

# 2010 Public Water System Annual Report

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Date prepared: January 3, 2010.

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Cartier Regional Water System

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## ***Introduction:***

The 2010 Annual Report for the Cartier Regional Water System summarizes the Co-op's ability to produce safe potable water and meet provincial regulations.

## ***1. Description of the Water System:***

The Cartier Regional Water System provides potable drinking water to a population of app. 8900 residents. Treated water produced from the Cartier Regional water treatment plant meets all health and aesthetic objectives as stated in the Guidelines for Canadian Drinking Water Quality, with the exception of the level of the THM; bromodichloromethane. This is further discussed in the Office of Drinking Water Annual Audit, which is included in this report as Appendix E.

### **1.1. Water supply source**

The Cartier Regional Water Treatment Plant (WTP) receives surface water from the Assiniboine River.

### **1.2. Intake structures:**

The stainless steel intake structure is specially designed to prevent injury to fish. It is located immediately east of the Baie Ste Paul bridge, & flows through a 400 mm pipe into a concrete wetwell on the south shore of the river. Two submersible pumps are available to pump the raw water through a 300 mm pipeline about 2 kilometres south to the WTP. Raw water can be pumped either to the aerated raw water storage pond, or directly to the WTP raw water wetwell located beneath the water plant. Normal operational strategy is to pump to the storage pond for pre-settling, and pre-treatment (summer season; as required) with potassium permanganate. The pond provides a buffer when river water quality may not be optimal (spring breakup, etc).

A completely new intake line will be installed in early 2011. The new intake will extend further into the flow of the river and will ensure a constant flow to the raw water wetwell. Also, an ability to flush the intake using existing pumps will be created. Currently, the intake is flushed using gravity flow and does not provide a sufficient flow of water to adequately flush the intake screens of silt build up.

### **1.3. Water treatment process:**

The Cartier Regional WTP is a conventional cold lime softening system. A powerful oxidant, potassium permanganate (KMnO<sub>4</sub>), can be fed at the river intake, the raw storage pond inlet, & in the treatment plant, or in any combination required. The KMnO<sub>4</sub> breaks down organic substances which contribute to taste & odour problems, & can lead to the formation of chlorinated organic compounds known as trihalomethanes.

Raw water flows from the pond into the WTP raw wetwell, into which Powdered Activated Carbon (PAC) is added. The PAC absorbs organics, again for taste & odour control. The water is pumped through a magnetic flow meter & a rate control valve, into the reaction zone of the clarifier, where it is rapidly mixed with recirculated sludge & a number of chemicals: lime to increase pH (relative alkalinity), which causes carbonate “hardness” minerals & many other dissolved substances to precipitate out; caustic soda, added as needed for non-carbonate hardness removal; coagulants, to bind precipitates & sediment together into a settleable “floc”; & occasionally PAC, again for taste & odour control. The water, sludge & chemicals pass from a rapid to a slow mix zone, & then into the clarification zone, where over a two hour period, clear water rises to the surface & solids settle down below. The clear effluent is collected & conveyed into a recarbonation tank where Carbon Dioxide is bubbled through the water to neutralize the high pH. The water then passes through gravity filters incorporating a 400 mm thick layer of Anthracite (crushed coal) over a 300 mm thick layer of crushed quartz sand. Turbidity is a measure of the clarity of water, & we have online 24 hr. monitoring of our 4 filter cell effluents, & also our treated water going to the distribution system. After filtration, a small dosage of chlorine is added to kill pathogenic organisms (bacteria, viruses, etc.). The free chlorine residual in our treated water entering the distribution system is also monitored continuously. Fluoride is added to a 1.0 PPM concentration for dental health purposes.

### **1.4. Distribution system:**

Treated water from the reservoir is pumped throughout the Cartier regional distribution system via two 25 horsepower duty pumps, & a 50 horsepower duty pump. The distribution system is partially looped and has approximate piped length of 580 kilometres. Piping is comprised of a mix of PE & PVC.

### **1.5. Storage reservoirs:**

Cartier Regional WTP: Raw Storage Reservoir Capacity: 60,000 M<sup>3</sup>

Cartier Regional WTP: Treated Reservoir Capacity: 1400 M<sup>3</sup>

Headingley Reservoir: Treated Reservoir Capacity: 1100 M<sup>3</sup>

St. Francois Xavier Reservoir: Treated Reservoir Capacity: 400 M<sup>3</sup>

## **1.6. Number of connections, population served and types of water users:**

The Cartier regional distribution system is comprised of 2995 service connections (all metered). We serve a population of app. 9600 in 7 different rural municipalities; the RM of Cartier, RM of Portage la Prairie, RM of St. Francois Xavier, RM of Headingley, RM of Grey, R.M. of Rockwood, and the RM of Rosser.

## **1.7. Classification and Certification:**

- Class 3 Water Treatment Facility Classification
- Certification level of operators:
  - Kale Black; Level 4 Water Treatment, Level 2 Water Distribution
  - Will Thomas, Level 2 Water Treatment & Water Distribution
  - Rick Malchuk, Level I Water Treatment & Water Distribution

## **2. Disinfection System in Use:**

The final step in the treatment of safe water is disinfection. Disinfection is the selective destruction or inactivation of potential disease causing organisms in water. As per the Drinking Water Safety Act the Cartier Regional Water System must ensure that a disinfectant residual of at least:

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

0.1 mg of free chlorine per litre of water is detectable at all times at any point in the distribution network.

### **2.1. Type of disinfection system used:**

The Cartier Regional WTP disinfects by adding Chlorine gas to the treated water via a Regal gas chlorinator. Sodium Hypochlorite is also added at the Peony and Headingley Reservoirs to boost chlorine residuals in those distribution systems.

### **2.2. Equipment redundancy and monitoring requirements:**

As required by the Drinking Water Safety Act the Cartier Regional WTP ensures continuous disinfection is maintained at the plant by keeping in stock all spare parts

required for the chlorinator. As additional backup, a complete spare chlorinator is also kept at the plant.

Disinfectant residuals are monitored daily at the water treatment plant, and at Headingley & St. Francois Xavier reservoirs. Residuals are also monitored periodically in the distribution system and recorded on the appropriate monitoring forms. Monthly chlorination report forms are sent to the regional Drinking Water Officer at the end of each month.

### 2.3. Disinfectant residual overall performance / results:

For 2010, the Cartier Regional Water System has met all regulatory requirements in regard to monitoring and reporting disinfection residuals leaving the water treatment plant and in the distribution system.

### 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 maximum acceptable concentration for a groundwater supply source. Concentration values in excess constitute a health-related issue and require corrective actions. The 2010 results for the Cartier Regional Water System are summarized in the following table:

Parameter	Standard	Frequency	Test Results
Bacterial; TC & EC **	0 TC, 0 EC	Bi-weekly	100 % passed
Disinfectant Residual	WTP (> 0.5 mg/L)	Daily	100 % compliance
“ “	Distribution (> 0.1 mg/L)	Periodically	100 % compliance
Turbidity	0.30 NTU *	Daily	100 % compliance
Lead	0.01 mg/L	Annual	0.000179 mg/L
Fluoride	1.00 mg/L	“	1.00 mg/L
Arsenic	0.01 mg/L	“	0.00095 mg/L
Iron	0.30 mg/L	“	0.106 mg/L
Nitrate	As Nitrogen; 10 mg/L	“	0.588 mg/L
Uranium	0.02 mg/L	“	<0.00010 mg/L
Trihalomethane (THM) ***	0.100 mg/L	Quarterly	0.121 mg/L

\* NTU (Nephelometric turbidity unit)

\*\* Bacterial testing: We test the raw water (untreated surface water), the treated water (leaving the water treatment facility) and the water in the distribution system every two weeks (bi-weekly) for the presence of Total Coliform (TC) and E. coli (EC) bacteria. If these bacteria are present in the water it is an indication that disease causing organisms may also be present.

\*\*\* THM: Trihalomethanes are formed when chlorine reacts with naturally occurring organic matter in the water. Studies have shown a link between high levels of THM's and cancer. For that reason, the province has set a health based standard for THM's of 100 micrograms per litre, or 0.100 mg/L. The THM standard is based on an average of four samples per year. We test THM levels in three locations in the distribution system on a seasonal basis

#### ***4. Water System Incidents and Corrective Actions***

In 2010, two corrective action reports were filed with Manitoba Water Stewardship.

1. April 7, 2010 – Lime feed to the clarifier failed overnight. Lime is mixed with raw water in the clarifier and also acts as a coagulant as it mixes with particles in the raw water to form a “sludge” blanket. In this case, the lime feed was off long enough for the sludge blanket to disappear. When this happens, the turbidity in the clarifier increases and it is more difficult for the filters to operate. The filtered water surpassed the NTU limit of 0.30 temporarily, until the lime feed lines could be cleaned and the sludge blanket could be re-established.

2. November 16, 2010 – Every fall when the raw water gets colder, the coagulant we use is changed to an anionic form as opposed to a cationic form. In 2010, it is possible that these chemicals were changed to quickly, resulting in filtered water turbidities reaching the 0.30 NTU limit. All filters were washed repeatedly until the filter effluent turbidity was brought down below the limit of 0.30.

#### ***5. Additional records required***

As part of Manitoba Health's fluoridation program, water samples are collected on a daily basis from the treated water reservoir and tested on site. Daily fluoride results are recorded and a 14 day composite sample is submitted by-weekly for analysis (See Appendix “D” – 2010 Fluoridation Results). Until March 25, 2011, the Cartier Regional WTP maintained a 1.00 mg/L fluoride level. The new recommended level of fluoride in drinking water is 0.70 mg/L. The operating range for fluoride, as identified by Manitoba Health, is now 0.50-0.90 mg/L.

#### ***6. Drinking Water Safety Orders on your System and Actions Taken in Response***

In 2010, no Drinking Water Safety Orders were issued for the Cartier Regional Water System.

## ***7. Boil Water Advisories Issued and Actions Taken in Response***

In 2010, no Boil Water Advisories were issued for the Cartier Regional Water System.

## ***8. Warnings Issued or Charges Laid on the System in Accordance with The Drinking Water Safety Act:***

In accordance with the Drinking Water Safety Act, no warnings or charges were issued for the Cartier Regional Water System in 2010.

## ***9. Future System Expansion and/or Increased Production***

The Cartier Regional Water Treatment Plant will be upgrading to an Ultra filtration / Reverse Osmosis treatment to better handle organics in the raw water responsible for high THM's. Work began on upgrading the storage capacity of the water treatment plant site in June of 2010. When the new reservoir is complete, the treated storage capacity at the facility will approximately double. The planned expansion / upgrade will be built on top of the increased storage reservoir. Initial flows are expected to maintain the current design flow rate of 60 L/sec.

New stand-by generators are to replace current generators for the Cartier Water Treatment Plant, Peony Reservoir in Portage La Prairie, St. Francois Reservoir in the town of St. Francois Xavier and the Headingley Reservoir in the R.M. of Headingley.

## Appendix A; Cartier WTP Bacteriological results

Date	Raw EC / TC	Treated TC / EC	Free Cl <sub>2</sub> residual	
Jan. 12 / 10	21 / 109	0 / 0	1.99 mg/L	
Jan. 27 / 10	28 / > 200	0 / 0	2.20 mg/L	
Feb. 10 / 10	19 / > 200	0 / 0	1.99 mg/L	
Feb. 22 / 10	21 / > 200	0 / 0	2.02 mg/L	
Mar. 9 / 10	16 / 165	0 / 0	1.93 mg/L	
Mar. 23 / 10	1 / > 200	0 / 0	2.14 mg/L	
Apr. 6 / 10	0 / > 200	0 / 0	2.20 mg/L	
Apr. 20 / 10	0 / 159	0 / 0	1.70 mg/L	
May 4 / 10	1 / 83	0 / 0	2.20 mg/L	
May 18 / 10	0 / 6	0 / 0	1.93 mg/L	
Jun. 1 / 10	38 / > 200	0 / 0	2.20 mg/L	
Jun. 8 / 10	2 / > 200	0 / 0	2.12 mg/L	
Jun. 22 / 10	6 / 144	0 / 0	2.01 mg/L	
Jul. 6 / 10	32 / > 200	0 / 0	1.62 mg/L	
Jul. 19 / 10	6 / > 200	0 / 0	2.16 mg/L	
Aug. 3 / 10	45 / 101	0 / 0	2.02 mg/L	
Aug. 17 / 10	6 / 165	0 / 0	1.23 mg/L	
Aug. 31 / 10	78 / > 200	0 / 0	1.87 mg/L	
Sep. 14 / 10	8 / 200	0 / 0	1.86 mg/L	
Sep. 28 / 10	1 / 165	0 / 0	2.19 mg/L	
Oct. 12 / 10	0 / > 200	0 / 0	2.12 mg/L	
Oct. 26 / 10	7 / > 200	0 / 0	2.12 mg/L	
Nov. 9 / 10	12 / > 200	0 / 0	2.20 mg/L	
Nov. 23 / 10	0 / 165	0 / 0	1.98 mg/L	
Dec. 7 / 10	5 / 109	0 / 0	2.20 mg/L	
Dec. 21 / 10	2 / 36	0 / 0	2.20 mg/L	

## **Appendix B; Headingley Reservoir Bacteriological results**

Date	Reservoir Inlet	Free Cl2 residual	Reservoir Outlet	Free Cl2 residual
Jan. 12 / 10	0 / 0	0.94 mg/L	0 / 0	1.24 mg/L
Jan. 27 / 10	0 / 0	1.25 mg/L	0 / 0	1.15 mg/L
Feb. 10 / 10	0 / 0	0.69 mg/L	0 / 0	1.11 mg/L
Feb. 22 / 10	0 / 0	1.66 mg/L	0 / 0	1.25 mg/L
Mar. 9 / 10	0 / 0	1.40 mg/L	0 / 0	1.34 mg/L
Mar. 23 / 10	0 / 0	1.41 mg/L	0 / 0	1.60 mg/L
Apr. 6 / 10	0 / 0	1.47 mg/L	0 / 0	1.17 mg/L
Apr. 20 / 10	0 / 0	1.10 mg/L	0 / 0	1.34 mg/L
May 4 / 10	0 / 0	1.32 mg/L	0 / 0	1.27 mg/L
May 18 / 10	0 / 0	1.48 mg/L	0 / 0	1.37 mg/L
Jun. 1 / 10	0 / 0	1.28 mg/L	0 / 0	1.66 mg/L
Jun. 8 / 10	0 / 0	1.93 mg/L	0 / 0	1.81 mg/L
Jun. 22 / 10	0 / 0	1.46 mg/L	0 / 0	1.49 mg/L
Jul. 6 / 10	0 / 0	1.16 mg/L	0 / 0	1.10 mg/L
Jul. 19 / 10	0 / 0	0.77 mg/L	0 / 0	1.27 mg/L
Aug. 3 / 10	0 / 0	1.00 mg/L	0 / 0	0.92 mg/L
Aug. 17 / 10	0 / 0	1.48 mg/L	0 / 0	0.92 mg/L
Aug. 31 / 10	0 / 0	0.35 mg/L	0 / 0	0.95 mg/L
Sep. 14 / 10	0 / 0	1.17 mg/L	0 / 0	0.73 mg/L
Sep. 28 / 10	0 / 0	1.28 mg/L	0 / 0	1.37 mg/L
Oct. 12 / 10	0 / 0	0.74 mg/L	0 / 0	1.48 mg/L
Oct. 26 / 10	0 / 0	0.84 mg/L	0 / 0	0.96 mg/L
Nov. 9 / 10	0 / 0	0.58 mg/L	0 / 0	1.55 mg/L
Nov. 23 / 10	0 / 0	0.79 mg/L	0 / 0	0.93 mg/L
Dec. 7 / 10	0 / 0	1.65 mg/L	0 / 0	1.39 mg/L
Dec. 21 / 10	0 / 0	0.96 mg/L	0 / 0	0.92 mg/L

### **Appendix C; St Francois Xavier Reservoir Bacteriological results**

Date	Reservoir Inlet	Free Cl2 residual	Reservoir Outlet	Free Cl2 residual
Jan. 12 / 10	0 / 0	0.83 mg/L	0 / 0	0.81 mg/L
Jan. 27 / 10	0 / 0	1.12 mg/L	0 / 0	0.77 mg/L
Feb. 10 / 10	0 / 0	0.84 mg/L	0 / 0	0.54 mg/L
Feb. 22 / 10	0 / 0	1.27 mg/L	0 / 0	1.09 mg/L
Mar. 9 / 10	0 / 0	1.82 mg/L	0 / 0	0.97 mg/L
Mar. 23 / 10	0 / 0	1.75 mg/L	0 / 0	1.00 mg/L
Apr. 6 / 10	0 / 0	1.69 mg/L	0 / 0	1.03 mg/L
Apr. 20 / 10	0 / 0	1.35 mg/L	0 / 0	1.08 mg/L
May 4 / 10	0 / 0	0.77 mg/L	0 / 0	1.15 mg/L
May 18 / 10	0 / 0	1.60 mg/L	0 / 0	1.38 mg/L
Jun. 1 / 10	0 / 0	2.20 mg/L	0 / 0	1.39 mg/L
Jun. 8 / 10	0 / 0	1.65 mg/L	0 / 0	1.65 mg/L
Jun. 22 / 10	0 / 0	1.45 mg/L	0 / 0	1.24 mg/L
Jul. 6 / 10	0 / 0	1.30 mg/L	0 / 0	1.04 mg/L
Jul. 19 / 10	0 / 0	1.04 mg/L	0 / 0	0.72 mg/L
Aug. 3 / 10	0 / 0	1.35 mg/L	0 / 0	1.01 mg/L
Aug. 17 / 10	0 / 0	1.68 mg/L	0 / 0	0.98 mg/L
Aug. 31 / 10	0 / 0	0.88 mg/L	0 / 0	0.50 mg/L
Sep. 14 / 10	0 / 0	1.23 mg/L	0 / 0	0.80 mg/L
Oct. 28 / 10	0 / 0	1.51 mg/L	0 / 0	0.97 mg/L
Oct. 12 / 10	0 / 0	1.48 mg/L	0 / 0	0.82 mg/L
Oct. 26 / 10	0 / 0	1.63 mg/L	0 / 0	0.64 mg/L
Nov. 9 / 10	0 / 0	1.65 mg/L	0 / 0	0.73 mg/L
Nov. 23 / 10	0 / 0	1.68 mg/L	0 / 0	0.81 mg/L
Dec. 7 / 10	0 / 0	1.73 mg/L	0 / 0	0.98 mg/L
Dec. 21 / 10	0 / 0	1.37 mg/L	0 / 0	0.54 mg/L

## **Appendix D; Cartier WTP Fluoridation results\***

Dates / sampling period	Composite Result; mg/L
	ALS Laboratory Result / WTP Lab Result
Period # 1; Mar 27 / 10 - Apr 9 / 10	0.73 mg/L / 1.00 mg/L
Period # 2; Apr 10 – 23 / 10	0.81 mg/L / 0.80 mg/L
Period # 3; Apr 24 – May 7 / 10	0.82 mg/L / 1.00 mg/L
Period # 4; May 8 – 21 / 10	0.89 mg/L / 1.00 mg/L
Period # 5; May 22 – Jun 4 / 10	0.91 mg/L / 1.30 mg/L
Period # 6; Jun 5 – 18 / 10	0.98 mg/L / 1.20 mg/L
Period # 7; Jun 19 – Jul 2 / 10	0.92 mg/L / 1.20 mg/L
Period # 8; Jul 3 – Jul 16 / 10	1.03 mg/L / 1.20 mg/L
Period # 9; Jul 17 - 30 / 10	0.97 mg/L / 1.20 mg/L
Period # 10; Jul 31 – Aug 13 / 10	0.99 mg/L / 1.20 mg/L
Period # 11; Aug 14 – Aug 27 / 10	0.99 mg/L / 1.20 mg/L
Period # 12; Aug 28 – Sept 10 / 10	0.98 mg/L / 1.20 mg/L
Period # 13; Sept 11 – Sept 24 / 10	0.95 mg/L / 1.10 mg/L
Period # 14; Sept 25 – Oct 10 / 10	0.84 mg/L / 1.30 mg/L
Period # 15; Oct 9 – 22 / 10	0.78 mg/L / 1.00 mg/L
Period # 16; Oct 23 - Nov 5 / 10	0.82 mg/L / 1.10 mg/L
Period # 17; Nov 6 – 19 / 10	0.79 mg/L / 1.30 mg/L
Period # 18; Nov 20 - Dec 3 / 10	0.50 mg/L / 1.10 mg/L
Period # 19; Dec 4 – 17 / 10	0.40 mg/L / 1.00 mg/L
Period # 20; Dec 18 / 10 – Dec 31 / 10	0.36 mg/L / 1.00 mg/L
Period # 21; Jan 1 – 14 / 11	0.63 mg/L / 0.80 mg/L
Period # 22; Jan 15 – 28 / 11	0.93 mg/L / 1.20 mg/L
Period # 23; Jan 29 – Feb 11 / 11	0.59 mg/L / 1.10 mg/L
Period # 24; Feb 12 – 25 / 11	0.47 mg/L / 1.20 mg/L
Period # 25; Feb 26 – Mar 11 / 11	0.68 mg/L / 1.00 mg/L
Period # 26; Mar 12 – 25 / 11	0.57 mg/L / 0.90 mg/L

\*A discrepancy between the Cartier water plant lab results and ALS Lab results on the composite fluoride sample is currently being investigated.

On March 1, 2011, samples of our raw water, hydrofluorosilicic acid and regular composite sample were taken to ALS Laboratory for analysis. It is unknown at this time what may be causing our results to vary.

On March 15, 2011, Manitoba Health changed the recommended optimal level of fluoride in drinking water to 0.70 mg/L. Changes to the dosage rate were made immediately after receipt of this notification.

## ***Appendix E; Cartier WTP Audit 2010***

Please see accompanying attached file in PDF format. (Cartier Regional Co-op Audit\_2010)