Public Water System 2022 Annual Report

March 24, 2023

Lac du Bonnet Water Treatment Facility

Town of Lac du Bonnet

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Introduction:

The 2022 Annual Report on the Lac du Bonnet Water Treatment Facility summarizes the Utilities ability to produce safe potable water to all users of the facility.

1. Description of the water system:

The Lac du Bonnet Public Water System (LDBPWS), consisting of raw water conveyance, treatment, storage, and distribution, was constructed in 1976. A major expansion of the water treatment plant (WTP) was completed in 2003 to increase the reservoir capacity, change the treatment process to ballasted flocculation followed by UV disinfection and to provide a new distribution pumping system. The water treatment plant operates year-round to service the Town of Lac du Bonnet via a piped distribution system. The WTP also services customers outside of the Town through a truck fill. The Lac du Bonnet water system provides potable drinking water to a population of 1089 residents (2016 Census) as well as 799 bulk card users in the rural areas around the town of Lac du Bonnet. Treated water produced at our facility not only meets but exceeds all health and aesthetic objectives to date as stated in the *Guidelines for Canadian Drinking Water Quality*.

1.1 Water supply source + Intake Structures

The water source for the LDBPWS is the Winnipeg River. A barrel style intake screen is located approximately 30 meters from the shore and raw water is conveyed to a wet well via a 250 mm pipe. Raw water from the wet well is pumped to the WTP by submersible intake pumps (IP-1/2, each rated at 19 L/s) through a 150 mm dia. pipeline. The pipeline between the pumphouse and WTP is 519 m long. The pumps operate in a duty / standby configuration and a 25-kW diesel generator allows one pump to operate under power outages. The pumps are called to start based on the level in the reservoir at the WTP and communication to the WTP is through telemetry. The wet well is covered by a superstructure that houses the diesel generator and electrical panels. The diesel generator located over the wet well provides a potential contamination risk to the raw water. This risk has been mitigated by curbing the access hatch that provides access to the wet well. The pumphouse is located between residential properties located on the Winnipeg River. The Winnipeg River system is used for recreational purposes and there are no other methods of source protection.

1.2 Water Treatment Process

The treatment processes include chemically assisted ballasted flocculation and filtration, UV disinfection and chlorination. The chemically assisted ballasted flocculation process at the Lac du Bonnet Water Treatment Plant (LDB WTP) uses a multi barrier treatment process to treat the raw water from the river, the raw water comes out of the river with an average turbidity between 6-15 nephelometric turbidity units (NTU). The chemically assisted ballasted flocculation process at the LDB WTP is an Actiflo ACP 300 followed by two Dusenflo 400 filters. John Meunier (now Veolia) provided the equipment. The process is designed to meet the DWSA turbidity requirement of 0.3 NTU 95% of the time and always less than 1 NTU. The process also satisfies the DWSA requirement for a filtration barrier for a surface water source and can provide 2 log reduction for Giardia and Cryptosporidium so long as it is meeting the DWSA turbidity requirement (demonstrated by online monitoring), is designed in accordance with Ten State Standards and has an effective filter cleaning system.

It then flows through the UV system using ultra violet lights to neutralize or deactivate bacteria, and works with the filtration to get 3 log reduction. From this point the finished product flows into the Clear well at which point the water is chlorinated(disinfected) by sodium hypochlorite (liquid chlorine) pumped by a metering pump. It is then monitored and tested twice daily for chlorine residuals. As per the *Drinking water safety act* the Lac du Bonnet Water Treatment plant operator must ensure a disinfectant residual of at least:

* 0.5 mg/L of free chlorine is detectable at the point where water enters the distribution system, after a minimum contact time of 20 minutes.

*0.1 mg/L of free chlorine is detectable at all times at any point in the distribution system.

1.3 Water storage reservoirs:

The reservoirs contain treated water to be supplied to the residents and other users at all times, they consist of 3 chambers beneath the plant and one exterior reservoir directly south of the plant. The exterior chamber holds 1,246,000L, chamber 1 beneath the plant holds 278,000 L, chamber 2 beneath the plant holds, 99,600 L, and chamber 3 holds 91,000 L, to come to a total of 1,714,600 L of treated water. The water used is replenished every day and we have just over two day's supply based on history's worst-case scenario.

1.4 Distribution System

The distribution system consists of 4 turbine pumps at the treatment facility. One is the Jockey pump which maintains a consistent pressure in low demand situations and is smaller than duty pumps 1+2. Both duty pumps 1 and 2 are the same size but alternate pumping water only as required and jointly for higher demands. The 4^{th} pump is a 60HP fire pump that can maintain pressure from the lowest to the highest demands. All pumps have variable frequency drives so when the distribution system requires more water the pumps moderately increase in speed and

when the system requires less, they gradually decrease in speed to ensure proper pressures and flow with minimal hammer.
The underground distribution system consists of many different sizes and types of piping including: PVC(series 160 and C900 Blue Brute) and Copper, and sizes vary from 3/4" up to 10" in diameter.

1.5 # of Connections, types of users and population served

There are 535 connections to our distribution system. Users consist of commercial, home, and bulk fill users. The population served to date is 1089 as well as 799 bulk card users.

1.6 Classification and certification

The classification of Lac du Bonnet treatment facility is a Level 2.
Certification of operators is as follows for 2022.

Cameron Boulet	Level 3 Operator in Charge
	Level 2 Distribution
Jen Bellin	Level 1 Water Treatment
	Level 1 Distribution
Derrick Martin	Operator in Training

- The operator in charge holds all required licenses for the safe operation of this facility. Operators must attend other courses and conferences to maintain CEU'S (continuing education units). And apply for a license renewal every 5 years. They must obtain a certain limit of CEU's to be able to renew their license. The facility classification and operator certification fall under the Manitoba Conservation Water and Wastewater Facility Operators Regulation under Environment Act.

2. Disinfection system in use

2.1 Type of disinfection system

The Lac du Bonnet Water Treatment Plant uses two disinfection systems that include, a UV Disinfection system and a Chlorination System to meet government regulations. At this point filtration and UV gives a 3-log 99.9% reduction of crypto and giardia.

A single UV disinfection unit is located downstream of the filters for disinfection of the treated water. The purpose of the UV disinfection process is inactivation of pathogens. A Wedeco (B-120) low pressure UV Disinfection System is used at the LDB WTP. The UV system is validated by OEVGW for a 40 mJ/cm2. No redundancy is provided for the UV disinfection process. UV intensity is monitored and tracked by the SCADA system. The UV dose is function of intensity and exposure time. The measured UV intensity multiplied by the known exposure

time (flow and vessel geometry) gives an indication of the delivered dose. If the measured UV intensity is below that required to provide the design dose and alarm is generated.

The second disinfection system is chlorination. The Water plant uses sodium hypochlorite at a 12% solution which is added to the water after the UV system. A metering pump is used to inject the chlorine to the system at a specific dosage rate to maintain optimal free chlorine values in the reservoirs. Our reservoirs hold just over two day's supply and far exceed 20-minute contact time of chlorine which get our 4-log (99.99%) reduction of viruses. We have two metering pumps that are online and fully operational and used in rotation to ensure that both pumps are in good working order. If one of these pumps should fail, we carry a back-up pump on hand that could be quickly installed to maintain the two-pump system.

The Water Treatment system has a multi barrier alarm system that notifies the operator if the free chlorine limits reach a certain level. This alarm is set above the regulation limit, this would signal the plant to shut down and allow the operator to get to the plant and correct the dosage to maintain compliance with the drinking water regulations. Alarm Set points for chlorine are a low alarm for 0.65mg/L and a high of 1.5mg/L.

In the event of a power outage the water plant has a back-up generator to ensure uninterrupted and continuous power to the water treatment plant and distribution system to not only treat the water but supply safe drinking water at all times.

2.2 Equipment monitoring requirements and redundancy program:

Chlorine residuals are monitored 24/7/365 days a year by an online analyzer every minute. Manual readings are taken twice daily from sample point by analyzer and also bi-weekly in the distribution system as per our operating license requirements. These readings are recorded on monthly chlorination forms which are sent to the drinking water officer for review at the end of every month.

As required by the drinking water safety act the Lac du Bonnet Water treatment operators ensure continuous disinfection is maintained at the plant by keeping stock of all spare parts for the chlorinator pump plus 1 complete back up chlorinator pump ready to use at all times.

2.3 Disinfectant residual overall performance and results

For 2022, the Lac du Bonnet Water Treatment facility has had a problem with SCADA recording and data. All manual tests have been within license parameters, regulatory requirements regarding monitoring disinfection residuals leaving the facility have been corrected with some improvements still to be made.

3. List of water quality standards:

The province of Manitoba has adopted a number of water quality standards from the *Guidelines for Canadian drinking water quality*, developed by Health Canada. The parameters are health-based and they express the (MAC) Maximum Acceptable Concentrations for drinking

water. Concentration values in excess constitute a health-related issue and require corrective actions.

Parameters

	Quality Standard
Total coliform and E. coli	Less than one E. coli and total coliform bacteria detectable per 100 mL in all treated and distributed water
Chlorine residuals	* A free chlorine residual of at least 0.5mg/L in water entering the distribution system following a min. contact time of 20 minutes * A free chlorine residual of at least 0.1mg/L at all times at any point in the distribution system
Ultraviolet Disinfection	95% of water produced per month is. disinfected within validated conditions.
Total Trihalomethanes	Less than or equal to 0.10mg/L as locational annual average of quarterly samples as an annual
Total Haloacetic Acids	Less than or equal to 0.08mg/L as locational annual average of quarterly samples
Turbidity	Less than or equal to 0.3 NTU in 95% of the measurements in a month of the effluent from each operating particulate filter Not exceed 0.3 NTU for more than twelve consecutive hours of filter operation or for two consecutive daily measurements Not exceed 1.0 NTU for any continuous or daily measurement
Lead	Less than or equal to 0.010mg/L.

3.1 Disinfection Monitoring and reporting Regulatory Requirements PWS Performance

Free chlorine residual entering distribution system	**> 0.5 mg/L**	**100%**
Frequency of testing entering distribution system	**Daily**	**100%**
Free Chlorine residual in distribution system	**>0.1 mg/L**	**100%**
Frequency of testing in distribution system	**Bi-weekly**	**100%**
Report Submissions	**Monthly**	**100%**

Ultraviolet Light

Ultraviolet Light Monitoring	**Continuous**	**100%**
Report Submissions	**Daily**	**100%**
Report Submissions	**Monthly**	**100%**

3.2 Bacteriological Monitoring and reporting

	Regulatory requirement	**PWS Performance**
Number of raw/incoming water samples	26	26
Number of treated water samples	26	26
Number of distribution water samples	26	26
Frequency of testing	Bi-weekly	100%
Total Coliform present in samples	0 TC per 100ml	100%
E. Coli present in samples	0 EC per 100ml	100%

The Public Water System has met their regulatory requirements for 2022. There was one issue where the samples froze, but we were able to resample in the allotted time frame.

3.3 Physical Monitoring and Reporting

	Regulatory requirement	PWS performance
Chemically assisted, rapid gravity filtration process	< 0.3 NTU in at least 95% Of the samples taken per Month	100%
	Not to exceed 0.3 NTU For more than twelve continuous Hours were continuous measurements are taken.	100%

Frequency of testing	Continuous	100%
Report Submissions	Monthly	100%

3.4 Disinfection By-products Monitoring and Reporting

	Regulatory Requirements	PWS performance
Trihalomethane sampling requirements	Quarterly every year	100%
Total Trihalomethane Standard	0.10 mg/L	
Annual quarterly average in distribution	0.09275 mg/L	100%
Haloacetic Acids	Quarterly every year	100%
Haloacetic Acids	0.08 mg/L	
Annual quarterly average in distribution	0.0575 mg/L	100%

Sampling THM's and HAA's are required on a Bi-annual basis but Town of Lac du Bonnet has been submitting on an annual basis and will be submitting quarterly in 2023.

THM's are a chlorine disinfection by-product found in drinking water, acceptable amount being 0.1mg/L average over 4 quarterly samples. In 2022 our average was 0.09275mg/L. Which is below the guidelines.

Haloacetic Acids are also chlorine disinfection by-products found in drinking water. In 2008, Health Canada established a guideline of 0.08mg/L for HAA's. HAA analysis was submitted in 2022 and the results for our system were 0.0575mg/L average which is below the guideline.

Lead	**Regulatory requirements**	**PWS Performance**
Lead	>0.005mg/L	100%

3.5 Water Chemistry Analyses

The operators did submit an annual water sample from the Lac du Bonnet PWS for chemical analyses for 2022. This action is considered to fulfill the general chemistry monitoring requirement outlined in our Operating license. The report (attached) indicated that the treated water met all health-related guidelines as stipulated in health Canada's Guidelines for Canadian Drinking Water Quality. (http//www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potb/guide/index_e.html), in addition in 2022 we will be submitting quarterly samples ourselves in February, May, June and November for THM's and HHA's as a part of our ongoing monitoring of the performance of the treatment facility along with annual chemical sampling.

Parameter	Water Quality Standard	Town of LDB Raw water	Town of LDB Treated water	Town of LDB Distribution
Hardness		49.3	51.6	
pH	7.00 – 10.5	7.83	7.38	
Total Dissolved Solids	500	77	102	
Nitrate	10	0.0917	0.0921	
Aluminum	2.9	0.15	0.0434	0.0400
Arsenic	0.01	0.00114	0.00026	0.00026
Antimony	0.006	<0.00010	<0.00010	<0.00010
Barium	2	0.0100	0.00877	0.00877
Boron	5	<0.010	<0.010	0.013
Copper	2	0.00189	0.00473	0.0200
Cadmium	0.005	0.0000064	<0.0000050	<0.0000050
Chromium	0.05	0.00043	<0.000010	<0.000010
Lead	0.005	0.000233	<0.000050	0.000520
Manganese	0.12	0.0134	0.00071	0.00065
Uranium	0.02	0.000103	<0.000010	<0.000010
Chloride	250	1.80	22.7	
Zinc	5	0.0074	0.0043	0.0048

4. Water System Incidents and corrective actions

This year, in all circumstances where the SCADA report showed non-compliance issues all subsequent reviews showed raw data that the system was compliant. The issues were momentary and were a result of deficient SCADA programming rather than a problem with the water treatment process.

On January 4, 2022, there was a watermain break near the drainage ditch in Lakeside Park. We contacted the Office of Drinking Water; a Boil Water Advisory was issued for part of the town. The boil water advisory affected approximately one hundred residential households who were located south of Oak Street. The water was turned off around 7pm and was off until the break was fixed the next day. The town provided the residents affected with clean drinking water in the form of 18L water jugs. Once fixed, we took two bacteriological samples 24hrs apart that came back clean, and the boil water advisory was lifted.

On March 22, 2022, there was another watermain break in the same place as the Jan.4th break. Once again, a boil water advisory was issued, for the approximate 100 households south of Oak Street. We were able to get the water turned back on within 8 hrs. Since the break was in the same location earlier in the year, we made the decision to install valves on either side of the ditch to allow us the ability to isolate the area for repair. We were able to get the water back on to the residents within the same day. The entire fix took a couple of days, and a new line was installed between the valves. Once fixed we had to take two bacteriological samples 24hrs apart from the new line, they came back clean and the line was put in use.

On April 24,2022 the water plant experienced power bump causing UV system to restart without appropriate cooling down period. This resulted in Alarm (Bulb out) causing shutdown of UV

system. Corrective actions were taken to isolate and troubleshoot (replace bulbs). UV system had 2 power bumps in the course of a 6-hour span. We contacted Office of Drinking Water to advise and get guidance in maintaining regulatory compliances.

5. Drinking water safety orders and actions taken:

In 2022, no drinking water safety orders were issued for the Lac du Bonnet Public Water System.

6. Boil Water advisories issued and actions taken in response

In 2022, there was 2 boil water advisories issued for a certain section of Town south of Oak Street. They were issued due to watermain breaks. The breaks were repaired, and bacteriological samples were taken to ensure that the water was clean and potable.

7. Warnings issued, or charges laid on the system in accordance with The Drinking Water Safety Act

In 2022, no charges laid or warnings were received by the Lac du Bonnet Public water system.

8. System expansion and/or increased production

The Town of Lac du Bonnet continuous education and training of our Water Works Department will have an additional level 2 certified operator and level 1 certified operator by the end of 2023.
It is in the works to install a new raw water intake line and make the current line a secondary line to provide backup if one should fail in 2024.
Upgrades to the PLC and SCADA System scheduled for 2023.
The filter media was removed, and new media installed in both filters in February of 2023.
We plan on upgrading our chemical feed lines and platforms in the next 5 years.

9. System Upgrades Preformed

A new double check valve on our Bulk Station to ensure we keep out contaminates. New turbidity meters have been installed throughout the Water treatment plant to ensure we meet water safeties act regulations. New chemical pumps have been installed and filter media replaced to meet the 20-year requirements.

10. Summary:

The Water Treatment Plant's SCADA system provides accurate online monitoring of turbidity of the Actiflo system and the distribution system. This SCADA system takes online readings every minute to generate the best accuracy in its reporting. The negative side of this enhanced reading is it picks up a spike that lasts for seconds whereas readings taken every five minutes as per guidelines these spikes would be averaged and quite likely go unrecorded. Instances where Free

chlorine residual entering the distribution system reported by our online monitoring the daily average was well above the regulatory limits. This year we will be working with IT to improve monitoring and give a more detailed report.

If you wish to obtain a copy of this report you can go to our website Web: lacduBonnet.com and download it or go to the Town office and request a copy of the report.