acceptable Concentration (MAC) or interim Maximum Acceptable Concentration (iMAC), or based on odour, taste, or staining, Aesthetic Objective (AO). These limits may be expressed as milligrams per litre (mg/L), micrograms per litre ( $\mu\text{g/L}$ ), or counts per millilitre or litre (0 cts/100mL or 0 cts/100L).

### Coliform Bacteria, Total

Total coliform bacteria are used as an operational tool to determine how well the drinking water treatment system is operating. Total coliform include a variety of natural occurring bacteria in water, soil, and vegetation as well as human and animal faeces. The majority of these bacteria are harmless. The presence of total coliform bacteria indicates that the system is vulnerable to contamination and that additional actions need to be taken. Any exceedances should be investigated. Testing is used to ensure water quality meets

permitted levels. The guideline for the presence/absence of Total Coliforms is a health objective, and as such is expressed as a MAC. The WSA limit for total coliform bacteria is 0 cts/100mL of sample.

#### Escherichia coli, (E. coli)

E. coli is used as an indicator of the microbiological safety of drinking water. If it is detected, other pathogens may also be present. The presence of E. coli in water indicates recent fecal pollution from animal and/or human sources and the potential presence of microorganisms capable of causing gastrointestinal illnesses. E. coli is not reported when total coliform is not detected. The limit set by the WSA for drinking water is 0-cts/100 mL, which is also a MAC.

#### Chlorine

Chlorine is an oxidizing agent that is commonly used as a disinfectant. When chlorine is added to water it reacts to form two disinfectants known as "free residual chlorine" and "combined residual chlorine". A minimum of 0.10 mg/L of free residual chlorine or 0.50 mg/L of total residual (free plus combined) must be maintained continuously throughout the distribution system.

The WSA has placed a limit of not less than 0.2 mg/L of free residual chlorine in the water entering the water distribution system. As per the permit to operate, the City must test free residual in the water entering the distribution system continuously or at least once per hour. The WTPs use on-line analytical instruments to monitor the free chlorine. In addition, free and total chlorine are tested at least once daily at WTP#1 and hourly at WTP #2 while the plant is in operation. These tests are used to confirm that the on-line instruments are operating properly.

#### Turbidity

Turbidity is used to assess the clarity of water. It is a measure of suspended inorganic and organic particles in the water. Turbidity can be caused by sediment, particles of dirt, clay, silt, air bubbles, vegetation, plankton, and other microscopic organisms suspended in the water. Turbid water may protect microorganisms from disinfection or prevent the removal of naturally occurring particles that the treatment process wants to control or eliminate.

While there is no limit for Turbidity in the distribution system, it is recommended that the turbidity be less than 5 NTU. The limit leaving WTP#1 is to be less than 1.0 NTU 95% of readings and the limit leaving the filters at WTP#2 is to be less than 0.3 NTU 95% of readings and never more than 1 NTU off of each filter.

#### Iron

Iron is an inorganic element and one of the most abundant metals in the earth's crust. Small quantities of iron are naturally found in many groundwater sources. An AO of less than 0.3 mg/L is used to minimize iron staining of laundry and plumbing fixtures, and to reduce undesirable tastes in beverages.

## Manganese

Manganese is a naturally occurring inorganic element from the erosion and weathering of rocks and minerals. Water naturally contains small amounts of manganese; the guideline limit is based on taste and staining of laundry and plumbing fixtures. The AO for manganese in drinking water is less than 0.05 mg/l.

## Additional Testing

Additional water quality parameters are tested as set out in the Permit to Operate a Waterworks, as directed by the WSA or at the discretion of the City of North Battleford.

## General Chemical

A general water quality analysis is done semi-annually on the treated water from WTP #1 and quarterly from WTP #2. Some of the parameters tested have guideline limits while others do not. The presence of some parameters may interfere with the removal of health-related parameters (such as bacteria), they may affect the treatment system's effectiveness, and they may be indicators of overall water quality. The City of North Battleford does not fluoridate the water, any fluoride present is naturally occurring in the source water. Starting in 2013, general chemical analysis was completed on the source waters for the WTPs to track changes in water quality that could affect the treatment processes.

## Health and Toxicity

Trace elements in North Battleford's water are monitored annually. These elements can be naturally occurring or the result of leaching, runoff, or spills. Some parameters are subject to a MAC while others are subject to an AO.

## Trihalomethanes

Trihalomethanes (THMs) are organic compounds formed in drinking water as a by-product of chlorine disinfection. THMs may be linked to cancer or other health problems. The MAC of total THMs is 100 µg/L (0.1 mg/L) based on an annual average of quarterly tests. The results for the City of North Battleford can be viewed in the results section.

## Pesticides

The City of North Battleford tests for pesticides in the treated water once every twenty-four months. Pesticides can enter source water (usually surface water) as a result of leaching and/or runoff from agricultural or other uses. Limits on pesticide concentrations are health based and subject to a MAC. The results of pesticide testing can be found in the results section. The next test will be done in 2015.

## Organics

The City of North Battleford tests for Organics in the treated water once every twenty-four months. Organics can enter source water (usually surface water) through a variety of means. Limits on organics are mainly health based and subject to a MAC. A few are

subject to an AO. The results of pesticide testing can be found in the results section. The next test will be done in 2015.

### Cryptosporidium and Giardia

Cryptosporidium (pronounced as cryp-toe-spore-id-ium ) and Giardia (pronounced gee-are-dee-ah) are pathogens commonly found in surface water. They are associated with gastrointestinal upset. They can cause nausea, vomiting and diarrhoea. Cryptosporidium oocysts and Giardia cysts are found in human and animal wastes, which sometimes wash into rivers and lakes.

The minimum treatment process goal is a 3 log (99.9%) reduction or inactivation of Cryptosporidium oocysts and Giardia cysts. The combination of physical removal (filtration) and the use of an ultraviolet treatment system, allows WTP#2 to reach this goal. As part of the current operating permit, City of North Battleford is only required to test for these during periods of upset or under the direction of the WSA. One sample was submitted for analysis in 2013. The MAC for Cryptosporidia or Giardia is 0cts/100L. The results can be found in the results section.

### Microcystin

Microcystins are toxins produced by blue-green algae. Blue-green algae are commonly found in surface water when conditions are favourable for growth and the formation of algal blooms. The toxins are released when the algae die and may continue to be present in the water for weeks to months.

Most microcystins are liver toxins, but they are also a skin, eye and throat irritant. Blue-green algal blooms can occur with adequate levels of phosphorous and nitrogen, a temperature range of 5 to 30 C and a 6 to 9 pH range. Most blooms will occur in late summer and early fall.

Health Canada has set a guideline MAC of 1.5µg/L that will be adopted once a practical analytical method is available to all jurisdictions. The City was not required to submit a sample for microcystin analysis in 2013.

## **Results Section**

### **WTP#1 Summary**

The treated water leaving WTP #1 was tested for five parameters (turbidity, free chlorine, total chlorine, iron, and manganese) daily and met the guidelines set out by the WSA.

The monthly average for turbidity from the on-line analyzer ranged from 0.032(November Train B) to 0.343 NTU (June Train B). The highest reading recorded was 0.990 NTU (July, Train B) while the lowest reading was 0.020 NTU (November, Train B). The high readings are below the limit set out by the WSA.

The average monthly free chlorine reading from the on-line analyzer ranged from 0.80 mg/L (June Train B) to 1.17 mg/L (February Train B). The highest free chlorine reading

recorded was 2.31 mg/L (January Train B) while the lowest free chlorine reading was 0.56 mg/L (February Train A). A summary of the results for WTP #1 can be found in **Table 1, Appendix B**.

Average iron readings ranged from 0.032 mg/L (January and December, Train A) to 0.140 mg/L (May, Train B). The highest reading recorded was 0.170 mg/L (March, Train B) while the lowest reading was below detection limits (several readings). All readings were below the AO of 0.3 mg/L.

Average manganese readings ranged from 0.009 (November, Train B) to 0.023 mg/L (February, Train A). The lowest reading for manganese recorded was below Detection Limits (several readings) and the highest was 0.190 mg/L. While there were 5 days where the reading recorded was above the AO, the average readings for manganese were below the AO of 0.05 mg/L.

## **WTP#2 Summary**

The treated water leaving WTP #2 was tested daily for turbidity and free chlorine and met the guidelines set out by the WSA. Turbidity was tested leaving the filters and clearwell, while the free chlorine was tested leaving the clearwell.

The average turbidity leaving the four filters ranged from 0.029 – 0.73 NTU for filter #1, 0.029 – 0.080 NTU for filter #2, 0.031 – 0.049 NTU for filter #3, and 0.022 – 0.034 NTU for filter #4. The highest turbidity reading recorded from the filters was 0.204 NTU (May, filter #2) while the lowest reading was 0.020 NTU (October, filter #4).

Average Free chlorine readings recorded entering the distribution system ranged from 0.97 mg/L to 1.41 mg/L. The highest chlorine reading recorded was 2.86 mg/L (April) while the lowest was 0.30 mg/L (May). The results can be found in **Table 2, Appendix B**.

## **Routine Sampling**

In 2013, 342 samples were submitted as part of the routine monitoring required by the WSA. None of these samples came back positive for Total Coliforms or E. coli. One sample at one location had Free and Total Chlorine residuals below guidelines. These lines were flushed and the chlorine residuals were retested until the free chlorine readings were above 0.2 mg/L. An additional 108 'other' samples were submitted for testing as a result of new services, complaints, water main breaks, or samples taken at the water treatment plants. Two of the new service connection samples tested positive for Total Coliform. Follow up samples for those locations came back negative. **Table 3, Appendix B** shows the results for the routine monitoring of the distribution system as well as the results of 'other' sampling.

## **General Chemical**

Two samples of the treated water from WTP#1 and four from WTP#2 were submitted for General Chemical Analysis in 2013. The parameters tested met all aesthetic objectives. The results are shown in **Table 4, Appendix B**.



One sample of the source water from each WTP was also submitted for analysis. The results are shown in **Table 5, Appendix B**.

### **Health and Toxicity with Cyanide and Mercury**

One sample of the treated water from each WTP was submitted for Health and Toxicity with Cyanide and Mercury in 2013. The parameters tested were either below the guidelines or below detection limits. The results are shown in **Table 6, Appendix B**.

### **THMs**

Two samples from the distribution system along with a sample from each WTP were submitted for THMs each quarter in 2013. The average for the 16 samples was 34 µg/L, which is below the MAC of 100 µg/L. The results are shown in **Table 7, Appendix B**.

### **Cryptosporidium and Giardia**

A sample of treated water from Water Treatment plant #2 was submitted in August of 2013 for Cryptosporidia and Giardia testing. The results came back 0 cts/100L for Cryptosporidia oocysts or Giardia cysts. The results can be found in **Table 8, Appendix B**.

### **Pesticides**

One sample of the treated water from each WTP was submitted for Pesticides analysis in 2013. All tested parameters were below detection limits. The results can be found in **Table 9, Appendix B**.

### **Organics**

One sample of the treated water from each WTP was submitted for Organics analysis in 2013. All tested parameters were below detection limits. The results can be found in **Table 10, Appendix B**.

### **Water Production**

In 2013, over 1.88 million m<sup>3</sup> of potable water was produced by the two Water Treatment Plants. WTP #1 produced 1.39 million m<sup>3</sup>, while just over 0.49 million m<sup>3</sup> of potable water was produced by WTP #2. The increased production capability of WTP#1 allows WTP#2 to be run as a 'top off' plant.

Combined, the monthly amount of water produced by the WTPs ranged from a low of 127,809.9 m<sup>3</sup> in February to a high of 205,682.7.1 m<sup>3</sup> in May. (Figure 3). The average daily production was 5,177 m<sup>3</sup>. The peak amount produced by both WTPs was 9,985.8 m<sup>3</sup> on June 6<sup>th</sup>. The lowest amount produced by both WTPs was 1912.7 m<sup>3</sup> on June 26<sup>th</sup>. This coincided with the flooding of the North Saskatchewan River. The production amounts for both WTPs along with the combined monthly total can be seen in **Table 1, Appendix B**.

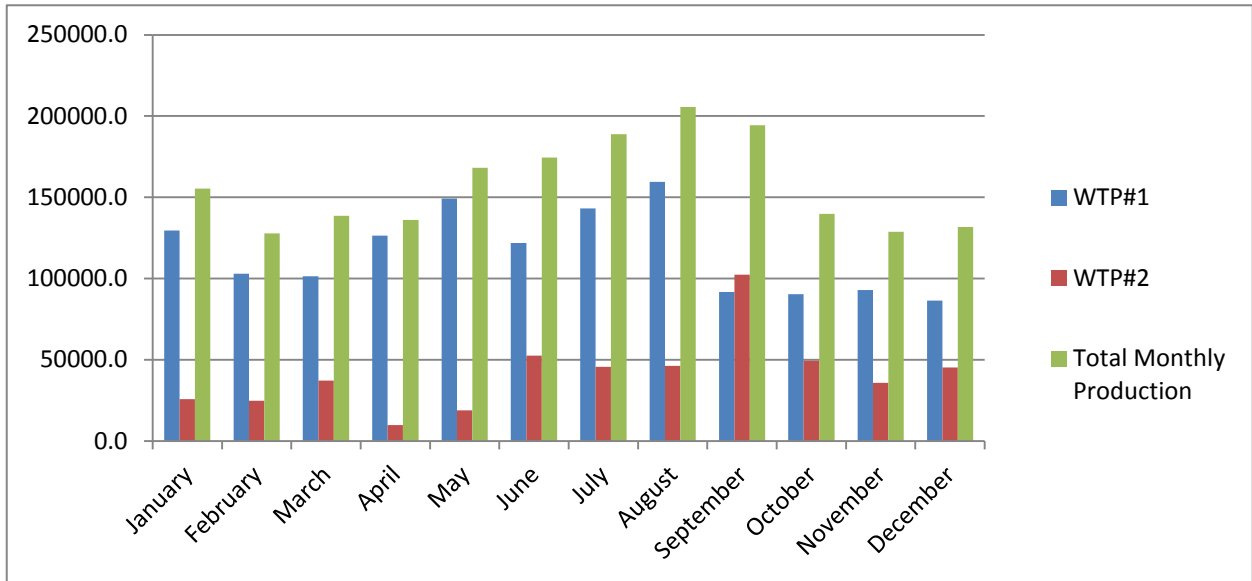


Figure 3 Monthly Production

## Conclusion

In conclusion, the North Battleford water treatment plants were able to provide potable water that met the WSA guidelines as set out in the Permit to Operate. For the distribution system in the City of North Battleford, chlorine levels generally exceeded the minimum level outlined by the WSA. In the one case where chlorine levels were below the WSA set limits, the distribution line was flushed until chlorine levels met the WSA guidelines and requirements.

## ACKNOWLEDGEMENTS

The Public Works and Utilities Department of the City of North Battleford prepared this report. The dedication and commitment of civic staff in providing safe water during 2013 is acknowledged.

Also acknowledged is the ongoing assistance of the WSA.

For more information please contact:

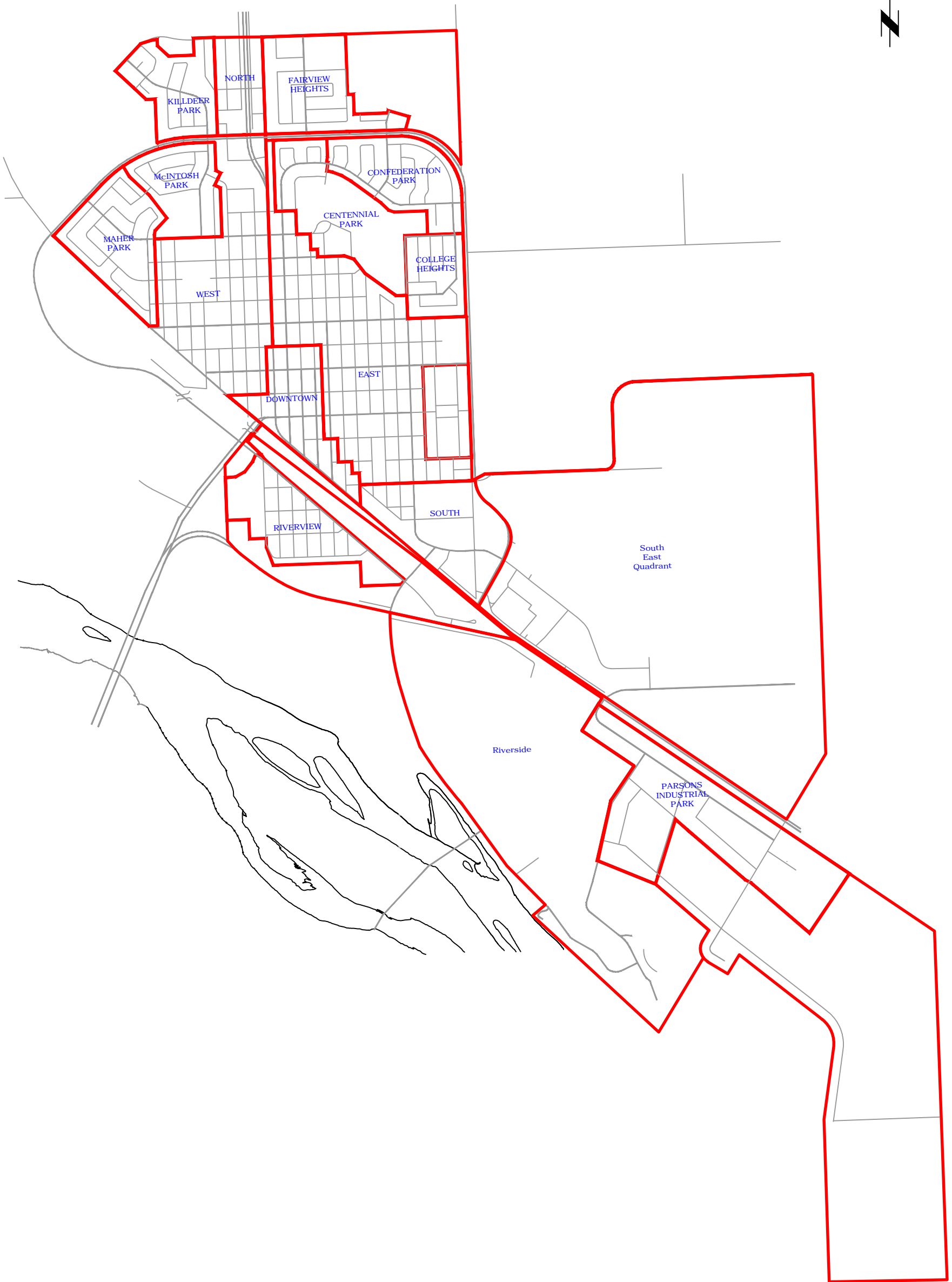
City of North Battleford


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*City of North Battleford  
Drinking Water Quality  
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Appendix A: Map of Sampling Zones*





 <b>North Battleford</b> Public Works & Utilities	DATE REVISED	BY	DESIGNED BY:	DATE:	SCALE:	PAGE:
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		JOB NO.:	SAMPLE ZONES WATER DISTRIBUTION			



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*City of North Battleford  
Drinking Water Quality  
2013 Report  
Appendix B: Results Tables*





Table 1								
Month		CHLORINE			TURBIDITY		IRON	MANGANESE
		Free (Lab)	Free (Wall)	Total				
		mg/L	mg/L	mg/L	NTU (Lab)	NTU (Wall)	mg/L	mg/L
January	Train A							
	Average	1.09	1.13	1.37	0.19	0.109	0.032	0.014
	Max	1.71	1.81	2.02	0.31	0.980	0.060	0.033
	Min	0.44	0.75	0.82	0.11	0.049	0.010	0.000
	Train B							
	Average	1.10	1.10	1.40	0.17	0.088	0.030	0.012
	Max	1.62	2.31	1.89	0.40	0.125	0.080	0.030
Min	0.67	0.81	0.98	0.09	0.061	0.000	0.000	
February	Train A							
	Average	0.99	0.98	1.19	0.19	0.075	0.036	0.032
	Max	2.04	1.94	2.20	0.78	0.224	0.080	0.190
	Min	0.59	0.56	0.75	0.08	0.038	0.000	0.004
	Train B							
	Average	1.16	1.17	1.38	0.14	0.080	0.025	0.023
	Max	1.90	2.04	2.20	0.27	0.108	0.080	0.140
Min	0.56	0.72	0.84	0.09	0.060	0.000	0.008	
March	Train A							
	Average	0.96	0.93	1.20	0.11	0.056	0.027	0.020
	Max	1.35	1.14	1.66	0.18	0.105	0.060	0.064
	Min	0.70	0.69	0.90	0.07	0.036	0.000	0.000
	Train B							
	Average	1.04	1.03	1.27	0.12	0.088	0.029	0.019
	Max	1.63	1.31	1.78	0.24	0.560	0.170	0.035
Min	0.74	0.82	0.98	0.08	0.054	0.000	0.000	
April	Train A							
	Average	1.03	1.03	1.27	0.16	0.053	0.029	0.013
	Max	1.53	1.50	1.76	0.37	0.094	0.090	0.041
	Min	0.75	0.74	0.94	0.07	0.029	0.000	0.000
	Train B							
	Average	1.10	1.12	1.37	0.13	0.064	0.015	0.012
	Max	1.83	1.50	2.03	0.28	0.094	0.050	0.031
Min	0.79	0.73	0.99	0.07	0.050	0.000	0.000	
May	Train A							
	Average	1.15	1.02	1.42	0.12	0.049	0.023	0.013
	Max	1.60	1.38	1.95	0.24	0.079	0.100	0.033
	Min	0.76	0.73	0.98	0.01	0.032	0.000	0.000
	Train B							
	Average	1.08	1.12	1.33	0.12	0.070	0.014	0.011
	Max	1.52	1.45	1.69	0.25	0.119	0.040	0.027
Min	0.71	0.78	0.91	0.06	0.040	0.000	0.000	
June	Train A							
	Average	1.03	0.97	1.24	0.11	0.046	0.022	0.016
	Max	1.56	1.44	1.72	0.34	0.086	0.050	0.032
	Min	0.64	0.67	0.95	0.06	0.033	0.000	0.008
	Train B							
	Average	0.95	0.98	1.18	0.10	0.069	0.021	0.012
	Max	1.30	1.25	1.44	0.26	0.089	0.110	0.032
Min	0.70	0.71	0.93	0.06	0.058	0.000	0.000	



Table 1								
Month		CHLORINE			TURBIDITY		IRON	MANGANESE
		Free (Lab)	Free (Wall)	Total				
		mg/L	mg/L	mg/L	NTU (Lab)	NTU (Wall)	mg/L	mg/L
July	Train A							
	Average	1.01	1.00	1.25	0.15	0.060	0.027	0.017
	Max	1.33	1.25	1.62	0.45	0.115	0.060	0.040
	Min	0.66	0.68	0.87	0.06	0.036	0.000	0.000
	Train B							
	Average	1.01	1.07	1.30	0.12	0.106	0.021	0.013
	Max	1.44	1.30	1.79	0.27	0.990	0.060	0.036
August	Train A							
	Average	1.08	0.99	1.32	0.12	0.080	0.025	0.017
	Max	1.34	1.08	1.47	0.18	0.230	0.070	0.036
	Min	0.90	0.88	1.06	0.07	0.036	0.000	0.000
	Train B							
	Average	1.03	1.05	1.32	0.11	0.070	0.028	0.015
	Max	1.23	1.28	1.81	0.20	0.095	0.100	0.033
September	Train A							
	Average	0.92	0.96	1.18	0.15	0.089	0.019	0.019
	Max	1.84	1.90	2.04	0.28	0.283	0.160	0.046
	Min	0.61	0.74	0.92	0.09	0.038	0.000	0.009
	Train B							
	Average	0.97	1.00	1.25	0.13	0.070	0.021	0.016
	Max	1.78	1.98	1.95	0.23	0.148	0.060	0.053
October	Train A							
	Average	1.25	1.19	1.56	0.13	0.043	0.021	0.014
	Max	2.05	1.63	2.30	0.27	0.084	0.090	0.038
	Min	0.32	0.85	1.11	0.06	0.031	0.000	0.000
	Train B							
	Average	1.22	1.11	1.57	0.11	0.037	0.018	0.014
	Max	1.88	1.55	2.42	0.22	0.070	0.090	0.032
November	Train A							
	Average	0.97	0.96	1.22	0.12	0.046	0.020	0.012
	Max	1.61	1.62	1.92	0.29	0.221	0.060	0.034
	Min	0.75	0.75	0.89	0.06	0.024	0.000	0.000
	Train B							
	Average	1.01	1.00	1.31	0.12	0.032	0.022	0.009
	Max	1.43	1.50	2.04	0.19	0.037	0.110	0.019
December	Train A							
	Average	1.07	1.08	1.35	0.11	0.048	0.032	0.012
	Max	1.62	1.79	1.99	0.19	0.105	0.080	0.037
	Min	0.62	0.71	0.87	0.05	0.031	0.000	0.000
	Train B							
	Average	1.11	1.13	1.38	0.10	0.037	0.020	0.011
	Max	1.55	1.61	1.97	0.15	0.088	0.080	0.032
Min	0.79	0.80	0.97	0.06	0.030	0.000	0.000	



Table 2										
	Raw Water		Filter Effluent Turbidities (NTU)				Clearwell Turbidities (NTU)		Clearwell Free Cl <sub>2</sub> (mg/L)	
	RATE (m <sup>3</sup> /hr)	TURBIDITY (NTU)	No. 1 1720 D	No. 2 1720 D	No. 3 1720 D	No.4 1720 D	1 / 2 1720 D	3 / 4 1720 D	1 / 2 Cl 17	3 / 4 Cl 17
<b>January</b>										
Max	252.00	5.09	---	---	0.058	0.049	0.055	0.053	1.280	1.360
Min	252.00	1.14	---	---	0.034	0.026	0.046	0.022	0.660	0.590
Average	252.00	3.73	---	---	0.038	0.029	0.049	0.030	1.074	1.025
<b>February</b>										
Max	252.00	4.25	---	---	0.135	0.045	0.054	0.086	1.51	1.31
Min	252.00	2.15	---	---	0.035	0.026	0.046	0.022	0.64	0.67
Average	252.00	3.44	---	---	0.046	0.029	0.048	0.033	1.07	1.05
<b>March</b>										
Max	252.00	6.43	---	---	0.186	0.038	0.060	0.133	1.640	1.440
Min	252.00	2.63	---	---	0.028	0.024	0.042	0.021	0.800	0.650
Average	252.00	3.50	---	---	0.043	0.027	0.048	0.031	1.067	1.090
<b>April</b>										
Max	360.00	354.00	0.065	0.089	0.064	0.061	0.489	0.173	2.860	2.320
Min	252.00	3.64	0.028	0.034	0.036	0.027	0.052	0.026	0.330	0.340
Average	278.40	31.08	0.036	0.044	0.049	0.034	0.094	0.055	1.250	0.973
<b>May</b>										
Max	252.00	498.00	0.087	0.204	0.060	0.054	0.329	0.336	2.130	2.190
Min	252.00	13.00	0.028	0.028	0.035	0.025	0.039	0.029	0.640	0.300
Average	252.00	85.90	0.036	0.043	0.042	0.034	0.072	0.064	1.195	1.004
<b>June</b>										
Max	324.00	3523.00	0.154	0.069	0.056	0.044	0.182	0.144	2.080	1.760
Min	252.00	62.80	0.033	0.028	0.033	0.022	0.035	0.024	0.460	0.330
Average	261.82	1332.96	0.038	0.036	0.043	0.031	0.048	0.042	1.065	1.062
<b>July</b>										
Max	324.00	521.00	0.040	0.038	0.052	0.032	0.640	0.186	1.540	1.320
Min	252.00	36.20	0.028	0.025	0.034	0.020	0.028	0.028	0.580	0.500
Average	257.14	256.75	0.033	0.029	0.036	0.023	0.045	0.044	1.152	1.018
<b>August</b>										
Max	360.00	177.00	0.093	0.107	0.061	0.058	0.266	0.160	2.340	1.600
Min	150.00	8.94	0.056	0.065	0.035	0.022	0.031	0.028	0.490	0.430
Average	273.77	23.10	0.073	0.080	0.046	0.033	0.048	0.048	1.125	1.044
<b>September</b>										
Max	360.00	15.30	0.113	0.089	0.072	0.074	0.101	0.061	1.620	1.490
Min	360.00	5.67	0.031	0.036	0.033	0.021	0.038	0.034	1.040	0.800
Average	360.00	9.17	0.044	0.048	0.044	0.033	0.046	0.044	1.414	1.322
<b>October</b>										
Max	360.00	6.49	0.042	0.076	0.036	0.029	0.055	0.048	1.730	1.680
Min	288.00	1.48	0.027	0.034	0.028	0.020	0.034	0.027	0.910	0.760
Average	320.73	4.80	0.029	0.037	0.031	0.022	0.039	0.031	1.343	1.230
<b>November</b>										
Max	288.00	8.63	0.046	0.056	0.046	0.032	0.052	0.088	1.540	1.230
Min	288.00	2.18	0.028	0.027	0.031	0.021	0.036	0.028	0.860	0.750
Average	288.00	3.52	0.031	0.035	0.033	0.023	0.041	0.035	1.160	0.973
<b>December</b>										
Max	288.00	5.73	0.046	0.046	0.045	0.035	0.047	0.047	1.64	1.38
Min	288.00	2.34	0.027	0.026	0.029	0.021	0.036	0.021	0.69	0.68
Average	288.00	3.96	0.030	0.029	0.033	0.023	0.039	0.031	1.06	1.01



Table 3						
LOCATION	SAMPLES	BACTERIOLOGICAL			CHLORINE	TURBIDITY
		# of positive samples			# of samples below guidelines	
	# of Samples	>200 Background Colonies	Total Coliform	E. Coli	Total < 0.5 Free < 0.1	Average
North	24	0	0	0	0	0.23
Fairview Heights/Confederaton Park/Centennial Park	25	0	0	0	0	0.22
Kildeer Park	50	0	0	0	0	0.26
Maher/McIntosh Park	22	0	0	0	0	0.14
West	25	0	0	0	0	0.13
Downtown	24	0	0	0	0	0.25
East/College Heights	25	0	0	0	0	0.19
South	25	0	0	0	0	0.17
Southeast	24	0	0	0	1	0.28
River View	50	0	0	0	0	0.15
Riverside	18	0	0	0	0	0.24
Parsons Industrial Park	48	0	0	0	0	0.35
Other <sup>1</sup>	108	0	2	0	0	0.69
<b>Total Samples</b>	<b>468</b>	<b>0</b>	<b>2</b>	<b>0</b>		
<b># of Routine Samples</b>	<b>342</b>	<b>0</b>	<b>0</b>	<b>0</b>		
<b># of Routine Samples Required</b>	<b>156</b>					

<sup>1</sup> These samples are not part of the routine sampling

<sup>2</sup> In cases where a sample comes back positive for Total Coliforms or E. Coli, samples are submitted 24 hours apart until 2 consecutive samples come back negative

\*In cases where the Free and Total Chlorine falls below the guidelines set out by the Water Security Agency, the lines are flushed and chlorine retested.





Table 4					
WTP#1		Treated		Source	Guideline
Month		13-Mar	9-Sep	18-Nov	AO
Parameter	Units	Results	Results	Results	
Bicarbonate	mg/L	265	305	298	
Calcium	mg/L	84	110	100	
Carbonate	mg/L	<1	<1	<1	
Chloride	mg/L	18	24	13	250
Hydroxide	mg/L	<1	<1	<1	
Magnesium	mg/L	29	35	31	200
pH	pH Units	7.75	7.58	8.08	6.5-9.0
Potassium	mg/L	2.2	2.7	2.5	
Sodium	mg/L	33	49	41	300
E.C.	uS/cm	740	933	846	
Sulphate	mg/L	160	230	210	500
Sum of Ions	me/L	591	756	696	
Total Alkalinity	mg/L	217	250	244	500
Total Hardness	mg/L	329	418	377	800
Nitrate	mg/L	<0.04	<0.04	<0.04	45*
Fluoride	mg/L	0.14	0.13	0.11	1.5
TDS	mg/L	477	646	565	1500

Table 5							
WTP#2		Treated				Source	
Month		13-Mar	05-Jun	9-Sep	01-Nov	18-Nov	AO
Analyte	Units	Results	Results	Results	Results	Results	
Bicarbonate	mg/L	167	124	154	182	196	
Calcium	mg/L	49	44	46	54	56	
Carbonate	mg/L	<1	<1	<1	<1	2	
Chloride	mg/L	13	51	20	15	6	250
Hydroxide	mg/L	<1	<1	<1	<1	<1	
Magnesium	mg/L	15	22	16	16	17	200
pH	pH Units	7.74	7.5	7.69	8.14	8.33	6.5-9.0
Potassium	mg/L	1.5	5.8	2.3	1.7	1.7	
Sodium	mg/L	11	24	13	12	12	300
E.C.	uS/cm	402	514	402	428	427	
Sulfate	mg/L	52	81	60	59	57	500
Sum of Ions	me/L	402	353	311	341	349	
Total Alkalinity	mg/L	137	102	126	149	165	500
Total Hardness	mg/L	184	200	180	200	210	800
Nitrate	mg/L	2.3	1.2	<0.04	1.2	1.3	45*
Fluoride	mg/L	0.13	0.09	0.07	0.11	0.13	1.5
TDS	mg/L	231	310	233	247	249	1500

\*This is a MAC based on Nitrate as NO<sub>3</sub>



Table 6						
Chemical Health + Cyanide and Mercury						
Parameter	Units	WTP#1	WTP#2	MAC	iMAC	AO
Aluminum	mg/L	0.0006	0.024	n/a		
Arsenic	mg/L	0.2	<0.1		0.025	
Barium	mg/L	0.053	0.059	1		
Boron	mg/L	0.04	0.02		5	
Cadmium	mg/L	<0.00001	<0.00001	0.005		
Chromium	mg/L	<0.0005	<0.0005	n/a		
Copper	mg/L	0.0037	0.0075	1		
Iron	mg/L	0.0068	0.012			0.3
Lead	mg/L	0.0002	<0.0001	0.01		
Manganese	mg/L	0.0014	0.0012			0.05
Selenium	mg/L	<0.0001	0.0002	0.01		
Uranium	ug/L	0.4	0.3	0.02		
Zinc	mg/L	0.0029	0.0029			5
Cyanide	mg/L	<1	<1	0.2		
Mercury	mg/L	<0.01	<0.01	0.001		

Table 7						
Trihalomethanes						
	BROMOFORM	DIBROMO CHLORO METHANE	DICHLORO BROMO METHANE	CHLOROFORM	Total THMs	iMAC
Location						
DATE	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
<b>Riverview</b>						
13-Mar-13	<2	<1	3	24	27	
5-Jun-13	<2	<1	2.1	16	19.6	
9-Sep-13	<2	1.8	7.1	27	35.9	
18-Nov-13	<2	2	7.7	34	43.7	31.55
<b>Downtown</b>						
13-Mar-13	<2	<1	3	24	27	
5-Jun-13	<2	<1	4.2	27	31.2	
9-Sep-13	<2	1.5	6.4	29	36.9	
18-Nov-13	<2	1	7.3	30	38.3	33.35
<b>WTP#1</b>						
13-Mar-13	<2	<1	5	19	23	
5-Jun-13	<2	<1	2.1	16	18.1	
9-Sep-13	<2	<1	4.4	30	40.5	
18-Nov-13	<2	<1	<0.5	<0.5	<2	27.2
<b>WTP#2</b>						
13-Mar-13	<2	<1	<0.5	<0.5	<2	
5-Jun-13	<2	<1	2.9	59	61.9	
9-Sep-13	<2	2.2	8.3	45	49.4	
18-Nov-13	<2	<1	2.1	21	23.1	44.8
<b>Average</b>	<2	2	5	29	34	<100
<b>Max</b>	<2	2	8	59	62	
<b>Min</b>	<2	1	2	16	18	



Table 8		
Cryptosporidia and Giardia		
Month	29-Aug-13	
Analyte	Results	Units
Volume Filtered	936	L
Giardia cysts	0	cysts/100L
Cryptosporidium oocysts	0	oocysts/100L

Table 9					
Pesticides					
Parameter	Units	WTP#1	WTP#2	MAC	iMAC
		Results	Results		
Atrazine	µg/L	<1	<1		5
Bromoxynil(Buctril)	µg/L	<0.5	<0.5		5
Carbofuran	µg/L	<2	<2	90	
Chlorpyrifos(Lorsban)	µg/L	<2	<2	90	
Dicamba(Banvel)	µg/L	<0.5	<0.5	120	
2,4 D	µg/L	<0.5	<0.5		100
Diclofop-methyl(HoeGrass)	µg/L	<3	<3	9	
Dimethoate(Cygon)	µg/L	<0.01	<0.01		20
Malathion	µg/L	<2	<2	190	
Pentachlorophenol(PCP)	µg/L	<2	<2	60	
Picloram(Tordon)	µg/L	<1	<1		190
Trifluralin(Treflan)	µg/L	<0.5	<0.5		45

Table 10						
Organics						
Parameter	Units	WTP#1	WTP#2	MAC	iMAC	AO
<b>BTEX</b>						
Benzene	µg/L	<0.2	<0.2	5		
Toluene	µg/L	<0.2	<0.2			24
Ethylbenzene	µg/L	<0.2	<0.2			2.4
Xylenes	µg/L	<0.2	<0.2			300
<b>Organochlorides</b>						
Benzo(a)pyrene	µg/L	<0.01	<0.01	0.01		
Carbon tetrachloride	µg/L	<2	<2	5		
Dichlorobenzene, 1,2	µg/L	<0.5	<0.5	200		
Dichlorobenzene, 1,4	µg/L	<0.5	<0.5	5		
Dichloroethane, 1,2	µg/L	<0.5	<0.5		5	
Dichloroethylene, 1,1	µg/L	<0.5	<0.5	14		
Dichloromethane	µg/L	<0.5	<0.5	50		
Dichlorophenol, 2,4	µg/L	<1	<1	900		
Monochlorobenzene	µg/L	<0.5	<0.5	80		
Tetrachlorophenol, 2,3,4,6	µg/L	<0.5	<0.5	100		
Trichloroethylene	µg/L	<0.5	<0.5	50		
Trichlorophenol, 2,4,6	µg/L	<1	<1	5		
Vinyl Chloride	µg/L	<0.5	<0.5	2		



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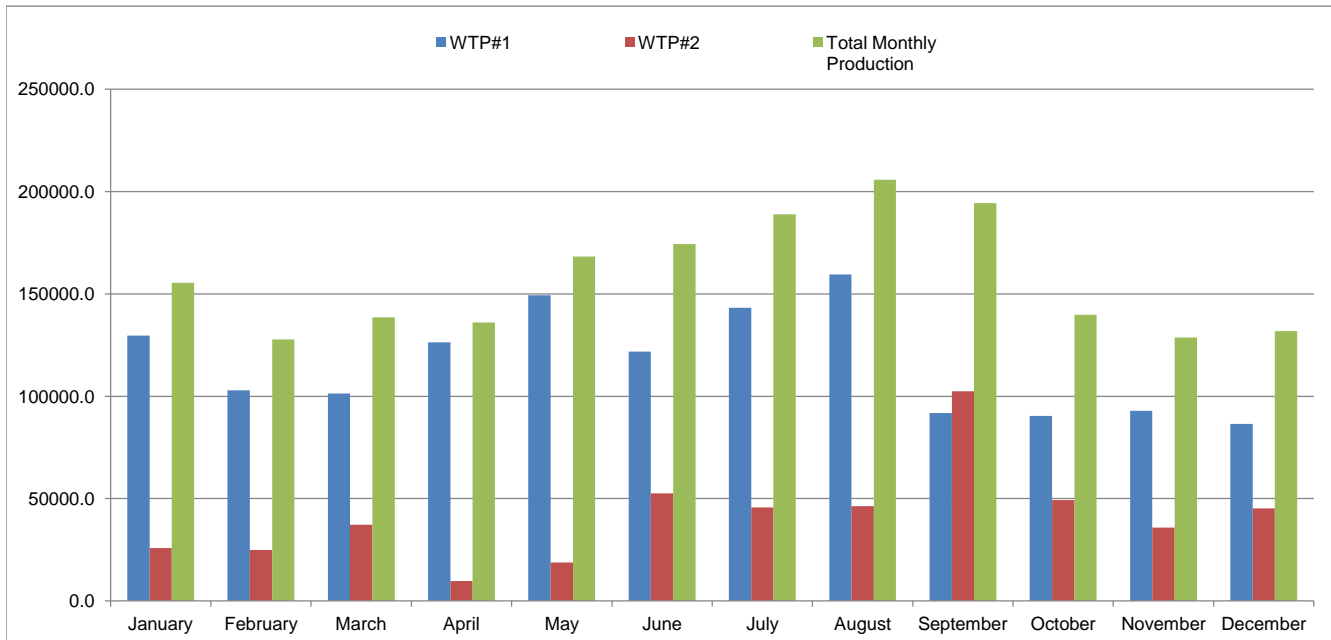
*City of North Battleford*  
*Drinking Water Quality*  
*2013 Report*  
*Appendix C: Water Production Volumes*





Month	WTP#1		WTP#2		Combined	
	Total	Average	Total	Average	Total Monthly Production	Average Daily Production
January	129666.0	4182.8	25787.3	831.8	155453.3	5014.6
February	102951.0	3676.8	24858.9	887.8	127809.9	4564.6
March	101339.0	3269.0	37227.1	1200.9	138566.1	4469.9
April	126322.0	4210.7	9737.0	324.6	136059.0	4535.3
May	149330.0	4817.1	18831.9	607.5	168161.9	5424.6
June	121819.0	4872.8	52574.9	1752.5	174393.9	6625.3
July	143254.7	4939.8	45642.1	1472.3	188896.8	6412.1
August	159430.6	5142.9	46252.1	1492.0	205682.7	6634.9
September	91817.8	3060.6	102462.7	3415.4	194280.5	6476.0
October	90408.3	2916.4	49359.2	1592.2	139767.5	4508.6
November	92856.1	3095.2	35879.0	1196.0	128735.1	4291.2
December	86497.4	2790.2	45286.8	1460.9	131784.2	4251.1
Yearly Total	1395691.9	3823.8	493899.0	1353.1	1889590.9	5177.0

NOTE: All reading are in m<sup>3</sup>





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*City of North Battleford  
Drinking Water Quality  
2013 Report  
Appendix D: Glossary*



## Glossary

**AO** – Aesthetic Objective and is based on taste, odour, or staining

**BOD** – Biochemical Oxygen Demand is the amount of dissolved oxygen needed by aerobic organisms in water to break down organic material present.

**BTEX** – Benzene, Toluene, Ethylbenzene, and Xylene are volatile organic compounds typically found in petroleum products such as gasoline and diesel.

**EC** – is a measure of water's ability to conduct electricity, The higher the concentration of dissolved ions, the higher the conductivity. It is most often measured in  $\mu\text{S}/\text{cm}$  – microSiemens per centimetre.

**E. coli** – is the only member of the total coliform group of bacteria that is found only in the intestines of mammals. The presence of E. coli in water indicates recent fecal contamination and may indicate the possible presence of disease-causing pathogens

**FEH WTP** – F.E. Holliday Water Treatment Plant

**iMAC** – Interim Maximum Acceptable Limit and is health based

**MAC** - Maximum Acceptable Limit and is health based

**Microcystins** – are toxins produced by blue-green algae (cyanobacteria).

**mg/L** – milligrams per litre

**NTU** – Nephelometric Turbidity Unit is based on the amount of light that is scattered by particles

**OG** – Operational Guidelines and is based on operational considerations (for example the water treatment process used)

**Pathogen** – is a disease causing microorganism such as a virus or bacterium.

**pH** – is a measure of how acidic or basic a solution is. It ranges from 0 to 14. A pH of 7 is neutral. A pH less than 7 is acidic while a pH greater than 7 is basic.

**S.E.** – Saskatchewan Ministry of the Environment is the department that oversees solid waste disposal

**WSA** – The Water Security Agency was created on October 1, 2012. The former Saskatchewan Watershed Authority is now part of this new provincial water organization. This agency regulates and monitors waterworks and wastewaterworks.

**THMs** – Trihalomethanes are disinfection by-products that form when chlorine is added to water that contains natural organic matter.

**TKN** – Total Kjeldahl nitrogen is the sum of organic nitrogen, ammonia, and ammonium.

**Total Coliforms** – are a group of bacteria commonly found in the environment. They are not likely to cause illness, but their presence indicates the water supply may be vulnerable to contamination by more harmful microorganisms.

**Total P** – Total Phosphorus is a measure of all the forms of phosphorus in a sample

**TSS** – Total Suspended Solids includes all particles suspended in water which will not pass through a filter.

**Turbidity** – is a measure of relative clarity of a liquid. Guidelines for turbidity are a safeguard against pathogens in drinking water.

**VSS** – Volatile Suspended Solids is the portion of Total Suspended Solids that can be ignited and is made up of organic material.

**WSA** – The Water Security Agency was created on October 1, 2012. The former Saskatchewan Watershed Authority is now part of this new provincial water organization.

**WTP** – Water Treatment Plant

**WTP #1**- Water Treatment Plant #1, this is the groundwater plant

**WTP #2** – Water Treatment Plant #2, also officially known as F.E.Holliday Water Treatment Plant, this is the surface water plant

**µg/L** – micrograms per litre; this is 1000 times smaller than a milligram (0.001mg/L)