



## Public Water System Annual Report -2018-

Name of the Public Water System: **Cartier Regional Water Co-op (CRWC) – 3 Locations**  
**36.00 – Cartier Regional Water System**  
**89.40 – Headingley Regional Water System &**  
**162.75 – Peony Farm Reservoir Public Water System**

Name of the legal owner: **Cartier Regional Water Co-op Inc.**

Contact person: **Danielle Vaillant, Manager CRWC Inc.**

Phone: **204-832-2555**

Email: **dvaillant@crwc.ca**

Website: **crwc.ca**

Water system's emergency number: **Cartier WTP-36.00: 204-353-4055 or**  
**Headingley WTP-89.40: 204-832-2555**

Name of Operator: **Danielle Vaillant, Manager of CRWC**

Phone during business hours: **204-832-3555**

Emergency number: **Cartier WTP-36.00: 204-353-4055 or**  
**Headingley WTP-89.40: 204-832-2555**

Date prepared: **March 29, 2019**

A handwritten signature in black ink that reads 'Danielle Vaillant'.

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Danielle Vaillant

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## ***Introduction***

The Cartier Regional Water Co-op owns and operates 2 main water treatment facilities, 10 rural reservoirs, 2 booster stations, 7 truckfill stations, and over 230 km of transmission line. The owned reservoir at Peony Farm in Portage la Prairie is supplied with water produced at the city of Portage la Prairie water treatment facility. The CRWC owned and operated water treatment facilities strive to provide high-quality drinking water in sufficient quantity to meet public demand. It is our goal to do so in a safe, cost-effective manner while remaining in compliance with the regulatory requirements governing the provision of drinking water.

It is our belief that the public has a right to easily access information related to the drinking water they consume and the system through which it is provided. To that end, the Cartier Regional Water Co-op has prepared the following report.

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

The Cartier Regional Water System provides potable drinking water to a population of approximately 13,500 residents. Treated water produced from the Cartier Regional Water Co-op Treatment Facilities (2) meets all health and aesthetic objectives as stated in the Guidelines for Canadian Drinking Water Quality.

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

The Cartier Regional Water Treatment Plant (WTP) and Headingley Regional Water Treatment Plant (WTP) receive surface water from the Assiniboine River. The Peony Farm Reservoir location receives its water source from the City of Portage La Prairie Water Treatment Facility.

#### **1.2. Intake Structures and Storage Ponds:**

The Cartier WTP has a stainless-steel intake structure that is specially designed to prevent injury to fish. It is located immediately North of the Baie St. Paul Bridge and flows through a 400 mm pipe into a concrete wetwell on the East shore of the river. Two submersible pumps are available to pump the raw water through a 300 mm to the WTP. Raw water can be pumped either to the aerated raw water storage ponds or directly to the WTP raw water chamber located beneath the water plant. The normal operational strategy is to pump to the storage north pond, flowing into the south storage pond for pre-settling, and pre-treatment in the summer season when required with aeration and algaecide control. The ponds provide a buffer when river water quality may not be optimal. 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.

When required, clearing of silt and debris from the intake screen is contracted out. In 2018, construction of an additional raw water storage was done to increase raw water storage and provide redundancy for the facility. The project includes a wetwell to help identify levels in both the old and new storage ponds to help with managing operations of the WTP.

The Headingley WTP utilizes the existing Headingley Correctional Centre River Intake Building that is located on the grounds. The CRWC has a memorandum of understanding (MOU) with Manitoba Infrastructure (MIT) to own, operate and maintain the intake channel, wetwell, pumps and gate valves. The intake channel is made of concrete and directs the flow of the river into the pump house passing through bar screens before entering a pumping chamber. Both chambers are equipped with sluice gate valves that stay open during normal operation. The wetwell maintains a static water level and there are two 60 hp pumps that operate on a lead/lag operation and pump water when the raw water storage ponds call for them to fill. As the water is being pumped from the wetwell into the service line to the ponds, a low dose of algaecide is added to control algae growth and to lower the organic level in the ponds. The river water is pumped through a 400 mm service line into two raw water storage ponds. The raw water storage ponds currently operate in parallel but also have the ability to operate in series. There is the ability to isolate one storage pond for maintenance and still supply the WTP with raw water. Both raw water storage ponds are equipped with aeration lines that are fed from blowers that are housed in the Raw Water Pump House (RWPH) located next to the storage ponds. The RWPH also contains a wetwell with level control that indicates the level in the raw ponds and provides the controls back to the RIPH pumps. During normal river conditions, the ponds fill regularly. During high flows and high turbidity in the river, the ability to cease filling of the ponds and have plenty of storage to operate the facility is maintained until normal conditions return to the river. Also contained in the wetwell are three 100 hp raw water pumps that are called to operate when the WTP is producing water.

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

#### **Cartier WTP:**

A powerful oxidant, potassium permanganate ( $\text{KMnO}_4$ ), *can* be fed to the raw storage pond inlet and is only being fed during periods of high manganese and organics. The  $\text{KMnO}_4$  breaks down organic substances that contribute to taste and odour problems and which can lead to the formation of chlorinated organic compounds known as trihalomethanes. In 2018, we have determined that potassium permanganate is no longer desirable to use for pre-treating organics. In 2017, a contractor was hired by the Cartier WTP to have the storage pond dredged and cleaned. The removal of silt and sludge from the storage ponds greatly improved the water quality and also improved the performance of the aeration in the ponds. The Cartier WTP uses an algaecide fed directly to the pond to control organics and further improve raw water quality.

Raw water flows from the storage pond into the WTP raw water chamber by gravity. A control valve operates to maintain an ideal, stable level in the raw water chamber. The Raw water is pumped by two 30 hp pumps into the raw water process piping to the three-stage flocculation basins. The raw water flows through the process piping where it is injected with a pH suppressant (Sulphuric Acid) and a coagulant to begin the advanced coagulation process. The coagulated water then passes through 2 inline static mixers and an inline magnetic flow meter before it is deposited into the initial flocculation basin. The three-stage flocculation basins provide additional mixing to aid in the coagulation process before the raw water enters the ultra-filtration (UF) process. The three break tanks provide added mixing and coagulation before the raw water enters the ultra-filtration (UF) process. A pre-filter to the UF skids removes bigger floc (debris) created in the three-stage coagulation process. The UF provides 0.04-micron filtration and removes virtually all particulate matter before reaching the reverse osmosis (RO) process. The UF process is equipped with a common raw water turbidimeter and individual permeate turbidimeters for each UF train.

The permeate turbidimeters are set to alarm at 0.1 NTU and shutdown at 0.29 NTU. The turbidity is monitored continuously, and a value is captured every 5 minutes and reported on a monthly report. The UF Permeate is sent to the UF/RO breaktank chambers, where the water is used to feed the RO membranes and as backwash water for the UF membranes. The UF permeate is treated with a low dose of chlorine to eliminate the potential for biogrowth in the RO feed chambers. The RO feed pumps supply the UF permeate to the RO membranes during operation. Sodium Bisulphite (SBS) is added upstream of the RO trains to neutralize the remaining chlorine residual before entering the RO membranes. RO treated water is so pure that an RO by-pass line feeding UF permeate water is used to add necessary minerals back into the water to achieve the desired hardness of the finished water and to stabilize water chemistry. During the summer months, when the organic content in the raw water is at its highest, adjustments are made to lower the UF permeate blend ratio into the RO water to help reduce organic content in the finished water. A sequestering agent is added downstream of the RO's prior to entering the clearwell. This is added to help stabilize the water that enters the distribution system.

Turbidity is a measure of the relative clarity of the water and is a key parameter of all drinking water operating licenses. The operating license requires the treatment facility to continuously monitor the turbidity from the ultra-filtration membranes. The Cartier WTP has 24-hour online monitoring of the UF treated water and final plant effluent going to the distribution system. After the RO process, the water pH is adjusted with sodium hydroxide and a small dosage of chlorine is added to kill pathogenic organisms (bacteria, viruses, etc.). The free chlorine residual in the treated water entering the distribution system is also monitored and recorded continuously. Fluoride is added to a dosage of 0.70 mg/L concentration for dental health purposes. See Figures 1 and 2 for process flow diagram.

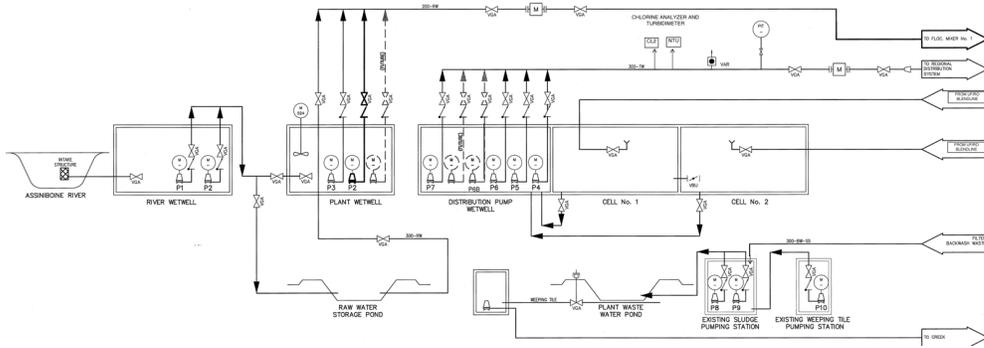


Figure 1 - Cartier WTP Process Flow Diagram 1 of 2

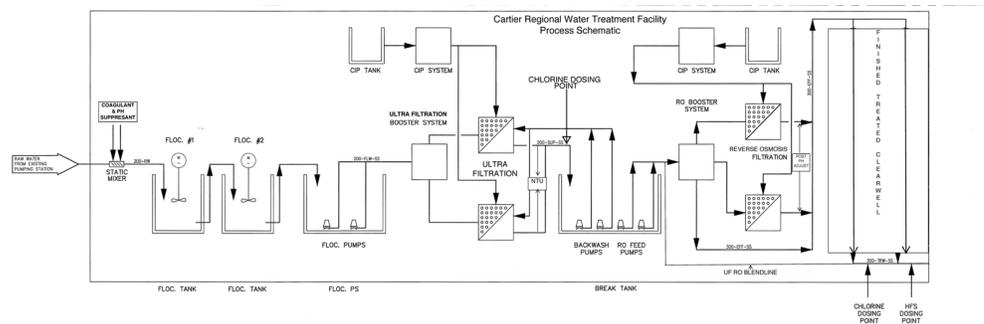


Figure 2 - Cartier WTP Flow Process Diagram 2 of 2

### Headingley WTP:

The Headingley WTP operates similarly to the Cartier WTP. They both draw from the same water source and both contain GE membrane equipment for water treatment. The main difference between the facilities in regard to treatment is that the finished treated water is not a blend of UF and RO permeate. Headingley WTP uses calcite contactors that contain calcite media to add hardness/minerals back into the finished water. The main reason for this is to eliminate reintroducing organics and metals, such as manganese and iron into the finished water, which comes from the UF permeate when blended. The raw water flows into the facility and passes through 500-micron filters, pre-treated with a coagulant and pH depressed with carbon dioxide. It travels through two chambers that contain mixers. The mixers promote the reaction of coagulation; raw water particles bind together to form a pin floc. The pre-treated raw water flows into the UF feed chamber and UF feed pumps send the water to the UF membranes. The UF's provide 0.04-micron filtration and removes virtually all-particulate matter before reaching the RO membranes. Each UF membrane skid is equipped with a raw and permeate turbidimeter. The permeate turbidimeters are set to alarm at 0.1 NTU and production to shutdown at 0.29 NTU. The turbidity is monitored continuously, and a value is captured every 5 minutes and reported on

a monthly report. The UF permeate is sent to the UF/RO breaktank chambers, where the water is used to feed the RO membranes and as backwash water for the UF membranes. The UF permeate is treated with a low dose of chlorine to eliminate the potential for biogrowth in the RO feed chambers. The RO feed pumps supply the RO membranes during operation. SBS is added upstream of the RO membranes to neutralize the chlorine. The RO permeate is produced and pH depressed before 50% of it passes through calcite contactors. The calcite and RO permeate blend to achieve a final water of 40-80 mg/L of hardness (CaCO<sub>3</sub>). The Final treated water is pH corrected with sodium hydroxide and disinfected with chlorine before entering the clearwell. The water flows through the clearwell to achieve contact time between the treated water and the chlorine for sufficient disinfection prior to reaching the pump chamber. See Figure 3 for process overview.

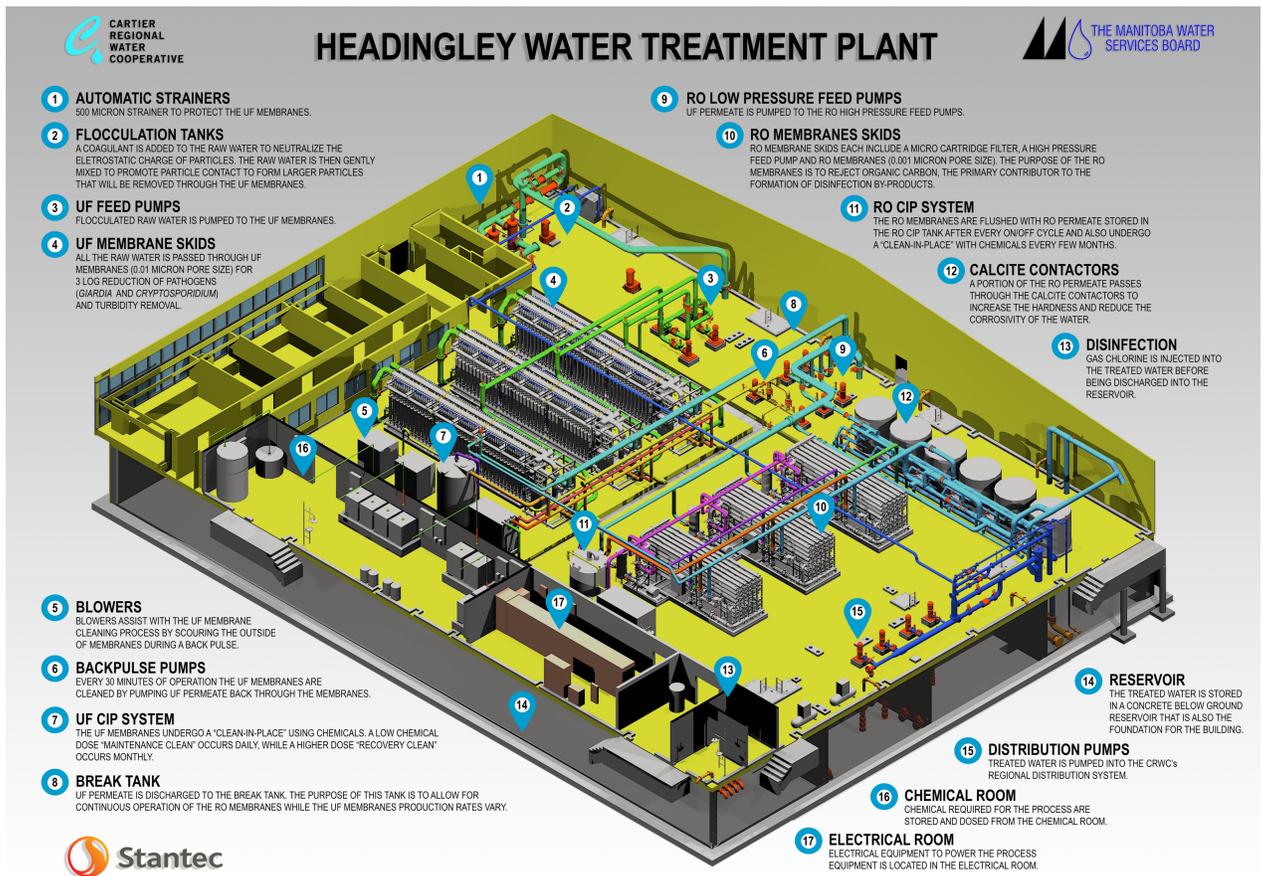


Figure 3 - Headingley WTP Treatment Process Overview

## 1.4. Distribution system:

### Cartier WTP (36.00):

Treated water from the reservoir is pumped throughout the Cartier Regional distribution system via 1-5 horsepower (HP) jockey pump, 2-25 HP duty pumps, 1-30 HP

duty pump, & 1-75 HP stand-by pump. These pumps are controlled by variable frequency drives (VFDs). The distribution system is partially looped and has an approximate piped length of 580 kilometres. Piping is comprised of both high-density polyethylene (HDPE) & polyvinylchloride (PVC) pipe. Figure 4 outlines the Cartier WTP service area.

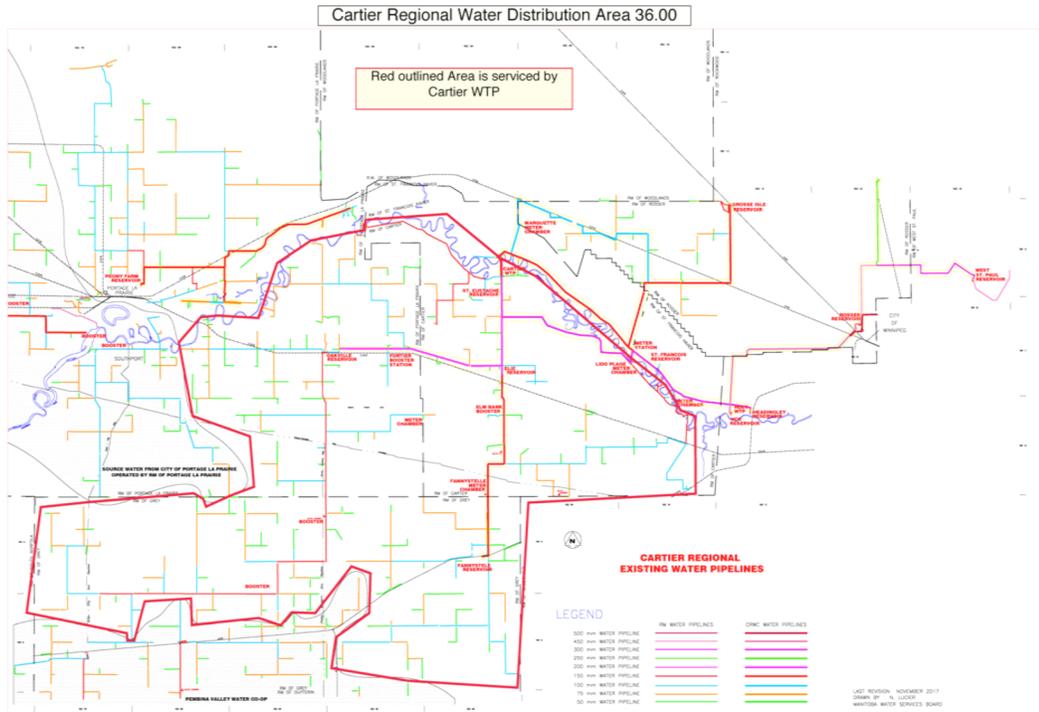


Figure 4 - 36.00 Cartier Regional Water Distribution System Map

### Headingley WTP (89.40):

There are (4) distribution pumps that service three main headers that leave the facility into distribution. The Centerport distribution line services the Rosser Reservoir and RM of Rosser. From the Rosser Reservoir, treated water is pumped to the Stoney Mountain Institute and to the West St. Paul Reservoir, which services the RM of WSP. The RM of Headingley line services the Headingley Reservoir, RM of Headingley, St. Francois Xavier, RM of St. Francois Xavier, RM of Rosser and Grosse Isle Reservoir. The HCC/ WWTP lines service the Headingley Correctional Centre and the RM of Headingley Wastewater Treatment Plant. Figure 5 outlines the Headingley WTP service area.

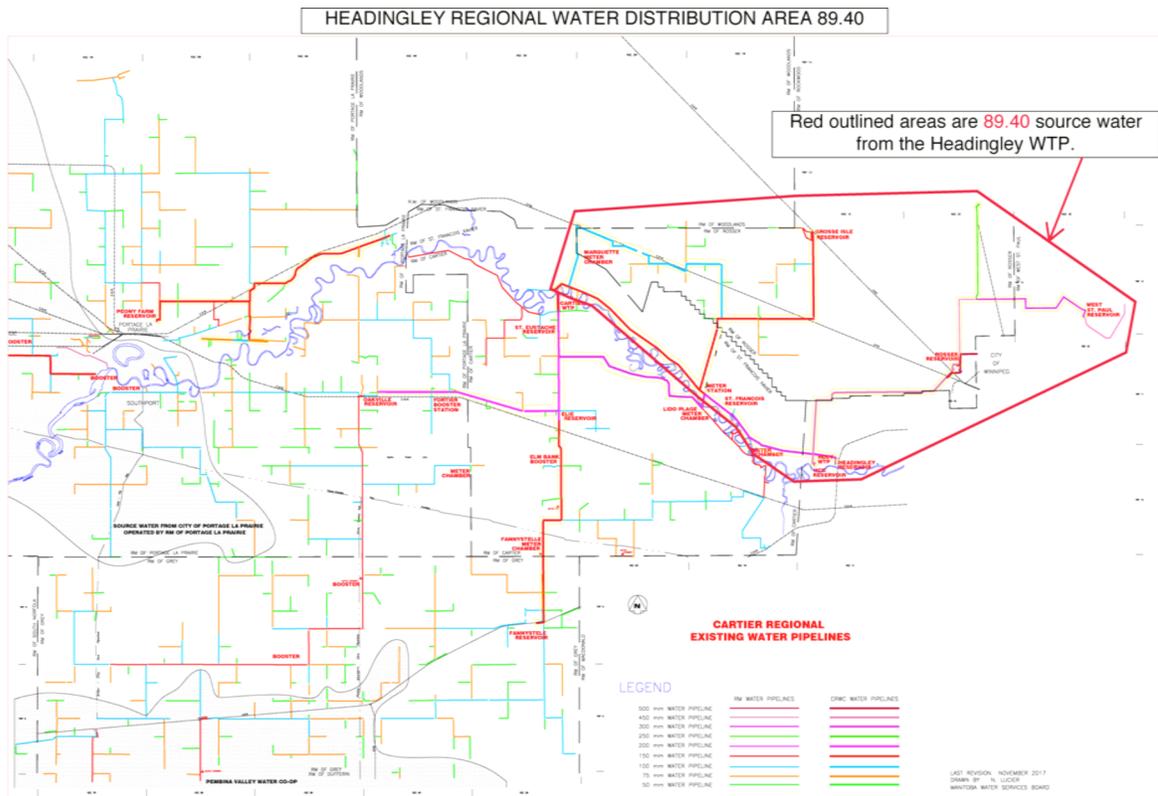


Figure 5 - 89.40 Headingley Regional Water Distribution System Map

**Peony Farm (162.75):**

The Cartier Regional Water Co-op owns and operates a facility located near the Peony Farm area in the RM of Portage la Prairie. The CRWC purchases treated water from the City of Portage la Prairie to fill the Peony Farm Reservoir. An incoming chlorine analyzer measures the amount of chlorine residual in the receiving water. If necessary, chlorine is added when the reservoir is filling. An outgoing chlorine analyzer measures the chlorine residuals leaving the facility to ensure that all regulations are met. There is a standby Generator that runs the facility in the case of a power event. A program to regularly flush the main lines from the facility to help improve water quality in the system has been implemented. Figure 6 is a map of the service area for the Peony Farm Reservoir (162.75).

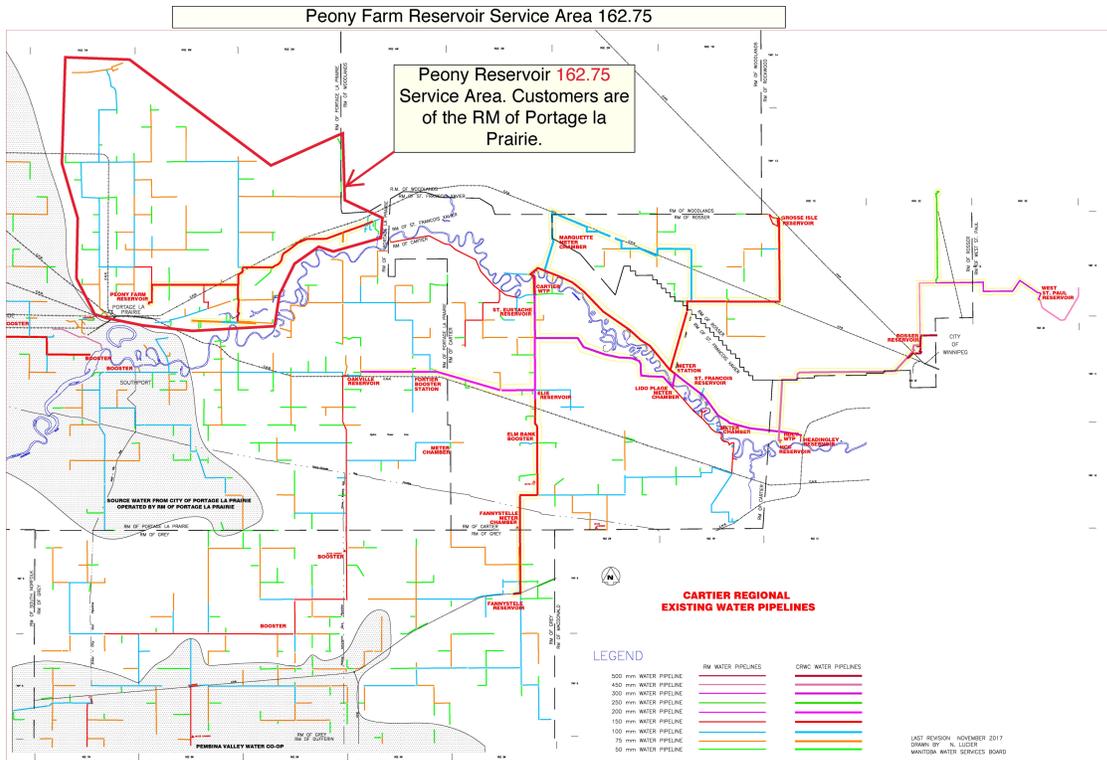


Figure 6 – 162.75 Peony Farm Service Area Map

The CRWC has an agreement for taking in the bacteriological samples for the RM of SFX under 211.50 and RM of Headingley under 89.50. A summary of the results can be found in Appendix D and E.

### 1.5. Storage reservoirs:

Cartier Regional WTP:	Raw Storage Reservoir Capacity:	60,000 M <sup>3</sup>
Cartier Regional WTP:	Treated Reservoir Capacity:	3000 M <sup>3</sup>
Elie Reservoir:	Treated Reservoir Capacity:	230 M <sup>3</sup>
St. Eustache Reservoir:	Treated Reservoir Capacity:	76 M <sup>3</sup>
Oakville Reservoir:	Treated Reservoir Capacity:	670 M <sup>3</sup>
Fannystelle Reservoir:	Treated Reservoir Capacity:	150 M <sup>3</sup>
Peony Farm Reservoir:	Treated Reservoir Capacity:	230 M <sup>3</sup>
Headingley Regional WTP:	Raw Storage Reservoir Capacity:	135,107 M <sup>3</sup>
Headingley Regional WTP:	Treated Reservoir Capacity:	4400 M <sup>3</sup>
Headingley Reservoir:	Treated Reservoir Capacity:	2400 M <sup>3</sup>
SFX Reservoir:	Treated Reservoir Capacity:	400 M <sup>3</sup>
Grosse Isle Reservoir:	Treated Reservoir Capacity:	400 M <sup>3</sup>
Rosser Reservoir:	Treated Reservoir Capacity:	7600 M <sup>3</sup>
West St. Paul Reservoir:	Treated Reservoir Capacity:	4809 M <sup>3</sup>

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

The Cartier regional distribution system is comprised of 4477 service connections (all metered) serving a population of greater than 13,100 people in 8 different rural municipalities; the RM of Cartier, RM of Portage la Prairie, RM of St. François Xavier, RM of Headingley, RM of Grey, R.M. of Rockwood, and the RM of Rosser and RM of West St. Paul.

Table 1 - CRWC Population Served (as of 1 Dec 16)

	RM Residential	CRWC Residential	RM Comm/Institut	CRWC Comm/Institut
Portage la Prairie	1647	504	35	
Cartier	559	42	61	
Grey	229		23	
SFX	284	86	3	1
Headingley	957	6	83	
Rosser ( incl Woodlands)	96	23	8	2
Rockwood	44			
<b>TOTAL</b>	<b>3816</b>	<b>661</b>	<b>213</b>	<b>3</b>
<b>Total Residential</b>	4477			
<b>Total Comm/Institut.</b>	216			RM = municipal line
				CRWC = regional line
<b>Population Served</b>				
<b>Residential</b>	12312	4477 x 2.75		
<b>Truck Fill</b>	447	Estimate: 670,000 gallons sold in Nov @ 50 god per person		
<b>2 x prisons</b>	350	Estimate: 300 at HCC, 50 at women's prison		
	<b>13,100</b>			

## 1.7. Classification and Certification:

Table 2 - Classification and Certification for CRWC Facilities and Operators

	<i>Cartier WTP</i>	
	Water Treatment	Class 4
	Water Distribution	Class 2
	<i>Headingley WTP</i>	
	Water Treatment	Class 3
	Water Distribution	Class 2
	<i>Current Operators</i>	
<b>Danielle Vaillant</b>	Water Treatment	Class 4
<b>Manager-CRWC</b>	Water Distribution	Class 2
	Wastewater Treatment	Class 2
	Wastewater Collection	Class 2
<b>Grant McGorman</b>	Water Treatment	Class 4
<b>Lead Operator – Cartier</b>	Water Distribution	Class 2
	Wastewater Treatment	Class 2
	Wastewater Collection	Class 2
<b>Travis Reinsch</b>	Water Treatment	O-I-T
	Water Distribution	O-I-T
<b>Jason Tanguay</b>	Water Treatment	Class 2
	Water Distribution	Class 2
	Wastewater Treatment	Class 1
	Wastewater Collection	Class 1
<b>David Epler</b>	Water Treatment	Class 4
<b>Lead Operator-Headingley</b>	Water Distribution	Class 2
	Wastewater Treatment	Class 2
	Wastewater Collection	Class 2
<b>Colter Milne</b>	Water Treatment	Class 3
	Water Distribution	Class 2
<b>Tyler Hay</b>	Water Treatment	Class 2
	Water Distribution	Class 2

## **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 license issued under the *Drinking Water Safety Act*, the Cartier regional water Co-op must ensure that the water has a measurable free chlorine residual of at least:

- 0.5 mg/L in water entering the distribution system following a minimum contact time of 20 minutes
- 0.1 mg/L at all times at any point in the water distribution system

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

The Cartier and Headingley Regional WTP's disinfects by adding chlorine gas to the treated water via Regal gas chlorinator systems. Sodium hypochlorite can also be added at all of the reservoirs if required.

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

As required by the *Drinking Water Safety Act*, the Cartier and Headingley Regional WTP ensures continuous disinfection is maintained at the plant by keeping in stock all spare parts required for the chlorination systems. As an additional backup, a complete spare chlorinator is also kept at the plants. At the Cartier WTP, two identical trains of UF and RO membranes are in place, each RO with a capacity of 30 litres per second. At the Headingley WTP, 3 identical trains of UF and RO membranes are in place, each RO with a capacity of 50 l/s

Disinfectant residuals are monitored continuously, capturing readings every 5 minutes at the water treatment plants and at the reservoirs. Residuals are also monitored on a regular basis when water samples are taken for bacterial analysis 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:**

The Cartier Regional Water System has met all regulatory requirements in 2018 for monitoring and reporting disinfection residuals leaving the water treatment plants 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 health-based parameters express the maximum acceptable concentration. Concentration values in excess constitute a health-related issue and require corrective actions. The 2018 results for the Cartier and Headingley Regional Water System are summarized in the following tables:

**Table 3 - Cartier WTP Chemistry Results – Summer 2018**

Parameter	Standard	Frequency	Test Results
Bacterial; TC & EC **	0 TC, 0 EC	Weekly	100 % passed
Disinfectant Residual	WTP (> 0.5 mg/L)	Continuously	100 % compliance
“ “	Distribution (> 0.1 mg/L)	Continuously	100 % compliance
Turbidity	0.10 NTU *	Continuously	100 % compliance
Lead	0.01 mg/L	Annually	0.000137 mg/L
Fluoride	1.5 mg/L	“	0.517 mg/L
Arsenic	0.01 mg/L	“	0.00089 mg/L
Antimony	0.006 mg/L	“	<0.00010 mg/L
Barium	1 mg/L	“	0.00821 mg/L
Cadmium	0.005 mg/L	“	<0.0000050 mg/L
Chromium	0.05 mg/L	“	0.00012 mg/L
Copper	1 mg/L	“	0.0329 mg/L
Iron	0.30 mg/L	Regularly	<0.10 mg/L
Manganese	0.05 mg/L	Regularly	0.0168 mg/L
Nitrate	As Nitrogen; 10 mg/L	“	0.0636 mg/L
Nitrite	As Nitrogen; 1 mg/L	“	<0.0010 mg/L
Selenium	0.05 mg/L	“	0.000104 mg/L
Uranium	0.02 mg/L	“	0.0003888 mg/L
Trihalomethanes (THM) ***	0.100 mg/L	Quarterly	See appendix F
Haloacetic Acids****	0.08 mg/L	Quarterly	See appendix F

**Table 4 – Headingley WTP Chemistry Results – Summer 2018**

Parameter	Standard	Frequency	Test Results
Bacterial; TC & EC **	0 TC, 0 EC	Weekly	100 % passed
Disinfectant Residual	WTP (> 0.5 mg/L)	Continuously	100 % compliance
“ “	Distribution (> 0.1 mg/L)	Continuously	100 % compliance
Turbidity	0.30 NTU *	Continuously	100 % compliance
Lead	0.01 mg/L	Annually	0.000117 mg/L

Fluoride	1.5 mg/L	“	<0.020 mg/L
Arsenic	0.01 mg/L	“	0.00011 mg/L
Antimony	0.006 mg/L	“	<0.00010 mg/L
Barium	1 mg/L	“	0.00131 mg/L
Boron	5 mg/L	“	0.080 mg/L
Cadmium	0.005 mg/L	“	<0.0000050 mg/L
Chromium	0.05 mg/L	“	0.00022 mg/L
Copper	1 mg/L	“	0.00266 mg/L
Iron	0.30 mg/L	Regularly	0.012 mg/L
Manganese	0.05 mg/L	Regularly	0.00180 mg/L
Nitrate	As Nitrogen; 10 mg/L	“	0.0050 mg/L
Selenium	0.05 mg/L	“	<0.000050 mg/L
Uranium	0.02 mg/L	“	0.000018 mg/L
Trihalomethane (THM) ***	0.100 mg/L	Quarterly	See appendix F
Haloacetic Acids (HAA's) ****	0.08 mg/L	Quarterly	See appendix F

\* NTU (Nephelometric turbidity unit)

\*\* Bacterial testing: The raw water (untreated surface water), the treated water (leaving the water treatment facility) and the water in the distribution system is tested weekly (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. Please see Appendix A, B, C, D, & E for a summary of the results.

\*\*\* 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 0.100 mg/L. The THM standard is based on an average of four samples per year. THM levels in four locations in the distribution system are tested on a quarterly basis every year. Please see Appendix F for a summary of the results.

\*\*\*\*HAA: Haloacetic Acids are formed when chlorine reacts with naturally occurring organic matter in the water. Studies have shown a link between high levels of HAA's and cancer. For that reason, the province has set a health-based standard for HAA's of 0.08 mg/L. The HAA standard is based on an average of four samples per year. HAA levels in four locations in the distribution system are tested on a quarterly basis every year. Please see Appendix F for a summary of the results.

### 3.1 Result Improvement

The Cartier Regional Water Co-op has been monitoring Trihalomethanes (THM) for the past several years and has met the Provincial and Federal guidelines. The THM standard of 0.1 mg/L is based on a running average of quarterly samples and the health risks associated with elevated THM's are based on a lifetime exposure. The average THM result for 2018 was below the 0.100 mg/L regulation with the exception of the Peony Farm area where we saw it slightly above the guideline. A plan to swab the lines that leave the Peony Farm reservoir will be done in 2019 to help improve the THMs. We have no control over the treatment process of the water we receive therefore we will try and mitigate the higher THMs by regular distribution maintenance. We continue to work towards optimizing our new treatment system and the quality of water that is delivered to our customers.

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

There were no major water system incidents in 2018. Corrective actions were taken and reported as required for normal minor variations during the course of routine operations. In the Office of Drinking Water Audit, Peony Farm 162.75 was not in compliance due to the higher THM average for the year.

The Cartier WTP 36.00 region suffered brown water incidents due to a distribution event that disturbed the mainline to the customers. Flushing of the lines solved the brown water issues. A plan to swab the mainlines in Spring 2019 will be done to help clear the lines of any brown sediment that has built up over the years.

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

As part of Manitoba Health's fluoridation program, Cartier WTP (36.00) collects water samples 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 bi-weekly for analysis. The recommended level of fluoride in drinking water is 0.70 mg/L and the operating range set by Manitoba Health is 0.50-0.90 mg/L.

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

In 2018, no Drinking Water Safety Orders were issued for the Cartier Regional Water System.

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

In 2018, 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 2018.

#### **9. *Major Expenses Incurred***

The CRWC has begun to implement higher security infrastructure for their facilities. Security improvements include cybersecurity and physical security. The updates will take several years, and we intend to exercise due diligence to make sure we are fully secure from any potential threats.

An additional storage pond was construction on the north side of the Cartier WTP location. It is now in a warranty period and performing as designed.

Regular pump repair and replacements were done at various CRWC locations.

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

In 2019, Headingley WTP will undergo a pond repair and addition of riprap along the banks of the ponds to increase capacity and improve the durability of the ponds.

Elie Reservoir is due for an upgrade. Engineering of the facility is near completion and a new facility will be built in the near future.

The bulk water rate will increase from \$3.40 per cubic meter to \$3.45 per cubic meter as of April 1, 2019

## Appendix A: Cartier WTP 36.00 2018 Bacteriological Results

Date	Sample Identification	TC	EC	Free CL2	Total CL2
09-Jan-18	CARTIER REGIONAL 1 - RAW	18	0		
09-Jan-18	CARTIER REGIONAL 2 - TREATED	0	0	1.36	1.61
09-Jan-18	CARTIER REGIONAL 3 - DIST @ FORTIER BOOSTER	0	0	1.27	1.34
09-Jan-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.2	1.4
09-Jan-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.3	1.4
09-Jan-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT - T. ANSEUUW	0	0	0.87	1.15
09-Jan-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.3	1.32
23-Jan-18	CARTIER REGIONAL 1 - RAW	12	0		
23-Jan-18	CARTIER REGIONAL 2 - TREATED	0	0	1.63	1.92
22-Jan-18	CARTIER REGIONAL 3 - DIST OAKVILLE RES IN	0	0	1.27	1.50
23-Jan-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.30	1.50
23-Jan-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.40	1.60
23-Jan-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT -R. McKay	0	0	0.54	0.72
22-Jan-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.13	1.34
06-Feb-18	CARTIER REGIONAL 1 - RAW	10	0		
06-Feb-18	CARTIER REGIONAL 2 - TREATED	0	0	1.57	1.8
06-Feb-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE RES IN	0	0	1.36	1.65
06-Feb-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.5	1.7
06-Feb-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.5	1.7
06-Feb-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.38	1.54
05-Feb-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.38	1.58
20-Feb-18	CARTIER REGIONAL 1 - RAW	24	2		
20-Feb-18	CARTIER REGIONAL 2 - TREATED	0	0	1.37	1.63
20-Feb-18	CARTIER REGIONAL 3 - DIST @ ELIE RESERVOIR IN	0	0	1.4	1.6
20-Feb-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.3	1.5
20-Feb-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.4	1.5
20-Feb-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.19	1.42
20-Feb-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.24	1.4
06-Mar-18	CARTIER REGIONAL 1 - RAW	12	1		
06-Mar-18	CARTIER REGIONAL 2 - TREATED	0	0	1.4	1.67
06-Mar-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE RES IN	0	0	1.3	1.5
06-Mar-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.3	1.5
06-Mar-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.3	1.5
06-Mar-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.29	1.48
08-Mar-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.28	1.35

20-Mar-18	CARTIER REGIONAL 1 - RAW	34	2		
20-Mar-18	CARTIER REGIONAL 2 - TREATED	0	0	1.46	1.69
20-Mar-18	CARTIER REGIONAL 3 - DIST @ ELM BANK BOOSTER	0	0	1.40	1.54
20-Mar-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.40	1.50
20-Mar-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.40	1.60
19-Mar-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.28	1.47
19-Mar-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.34	1.52
03-Apr-18	CARTIER REGIONAL 1 - RAW	200	0		
03-Apr-18	CARTIER REGIONAL 2 - TREATED	0	0	1.54	1.71
03-Apr-18	CARTIER REGIONAL 3 - DIST OAKVILLE RES IN	0	0	1.46	1.61
03-Apr-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.5	1.6
03-Apr-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.5	1.7
03-Apr-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.30	1.50
03-Apr-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.53	1.62
17-Apr-18	CARTIER REGIONAL 1 - RAW	8	0		
17-Apr-18	CARTIER REGIONAL 2 - TREATED	0	0	1.45	1.84
17-Apr-18	CARTIER REGIONAL 3 - DIST @ FANNYSTELLE RESERVOIR IN	0	0	1.28	1.48
17-Apr-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.40	1.50
17-Apr-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.40	1.60
17-Apr-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.25	1.43
17-Apr-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.38	1.48
01-May-18	CARTIER REGIONAL 1 - RAW	89	1		
01-May-18	CARTIER REGIONAL 2 - TREATED	0	0	1.56	1.68
30-Apr-18	CARTIER REGIONAL 3 - DIST @ ELIE RESERVOIR IN	0	0	1.50	1.60
30-Apr-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.40	1.50
30-Apr-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.40	1.60
01-May-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.12	1.33
30-Apr-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.35	1.48
15-May-18	CARTIER REGIONAL 1 - RAW	59	0		
15-May-18	CARTIER REGIONAL 2 - TREATED	0	0	1.24	1.44
14-May-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE RES IN	0	0	1.20	1.30
14-May-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.20	1.30
14-May-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.20	1.30
15-May-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.04	1.16
15-May-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.00	1.11
29-May-18	CARTIER REGIONAL 1 - RAW	34	0		
29-May-18	CARTIER REGIONAL 2 - TREATED	0	0	1.31	1.48
29-May-18	CARTIER REGIONAL 3 - DIST @ ----->FORTIER BOOSTER	0	0	1.30	1.44
28-May-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.20	1.30
28-May-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.20	1.30
28-May-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	0.95	1.14

28-May-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.05	1.27
12-Jun-18	CARTIER REGIONAL 1 - RAW	200	5		
12-Jun-18	CARTIER REGIONAL 2 - TREATED	0	0	1.66	1.83
11-Jun-18	CARTIER REGIONAL 3 - DIST @ -----> OAKVILLE IN	0	0	1.45	1.62
11-Jun-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.00	1.70
11-Jun-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.50	1.70
11-Jun-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.29	1.41
11-Jun-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.32	1.47
26-Jun-18	CARTIER REGIONAL 1 - RAW	200	4		
26-Jun-18	CARTIER REGIONAL 2 - TREATED	0	0	1.19	1.36
25-Jun-18	CARTIER REGIONAL 3 - DIST @ ----->FANNYSTELLE IN	0	0	1.15	1.27
25-Jun-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.10	1.20
25-Jun-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.10	1.20
25-Jun-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.24	1.31
25-Jun-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.08	1.20
10-Jul-18	CARTIER REGIONAL 1 - RAW	200	56		
10-Jul-18	CARTIER REGIONAL 2 - TREATED	0	0	1.57	1.95
09-Jul-18	CARTIER REGIONAL 3 - DIST @ -----> ELIE IN	0	0	1.4	1.6
09-Jul-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.4	1.5
09-Jul-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.4	1.5
09-Jul-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.14	1.26
09-Jul-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.20	1.35
24-Jul-18	CARTIER REGIONAL 1 - RAW	>200	78		
24-Jul-18	CARTIER REGIONAL 2 - TREATED	0	0	1.51	1.62
24-Jul-18	CARTIER REGIONAL 3 - DIST @ ST. EUSTACHE IN	0	0	1.5	1.7
24-Jul-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.5	1.7
24-Jul-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.5	1.7
24-Jul-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.44	1.64
24-Jul-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.4	1.5
07-Aug-18	CARTIER REGIONAL 1 - RAW	>200	43		
07-Aug-18	CARTIER REGIONAL 2 - TREATED	0	0	1.47	1.65
07-Aug-18	CARTIER REGIONAL 3 - DIST @ ELMBANK BOOSTER	0	0	1.28	1.51
07-Aug-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.50	1.70
07-Aug-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.60	1.70
07-Aug-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.4	1.48
07-Aug-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.36	1.52
21-Aug-18	CARTIER REGIONAL 1 - RAW	>200	1		
21-Aug-18	CARTIER REGIONAL 2 - TREATED	0	0	1.30	1.54
21-Aug-18	CARTIER REGIONAL 3 - DIST @ OAKVILLE IN	0	0	1.40	1.60
21-Aug-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.50	1.60
21-Aug-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.40	1.50
21-Aug-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.37	1.48

21-Aug-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.37	1.51
04-Sep-18	CARTIER REGIONAL 1 - RAW	>200	>200		
04-Sep-18	CARTIER REGIONAL 2 - TREATED	0	0	1.48	1.61
04-Sep-18	CARTIER REGIONAL 3 - DIST @ PLANT IN	0	0	1.38	1.52
04-Sep-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.6	1.7
04-Sep-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.5	1.7
04-Sep-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.31	1.44
04-Sep-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.44	1.56
18-Sep-18	CARTIER REGIONAL 1 - RAW	>200	200		
18-Sep-18	CARTIER REGIONAL 2 - TREATED	0	0	1.61	1.76
18-Sep-18	CARTIER REGIONAL 3 - DIST @ Elie In	0	0	1.4	1.5
18-Sep-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.4	1.5
18-Sep-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.4	1.5
18-Sep-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.24	1.39
18-Sep-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.21	1.44
02-Oct-18	CARTIER REGIONAL 1 - RAW	145	11		
02-Oct-18	CARTIER REGIONAL 2 - TREATED	0	0	1.44	1.62
01-Oct-18	CARTIER REGIONAL 3 - DIST @ -----> St. Eustache In	0	0	1.40	1.60
03-Oct-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.40	1.50
01-Oct-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.40	1.50
01-Oct-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.25	1.38
01-Oct-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.27	1.41
16-Oct-18	CARTIER REGIONAL 1 - RAW	109	15		
16-Oct-18	CARTIER REGIONAL 2 - TREATED	0	0	1.41	1.63
16-Oct-18	CARTIER REGIONAL 3 - DIST @ -----> FORTIER BOOSTER	0	0	1.31	1.41
16-Oct-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.40	1.50
16-Oct-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.40	1.50
15-Oct-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.31	1.42
15-Oct-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.33	1.47
30-Oct-18	CARTIER REGIONAL 1 - RAW	56	4		
30-Oct-18	CARTIER REGIONAL 2 - TREATED	0	0	1.59	1.74
29-Oct-18	CARTIER REGIONAL 3 - DIST @ -----> OAKVILLE IN	0	0	1.52	1.65
29-Oct-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.40	1.50
29-Oct-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.40	1.60
29-Oct-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.39	1.52
29-Oct-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.39	1.54
13-Nov-18	CARTIER REGIONAL 1 - RAW	29	0		
13-Nov-18	CARTIER REGIONAL 2 - TREATED	0	0	1.67	1.96
13-Nov-18	CARTIER REGIONAL 3 - DIST @ -----> FANNYSTELLE RES IN	0	0	1.51	1.62
13-Nov-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.50	1.60
13-Nov-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.60	1.70
13-Nov-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.51	1.62

13-Nov-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.16	1.37
27-Nov-18	CARTIER REGIONAL 1 - RAW	4	0		
27-Nov-18	CARTIER REGIONAL 2 - TREATED	0	0	1.56	1.77
27-Nov-18	CARTIER REGIONAL 3 - DIST @ ----->ELIE RES IN	0	0	1.50	1.70
27-Nov-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.40	1.50
27-Nov-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.50	1.60
26-Nov-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.21	1.28
28-Nov-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.29	1.44
11-Dec-18	CARTIER REGIONAL 1 - RAW	6	0		
11-Dec-18	CARTIER REGIONAL 2 - TREATED	0	0	1.54	1.72
11-Dec-18	CARTIER REGIONAL 3 - DIST @ -----> St. Eustache IN	0	0	1.50	1.70
11-Dec-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.40	1.60
11-Dec-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.40	1.60
03-Dec-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.19	1.32
10-Dec-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.25	1.62
26-Dec-18	CARTIER REGIONAL 1 - RAW	0	0		
26-Dec-18	CARTIER REGIONAL 2 - TREATED	0	0	1.47	1.69
26-Dec-18	CARTIER REGIONAL 3 - DIST @ -----> ELM BANK	0	0	1.21	1.40
26-Dec-18	CARTIER REGIONAL 3 - DIST - ST. EUSTACHE OUT	0	0	1.60	1.80
26-Dec-18	CARTIER REGIONAL 3 - DIST - ELIE OUT	0	0	1.70	1.80
18-Dec-18	CARTIER REGIONAL 3 - DIST - FANNYSTELLE OUT	0	0	1.11	1.27
17-Dec-18	CARTIER REGIONAL 3 - DIST - OAKVILLE OUT	0	0	1.46	1.46

## Appendix B: Headingley WTP 89.40 2018 Bacteriological Results

Date	Sample Identification	TC	EC	Free CL2	Total CL2
02-Jan-18	HEADINGLEY REGIONAL 1 - RAW	8	2		
02-Jan-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.26	1.32
04-Jan-18	HEADINGLEY REGIONAL 3 - DIST @ -----> WSP RES IN	0	0	1.05	1.12
02-Jan-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.31	1.45
02-Jan-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	0.89	0.93
02-Jan-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.39	1.45
02-Jan-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.11	1.19
04-Jan-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.06	1.14
16-Jan-18	HEADINGLEY REGIONAL 1 - RAW	10	0		
16-Jan-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.26	1.31
16-Jan-18	HEADINGLEY REGIONAL 3 - DIST @ -----> HDLY RES IN	0	0	1.35	1.42
16-Jan-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.32	1.35
16-Jan-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.3	1.38
16-Jan-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.35	1.37
16-Jan-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.15	1.21
15-Jan-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.06	1.14

30-Jan-18	HEADINGLEY REGIONAL 1 - RAW	10	0	0	0
30-Jan-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.27	1.3
30-Jan-18	HEADINGLEY REGIONAL 3 - DIST @ -----> ROSSER IN	0	0	1.13	1.19
30-Jan-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.34	1.39
30-Jan-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.3	1.38
30-Jan-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.21	1.23
30-Jan-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.15	1.21
31-Jan-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.06	1.14
13-Feb-18	HEADINGLEY REGIONAL 1 - RAW	6	0	0	0
13-Feb-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.23	1.27
13-Feb-18	HEADINGLEY REGIONAL 3 - DIST @ -----> SFX RES IN	0	0	1.32	1.33
13-Feb-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.25	1.37
13-Feb-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.2	1.26
13-Feb-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.3	1.35
13-Feb-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.12	1.16
13-Feb-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	0.91	0.99
27-Feb-18	HEADINGLEY REGIONAL 1 - RAW	6	0		
27-Feb-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.26	1.31
27-Feb-18	HEADINGLEY REGIONAL 3 - DIST @ -----> GI RES IN	0	0	1.13	1.28
27-Feb-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.37	1.43
27-Feb-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.16	1.2
27-Feb-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.24	1.29
27-Feb-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.11	1.21
27-Feb-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	0.88	0.96
13-Mar-18	HEADINGLEY REGIONAL 1 - RAW	10	1		
13-Mar-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.29	1.36
13-Mar-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.37	1.42
13-Mar-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.03	1.08
13-Mar-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.29	1.33
13-Mar-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.12	1.21
13-Mar-18	HEADINGLEY REGIONAL 3 - DIST @ -----> HCC IN	0	0	1.34	1.4
13-Mar-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	0.86	0.89
27-Mar-18	HEADINGLEY REGIONAL 1 - RAW	16	1		
27-Mar-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.26	1.33
27-Mar-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.34	1.44
27-Mar-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.03	1.08
27-Mar-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.15	1.26
27-Mar-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.1	1.17
27-Mar-18	HEADINGLEY REGIONAL 3 - DIST @ ----->HDLY WWTP	0	0	1.21	1.28
27-Mar-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	0.94	0.98
09-Apr-18	HEADINGLEY REGIONAL 1 - RAW	14	0		
09-Apr-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.31	1.35
09-Apr-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.36	1.43

10-Apr-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.03	1.07
09-Apr-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.39	1.45
10-Apr-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.13	1.22
09-Apr-18	HEADINGLEY REGIONAL 3 - DIST @ -----> Fast Enterprises	0	0	1.37	1.45
13-Apr-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	0.96	1.05
23-Apr-18	HEADINGLEY REGIONAL 1 - RAW	11	0		
23-Apr-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.28	1.34
24-Apr-18	HEADINGLEY REGIONAL 3 - DIST @ -----> WSP IN	0	0	1.01	1.05
23-Apr-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.25	1.35
24-Apr-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.00	1.06
23-Apr-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.33	1.35
24-Apr-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.17	1.28
24-Apr-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.07	1.14
08-May-18	HEADINGLEY REGIONAL 1 - RAW	43	10		
08-May-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.24	1.28
08-May-18	HEADINGLEY REGIONAL 3 - DIST @ -----> HDLY RES IN	0	0	1.29	1.34
08-May-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.30	1.34
08-May-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.06	1.12
08-May-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.32	1.36
08-May-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.17	1.27
09-May-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.40	1.41
22-May-18	HEADINGLEY REGIONAL 1 - RAW	31	2		
22-May-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.12	1.16
22-May-18	HEADINGLEY REGIONAL 3 - DIST @ ROSSER RES. IN	0	0	1.2	1.27
22-May-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.20	1.27
22-May-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.17	1.25
22-May-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.19	1.24
22-May-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.13	1.19
22-May-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.45	1.47
05-Jun-18	HEADINGLEY REGIONAL 1 - RAW	>200	25		
05-Jun-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.25	1.30
05-Jun-18	HEADINGLEY REGIONAL 3 - DIST @ -----> SFX RES. IN	0	0	1.20	1.29
05-Jun-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.14	1.20
05-Jun-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.02	1.11
05-Jun-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.07	1.17
05-Jun-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.07	1.15
05-Jun-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.29	1.34
19-Jun-18	HEADINGLEY REGIONAL 1 - RAW	>200	43		
19-Jun-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.21	1.25
19-Jun-18	HEADINGLEY REGIONAL 3 - DIST @ -----> G.I. RES. IN	0	0	1.26	1.39
19-Jun-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.28	1.33
19-Jun-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.14	1.26
19-Jun-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.19	1.28
19-Jun-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.03	1.12

19-Jun-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.09	1.18
03-Jul-18	HEADINGLEY REGIONAL 1 - RAW	200	10		
03-Jul-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.27	1.31
03-Jul-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.29	1.31
03-Jul-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.13	1.19
03-Jul-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.25	1.33
03-Jul-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.07	1.44
03-Jul-18	HEADINGLEY REGIONAL 3 - DIST @ -----> H.C.C IN	0	0	1.33	1.38
04-Jul-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.11	1.19
17-Jul-18	HEADINGLEY REGIONAL 1 - RAW	>200	1		
17-Jul-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.22	1.24
17-Jul-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.24	1.32
18-Jul-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.18	1.28
17-Jul-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.29	1.38
18-Jul-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.03	1.11
17-Jul-18	HEADINGLEY REGIONAL 3 - DIST @ -----> HDLY W.W.T.P.	0	0	1.22	1.29
17-Jul-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.08	1.12
31-Jul-18	HEADINGLEY REGIONAL 1 - RAW	>200	9		
31-Jul-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.35	1.40
31-Jul-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.34	1.41
31-Jul-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.15	1.25
31-Jul-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.32	1.38
31-Jul-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.10	1.22
31-Jul-18	HEADINGLEY REGIONAL 3 - DIST @ -----> FAST ENT.	0	0	1.27	1.36
31-Jul-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.12	1.17
14-Aug-18	HEADINGLEY REGIONAL 1 - RAW	>200	36		
14-Aug-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.27	1.31
14-Aug-18	HEADINGLEY REGIONAL 3 - DIST @ -----> W.S.P. RES. IN	0	0	1.28	1.31
14-Aug-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.26	1.38
14-Aug-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.29	1.34
14-Aug-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.31	1.38
14-Aug-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.15	1.23
14-Aug-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.12	1.13
28-Aug-18	HEADINGLEY REGIONAL 1 - RAW	>200	>200		
28-Aug-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.35	1.37
28-Aug-18	HEADINGLEY REGIONAL 3 - DIST @ -----> HDLY RES. IN	0	0	1.33	1.40
28-Aug-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.29	1.40
28-Aug-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.31	1.36
28-Aug-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.31	1.36
28-Aug-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.15	1.24
28-Aug-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.02	1.08
11-Sep-18	HEADINGLEY REGIONAL 1 - RAW	>200	>200		
11-Sep-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.23	1.28
11-Sep-18	HEADINGLEY REGIONAL 3 - DIST @ -----> ROSSER RES. IN	0	0	1.38	1.49

11-Sep-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.19	1.29
10-Sep-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.28	1.41
11-Sep-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.31	1.47
10-Sep-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.16	1.26
11-Sep-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.11	1.17
25-Sep-18	HEADINGLEY REGIONAL 1 - RAW	>200	>200		
25-Sep-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.21	1.25
25-Sep-18	HEADINGLEY REGIONAL 3 - DIST @ -----> SFX RES. IN	0	0	1.20	1.28
25-Sep-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.01	1.13
25-Sep-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.15	1.22
25-Sep-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.17	1.22
25-Sep-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.11	1.24
25-Sep-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.13	1.18
09-Oct-18	HEADINGLEY REGIONAL 1 - RAW	>200	200		
09-Oct-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.23	1.30
09-Oct-18	HEADINGLEY REGIONAL 3 - DIST @ ----->	0	0	1.05	1.11
09-Oct-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.17	1.22
09-Oct-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.11	1.15
09-Oct-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.20	1.26
09-Oct-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.04	1.1
09-Oct-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.11	1.16
22-Oct-18	HEADINGLEY REGIONAL 1 - RAW	>200	83		
22-Oct-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.02	1.09
22-Oct-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	0.98	1.07
23-Oct-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.02	1.06
22-Oct-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.01	1.18
23-Oct-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	1.02	1.13
22-Oct-18	HEADINGLEY REGIONAL 3 - DIST @ -----> H.C.C. IN	0	0	0.98	1.03
22-Oct-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.04	1.07
06-Nov-18	HEADINGLEY REGIONAL 1 - RAW	145	12		
06-Nov-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.21	1.28
06-Nov-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.22	1.29
06-Nov-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	0.9	1
06-Nov-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.06	1.15
06-Nov-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	0.9	1.04
06-Nov-18	HEADINGLEY REGIONAL 3 - DIST @ -----> HDLY W.W.T.P.	0	0	1.41	1.52
06-Nov-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.02	1.06
20-Nov-18	HEADINGLEY REGIONAL 1 - RAW	25	0		
20-Nov-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.21	1.28
20-Nov-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.26	1.34
19-Nov-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	0.91	1.00
20-Nov-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.14	1.22
19-Nov-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	0.82	0.92
20-Nov-18	HEADINGLEY REGIONAL 3 - DIST @ -----> Fast Enterprises	0	0	1.17	1.21

20-Nov-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	0.89	0.97
04-Dec-18	HEADINGLEY REGIONAL 1 - RAW	14	2		
04-Dec-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.21	1.31
06-Dec-18	HEADINGLEY REGIONAL 3 - DIST @ -----> W.S.P. RES. IN	0	0	0.86	0.90
04-Dec-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.29	1.37
04-Dec-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	0.94	1.03
04-Dec-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.21	1.24
04-Dec-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	0.94	1.02
06-Dec-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	0.87	0.91
18-Dec-18	HEADINGLEY REGIONAL 1 - RAW	9	0		
18-Dec-18	HEADINGLEY REGIONAL 2 - TREATED	0	0	1.24	1.28
18-Dec-18	HEADINGLEY REGIONAL 3 - DIST @ -----> HDLY RES. IN	0	0	1.29	1.37
18-Dec-18	HEADINGLEY REGIONAL 3 - DIST - HDLY OUT	0	0	1.26	1.34
18-Dec-18	HEADINGLEY REGIONAL 3 - DIST - ROSSER OUT	0	0	1.03	1.13
18-Dec-18	HEADINGLEY REGIONAL 3 - DIST - ST. FX OUT	0	0	1.18	1.23
18-Dec-18	HEADINGLEY REGIONAL 3 - DIST - GI OUT	0	0	0.88	1.01
18-Dec-18	HEADINGLEY REGIONAL 3 - DIST - WSP OUT	0	0	1.00	1.07

## Appendix C: RM of Headingley 89.50 2018 Bacteriological results

Date	Sample Identification	TC	EC	Free CL2	Total CL2
2-Jan-18	HEADINGLEY 3 - DIST @ --> HDLY SPORT SHOP	0	0	1.35	1.43
15-Jan-18	HEADINGLEY 3 - DIST @ --> LIBRARY	0	0	1.31	1.41
30-Jan-18	HEADINGLEY 3 - DIST @ --> FLYING J	0	0	1.18	1.32
13-Feb-18	HEADINGLEY 3 - DIST @ --> TAILLIEU CONST.	0	0	0.86	0.91
27-Feb-18	HEADINGLEY 3 - DIST @ --> NOVENTIS C.U.	0	0	1.24	1.31
13-Mar-18	HEADINGLEY 3 - DIST @ --> PHONEIX SCHOOL	0	0	1.32	1.36
27-Mar-18	HEADINGLEY 3 - DIST @ --> FLYING J	0	0	1.11	1.24
10-Apr-18	HEADINGLEY 3 - DIST @ --> COLUMBIA INSURANCE	0	0	1.32	1.44
24-Apr-18	HEADINGLEY 3 - DIST @ --> HDLY SPORT SHOP	0	0	1.31	1.38
8-May-18	HEADINGLEY 3 - DIST @ --> FIREHALL	0	0	1.15	1.22
22-May-18	HEADINGLEY 3 - DIST @ --> LIBRARY	0	0	1.15	1.18
5-Jun-18	HEADINGLEY 3 - DIST @ --> MOTEL 6	0	0	1.09	1.14
19-Jun-18	HEADINGLEY 3 - DIST @ --> PHOENIX SCHOOL	0	0	1.02	1.08
3-Jul-18	HEADINGLEY 3 - DIST @ --> COLUMBIA INSURANCE	0	0	1.18	1.24
17-Jul-18	HEADINGLEY 3 - DIST @ --> FLYING J TRUCKSTOP	0	0	1.24	1.30
31-Jul-18	HEADINGLEY 3 - DIST @ --> THUNDER RAPIDS	0	0	1.27	1.37
14-Aug-18	HEADINGLEY 3 - DIST @ --> TAILLIEU CONST.	0	0	0.87	0.91
28-Aug-18	HEADINGLEY 3 - DIST @ --> PHOENIX SCHOOL	0	0	1.07	1.18
11-Sep-18	HEADINGLEY 3 - DIST @ --> MOTEL 6	0	0	1.05	1.12
25-Sep-18	HEADINGLEY 3 - DIST @ --> NOVENTIS CREDIT UNION	0	0	1.15	1.21
9-Oct-18	HEADINGLEY 3 - DIST @ --> HDLY SPORT SHOP	0	0	1.21	1.34
22-Oct-18	HEADINGLEY 3 - DIST @ --> FLYING J TRUCKSTOP	0	0	0.80	0.92
6-Nov-18	HEADINGLEY 3 - DIST @ --> TAILLIEU CONST.	0	0	0.62	0.67
20-Nov-18	HEADINGLEY 3 - DIST @ --> LIBRARY	0	0	1.21	1.26
4-Dec-18	HEADINGLEY 3 - DIST @ --> MOTEL 6	0	0	1.23	1.31
18-Dec-18	HEADINGLEY 3 - DIST @ --> HDLY SPORT SHOP	0	0	1.28	1.34

## Appendix D: RM of St Francois Xavier 211.50 2018 Bacteriological Results

Date	Sample Identification	TC	EC	Free CL2	Total CL2
2-Jan-18	ST. FRANCOIS XAVIER 3 - DIST @ --->COUNTRY KIDS LEARNING CENTRE	0	0	1.35	1.55
15-Jan-18	ST. FRANCOIS XAVIER 3 - DIST @ --->COUNTRY STORE	0	0	1.30	1.37
30-Jan-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> CREDIT UNION	0	0	1.02	1.11
13-Feb-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> RM OFFICE	0	0	1.32	1.42
27-Feb-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> KOA	0	0	1.35	1.45
13-Mar-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> MYERA GROUP	0	0	1.43	1.48
27-Mar-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> COUNTRY STORE	0	0	1.29	1.36
10-Apr-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> VET CLINIC	0	0	1.34	1.45
24-Apr-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> KOA	0	0	1.05	1.14
8-May-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> RM OFFICE	0	0	1.29	1.34
22-May-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> COUNTRY KIDS LEARNING CENTRE	0	0	1.10	1.16
5-Jun-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> CREDIT UNION	0	0	1.05	1.15
19-Jun-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> SFX ELEMENTARY SCHOOL	0	0	1.13	1.19
3-Jul-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> COUNTRY STORE	0	0	1.16	1.24
17-Jul-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> KOA	0	0	1.27	1.38
31-Jul-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> MYERA GROUP	0	0	1.31	1.38
14-Aug-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> R.M OFFICE	0	0	1.33	1.40
28-Aug-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> SFX ELEMENTARY SCHOOL	0	0	1.11	1.18
11-Sep-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> COUNTRY STORE	0	0	1.05	1.13
25-Sep-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> SFX CREDIT UNION	0	0	1.13	1.15
9-Oct-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> VET CLINIC	0	0	1.20	1.24
22-Oct-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> COUNTRY STORE	0	0	1.07	1.14
6-Nov-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> R.M OFFICE	0	0	1.03	1.12
20-Nov-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> SFX CREDIT UNION	0	0	1.14	1.19
4-Dec-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> COUNTRY KIDS LEARNING CENTRE	0	0	0.91	1.06
18-Dec-18	ST. FRANCOIS XAVIER 3 - DIST @ ---> COUNTRY STORE	0	0	1.21	1.28

## Appendix E: Peony Farm Reservoir 162.75 2018 Bacteriological Results

Date	Sample Identification	TC	EC	Free CL2	Total CL2
02-Jan-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	0.98	1.30
02-Jan-18	PEONY FARM 3 - DIST - PP @ RINK	0	0	0.13	0.41
08-Jan-18	PEONY FARM 3 - DIST - PP @ RINK	0	0	0.16	0.45
16-Jan-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.17	1.44
22-Jan-18	PEONY FARM 3 - DIST - PP @ RINK	0	0	0.15	0.22
29-Jan-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.28	1.78
05-Feb-18	PEONY FARM 3 - DIST - PP @ RINK	0	0	0.17	0.47
12-Feb-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.32	1.71
20-Feb-18	PEONY FARM 3 - DIST - PP @ RINK	0	0	0.21	0.57
26-Feb-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.15	1.38
08-Mar-18	PEONY FARM 3 - DIST - PP @ RINK	0	0	0.32	0.66
15-Mar-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.14	1.45
19-Mar-18	PEONY FARM 3 - DIST - PP @ RINK	0	0	0.39	0.66
26-Mar-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.22	1.46
03-Apr-18	PEONY FARM 3 - DIST - PP @ RINK	0	0	0.54	0.76
23-Apr-18	PEONY FARM 3 - DIST - PP @ PPF 26H/21	0	0	1.10	1.36
23-Apr-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.29	1.62
07-May-18	PEONY FARM 3 - DIST - PP @ ---> PTH 26 EAST HYDRANT	0	0	0.57	0.71
07-May-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.23	1.55
22-May-18	PEONY FARM 3 - DIST - PP @ ---> RINK	0	0	0.35	0.85
22-May-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	0.99	1.22
04-Jun-18	PEONY FARM 3 - DIST - PP @ ---> SPRUCE HYDRANT	0	0	0.84	1.01
04-Jun-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.19	1.49
18-Jun-18	PEONY FARM 3 - DIST - PP @ ---> PPF 70/28	0	0	1.16	1.29
18-Jun-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	0.14	0.29
03-Jul-18	PEONY FARM 3 - DIST - PP @ ---> OAK DRIVE	0	0	0.39	1.17
03-Jul-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.22	1.35
16-Jul-18	PEONY FARM 3 - DIST - PP @ ---> Arena	0	0	0.83	1.30
16-Jul-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.25	1.50
30-Jul-18	PEONY FARM 3 - DIST - PP @ ---> Arena	0	0	0.40	0.54
30-Jul-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.31	1.72
13-Aug-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.38	1.65
13-Aug-18	PEONY FARM 3 - DIST - PP @ ---> Rink	0	0	0.26	0.63
27-Aug-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.41	1.61
28-Aug-18	PEONY FARM 3 - DIST - PP @ ---> Rink	0	0	0.34	0.79
11-Sep-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.16	1.45
11-Sep-18	PEONY FARM 3 - DIST - PP @ ---> PP ARENA	0	0	0.32	0.62
24-Sep-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.15	1.51
24-Sep-18	PEONY FARM 3 - DIST - PP @ ---> PP ARENA	0	0	0.33	0.71
09-Oct-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.35	1.53

09-Oct-18	PEONY FARM 3 - DIST - PP @ ---> PP ARENA	0	0	0.47	0.77
09-Oct-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	0.60	0.96
09-Oct-18	PEONY FARM 3 - DIST - PP @ ---> PP ARENA	0	0	0.19	0.69
20-Nov-18	PEONY FARM 3 - DIST - PP @ ---> RINK	0	0	0.10	0.32
20-Nov-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.20	1.58
03-Dec-18	PEONY FARM 3 - DIST - PP @ --->RINK	0	0	0.29	0.35
03-Dec-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.19	1.39
17-Dec-18	PEONY FARM 3 - DIST - PP @ --->Rink	0	0	0.12	0.56
17-Dec-18	PEONY FARM 3 - DIST - PF OUTGOING	0	0	1.32	1.63

## Appendix F: Cartier and Headingley Regional Water System THM and HAA Results

### Cartier Regional (36.00) THM Results

2018 - THM sampling location	1 <sup>st</sup> Quarter	2 <sup>nd</sup> Quarter	3 <sup>rd</sup> Quarter	4 <sup>th</sup> Quarter	AVG THM (mg/L)	AVG THM (µg/L)
Cartier RWTP – Oakville IN - 1	0.0323	0.0506	0.0828	0.0296	0.048825	48.83
Cartier RWTP - Fannystelle IN - 2	0.0342	0.056	0.0785	0.0319	0.05015	50.15

### Cartier Regional (36.00) HAA Results

2018 - HAA sampling location	1 <sup>st</sup> Quarter	2 <sup>nd</sup> Quarter	3 <sup>rd</sup> Quarter	4 <sup>th</sup> Quarter	AVG HAA (mg/L)	AVG HAA (µg/L)
Cartier RWTP – Fortier Booster - 1	0.0289	0.0494	0.0407	0.0184	0.03435	34.35
Cartier RWTP – Elm Bank Booster - 2	0.0291	0.0514	0.0391	0.0169	0.034125	34.13

### Headingley Regional (89.40) THM Results

2018 - THM sampling location	1 <sup>st</sup> Quarter	2 <sup>nd</sup> Quarter	3 <sup>rd</sup> Quarter	4 <sup>th</sup> Quarter	AVG THM (mg/L)	AVG THM (µg/L)
Headingley RWTP – Grosse Isle IN	0.0181	0.0122	0.0578	0.0247	0.0282	28.20
Headingley RWTP - West St. Paul IN	0.0185	0.0059	0.0476	0.0116	0.0209	20.90

### Headingley Regional (89.40) HAA Results

2018 - HAA sampling location	1 <sup>st</sup> Quarter	2 <sup>nd</sup> Quarter	3 <sup>rd</sup> Quarter	4 <sup>th</sup> Quarter	AVG HAA (mg/L)	AVG HAA (µg/L)
Headingley RWTP – SFX IN	<0.0054	0.0064	0.014	<0.0054	0.0102	10.2
Headingley RWTP – ROSSER IN	<0.0054	0.0060	0.0069	<0.0054	0.03345	33.45

### RM of Headingley (89.50) THM Results

2018 - THM sampling location	1 <sup>st</sup> Quarter	2 <sup>nd</sup> Quarter	3 <sup>rd</sup> Quarter	4 <sup>th</sup> Quarter	AVG THM (mg/L)	AVG THM (µg/L)
Headingley 3 Dist Taillieu Construction	0.0061	0.0076	0.0418	0.0031	0.01465	14.65

### RM of Headingley (89.50) HAA Results

2018 - HAA sampling location	1 <sup>st</sup> Quarter	2 <sup>nd</sup> Quarter	3 <sup>rd</sup> Quarter	4 <sup>th</sup> Quarter	AVG HAA (mg/L)	AVG HAA (µg/L)
Headingley 3 – Distribution – Fire Hall	<0.0054	0.0068	0.0111	<0.0054	0.00895	8.95

### RM of SFX (211.50) THM Results

2018 - THM sampling location	1 <sup>st</sup> Quarter	2 <sup>nd</sup> Quarter	3 <sup>rd</sup> Quarter	4 <sup>th</sup> Quarter	AVG THM (mg/L)	AVG THM (µg/L)
St. Francois Xavier 3 – Dist - ESSO	0.0061	0.0064	0.0521	0.0032	0.01695	16.95

### RM of SFX (211.50) – HAA Results

2018 - HAA sampling location	1 <sup>st</sup> Quarter	2 <sup>nd</sup> Quarter	3 <sup>rd</sup> Quarter	4 <sup>th</sup> Quarter	AVG HAA (mg/L)	AVG HAA (µg/L)
St. Francois Xavier 3 – Dist - RM Office	<0.0054	<0.0054	0.0122	<0.0054	0.0071	7.10

**Peony Farm (188.25) – THM Results**

2018 - THM sampling location	1 <sup>st</sup> Quarter	2 <sup>nd</sup> Quarter	3 <sup>rd</sup> Quarter	4 <sup>th</sup> Quarter	AVG THM (mg/L)	AVG THM (µg/L)
Peony Farm 3 – Distribution – PPT-Rink	0.0785	0.0825	0.157	0.0979	0.103975	104.98

**Peony Farm (188.25) – HAA Results**

2018 - HAA sampling location	1 <sup>st</sup> Quarter	2 <sup>nd</sup> Quarter	3 <sup>rd</sup> Quarter	4 <sup>th</sup> Quarter	AVG HAA (mg/L)	AVG HAA (µg/L)
Peony Farm 3 – Dist- HB –Com. Hall	0.0275	0.0307	0.0327	0.0202	0.027775	27.78

**Appendix G: Cartier Regional Audits 2018**

For all CRWC DWO Audits please use the following link:

<http://crwc.ca/2018>