

Introduction:

In the early 90's, a number of municipalities in south central Manitoba joined to form the Pembina Valley Water Cooperative Inc. (PVWC). The purpose was to develop a regional approach to supplying potable water in an area which lacked wide distribution of good, plentiful water resources, but which also exhibited the highest rate of economic growth of any region in Manitoba. Municipalities that were members of the cooperative as of December, 2016 include:

Town of Altona	City of Winkler
R.M. of Dufferin	Town of Carman
R.M. of Grey	Municipality of Emerson - Franklin
R.M. of Montcalm	R.M. of Morris
Town of Morris	Municipality of Rhineland
R.M. of Roland	City of Morden
R.M. of Stanley	R.M. of Thompson

The mandate of the PVWC is to provide treated/potable water that meets all of the Canadian Drinking Water standards to its municipal members. It is governed by a board of 14 members, one representative from each municipal member.

The PVWC is a wholesaler of water which is distributed through its pipelines to its municipal customers. The municipalities then sell this water to the end user, their customers, which is then delivered through their own distribution system. The service area covers 3,500 square miles with a population base of approximately 50,000. The existing water supply system is shown in Figure 1.

Existing Water Supply

The Letellier water treatment plant (WTP) withdraws water from the Red River, pumps it into an oxbow with an approximate storage of two (2) months and has the ability to produce up to 96 litres per second (lps) of treated water. From there, treated water is provided to the Towns of Altona, and to the City of Winkler and Morden. Treated water is also provided from this plant to the Municipalities of Emerson-Franklin, Rhineland, Montcalm, Stanley, and the Roseau River First Nation.

PVWC Distribution

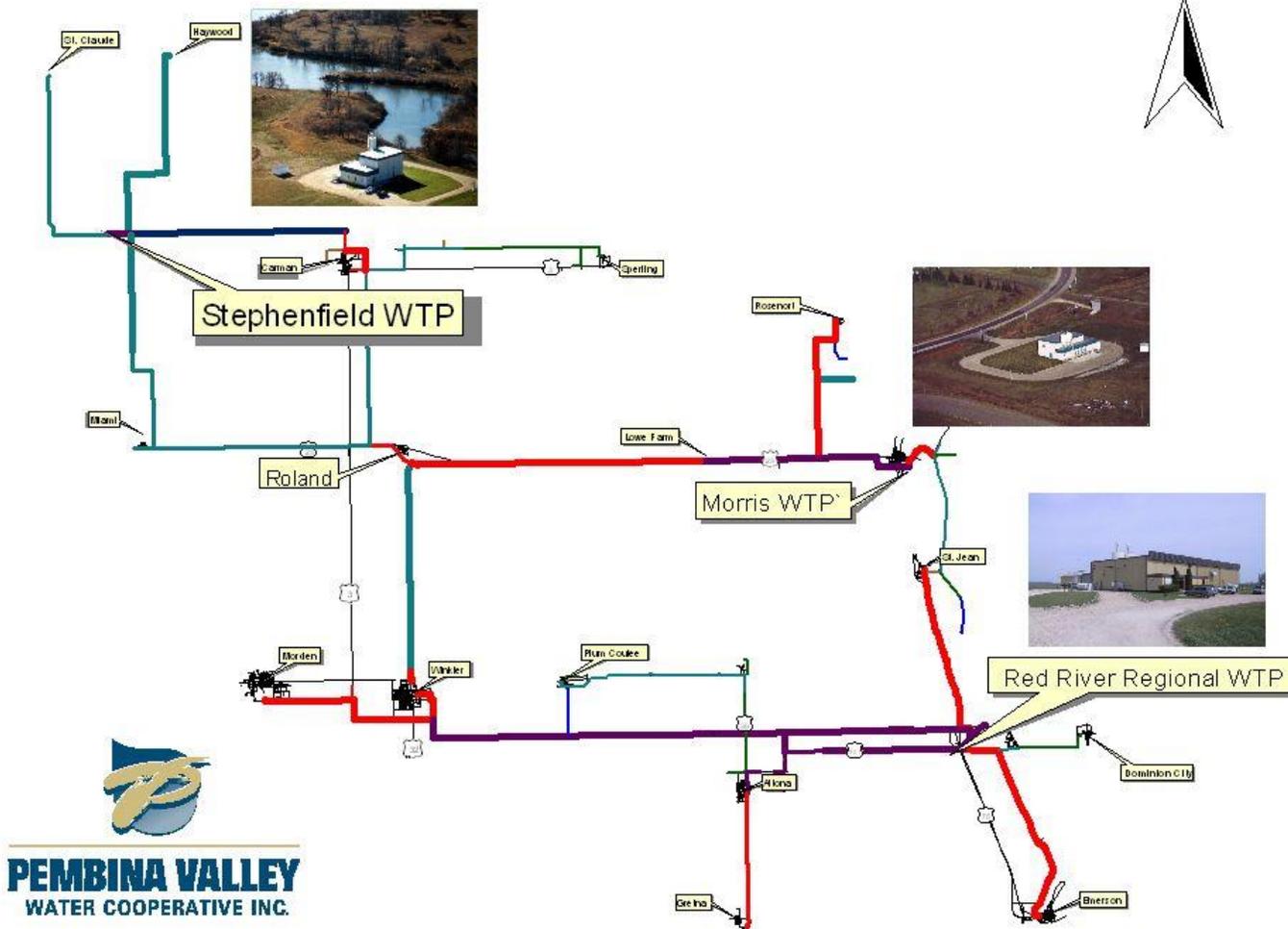


Figure 1 is a model of the PVWC distribution system, including the three water treatment plants.

The water treatment plant at Morris also withdraws water from the Red River and pumps it into a large holding pond of 1,000 acre feet. It currently has the capacity to produce up to 67 lps of treated water. From there, treated water is provided to the Town of Morris, the R.M.s of Morris, Montcalm, Roland, Thompson, and Dufferin and a partial supply to the City of Winkler and the R.M. of Stanley.

The Stephenfield water treatment plant withdraws water from the Stephenfield Reservoir and has a capacity to produce up to 25 lps of treated water. This plant provides water to St. Claude and Haywood and to the R.M.s of Dufferin, Grey, Thompson and a partial supply to the R.M.s of Roland, Morris and the Town of Carman.

By the licensing requirements of the existing system and as a matter of best management practice, all of the regions' existing supplies are utilized to their sustainable yield with the exception of the expanded water treatment plant in Morris. The expansion will allow for growth and drought resistance in the future. The City of Morden receives approximately

10% of their water supply from the PVWC with the remainder coming from Lake Minnewasta. The City of Winkler receives approximately 35% of their supply from the PVWC and the remainder is withdrawn from the Winkler Aquifer. The Town of Carman receives 25% of their water supply from the PVWC and the rest of their supply comes from the Boyne River.

The PVWC is a user-pay water supply system. The price includes the cost of production, operation and maintenance, principal and interest. There is no decreasing scale or other discounting in the pricing system. The price charged to deliver the water to the municipal system in 2016 was \$7.84 per thousand gallons.

Red River Regional Water Treatment Plant - Letellier

- Red River used as water source
- Raw water storage of approx 250 acre-feet
- Rated for 96 litres per second
- Storage capacity 2,450,000 litres or 540,000 gallons
- Senior plant operator- Dan Dupuis
- Drinking Water Officer- Kale Black



The following is a description of the major treatment process for the Red River Regional Water Treatment Plant: This lime softening plant, which is typical of those commonly found throughout the Manitoba prairies, is used to treat the water from the Red River.

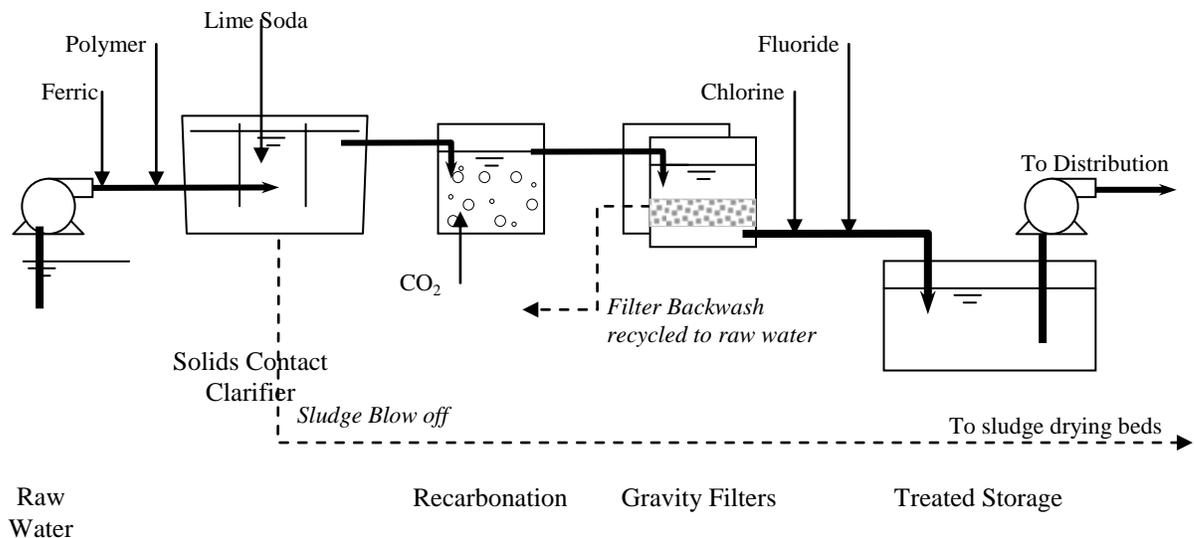


Figure 2 is a schematic of the existing process.

The current process consists of a screened raw water intake located off the Red River that pumps to an off stream storage reservoir beside the plant which is then pumped directly to

the solids contact clarifier. The cold lime softening clarifier then reduces hardness and turbidity. The subsequent re-carbonation step stabilizes the clarifier effluent and the gravity filters polish the water for final turbidity and pathogen reduction.

The filtered water is then dosed with chlorine for disinfection and fluoride for dental maintenance. The fluoridation program is monitored by Manitoba Health .

Disinfection Monitoring and Reporting

The treated water leaving the water plant is tested continuously for a level of chlorine that is high enough for proper disinfection in the distribution system.

	Requirement	Performance
Free chlorine residual entering the distribution system	≥ 0.5 mg/l	100%
Free chlorine residual in the distribution system	≥ 0.1 mg/l	<100%*
Frequency of testing of free chlorine entering distribution	Continuous	100%
Frequency of testing of distribution for free and total chlorine	Weekly	100%
Report submissions	Monthly	100%

*There was an incident in February where free chlorine was below 0.1. Free chlorine at the end of a distribution system is dependent on the initial chlorine injected at the source, the rate of flow in the distribution system and the time spent in the distribution system. These values are closely monitored by the operators along with bacterial test results. Changes in any of these factors can result in lower chlorine residuals. Corrective action forms are then submitted to the drinking water office.

Bacteriological Monitoring and Reporting

The raw and treated water is tested on a weekly basis for the presence of total coliform and E. coli bacteria. If these bacteria are present in the water it is an indication that disease causing organisms may also be present.

	Requirement	Performance	Corrective action form
E. coli	< 1 E. coli bacteria detectable per 100ml (treated)	100%	n/a
Total Coliform	< 1 total coliform bacteria detectable per 100mL (treated)	100%	n/a
E. coli	< 1 E. coli bacteria detectable per 100ml (distribution)	100%	n/a
Total Coliform	< 1 total coliform bacteria detectable per 100mL (distribution)	100%	n/a
Comments	The bacterial water quality standard has been met. A copy of the water test results are kept at the water treatment plant and at the main office in Altona.		

Turbidity Monitoring and Reporting

Turbidity is a measurement of the clarity of water. Turbidity is used to tell us if the treatment process and filtration is working to remove particles and other contaminants from the water. A high turbidity can cause the water to look cloudy and affect the disinfection process. Turbidity is continuously tested after the filtering process and before disinfection.

Turbidity, which is measured and reported in nephelometric turbidity units (NTU), is an optical measurement of water's ability to scatter and absorb light rather than transmit it in straight lines.

	Requirement	Performance
Chemically assisted, rapid gravity filtration process for water treatment	≤ 0.3 NTU in at least 95% of the samples taken per month	100%
	Not to exceed 0.3 NTU for more than 12 continuous hours	100%
	Not to exceed 1.0 NTU at any time	<100%*
Frequency of testing with hand held meter	Daily	100%
Frequency of testing online meter	Continuous	100%
Report submissions	Monthly	100%

*There were four incidents in the month of November that exceeded 1.0 NTU. Corrective action forms were submitted.

Disinfection By-products Monitoring and Reporting

Trihalomethane (THM's) 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. The province has set a standard for THM's of 100 micrograms per litre of water. The THM standard is based on an average of four samples per year. Our water from the Letellier plant is tested at four locations in the distribution system - Emerson, St.Jean Baptiste, Gretna and Morden.

Trihalomethane quarterly sampling

Locations	Requirement	Test Results
Emerson	Less than or equal to 100 µg/L as an annual average of quarterly samples	116 µg/L
St Jean Baptiste		117 µg/L
Gretna		120 µg/L
Morden		127µg/L

One factor in the increase in THM's is the regulatory requirements to maintain greater than 0.1 mg/l of chlorine residual in the water distribution system. This has made it necessary to increase the chlorine concentration leaving the water treatment plant which has the direct result of increasing the THM's. New treatment methods and operational methods are being investigated to reduce the disinfection by-products created by chlorine. A feasibility study for the water treatment plant upgrades and expansion will be completed in order to meet the THM compliance in 2017.

Major Expenses for the Red River Regional Water Treatment Plant in 2016

Two of the Booster stations were upgraded for efficiency and redundancy. The Plant also received a PLC upgrade to support plant control improvements.

Future Expenses for the Red River Regional Water Treatment Plant

A regional assessment of the system including a drought preparedness plan is being completed. A filter to waste project is planned. This will help reduce the turbidity spikes from entering the treated water.

Red River Regional Water Treatment Plant Water Analysis

RRRWTP Chemistry		Aesthetic	Raw	Treated	Raw	Treated
Analyte	Units	Objective	February	February	August	August
Colour, True	CU	15	10	6	33.4	<5.0
Conductivity	umhos/cm		987	730	743	547
Hardness (as CaCO ₃)	mg/L		360	135	322	126
Langelier Index (4 C)			0.44	-0.7	0.64	-1
Langelier Index (60 C)			1.2	0.068	1.4	-0.28
pH	pH units	6.8-8.5	7.89	7.61	8.23	7.52
Total Dissolved Solids	mg/L	500	619	422	504	344
Transmittance, UV (254 nm)	% T		64.7	85.1	44.3	83.6
Turbidity	NTU		3.83	<0.10	9.48	<0.10
Alkalinity, Total (as CaCO ₃)	mg/L		255	76.7	198	30.9
Ammonia, Total (as N)	mg/L		0.095	<0.010	0.058	<0.010
Bicarbonate (HCO ₃)	mg/L		311	93.6	241	37.7
Bromide (Br)	mg/L		0.13	<0.10	<0.10	<0.10
Carbonate (CO ₃)	mg/L		<0.60	<0.60	<0.60	<0.60
Chloride (Cl)	mg/L		65.9	69.1	40.9	46.9
Fluoride (F)	mg/L	0.6	0.177	0.674	0.177	0.87
Hydroxide (OH)	mg/L		<0.34	<0.34	<0.34	<0.34
Nitrate (as N)	mg/L		0.953	1.08	0.0494	0.233
Nitrite (as N)	mg/L		0.0149	<0.0010	0.0075	<0.0010
Sulfate (SO ₄)	mg/L		149	157	145	152
Dissolved Organic Carbon	mg/L		10.6	6.17	10.8	5.02
Total Organic Carbon	mg/L		10.8	6.22	10.9	5.07
Aluminum (Al)-Total	mg/L		0.0937	0.0054	0.328	0.0083
Arsenic (As)-Total	mg/L		0.00213	0.0007	0.00746	0.00125
Barium (Ba)-Total	mg/L		0.0667	0.0601	0.0498	0.0141
Boron (B)-Total	mg/L		0.105	0.045	0.075	0.047
Cadmium (Cd)-Total	mg/L		0.000016	<0.000010	0.000017	<0.000010
Calcium (Ca)-Total	mg/L		76	31.6	68.5	41.8
Copper (Cu)-Total	mg/L		0.00147	0.0071	0.0024	0.012
Iron (Fe)-Total	mg/L		0.154	<0.010	0.333	<0.010
Lead (Pb)-Total	mg/L		0.000094	<0.000090	0.000249	<0.000090
Lithium (Li)-Total	mg/L		0.0418	0.0398	0.0356	0.0355
Magnesium (Mg)-Total	mg/L		41.4	13.5	36.6	5.18
Manganese (Mn)-Total	mg/L	0.05	0.0593	<0.00030	0.244	0.00059
Phosphorus (P)-Total	mg/L		0.17	<0.10	0.39	<0.10
Potassium (K)-Total	mg/L		9.86	10.2	7.6	7.77
Silicon (Si)-Total	mg/L		8	3.03	9.96	2.33
Sodium (Na)-Total	mg/L		68.6	83.3	45.4	58.9
Strontium (Sr)-Total	mg/L		0.274	0.147	0.246	0.162
Uranium (U)-Total	mg/L		0.0022	<0.00010	0.00315	<0.00010
Zinc (Zn)-Total	mg/L		0.0064	0.0049	0.0055	0.0119

Morris Regional Water Treatment Plant

- Red River used as water source
- Raw water storage of 1,000 acre-feet
- Rated for 67 litres per second
- Storage capacity 2,800,000 litres or 616,000 gallons
- Senior plant operator- Byron Klassen
- Drinking Water Officer- Kale Black



The following is a description of the major treatment process for the Morris Regional Water Treatment Plant which was commissioned on March 17, 2010.

The plant is a state of the art microfiltration and membrane plant. Figure 4.2 is a schematic of the new process.

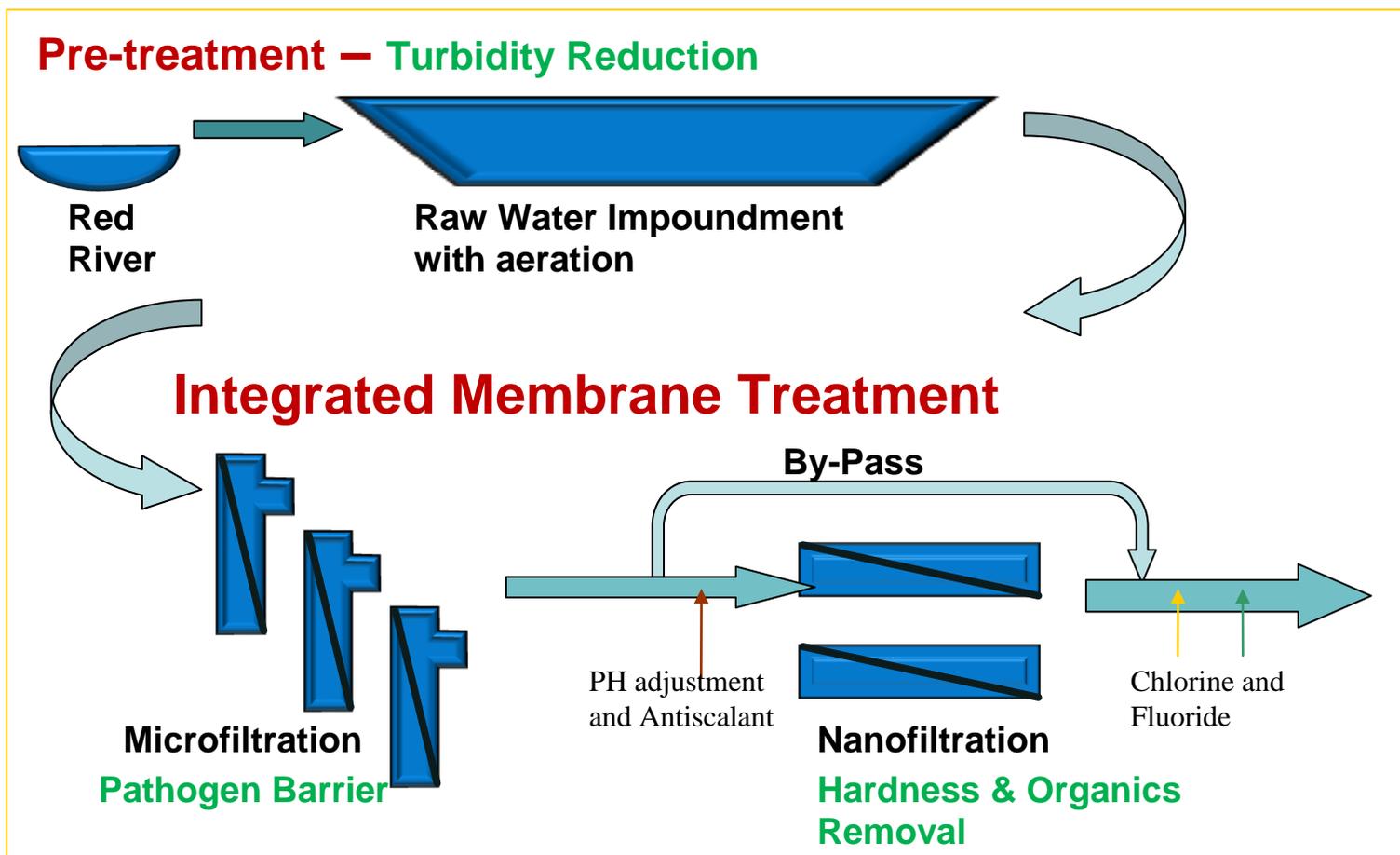


Figure 4.2

The process consists of a screened raw water intake located off of the Red River that pumps into a raw water impound for off stream storage and settling. The microfiltration removes the pathogens and reduces the turbidity to a point where it is potable. A partial percentage of the water is bypassed and put into the distribution system. The subsequent nanomembrane step removes the hardness and the organics so that when the water is blended the water exceeds all of the Manitoba Drinking Water guidelines. The blended water is then dosed with chlorine for disinfection and fluoride for dental maintenance. The fluoridation program is monitored by Manitoba Health.

Disinfection Monitoring and Reporting

The treated water leaving the water plant is tested continuously for a level of chlorine that is high enough for proper disinfection in the distribution system.

	Requirement	Performance
Free chlorine residual entering the distribution system	≥ 0.5 mg/l	100%
Free chlorine residual in the distribution system	≥ 0.1 mg/l	100%
Frequency of testing entering the distribution system	Continuous	100%
Frequency of testing in the distribution system	Weekly	100%
Report submissions	Monthly	100%

Bacteriological Monitoring and Reporting

The raw and treated water is tested on a weekly basis for the presence of Total Coliform and E. coli bacteria. If these bacteria are present in the water it is an indication that disease causing organisms may also be present.

	Requirement	Performance
Number of raw/incoming water samples	52	100%
Number of treated water samples	52	100%
Frequency of testing	Weekly	100%
Total Coliform present in treated water samples	0 per 100ml	100%
E-Coli present in treated water samples	0 per 100ml	100%

A copy of the water test results are kept at the water treatment plant and at the main office in Altona.

Turbidity Monitoring and Reporting

Turbidity is a measurement of the clarity of water. Turbidity is used to tell us if the treatment process and filtration is working to remove particles and other contaminants from the water. A high turbidity can cause the water to look cloudy and affect the disinfection process. Turbidity is continuously tested after the microfiltration process and before disinfection.

Turbidity, which is measured and reported in nephelometric turbidity units (NTU), is an optical measurement of water's ability to scatter and absorb light rather than transmit it in straight lines.

	Requirement	Performance
Continuous sampling of the effluent from each of the microfiltration skids.	≤ 0.1 NTU in at least 99% of the samples taken per month	100%
	Not to exceed 0.3 NTU for any continuous time	100%
Frequency of testing	Continuous	100%
Report submissions	Monthly	100%

Disinfection By-products Monitoring and Reporting

Trihalomethane (THM's) 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. The province has set a standard for THM's of 100 micrograms per litre of water. The THM standard is based on an average of four samples per year. Our water is tested at two locations in the distribution system, Miami and Rosenort.

	Requirement	Performance
Trihalomethane sampling requirements	2 sample locations 4 times a year	100%
Miami	<100 µg/L as an annual average of quarterly samples	64 µg/L
Rosenort		53 µg/L

The new treatment method and operational method is effective for decreasing the by-products created by chlorine.

Morris Regional Water Treatment Plant Water Analysis

MWTP Chemistry		Aesthetic	Raw	Treated
Analytes	Units	Objective	August	August
Colour, True	CU	15	15.2	<5.0
Conductivity	umhos/cm		863	242
Hardness (as CaCO3)	mg/L		376	83
Langelier Index (4 C)			0.92	-0.94
Langelier Index (60 C)			1.7	-0.16
pH	pH units	6.8-8.5	8.41	7.72
Total Dissolved Solids	mg/L	500	594	157
Transmittance, UV (254 nm)	% T		60.3	91
Turbidity	NTU		15.5	<0.10
Alkalinity, Total (as CaCO3)	mg/L		216	51.3
Ammonia, Total (as N)	mg/L		0.031	<0.010
Bicarbonate (HCO3)	mg/L		255	62.6
Bromide (Br)	mg/L		0.106	0.014
Carbonate (CO3)	mg/L		4.2	<0.60
Chloride	mg/L	250	52.4	16
Fluoride	mg/L		0.185	0.68
Hydroxide (OH)	mg/L		<0.34	<0.34
Nitrate-N	mg/L		0.101	0.0307
Nitrite-N	mg/L		0.0022 *	<0.0010
Sulfate	mg/L	500	176	41.2
Dissolved Organic Carbon	mg/L		10.3	2.11
Total Organic Carbon	mg/L		9.71	2.05
Aluminum (Al)-Total	mg/L		0.667	<0.0050
Arsenic (As)-Total	mg/L		0.00591	0.0013
Barium (Ba)-Total	mg/L		0.0762	0.0158
Boron (B)-Total	mg/L		0.117	0.1
Cadmium (Cd)-Total	mg/L		0.000039	<0.000010
Calcium (Ca)-Total	mg/L		82.4	17.8
Copper (Cu)-Total	mg/L	1	0.0084	0.0205
Iron (Fe)-Total	mg/L	0.3	0.769	<0.010
Lead (Pb)-Total	mg/L		0.000836	<0.000090
Lithium (Li)-Total	mg/L		0.05	0.0135
Magnesium (Mg)-Total	mg/L		41.3	9.39
Manganese (Mn)-Total	mg/L	0.05	0.187	0.00335
Phosphorus (P)-Total	mg/L		0.12	1.13
Potassium (K)-Total	mg/L		9.4	2.36
Silicon (Si)-Total	mg/L		10.1	2.25
Sodium (Na)-Total	mg/L	200	63.9	18.3
Strontium (Sr)-Total	mg/L		0.303	0.0675
Uranium (U)-Total	mg/L		0.00325	0.00073
Zinc (Zn)-Total	mg/L	5	0.0139	0.0033

Major Expenses for the Morris Regional Water Treatment Plant in 2016

The 2 skids of reverse osmosis membranes were replaced. Zebra mussels have been discovered on the river and pond intake screens, a plan to mitigate is being drafted.

Future Expenses for the Morris Regional Water Treatment Plant

The distribution system is expanding on the east side of the Red River feeding into the Municipality of Emerson-Franklin. Future growth, drought and regulatory study will begin in July 2017.

Stephenfield Regional Water Treatment Plant

- Stephenfield Lake used as water source
- Rated for 20 litres per second
- Storage capacity 950,000 litres or 209,000 gallons
- Senior plant operator- Paul Termeer
- Drinking Water Officer- Michaela Samek/Kale Black



The following is a description of the major treatment process for the Stephenfield Regional Water Treatment Plant. The existing plant is a typical lime softening plant found throughout the Manitoba prairies. Figure 4.3 is a schematic of the existing process.

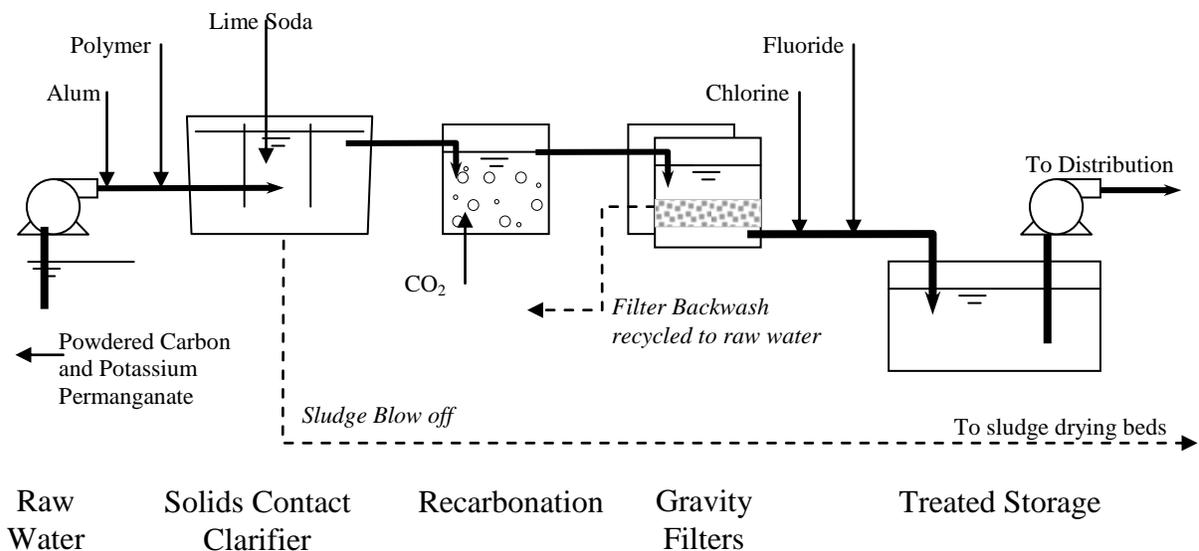


Figure 4.3

The current process consists of a screened raw water intake located in Stephenfield Lake that feeds water directly to the pumps in the water treatment plant. The pumps supply water

to the cold lime softening clarifier which reduces hardness and turbidity. The subsequent re-carbonation step stabilizes the clarifier effluent and the gravity filters polish the water for final turbidity and pathogen reduction.

The filtered water is then dosed with chlorine for disinfection and fluoride for dental maintenance. The fluoridation program is monitored by Manitoba Health.

Disinfection Monitoring and Reporting

The treated water leaving the water plant is tested continuously for a level of chlorine that is high enough for proper disinfection in the distribution system.

	Requirement	Performance
Free chlorine residual entering the distribution system	≥ 0.5 mg/l	100%
Free chlorine residual in the distribution system	≥ 0.1 mg/l	100%
Frequency of testing (A)	Continuous	100%
Frequency of testing (B)	Weekly	100%
Report submissions	Monthly	100%

Free chlorine at the end of a distribution system is dependent on the initial chlorine injected at the source, the rate of flow in the distribution system and the time spent in the distribution system. These parameters are closely monitored by the operators along with bacterial test results. Changes in any of these factors can result in lower chlorine residuals.

Bacteriological Monitoring and Reporting

The raw and treated water is tested on a weekly basis for the presence of Total Coliform and E. coli bacteria. If these bacteria are present in the water it is an indication that disease causing organisms may also be present.

	Requirement	Performance
Number of raw/incoming water samples	26	100%
Number of treated water samples	26	100%
Frequency of testing	Bi-Weekly	100%
Total Coliform present in treated water samples	0 per 100ml	100%
E-Coli present in treated water samples	0 per 100ml	100%

A copy of the water test results are kept at the water treatment plant and at the main office in Altona.

Turbidity Monitoring and Reporting

Turbidity is a measurement of the clarity of water. Turbidity is used to tell us if the treatment process and filtration is working to remove particles and other contaminants from the water. A high turbidity can cause the water to look cloudy and affect the disinfection process. Turbidity is continuously tested after the filters and before disinfection.

Turbidity, which is measured and reported in nephelometric turbidity units (NTU), is an optical measurement of water's ability to scatter and absorb light rather than transmit it in straight lines.

	Requirement	Performance
Chemically assisted, rapid gravity filtration process for water treatment	≤ 0.3 NTU in at least 95% of the samples taken per month	<100%*
	Not to exceed 1.0 NTU at any time	<100%*
Frequency of testing	Continuous	100%
Report submissions	Monthly	100%

*Three incidents occurred in March, September and December. Corrective action forms were submitted for all non-compliance occasions. The new plant will resolve this issue.

Disinfection By-products Monitoring and Reporting

Trihalomethane (THM's) 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. The province has set a standard for THM's of 100 micrograms per litre of water. The THM standard is based on an average of four samples per year. Our water is tested at two locations in the distribution system, St. Claude and the Dufferin Booster north of Carman.

	Requirement	Performance
Trihalomethane sampling requirements	2 sample locations 4 times a year	100%
Location		
St. Claude	≤100 µg/L as annual average of quarterly samples	166 µg/L
Dufferin Booster		139 µg/L

The need to keep the required chlorine residual at the distribution end forces a high chlorine injection at the plant site. The upgrade and expansion will address the THM non-compliance.

Major Expenses for the Stephenfield Regional Water Treatment Plant in 2016

The Stephenfield WTP is under an upgrade from 20 l/s to 40 l/s with an option to upgrade to 60 l/s. The contract was awarded to Parkwest Projects and is projected to be completed in June of 2017. PVWC has received funding from the New Building Canada Fund .

Associated Engineering was hired to help resolve the water losses in the R. M. of Dufferin. PVWC resources and R. M. of Dufferin resources have worked closely in the last number of months to resolve many of the water loss issues.

Future Expenses for the Stephenfield Regional Water Treatment Plant

An expansion is to 60 l/s in order to meet the future growth and demand will be considered in the future.

Stephenfield Regional WTP Water Analysis

SWTP Chemistry		Aesthetic	Raw	Treated
Analytes	Units	Objective	August	August
Colour, True	CU	5	51.2	<5.0
Conductivity	umhos/cm	20	668	332
Hardness (as CaCO ₃)	mg/L	0.3	362	89.5
Langelier Index (4 C)		n/a	0.93	-0.87
Langelier Index (60 C)		n/a	1.7	-0.1
pH	pH units	0.1	8.18	7.46
Total Dissolved Solids	mg/L	5	453	234
Transmittance, UV (254 nm)	% T	1	33	79.1
Turbidity	NTU	0.1	20	<0.10
Alkalinity, Total (as CaCO ₃)	mg/L	20	305	64.4
Ammonia, Total (as N)	mg/L	0.01	0.096	0.031
Bicarbonate (HCO ₃)	mg/L	24	372	78.6
Bromide (Br)	mg/L	0.1	<0.10	<0.10
Carbonate (CO ₃)	mg/L	12	<0.60	<0.60
Chloride	mg/L	0.2	9.93	18.8
Fluoride	mg/L	0.1	0.261	0.644
Hydroxide (OH)	mg/L	6.8	<0.34	<0.34
Nitrate-N	mg/L	0.005	0.0537	0.157
Nitrite-N	mg/L	0.001	0.006	<0.0010
Sulfate	mg/L	0.5	54.8	63.5
Dissolved Organic Carbon	mg/L	1	15.7	7.02
Total Organic Carbon	mg/L	1	16.1	7.11
Aluminum (Al)-Total	mg/L	0.005	0.0406	0.012
Arsenic (As)-Total	mg/L	0.0002	0.00785	0.00128
Barium (Ba)-Total	mg/L	0.0002	0.0605	0.00833
Boron (B)-Total	mg/L	0.01	0.13	0.1
Cadmium (Cd)-Total	mg/L	0.00001	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	0.1	96.6	31.1
Copper (Cu)-Total	mg/L	0.0002	0.00093	0.0169
Iron (Fe)-Total	mg/L	0.1	0.095	<0.010
Lead (Pb)-Total	mg/L	0.00009	<0.000090	0.000187
Lithium (Li)-Total	mg/L	0.002	0.0381	0.0379
Magnesium (Mg)-Total	mg/L	0.01	29.4	2.87
Manganese (Mn)-Total	mg/L	0.0003	2.34	0.00128
Phosphorus (P)-Total	mg/L	0.1	0.43	<0.10
Potassium (K)-Total	mg/L	0.02	8.31	8.58
Silicon (Si)-Total	mg/L	0.1	17.6	6.28
Sodium (Na)-Total	mg/L	0.03	21.8	32
Strontium (Sr)-Total	mg/L	0.0001	0.365	0.123
Uranium (U)-Total	mg/L	0.0001	0.00334	<0.00010
Zinc (Zn)-Total	mg/L	0.002	<0.0020	0.009

Organizational Resources

