

**Public Water System Annual Report (258.00)  
-2021-**

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Name of the Legal Owner: **Yellowhead Regional Water Co-op Inc.**

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Date Prepared: March 2022

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*Vince Hiebert*  
*Yellowhead Regional Water Co-op Inc.*

# Table of Contents

<b>1. Introduction:</b>	<b>3</b>
<b>2. Description of the Water System</b>	<b>3</b>
<i>2.1. Water Supply Source</i>	<i>3</i>
<i>2.2 Water Treatment Process</i>	<i>3</i>
<i>2.3 Classification and Certification</i>	<i>5</i>
<b>3. Water System Non-Compliance Incidents</b>	<b>6</b>
<b>4. Drinking Water Safety Orders, Warnings, and Charges</b>	<b>6</b>
<b>5. Major Expenses Incurred</b>	<b>7</b>
<b>6. YRWC System Maintenance</b>	<b>6</b>
<b>7. Future System Expansion</b>	<b>7</b>
<b>8. List of Water Quality Standards</b>	<b>7</b>
<b>Appendix A / Results and Analysis</b>	<b>10</b>
<b>Appendix B / PWTP Process Diagram</b>	<b>22</b>

## 1. Introduction:

The 2021 Yellowhead Regional Water Co-op Annual Report summarizes the water utility's ability to provide safe potable water and comply with provincial regulations.

## 2. Description of the Water System

The Yellowhead Regional Water Co-op (YRWC) provides potable drinking water to a population of approximately 3,500 residents. Corrective actions were taken and reported as required for normal minor variations during the course of operations.

The Yellowhead Regional Co-op water system consists of a network of pressure pipelines, booster stations, a pressure reducing station, water storage reservoirs, and meter stations. The YRWC owns the Arden, Austin, MacGregor, Plumas, and Gladstone (yellowhead) water storage reservoirs. The Co-op also owns the Lansdowne, Poplar Bluff and Bagot booster stations, as well as the Westbourne reducing station.

### 2.1 Water Supply Source

The YRWC receives its treated water supply from the City of Portage la Prairie Water Treatment Plant (City of Portage WTP), which uses the Assiniboine River as the raw water supply. The system provides treated water to the Rural Municipalities of North Norfolk, Westlake-Gladstone, Glenella-Lansdowne and the Towns of Gladstone and MacGregor; and the Villages of Austin, Bagot, Rossendale, Westbourne, Plumas and Arden.

### 2.2 Water Treatment Plant Process (City of Portage)

- *General Plant Description:*  
The City obtains its water from the Assiniboine River. Three 125-hp 265 l/s pumps transfer the raw water from the river impoundment area upstream of the spillway structure to the water treatment plant. The first stage of treatment is a pre-clarification process.
- *Ballasted Flocculation Clarification:*  
Is a unique process, where, in addition to various chemicals that are added to promote the coagulation and flocculation (sticking together in big clumps), very fine sand is added to the mix to make the floc (clumps) settle very quickly. This portion removes a large portion of turbidity, organics, and algae, reducing taste odor issues. Potassium permanganate is added as a pre-oxidant. The pre-clarified water is then passed through to the next process.
- *The softening clarifiers:*  
Are large circular basins, where hydrated lime and synthetic polymers are added for further coagulation and flocculation. Lime raises the pH to a point where calcium and magnesium are settled out, thus removing hardness from the water. Sodium Hydroxide is also added to the softening clarifiers to aid in the removal of non-carbonate hardness lowering the overall water hardness.
- *Re-carbonation:*  
Is the next step, where carbon dioxide is bubbled through the water to form carbonic acid to lower the pH. Stabilizing the pH prevents corrosion or scaling throughout the City's water distribution system. The lowering of the pH also aids in the Ozone process.
- *Ozone:*

Is a strong oxidant that is effective at destroying parasitic organisms such as giardia lamblia and cryptosporidium cysts, and the breakdown of organics. It is also effective in the elimination of viruses and bacteria. This process involves the bubbling of Ozone gas that is produced on site into the water prior to the filters.

- *Calcium Thiosulphate:*  
Is added after ozonation, for the removal of excess ozone gas after leaving the ozone contactor chamber.
- *Dual Media Filtration:*  
Follows the Ozone disinfection process. The break down of organics promote biologically active filtration which significantly improves further organics removal. The Filters contain Anthracite and Sand media in separate layers for longer filter life and filtering of the water. In 2008 a new stainless-steel under-drain system was installed in the sand filters to promote better filtration and the backwashing of the filters. Organics removal is crucial to the reduction of distribution by-products found in the drinking water supply after chlorination. The filtered water is then passed to a under floor reservoir where the water is then either pumped to the Granular Activated Carbon (GAC) Contactors, continued treatment process, or it is diverted for back washing the dual media filters or the GAC contactors. Using non-chlorinated water for backwashing respects the environment, as the backwash waste is ultimately returned to the River.
- *Granular Activated Carbon Contactors:*  
Are utilized as a final polishing step for the ultimate reduction in organics, and for the final taste and odor elimination. The adsorption of organic matter by the activated carbon reduces the amount of chlorine required for final disinfection, which ultimately minimizes disinfection by-products in the drinking water system. New Granular Activated Carbon was installed in the fall of 2008 and the spent GAC was returned for regeneration and reuse instead of shipping to landfill sites.
- *Disinfection:*  
Occurs in the Storage Reservoir. Final treatment occurs by adding Chlorine and allowing contact time. Chlorine is added for final disinfection, and a residual is maintained in the distribution system to eliminate any re-growth of pathogenic organisms.
- *Hydrofluosilicic Acid – Fluoride:*  
Is added for dental health and an Orthophosphate is added to reduce corrosion within the distribution system. The orthophosphate creates a thin film on the inside of the piping throughout the distribution system and helps prevent lead from leaching into the water supply.
- *Sodium Hydroxide:*  
Is added to raise the pH and increase the alkalinity of the water prior to entering the distribution system. The City of Portage la Prairie has two Reservoirs; the first is located at the Water Treatment Plant and the second in the Northwest section of the city. The reservoir located at the Water Treatment Plant has five 40 horsepower driven pumps to supply water to the McKay Reservoir and the distribution systems of the City of Portage la Prairie and Regional Water Systems. The Water Treatment Plant reservoir also has three 100 horsepower variable speed driven pumps to supply water to the Poplar Bluff Industrial Park and Regional Water Systems. The McKay Reservoir has eight 40 horsepower driven, 70 L/S pumps to supply water to the City of Portage la Prairie distribution system and other regional water systems. The Reservoir at the Water Treatment Plant has a capacity of 4.64 ML and the McKay Reservoir has 9.25 ML capacity.
- *Residuals Solids Management*  
Is accomplished via sludge drying beds. The waste sludge, comprised of “unwanted” material removed from the raw water, as well as the chemicals and lime used through the treatment

process, is collected and pumped to two 45,000 cubic meter ponds. In these ponds, the sludge settles to the bottom and clarified water is returned to the River.

- *Plant Specifications:*

The Plant type is a Conventional lime softening plant with Pre-clarification, biologically activate dual media filtration, ozone, carbon dioxide for pH adjustment and Granular Activated Carbon filters with chlorine disinfection for the distribution system. Design capacity of 34 million litres/day (net).

### 2.3 Classification and Certification

The City of Portage WTP is classified as a Class 4 water treatment facility and a Class 2 Water Distribution facility, and the YHRC water distribution is classified as a Class 2 water distribution facility. The facility classifications are used to determine certification requirements for water system operators.

### 3. Water System Non-Compliance Incidents (YRWC)

DATE	INCIDENT	OUTCOME
June	Failure to maintain a free chlorine residual of at least 0.5mg/L in accordance with the operating licence	Non compliant
June	Failure to maintain a free chlorine residual of at least 0.5mg/L in accordance with the operating licence	Non compliant
July	Failure to maintain a free chlorine residual of at least 0.5mg/L in accordance with the operating licence	Non compliant
July	Failure to maintain a free chlorine residual of at least 0.5mg/L in accordance with the operating licence	Non compliant
July	Failure to maintain a free chlorine residual of at least 0.5mg/L in accordance with the operating licence	Non compliant
October	Failure to maintain a free chlorine residual of at least 0.5mg/L in accordance with the operating licence	Non compliant
December	Failure to maintain a free chlorine residual of at least 0.5mg/L in accordance with the operating licence	Non compliant
December	Failure to maintain a free chlorine residual of at least 0.5mg/L in accordance with the operating licence	Non compliant
December	Failure to maintain a free chlorine residual of at least 0.5mg/L in accordance with the operating licence	Non compliant
Trihalomethanes 2020	Failure to meet the standard (Next testing year 2022)	Non compliant

#### **4. Drinking Water Safety Orders, Warnings, and Charges**

There were no Drinking Water Safety Orders or warnings issued under the Yellowhead licence (258.00), nor were any charges laid on the system.

#### **5. Major Expenses Incurred**

There were no major expenses incurred in the Yellowhead Regional Water Coop in 2021.

#### **6. YRWC system maintenance (Brief Overview)**

- Poplar Bluff Booster- No repairs required.
- Bagot Booster- No repairs required.
- MacGregor Reservoir (100,000gal) – We repaired one of the 7.5hp distribution town pumps due to end-of-life service.
- Austin Reservoir (120,000gal) – No repairs required.
- Pressure Reducing Station- No repairs required.
- Gladstone Reservoir (500,000 gal)
  - In March we replaced the UPS unit for the control panel.
  - In May We had the overhead chain hoist re-certified. In June we had the online analyzers calibrated.
  - In Dec we replace a pump and motor for one of the distribution pumps in the reservoir.
- Lansdowne Booter- No repairs required.
- Plumas Reservoir (90,000 gal) – Some planning took place for future upgrades to the Plumas reservoir.
- Arden Reservoir (35,000) – No repairs required.

#### **7. Future System Expansion**

- *POPLAR BLUFF INDUSTRIAL PARK RESERVOIR AND PUMPHOUSE:*

The Yellowhead Water Coop board in cooperation with the Manitoba Water Services Board, City of Portage, and the RM of Portage continue plans to build a water storage reservoir in the RM of Portage la Prairie. This reservoir will increase storage capacity for the city as well as improve the reliability of water supply to the entire YRWC. The new reservoir is to be constructed at the Poplar Bluff Industrial Park (PBIP) site, immediately east of the Roquette site and west of the Portage Diversion channel. The proposed PBIP reservoir will be sized to meet both the industrial and regional demands as well as meet the required residual pressure at the respective facilities based on the supplementary distribution pumping system at this site. In addition, it was also indicated that the existing 450 mm dia. supply pipeline from the City's WTP to new

reservoir in PBIP would be twinned. This would ensure an uninterrupted supply of water in case one of the supply lines required repairs. This project is scheduled to being in fiscal year 2022-23

## 8. List of Water Quality Standards

The Province of Manitoba has adopted a number of water quality standards from the Health Canada *Guidelines for Canadian Drinking Water Quality*. The health-based parameters express the maximum acceptable concentrations for drinking water. Concentration values in excess of the guidelines constitute a health-related issue and require corrective actions. Public water systems are required to monitor chlorine levels and undertake regular bacterial testing.

All health-based parameters were within the limits for 2020 for the YHRC Water System, with the exception of THM’s. A compliance plan is required to address elevated THM levels, which mainly consists of the combination of further operational changes and mechanical upgrades to the City of Portage WTP to improve organics removal and reduce THM formation potential. In 2018 the YHRC completed a pilot project to use specific aeration equipment (PAX) to target and decrease THM in the treated water which installed at the Plumas Reservoir. This system is still in operation and continues to lower THM’s in Plumas.

The Manitoba health-based standards for THM and HAA are 100 µg/L (micrograms per liter) and 80 µg/L, respectively. Both THM and HAA are by-products of disinfection, where chlorine combines with trace amounts of organics in the water. THM and HAA levels in the YRWC distribution system are sampled every second year, they were last monitored in 2018 and again in 2020. Below are the water quality and treatment standards as well as the water quality monitoring requirements for the Yellowhead Regional Water Coop.

Test results for 2021 are shown in **Appendix A**.

### Water Quality/Treatment Standards

Parameter	Quality Standard	Compliance
Total Coliform	Less than one total coliform bacteria detectable per 100mL in all distributed water	100%
E. coli	Less than one E. coli bacteria detectable per 100mL in all distributed water	100%
Chlorine Residual	A free Chlorine residual of at least 0.1mg/L at all times at any point in the water distribution system	99%
Total Trihalomethanes (THM’s)	Less than or equal to 0.10 mg/L as locational annual average of quarterly samples	Non-Compliant
Total Haloacetic acids (HAA’s)	Less than or equal to 0.08 mg/L as locational annual average of quarterly samples	Compliant
Lead	Less than or equal to 0.01 mg/L in the water distribution system	n/a

## Water Quality Monitoring Requirements

Parameter	Monitoring Requirement	Compliance
Bacteriological (total coliform and E. coli)	Biweekly sampling program with each set of samples consisting of a minimum of eight (8) distribution samples from the following. <ul style="list-style-type: none"> <li>Water entering the reservoir at Gladstone</li> <li>Water entering the reservoirs at Arden, Austin, MacGregor, and Plumas (two samples shall be alternated each sampling period)</li> <li>Water leaving the Arden, Austin, Gladstone, MacGregor and Plumas reservoirs</li> </ul> Consecutive sample sets to be separated by at least 12 days	99%
Free chlorine (distribution system)	<ul style="list-style-type: none"> <li>One sample per day of water entering the Yellowhead distribution system at the Poplar Bluff booster station</li> <li>One sample per day of water leaving the Arden, Austin, MacGregor and Plumas Reservoirs</li> <li>Continuous sampling of water entering the regional distribution system from the Gladstone reservoir</li> <li>A confirmatory sample to be taken daily at the online chlorine analyzer sampling point of water entering the regional distribution system from the Gladstone Reservoir</li> <li>At the same times and location(s) as bacteriological distribution system sampling</li> </ul>	99%
Total chlorine (distribution system)	<ul style="list-style-type: none"> <li>One sample per day of water entering the Yellowhead distribution system at the Poplar Bluff booster station</li> <li>One sample per day of water leaving the Arden, Austin, MacGregor and Plumas reservoir</li> <li>One confirmatory sample per day of water entering the regional distribution system from the Gladstone reservoir</li> <li>At the same times and location(s) as bacteriological distribution system sampling</li> </ul>	99%
Total trihalomethanes	One preserved distribution system sample taken on a quarterly basis during February, May, August, and November, every second year at the furthest point in the distribution system.	Non-Compliant
Total haloacetic acids (HAA's) (distribution sytem)	One preserved distribution system sample taken on a quarterly basis during February, May, August, and November, every second year at a mid point in the distribution system.	Compliant
Other Parameters	As per the instructions of the Drinking Water Officer	n/a
Lead	As per the instructions of the Drinking Water Officer	n/a

# Appendix A

**Bacterial, THM & HAA Results**  
**Chlorine Residual Analysis**  
**Water Chemistry Results**



Collection Date	Sample identification	TC	EC	CL2	CL2	HPC
M/D/Y				Free	Total	
1/4/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.74	1.86	
1/4/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.3	1.74	
1/4/2021	Yellowhead 3 Dist - Austin Incoming	0	0	0.74	0.98	
1/4/2021	Yellowhead 3 Dist - MacGregor Incoming	0	0	1.21	1.64	
1/5/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.34	2.14	
1/5/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.5	1.24	
1/5/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	1.29	2.14	
1/6/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	0.9	1.7	
1/18/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.48	1.82	
1/18/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	0.94	1.33	
1/19/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	1.4	1.9	
1/19/2021	Yellowhead 3 Dist - Arden Incoming	0	0	1.7	3	
1/20/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.11	1.69	
1/20/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.75	1.23	
1/20/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.51	0.99	
1/20/2021	Yellowhead 3 Dist - Plumas Incoming	0	0	1.08	1.5	
2/2/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	1.9	2.8	
2/2/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.25	1.82	
2/2/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.9	1.33	
2/2/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.94	1.34	
2/3/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.45	1.88	
2/3/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.45	2.05	
2/3/2021	Yellowhead 3 Dist - Austin Incoming	0	0	0.68	1.01	
2/3/2021	Yellowhead 3 Dist - MacGregor Incoming	0	0	0.8	1.32	
2/16/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.26	1.87	
2/16/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.92	1.26	
2/16/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.87	1.67	
2/16/2021	Yellowhead 3 Dist - Plumas Incoming	0	0	0.79	1.3	
2/17/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.36	1.87	
2/17/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.31	1.62	
2/17/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	2	3	
2/17/2021	Yellowhead 3 Dist - Arden Incoming	0	0	2.5	3.4	
3/1/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.99	2.19	
3/1/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.13	1.62	
3/1/2021	Yellowhead 3 Dist - Austin Incoming	0	0	0.47	1.25	
3/1/2021	Yellowhead 3 Dist - MacGregor Incoming	0	0	1.41	1.69	
3/2/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.29	1.68	
3/2/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.72	0.87	
3/2/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.69	1.5	
3/2/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	2	2.9	
3/15/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	2.01	2.2	

3/15/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.23	1.68
3/16/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.62	2.2
3/16/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.72	1.04
3/16/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	1.19	2.03
3/16/2021	Yellowhead 3 Dist - Plumas Incoming	0	0	1.25	1.54
3/16/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	1.9	2.6
3/16/2021	Yellowhead 3 Dist - Arden Incoming	0	0	2.2	3.2
3/29/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.58	1.89
3/29/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.32	1.54
3/29/2021	Yellowhead 3 Dist - Austin Incoming	0	0	1.1	1.41
3/29/2021	Yellowhead 3 Dist - MacGregor Incoming	0	0	0.54	1.04
3/30/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	0.98	1.55
3/30/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.8	1.15
3/30/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.62	1.29
3/31/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	1.1	2.4
4/12/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.21	1.43
4/12/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.19	1.45
4/13/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.01	1.52
4/13/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.68	1.1
4/13/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.62	0.98
4/13/2021	Yellowhead 3 Dist - Plumas Incoming	0	0	1.19	1.36
4/14/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	0.7	1.7
4/14/2021	Yellowhead 3 Dist - Arden Incoming	0	0	0.9	1.6
4/26/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.36	1.52
4/26/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.44	1.77
4/26/2021	Yellowhead 3 Dist - Austin Incoming	0	0	1.24	1.44
4/26/2021	Yellowhead 3 Dist - MacGregor Incoming	0	0	1.48	1.93
4/26/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	0.7	1.5
4/27/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.06	1.33
4/27/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.77	1.07
4/27/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	2.04	2.2
5/10/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	0.8	1.17
5/10/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.97	1.32
5/10/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.64	1
5/10/2021	Yellowhead 3 Dist - Plumas Incoming	0	0	0.88	1.3
5/10/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.26	1.58
5/10/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.26	1.48
5/12/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	0.9	1.6
5/12/2021	Yellowhead 3 Dist - Arden Incoming	0	0	1.5	2.3
5/25/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.46	1.81
5/25/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.85	1.31
5/25/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	1.09	1.41
5/25/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	0.7	1.3
5/26/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.96	2.2

5/26/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.23	1.6	
5/26/2021	Yellowhead 3 Dist - Austin Incoming	0	0	1.09	1.48	
5/26/2021	Yellowhead 3 Dist - MacGregor Incoming	0	0	0.99	1.68	
6/7/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	0.93	1.29	
6/7/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	0.97	1.13	
6/7/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.26	1.52	
6/7/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	1.07	1.44	
6/7/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.93	1.32	
6/7/2021	Yellowhead 3 Dist - Plumas Incoming	0	0	1.17	1.49	
6/7/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	1.6	2.2	
6/7/2021	Yellowhead 3 Dist - Arden Incoming	0	0	2.2	2.9	
6/21/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.35	1.71	
6/21/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.24	1.53	
6/21/2021	Yellowhead 3 Dist - Austin Incoming	0	0	1.29	1.65	
6/21/2021	Yellowhead 3 Dist - MacGregor Incoming	0	0	1.09	1.22	
6/22/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	0.98	1.36	
6/22/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.7	1.05	
6/22/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.98	1.35	
6/23/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	1.5	2.5	
7/5/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.35	1.71	
7/5/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.24	1.53	
7/6/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.06	1.41	
7/6/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.87	1.14	
7/6/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.8	1.27	
7/6/2021	Yellowhead 3 Dist - Plumas Incoming	0	0	0.46	0.88	
7/6/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	1	1.5	
7/6/2021	Yellowhead 3 Dist - Arden Incoming	0	0	0.8	1.5	
7/19/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.51	1.85	
7/19/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.03	1.39	
7/19/2021	Yellowhead 3 Dist - Austin Incoming	0	0	0.62	0.96	
7/19/2021	Yellowhead 3 Dist - MacGregor Incoming	0	0	0.68	1.01	
7/20/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	0.98	1.33	
7/20/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	1.18	1.63	
7/20/2021	Yellowhead 3 Dist - Gladstone Incoming	1	0	0.4	0.68	
7/20/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	0.8	1.5	
7/22/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	0.86	1.39	
7/22/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.58	0.9	
8/3/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.05	1.33	
8/3/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	1.23	1.64	
8/3/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.74	1.18	
8/3/2021	Yellowhead 3 Dist - Plumas Incoming	0	0	0.85	1.25	
8/3/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.59	1.96	
8/3/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.16	1.53	
8/3/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	1	2	

8/3/2021	Yellowhead 3 Dist - Arden Incoming	0	0	0.5	1.5
8/16/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.75	2.13
8/16/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.29	1.66
8/16/2021	Yellowhead 3 Dist - Austin Incoming	0	0	0.6	1.01
8/16/2021	Yellowhead 3 Dist - MacGregor Incoming	0	0	1.59	1.88
8/17/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	1.1	1.8
8/30/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.01	1.39
8/30/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.06	1.36
8/31/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.44	1.72
8/31/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	1.08	1.51
8/31/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.48	0.82
8/31/2021	Yellowhead 3 Dist - Plumas Incoming	0	0	0.72	1.01
8/31/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	0.8	1.4
8/31/2021	Yellowhead 3 Dist - Arden Incoming	0	0	1.3	1.8
9/13/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.12	1.35
9/13/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.25	1.45
9/13/2021	Yellowhead 3 Dist - Austin Incoming	0	0	1.02	1.34
9/13/2021	Yellowhead 3 Dist - MacGregor Incoming	0	0	1.08	1.26
9/13/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	0.8	1.6
9/14/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.25	1.6
9/14/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	1.35	1.89
9/14/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.99	1.41
9/27/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.23	1.53
9/27/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.04	1.42
9/27/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	0.9	1.5
9/27/2021	Yellowhead 3 Dist - Arden Incoming	0	0	1.3	2.1
9/28/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.5	1.78
9/28/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.92	1.29
9/28/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.97	1.3
9/28/2021	Yellowhead 3 Dist - Plumas Incoming	0	0	1.27	1.65
9/29/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	0.9	1.4
9/29/2021	Yellowhead 3 Dist - Arden Incoming	0	0	1.2	1.9
10/12/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.08	1.45
10/12/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.89	1.24
10/12/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.51	0.75
10/12/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	1.1	1.9
10/13/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.4	1.71
10/13/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.1	1.34
10/13/2021	Yellowhead 3 Dist - Austin Incoming	0	0	0.67	0.81
10/13/2021	Yellowhead 3 Dist - MacGregor Incoming	0	0	1.3	1.61
10/25/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.13	1.43
10/25/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.17	1.41
10/25/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	1.1	1.8
10/25/2021	Yellowhead 3 Dist - Arden Incoming	0	0	1	1.6

11/8/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.03	1.04	
11/8/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.14	1.61	
11/8/2021	Yellowhead 3 Dist - Austin Incoming	0	0	0.9	1.01	
11/8/2021	Yellowhead 3 Dist - MacGregor Incoming	0	0	0.71	1.09	
11/9/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	0.9	1.6	
11/9/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.26	1.53	
11/9/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.81	1.1	
11/9/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.66	1.27	
11/22/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.34	1.71	
11/22/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	0.97	1.27	
11/23/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.16	1.56	
11/23/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	1.06	1.24	
11/23/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.61	0.86	
11/23/2021	Yellowhead 3 Dist - Plumus Incoming	0	0	0.58	0.89	
11/24/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	1.2	1.8	
11/24/2021	Yellowhead 3 Dist - Arden Incoming	0	0	0.6	1	
12/7/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.42	1.78	
12/7/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	0.71	1.21	
12/7/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.81	1.01	
12/8/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.37	1.73	
12/8/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.01	1.4	
12/8/2021	Yellowhead 3 Dist - Austin Incoming	0	0	1.08	1.41	
12/8/2021	Yellowhead 3 Dist - MacGregor Incoming	0	0	0.97	1.32	
12/8/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	1.2	1.9	
12/20/2021	Yellowhead 3 Dist - Arden Outgoing	0	0	1	1.9	
12/20/2021	Yellowhead 3 Dist - Arden Incoming	0	0	0.6	1	
12/21/2021	Yellowhead 3 Dist - Gladstone Outgoing	0	0	1.25	1.77	
12/21/2021	Yellowhead 3 Dist - Plumus Outgoing	0	0	1.7	2.2	
12/21/2021	Yellowhead 3 Dist - Gladstone Incoming	0	0	0.32	0.92	
12/21/2021	Yellowhead 3 Dist - Plumus Incoming	0	0	0.69	1.2	
12/21/2021	Yellowhead 3 Dist - Austin Outgoing	0	0	1.11	1.49	
12/21/2021	Yellowhead 3 Dist - MacGregor Outgoing	0	0	1.27	1.75	

## Trihalomethane (THM) 2020 results

\*\* Next Sampling Year 2022\*\*

WATER SYSTEM NAME	CODE	FEB	MAY	AUG	NOV	AVG THM (µg/L)
Municipality of North Norfolk	151.50	136	81.4	153	73.1	110.9
Municipality of Glenella-Lansdowne (@ Arden)	6.25	234	173	124	109	160
Municipality of Westlake-Gladstone (@ Plumas)	247.20	55.3	48.5	69.4	55.6	57.2
Yellowhead Regional	258.00	195	161	128	153	159.3
(Source - City PLaP - 171.00)						

### Notes:

- All results reported in µg/l
- THM Annual Average Maximum Allowable Concentration = 100 µg/l

## Haloacetic Acids (HAA) 2020 results

\*\* Next Sampling Year 2022\*\*

WATER SYSTEM NAME	CODE	FEB	MAY	AUG	NOV	AVG HAA (µg/L)
Municipality of North Norfolk	151.50	38.9	26.9	54	22.1	35.48
Municipality of Glenella-Lansdowne (@ Arden)	6.25	84	83.4	53.1	22.7	60.8
Municipality of Westlake-Gladstone (@ Plumas)	247.20	71.8	69.9	88.1	40.9	67.68
Yellowhead Regional	258.00	34.7	28.8	67.2	29	39.9
(Source - City PLaP - 171.00)						

### Notes:

- All results reported in µg/l
- HAA Annual Average Maximum Allowable Concentration = 80 µg/l

**PWTP - Water Chemistry Results**

**Inorganic and Organic Testing**

Nov-21

**Physical Tests (Water)**

ALS ID					
Sampled Date					
Sampled Time					
Sample ID				Portage la Prairie 1 - Raw	Portage la Prairie 2 - Treated
Analyte	Unit	Guide Limit #1	Guide Limit #2		
Color, True	CU	15	-	7.2	,5.0
Conductivity	umhos/cm	-	-	1280	1000
Hardness (as CaCO3)	mg/L	-	-		
Langelier Index (4 C)	No Unit	-	-	N/A	N/A
Langelier Index (60 C)	No Unit	-	-	N/A	N/A
pH	pH units	7.00-10.5	-	8.50	7.81
Total Dissolved Solids	mg/L	500	-	795	590
Transmittance, UV (254 nm)	% T	-	-	70.1	91.2
Turbidity	NTU	-	-	23.3	0.10

Federal Guidelines for Canadian Drinking Water Quality (MAR, 2015)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

**Anions and Nutrients (Water)**

ALS ID					
Sampled Date					
Sampled Time					
Sample ID				Portage la Prairie 1 - Raw	Portage la Prairie 2 - Treated
Analyte	Unit	Guide Limit #1	Guide Limit #2		
Alkalinity, Total (as CaCO3)	mg/L	-	-	319	77.6
Ammonia, Total (as N)	mg/L	-	-	<0.010	0.015
Bicarbonate (HCO3)	mg/L	-	-	366	94.7
Bromate	mg/L	-	10	0.129	0.01
Bromide (Br)	mg/L	-	-	11.6	<0.60
Carbonate (CO3)	mg/L	-	-	46.80	52.7
Chloride (Cl)	mg/L	250	-	46.8	52.7
Fluoride (F)	mg/L	-	1.5	0.17	0.677
Hydroxide (OH)	mg/L	-	-	<0.34	<0.34
Nitrate (as N)	mg/L	-	10	<0.0050	0.0226
Nitrite (as N)	mg/L	-	1	<0.0010	<0.0010
Sulfate (SO4)	mg/L	500	-	319	325

Federal Guidelines for Canadian Drinking Water Quality (MAR, 2015)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

### Organic / Inorganic Carbon (Water)

ALS ID			
Sampled Date			
Sampled Time			
Sample ID		Portage la Prairie 1 - Raw	Portage la Prairie 2 - Treated
Analyte	Unit	Guide Limit #1	Guide Limit #2
Dissolved Organic Carbon	mg/L	-	-
Total Organic Carbon	mg/L	-	-
		8.6	5.39

Federal Guidelines for Canadian Drinking Water Quality (MAR, 2015)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

### Total Metals (Water)

ALS ID				
Sampled Date				
Sampled Time				
Sample ID		Portage la Prairie 1 - Raw	Portage la Prairie 2 - Treated	Portage la Prairie 3 - Treated
Analyte	Unit	Guide Limit #1	Guide Limit #2	
Aluminum (Al)-Total	mg/L	0.1	-	0.437
Antimony (Sb)-Total	mg/L	-	0.006	0.00017
Arsenic (As)-Total	mg/L	-	0.01	0.00394
Barium (Ba)-Total	mg/L	-	1	0.121
Beryllium (Be)-Total	mg/L	-	-	<0.00010
Bismuth (B)-Total	mg/L	-	-	<0.000050
Boron (B)-Total	mg/L	-	5	0.124
Cadmium (Cd)-Total	mg/L	-	0.005	0.0000375
Calcium (Ca)-Total	mg/L	-	-	93.1
Cesium (Cs)-Total	mg/L	-	-	0.000087
Chromium (Cr)-Total	mg/L	-	0.05	0.00126
Cobalt (Co)-Total	mg/L	-	-	0.00068
Copper (Cu)-Total	mg/L	1	2	0.00324
Iron (Fe)-Total	mg/L	0.3	-	1.06
Lead (Pb)-Total	mg/L	-	0.005	0.000536
Lithium (Li)-Total	mg/L	-	-	0.0668
Magnesium (Mg)-Total	mg/L	-	-	54.7
Manganese (Mn)-Total	mg/L	0.02	0.12	0.125
Molybdenum (Mo)-Total	mg/L	-	-	0.00331
Nickel (Ni)-Total	mg/L	-	-	0.00402
Phosphorus (P)-Total	mg/L	-	-	0.069
Potassium (K)-Total	mg/L	-	-	10.6
Rubidium ((Rb)-Total	mg/L	-	-	0.00269
Selenium (Se)-Total	mg/L	-	0.05	0.000388

Silicon (Si)-Total	mg/L	-	-	8.64	3.53	3.5
Silver (Ag)-Total	mg/L	-	-	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	200	-	71	77.3	78.4
Strontium (Sr)-Total	mg/L	-	7	0.369	0.209	0.209
Sulfur (S)-Total	mg/L	-	-	95.7	93.7	92.8
Tellurium (Te)-Total	mg/L	-	-	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	-	-	0.000019	<0.000010	<0.000010
Thorium (Th)-Total	mg/L	-	-	0.00011	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	-	-	0.0127	<0.00030	<0.00030
Tungsten (W)-Total	mg/L	-	-	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	mg/L	-	0.02	0.00315	0.000053	0.000048
Vanadium (V)-Total	mg/L	-	-	0.00282	0.00125	0.00127
Zinc (Zn)-Total	mg/L	5	-	0.0099	<0.0030	0.0075
Zirconium (Zr)-Total	mg/L	-	-	0.00061	<0.00020	<0.00020

**Federal Guidelines for Canadian Drinking Water Quality (MAR, 2015)**

**#1: GCDWQ - Aesthetic Objective**

**#2: GCDWQ - Maximum Acceptable Concentrations (MACs)**



**Detection Limit for result exceeds Guide Limit. Assessment against Guide Limit cannot be made.**

**Analytical result for this parameter exceeds Guide Limit listed on this report.**

**\*Please refer to the Reference Information section for an explanation of any qualifiers noted.**

# Appendix B

## Water Treatment Plant Process Diagram<sup>1</sup>

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<sup>1</sup> Obtained from WSP (Formerly Genivar)

