Annual Report 2013

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Pembina Valley Water Co-op (PVWC) ownership- 18 municipalities

Water Plants in operation

Red River Regional Water Treatment Plant - Letellier
Emergency contact number: (204) 324-7118

Morris Regional Water Treatment Plant - Morris
Emergency contact number: (204) 324-7561

Stephenfield Regional Water Treatment Plant - Stephenfield
Emergency contact number: (204) 745-8791

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Jake Fehr
Chief System Manager
Pembina Valley Water Co-op

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 are currently members of the cooperative include:

Town of Altona	R.M. of Dufferin
Town of Carman	R.M. of Franklin
Town of Emerson	R.M. of Grey
Town of Gretna	R.M. of Montcalm
City of Morden	R.M. of Morris
Town of Morris	R.M. of Rhineland
Town of Plum Coulee	R.M. of Roland
Village of St. Claude	R.M. of Stanley
City of Winkler	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 18 members, one representative from each municipal member.

The PVWC is a wholesaler of water which it distributes through its pipelines to its municipal customers. The municipalities then sell this water to the end user, their customers, delivered through their own distribution system. The service area covers 3500 square miles with a population base of approx. 50,000. The existing water supply system is shown on 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 Towns of Emerson, Altona, Gretna, Plum Coulee and to the City of Winkler and Morden. Treated water is also provided from this plant to the R.M.s of Franklin, Montcalm, Rhineland, Stanley, and the Roseau River First Nation.

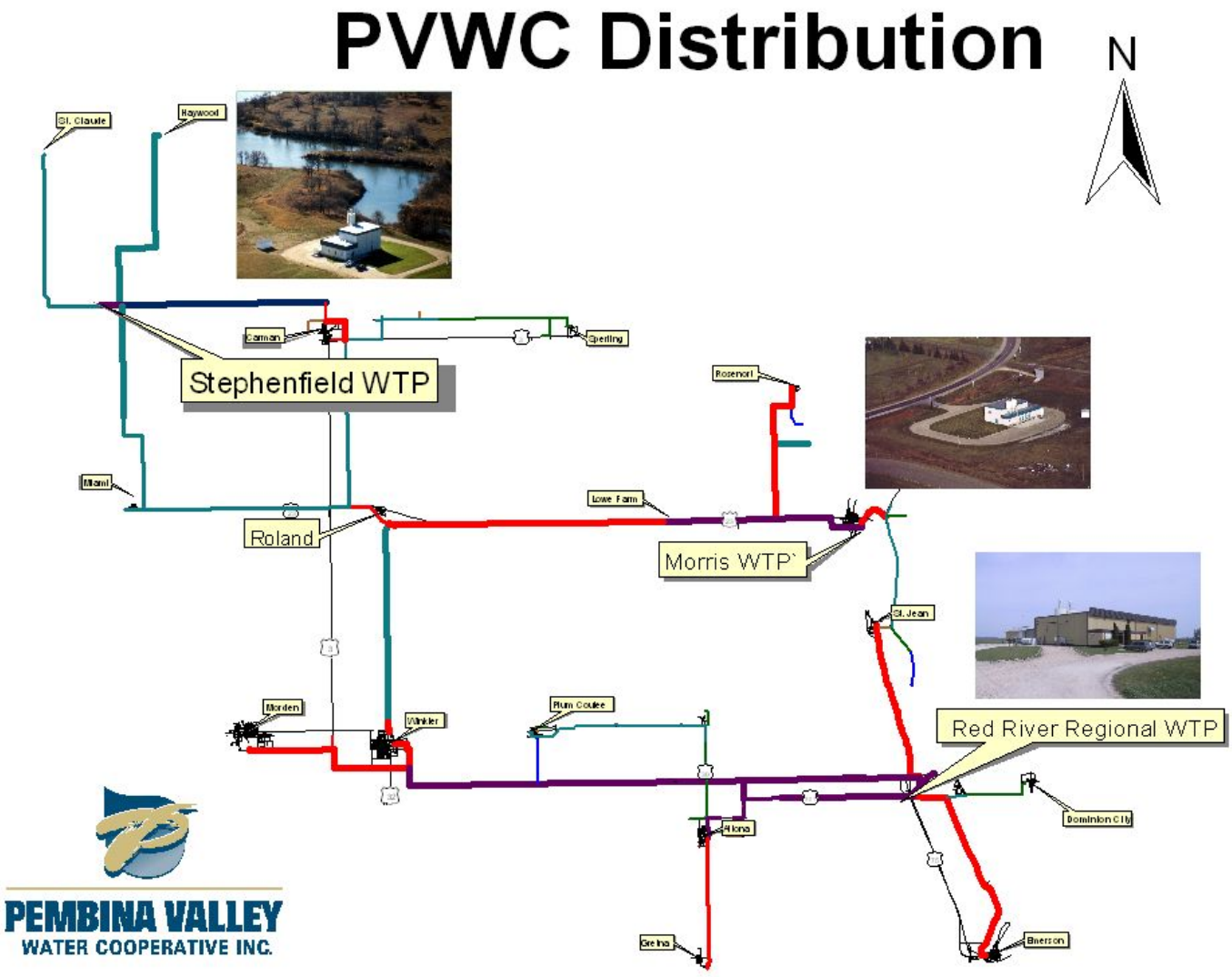

Figure 1 is a model of the PVWC distribution system, including the three water treatment plants.

The water treatment plant at Morris also withdraws water from the Red River and pumps it into a large holding pond of 1000 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 newly 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 2013 was $6.78 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 operater- Dan Dupuis
- Drinking Water Officer- Michaela Samek

The following is a description of the major treatment processes 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.

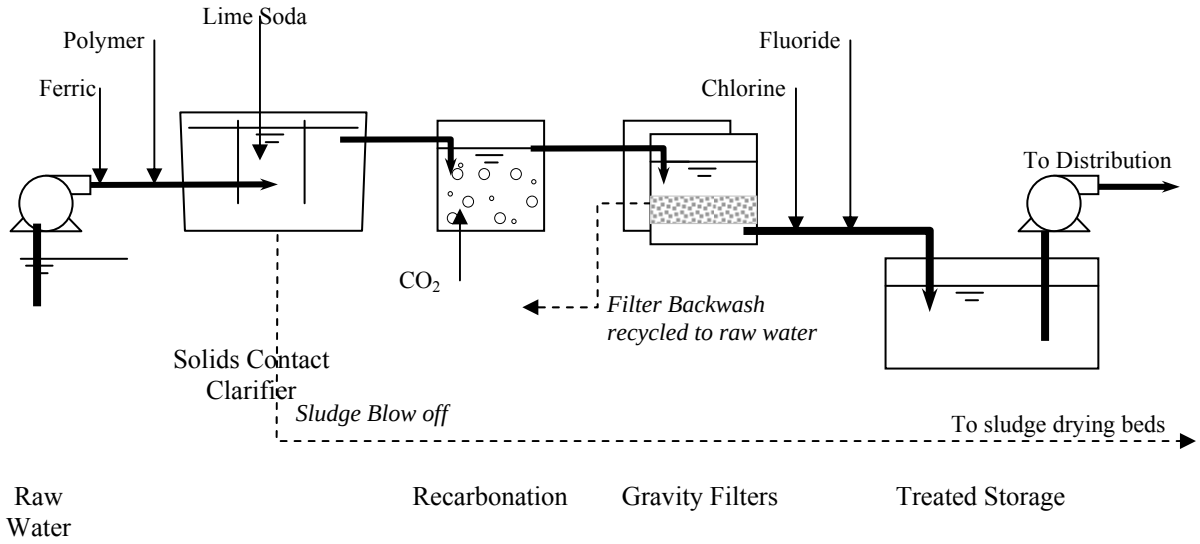

Figure 2 is a schematic of the existing process.

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 recarbonation 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 and Living.

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%

* 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 were submitted to meet regulations.

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 was 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%

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	134 µg/L
St Jean Baptiste		136 µg/L
Gretna		144 µg/L
Morden		145 µg/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.

Analysis of Raw & Treated Water Samples
Red River Water Treatment Plant

Parameter	Raw Water	Treated Water	Aesthetic Objective	Units
Conductivity	1084.	939	-	umhos/cm
Langelier Index (4 C)	1.00	-0.19	-	
Langelier Index (60 C)	1.77	0.57	-	
pH	8.5	8.0	6.5-8.5	pH units
Turbidity	13.46	<0.1	-	NTU
Alkalinity, Total (as CaCO3)	254	93.5	-	mg/L
Bicarbonate (HCO3)	290	113	-	mg/L
Carbonate (CO3)	14	<12	-	mg/L
Chloride	59.9	64.52	250	mg/L
Fluoride	0.19	0.511	-	mg/L
Hydroxide (OH)	<6.8	<6.8	-	mg/L
Nitrate and Nitrite as N	0.9985	0.572	-	mg/L
Nitrate-N	0.984	0.572	-	mg/L
Nitrite-N	0.0124	<0.0050	-	mg/L
Sulfate	243.25	251	500	mg/L
Hardness	397	162		mg/L

Parameter	Raw Water	Treated Water	Aesthetic Objective	Units
Calcium (Ca)-Total	70.0	35.8	-	mg/l
Copper (Cu)-Total	0.00249	0.00994	-	mg/l
Iron (Fe)-Total	0.45	<0.10	0.3	mg/l
Magnesium (Mg)-Total	34.2	15.5	-	mg/l
Manganese (Mn)-Total	0.150	0.0005	0.05	mg/l
Potassium (K)-Total	13.29	14.1	-	mg/l
Sodium (Na)-Total	103	146	-	mg/l
Zinc (Zn)-Total	0.0148	0.0103	-	mg/l

Major Expenses for Red River Regional Water Treatment Plant in 2013

An additional building with confinement was built for adding the chemical caustic soda to improve the water treatment process.

Future Expenses for the Red River Water Treatment Plant

A feasibility study has been completed in order to meet the THM regulation which is pending on available funds.

Water Issues

Devils Lake influence of high conductivity affected our ability to treat the water. In the distribution system a couple of upgrades were made to improve their reliability.

Morris Regional Water Treatment Plant

- Red River used as water source
- Raw water Storage of 1000 acre-feet
- Rated for 67 litres per second
- Storage capacity 2,800,000 litres or 616,000 gallons
- Senior plant operater- Byron Klassen
- Drinking Water Officer- Michaela Samek

The following is a description of the major treatment processes 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. The cold lime process was used in January and February.

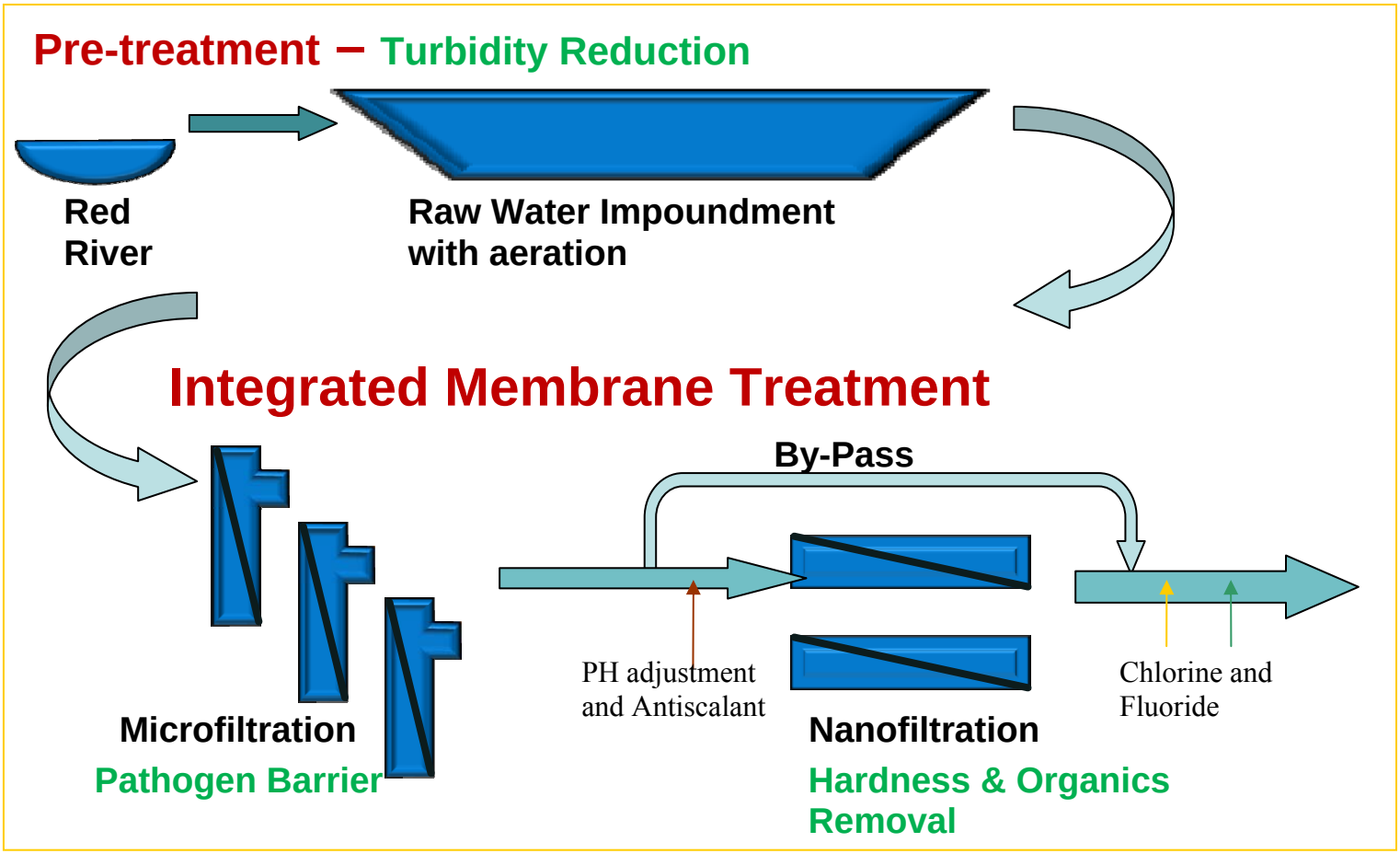

Figure 4.2

The new 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 and Living.

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	66 µg/L
Rosenort		53 µg/L

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

Analysis of Raw & Treated Water Samples
Morris Water Treatment Plant

Parameter	Raw Water	Treated Water	Aesthetic Objective	Units
Conductivity	1057	352	-	umhos/cm
Langelier Index (4 C)	0.8	-0..9	-	
Langelier Index (60 C)	1.5	-0.1	-	
pH	8.4	7.5	6.5-8.5	pH units
Turbidity	6.6	0.54	-	NTU
Alkalinity, Total (as CaCO3)	251	71	-	mg/L
Bicarbonate (HCO3)	294	87	-	mg/L
Carbonate (CO3)	14	<12	-	mg/L
Chloride	66.6	22.9	250	mg/L
Fluoride	0.186	0.690	-	mg/L
Hydroxide (OH)	<6.8	<6.8	-	mg/L
Nitrate and Nitrite as N	0.31	0.127	-	mg/L
Nitrate-N	0.31	0.09	-	mg/L
Nitrite-N	0.0049	<0.0010	-	mg/L
Sulfate	230	66.4	500	mg/L
Hardness	400	90-120		mg/L
Calcium (Ca)-Total	67.1	19.7	-	mg/l
Copper (Cu)-Total	0.0170725	0.031375	-	mg/l
Iron (Fe)-Total	0.19	<0.10	0.3	mg/l
Magnesium (Mg)-Total	49	14.075	-	mg/l
Manganese (Mn)-Total	0.064	0.0032	0.02	mg/l
Potassium (K)-Total	12.1	3.7025	-	mg/l
Sodium (Na)-Total	97	31.075	-	mg/l
Zinc (Zn)-Total	0.067025	0.0161	-	mg/l

Major Expenses for Morris Water Treatment Plant in 2013

No Major Expenses

Future Expenses for the Morris Treatment Plant

No major expenses at the Morris treatment plant

Other events

This year we closely monitored the raw water pond and realized how important the aeration system is for the improvement of the water quality and effect the operations.

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 operater- Paul Termeer
- Drinking Water Officer- Michaela Samek

The following is a description of the major treatment processes 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.

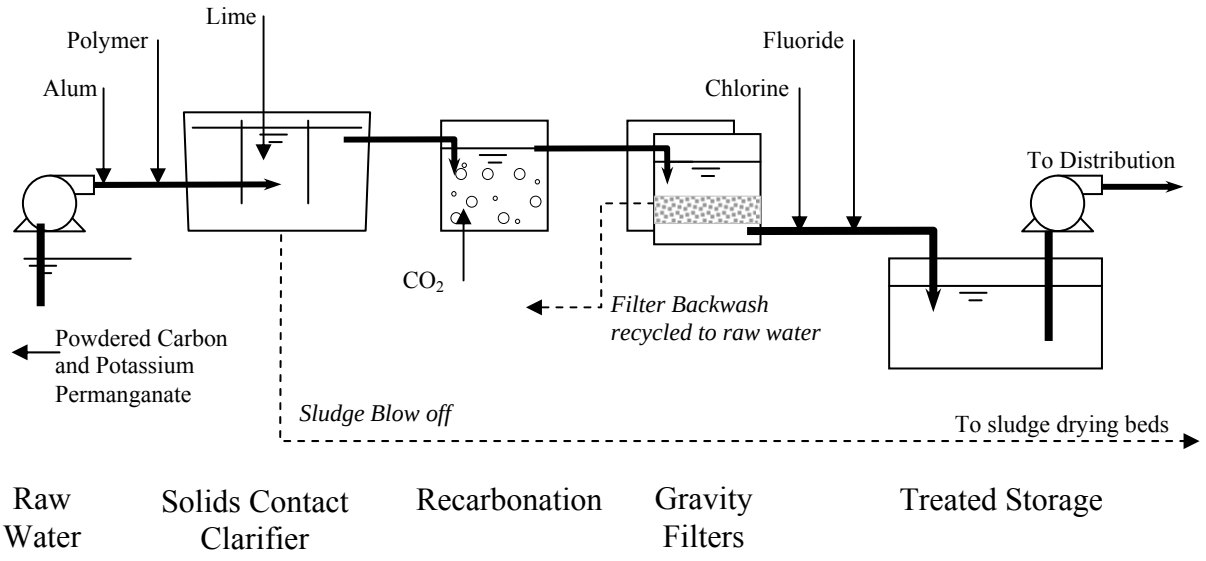

Figure 4.3

The current process consists of a screened raw water intake located in Stephenfield Lake that feeds water directly to pumps in the water plant that supplies water to the solids contact clarifier. The cold lime softening clarifier then reduces hardness and turbidity. The subsequent recarbonation 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 and Living.

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%

Corrective action forms were received for all non-compliance occasions.

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 Location	2 sample locations 4 times a year	100%
St. Claude	≤100 µg/L as annual average of quarterly samples	120 µg/L
Dufferin Booster		142 µg/L

Meeting the standard in the Stephenfield distribution system will be a challenge. The need to keep the required chlorine residual at the distribution end forces a high chlorine injection at the plant site. The compliance plan addresses the THM issue.

Analysis of Raw & Treated Water Samples
Stephenfield Water Treatment Plant

Parameter	Raw Water	Treated Water	Aesthetic Objective	Units
Conductivity	746	443	-	umhos/cm
Langelier Index (4 C)	0.67	-0.89	-	
Langelier Index (60 C)	1.45	-0.114	-	
pH	8.05	7.51	6.5-8.5	pH units
Turbidity	11.5	0.36	-	NTU
Alkalinity, Total (as CaCO3)	272	51.5	-	mg/L
Bicarbonate (HCO3)	325	63	-	mg/L
Carbonate (CO3)	<12	<12	-	mg/L
Chloride	11.6	19.6	250	mg/L
Fluoride	0.253	0.668	-	mg/L
Hydroxide (OH)	<6.8	<6.8	-	mg/L
Nitrate and Nitrite as N	0.33	0.38	-	mg/L
Nitrate-N	0.321	0.387	-	mg/L
Nitrite-N	0.0158	<0.0010	-	mg/L
Sulfate	106.4	125.	500	mg/L
Calcium (Ca)-Total	89.35	32	-	mg/l
Copper (Cu)-Total	0.00168	0.00409	-	mg/l
Iron (Fe)-Total	0.48	<0.10	0.3	mg/l
Magnesium (Mg)-Total	30.1	8.1	-	mg/l
Manganese (Mn)-Total	0.2665	0.002005	0.02	mg/l
Potassium (K)-Total	7.7175	7.9025	-	mg/l
Sodium (Na)-Total	20.5	20.7	-	mg/l
Zinc (Zn)-Total	0.0052	<0.0050	-	mg/l
Hardness	350-500	110-150	-	mg/l

Parameter	Raw Water	Treated Water	Detection Limit	Units
Total Organic Carbon	11.45	6.6	1	mg/l

Major Expenses for Stephenfield Water Treatment Plant in 2013

There were no major projects undertaken at the Stephenfield Water Treatment Plant.

Future Expenses for the Stephenfield Treatment Plant

A feasibility study has been completed in order to meet the THM regulations. To meet this requirement PVWC is waiting for available funding.

Organizational Layout Chart