



Annual Report

For the 2015 Operating Year

Whitechurch Drinking Water System 2015 Operation and Maintenance Annual Report

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- 1.0 INTRODUCTION AND BACKGROUND 4
- 2.0 DESCRIPTION OF WATER SYSTEM 4
- 3.0 SUMMARY OF WATER QUALITY MONITORING 5
- 3.1 Water Treatment Equipment Operation and Monitoring as Per Schedule 7, O. Reg 170/03..... 5
- 3.1.1 Point of Entry Chlorine Residual 5
- 3.1.2 Distribution Chlorine Residual 5
- 3.1.3 Turbidity 6
- 3.2 Microbiological Sampling as per Schedule 10, O. Reg.170/03 7
- 3.2.1 Raw Water Samples 7
- 3.2.2 Treated Water Samples 8
- 3.2.3 Distribution Samples 9
- 3.3 Chemical Sampling & Testing as per Schedule 13, O. Reg.170/03 10
- 3.3.1 Inorganics 10
- 3.3.2 Lead 11
- 3.3.3 Organics 12
- 3.3.4 Trihalomethanes 13
- 3.3.5 Nitrate & Nitrite 14
- 3.3.6 Sodium 14
- 3.3.7 Fluoride 14
- 3.3.8 Barium 15
- 4.0 WATER AND CHEMICAL USAGE 15
- 4.1 Chemical Usage 15
- 4.2 Annual Volumes 16
- 5.0 IMPROVEMENTS TO SYSTEM AND ROUTINE AND PREVENTATIVE MAINTENANCE 17
- 6.0 MINISTRY OF THE ENVIRONMENT INSPECTIONS AND REGULATORY ISSUES 17

LIST OF TABLES

Table 1 – Treated and Distribution Chlorine Residuals for Whitechurch Drinking Water System 6

Table 2 – Raw and Treated Water Turbidities for Whitechurch Drinking Water System 7

Table 3 – Microbiological Results for Raw Water at Whitechurch Drinking Water System 8

Table 4 – Microbiological Results for Point of Entry at Whitechurch Drinking Water System 9

Table 5 – Microbiological Results for Whitechurch Drinking Water Distribution System 10

Table 6 – Schedule 23 Results for Whitechurch Drinking Water System 11

Table 7 – Lead Sampling Program Results for Whitechurch Drinking Water System 11

Table 8 – Schedule 24 Results for Whitechurch Drinking Water System 12

Table 9 – Nitrate, Nitrite and THM Results at Whitechurch Drinking Water System 14

Table 10 – Sodium and Fluoride Results at Whitechurch Drinking Water System 15

Table 11 – Barium Results at Whitechurch Drinking Water System 15

Table 12 - Sodium Hypochlorite and Sodium Silicate Usage at Whitechurch Drinking Water System 16

Table 13 - Treated Water Volumes for Whitechurch Drinking Water System 17

1.0 INTRODUCTION AND BACKGROUND

The purpose of the 2015 Annual Report is to document the operation and maintenance data for the Whitechurch Drinking Water System for review by the Ministry of the Environment in accordance with O. Reg. 170/03. This report covers January 1, 2015 to December 31, 2015. A copy of this report will be submitted to the owner to be displayed to the residents.

2.0 DESCRIPTION OF WATER SYSTEM

The Whitechurch Drinking Water System (DWS # **2200008863**) is comprised of two (2) wells located within the Municipality of Huron-Kinloss in the Hamlet of Whitechurch. The system serves an originally estimated population of approximately 90 people and 39 connections. Both wells are located on the property of the Whitechurch Pumphouse at 9A Whitechurch Street. The pumphouse is equipped with an on-line chlorine analyzer and is monitored through a SCADA system based out of the Ripley Municipal office. As a redundancy, the pumphouse is also equipped with an auto-dialer that is independent of the SCADA system, to call out alarms in the event of communications/SCADA failure.

The Whitechurch Drinking Water System is a “secure groundwater system”, categorized as a Limited System. It is classified as a Small Municipal Residential drinking water system as per O.Reg 170/03. The system has a daily maximum capacity to deliver 260 cubic metres of potable water to the Hamlet of Whitechurch.

The two (2) wells are described as follows:

Well # 1 is a 152 mm diameter, 73.2 m deep drilled groundwater production well located approximately 15 m south of Well # 2. Well # 1 was drilled in 2003. The well pump and associated piping in Well #1 was installed in August 2007.

Well # 2 is a 152 mm diameter, 54.9 m deep drilled groundwater production well located approximately 10 m west of the pumphouse and 15 m north of Well # 1. Well # 2 was drilled in 2003. The well pump and associated piping in Well # 2 were brought on-line in March 2008.

From the well pump discharge header, the water is pumped to the chlorine contact watermain (10 m x 466 mm ID = 1708.8 L).

Both Whitechurch wells are secure deep bedrock wells, not under the influence of surface water. The wells penetrate limestone aquifers. Due to the depth and structure of the aquifers, the water temperature is relatively constant (<10°), turbidity is low, and the water is relatively hard. Both wells contain barium concentrations that exceed the Half-MAC (maximum allowable concentration) of 500 µg/L, requiring samples to be collected quarterly. All samples collected in 2015 were below the MAC of 1000 µg/L. The raw water is also relatively high in sodium and fluoride, but the lead content of the raw water is well below the half-MAC (Maximum Allowable Concentration). Those who are supplied water from the Whitechurch Drinking Water System are made aware of the various concentrations in their drinking water by numerous means of communication with the Township of Huron-Kinloss.

The Whitechurch Drinking Water System is equipped with a Supervisory Control and Data Acquisition system (SCADA) allowing for remote control, monitoring and record keeping of the system. This provides the operator with the current operating status of the supply and treatment equipment throughout the system at any given time via remote access by computer or iPhone.

A 15 kW diesel generator and fuel system has been installed outside adjacent to the pumphouse in a sound attenuated, weather-proof enclosure. There is a fence around the generator to prevent unwarranted entry. The diesel generator provides emergency backup power for the water system in the event of a power failure. A stand-by propane generator is also located at the Ripley Municipal office for back-up power requirements for the Municipal office and SCADA systems.

The raw water is disinfected using sodium hypochlorite (12%) and serves primarily as a measure to prevent microbiological growth within the raw water pipeline, pressure tanks, and distribution system. The Whitechurch Drinking Water System achieves a minimum of 2-log removal or inactivation of viruses as outlined in the MOECC *Procedure for Disinfection of Drinking Water in Ontario* with a chlorine contact watermain.

3.0 SUMMARY OF WATER QUALITY MONITORING

3.1 Water Treatment Equipment Operation and Monitoring

3.1.1 Point of Entry Chlorine Residual

In 2015, a total of 363 grab samples were collected and analyzed for Free Chlorine Residual at the Point of Entry (POE) for treated water using a HACH pocket chlorine colorimeter. One sample was missed on January 7, 2015, and one sample was missed on January 9, 2015 due to closed roads from weather conditions. The chlorine residuals are also measured continuously with an on-line HACH CL-17 Analyzer.

Table 1 shows the monthly average of on-line free chlorine residual values.

3.1.2 Distribution Chlorine Residual

In 2015, a Total of 363 grab samples were collected in the Whitechurch Distribution System. Two samples were missed due to closed roads from weather conditions (Jan. 7/15, and Jan. 9/15).

Table 1 – Treated (on-line) and Distribution (grab) Chlorine Residuals for Whitechurch Drinking Water System ^a

<i>Date</i>	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>	<i>Avg</i>	<i>Min</i>	<i>Max</i>	<i># Samples</i>
Average Treated Chlorine Residual (mg/L)	1.68	1.60	1.71	1.64	1.67	1.69	1.60	1.57	1.57	1.50	1.48	1.67	1.62	0.05	3.76	8,760
Average Distribution Chlorine Residual (mg/L)	1.57	1.55	1.62	1.46	1.41	1.43	1.25	1.19	1.26	1.20	1.26	1.40	1.38	0.78	1.92	363

^a – Results collected from January 1, 2015 – December 31, 2015

3.1.3 Turbidity

Drinking water turbidity was measured by a portable turbidity analyzer. The raw and treated water grab samples were collected monthly and analyzed for turbidity.

Table 2 provides a summary of raw and treated turbidity results. The maximum turbidity measured in the raw water was 0.450 NTU and the maximum turbidity measured in the treated water was 0.500 NTU.

Table 2 – Raw and Treated Water Turbidities for Whitechurch Drinking Water System ^a

Date	Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg	Min	Max	# Samples
Average Raw Turbidity (NTU)	W #1	0.188	0.173	0.263	0.163	0.205	0.187	0.230	0.150	0.180	0.150	0.145	0.155	0.260	0.110	0.380	29
	W #2	0.270	0.217	0.180	0.180	0.235	0.193	0.210	0.267	0.090	0.175	0.115	0.145	0.199	0.090	0.450	28
Average Treated Turbidity (NTU)	TW	0.296	0.327	0.270	0.253	0.270	0.290	0.280	0.235	0.160	0.260	0.150	0.190	0.260	0.140	0.500	29

^a – Results collected from January 1, 2015 – December 31, 2015

3.2 Microbiological Sampling

3.2.1 Raw Water Samples

Raw water samples are taken every week. In 2015, a total of 104 samples were collected and analyzed for E.Coli and Total Coliform. The E.Coli results obtained were 0 cfu/100 mL. The range of Total Coliform results were 0 - 10 cfu/100 mL. **Table 3.** provides a summary of bacteriological results performed on the raw water.

Table 3 – Microbiological Results for Raw Water at Whitechurch Drinking Water System ^a

Date	<i>E.Coli</i>			<i>Total Coliform</i>		
	# Samples	# Samples 0	# Samples 1-10	# Samples	# Samples 0	# Samples 1-100
Jan	8	8	0	8	8	0
Feb	8	8	0	8	7	1
Mar	10	10	0	10	10	0
Apr	8	8	0	8	8	0
May	8	8	0	8	8	0
Jun	10	10	0	10	8	2
Jul	8	8	0	8	2	6
Aug	8	8	0	8	4	4
Sept	10	10	0	10	10	0
Oct	8	8	0	8	8	0
Nov	8	8	0	8	4	4
Dec	10	10	0	10	9	1
Total	104	104	0	104	86	18

^a – Results collected from January 1, 2015 – December 31, 2015

3.2.2 Treated Water (Point of Entry) Samples

One (1) treated water sample is taken every week and analyzed for E.Coli, Total Coliform, and for Heterotrophic Plate Count (HPC). A total of 104 treated water samples were collected and analyzed for the above parameters. All samples were found to be safe. Each E.Coli and Total Coliform result from the treated water was 0 cfu/100 mL. The range of HPC results were 0 – 9 cfu/100 mL.

Table 4 provides a summary of all bacteriological results performed on treated water.

Table 4 – Microbiological Results for Treated Water (Point of Entry) at Whitechurch Drinking Water System
^a

Date	<i>E.Coli</i>			<i>Total Coliform</i>			<i>HPC</i>		
	# Samples	# Samples 0	# Samples 1-10	# Samples	# Samples 0	# Samples 1-100	# Samples	# Samples 0	# Samples 1-10
Jan	8	8	0	8	8	0	8	6	2
Feb	8	8	0	8	8	0	8	4	4
Mar	10	10	0	10	10	0	10	7	3
Apr	8	8	0	8	8	0	8	6	2
May	8	8	0	8	8	0	8	5	3
Jun	10	10	0	10	10	0	10	7	3
Jul	8	8	0	8	8	0	8	6	2
Aug	8	8	0	8	8	0	8	8	0
Sep	10	10	0	10	10	0	10	8	2
Oct	8	8	0	8	8	0	8	6	2
Nov	8	8	0	8	8	0	8	7	1
Dec	10	10	0	10	10	0	10	9	1
Total	104	104	0	104	104	0	104	79	25

^a – Results collected from January 1, 2015 – December 31, 2015

3.2.3 Distribution System

Typically, one (1) distribution sample is collected every week and tested for E.Coli, Total Coliform, and for Heterotrophic Plate Count (HPC). In 2015, a total of 51 distribution samples were collected and analyzed for the above parameters and all sampled were found to be safe. Each E.Coli and Total Coliform result from the distribution samples was 0 cfu/100 mL. The range of HPC results were 0 – 10 cfu/100 mL.

Table 5 provides a summary of all bacteriological samples taken in the distribution system.

Table 5 – Microbiological Results for Whitechurch Drinking Water Distribution System^a

Date	<i>E.Coli</i>			<i>Total Coliform</i>			<i>HPC</i>			
	# Samples	# Samples 0	# Samples 1-10	# Samples	# Samples 0	# Samples 1-10	# Samples	# Samples 0	# Samples 1-10	# Samples 11-100
Jan	4	4	0	4	4	0	4	5	3	0
Feb	4	4	0	4	4	0	4	5	3	0
Mar	5	5	0	5	5	0	5	9	1	0
Apr	4	4	0	4	4	0	4	7	1	0
May	4	4	0	4	4	0	3 ^b	5	3	0
Jun	5	5	0	5	5	0	5	7	3	0
Jul	4	4	0	4	4	0	4	6	2	0
Aug	4	4	0	4	4	0	4	8	0	0
Sep	5	5	0	5	5	0	5	8	2	0
Oct	4	4	0	4	4	0	4	7	1	0
Nov	4	4	0	4	4	0	4	7	1	0
Dec	5	5	0	5	5	0	5	9	1	0
Total	52	52	0	52	52	0	51	30	21	0

^a – Results collected from January 1, 2015 – December 31, 2015.

^b – One HPC sample was not completed due to laboratory equipment malfunction.

3.3 Chemical Sampling & Testing as per Schedule 13, O. Reg.170/03

3.3.1 Inorganics

Treated water samples are collected every 60 months and tested for inorganics. The most recent samples for the Whitechurch Drinking Water System were collected on June 5, 2015 and submitted to the laboratory for analysis of inorganics as listed in Schedule 23. All parameters were found to be within compliance. Inorganics will be sampled and analyzed again on or before June 10, 2020.

Results from the June 5, 2015 samples can be found in **Table 6**.

Table 6 – Schedule 23 Results for Whitechurch Drinking Water System ^a

<i>Parameter</i>	<i>Whitechurch Result (µg/L)</i>	<i>Maximum Allowable Concentration (µg/L)</i>
Antimony	<0.2	6
Arsenic	0.2<MDL	25
Barium	834	1000
Boron	15	5000
Cadmium	0.012	5
Chromium	<0.5	50
Mercury	<0.02	1
Selenium	1<MDL	10
Uranium	0.095	20

^a – Samples collected on June 5, 2015.

3.3.2 Lead

Schedule 15.1 of Ontario Regulation 170/03 requires that samples be taken during two seasons: once between December 15 and April 15 and once between June 15 and October 15. The Whitechurch Drinking Water System is currently under a reduced sampling program for lead where lead, pH and alkalinity are sampled in each season every 3 years. In the interim, pH and alkalinity are tested during each sampling season. In the two previous lead sampling seasons, two pH and alkalinity samples were taken on March 13, 2015 and two pH and alkalinity samples on June 10, 2015. These parameters are required to be sampled and analyzed again between the months of December 2015 and April 2016 and again between June and October 2016. Lead samples are required next in the 2017 sampling season. 2015 results can be found in Table 7.

Table 7 – Lead Sampling Program Results for Whitechurch Drinking Water System ^a

<i>Sampling Season</i>	<i>pH</i>	<i>Alkalinity (mg/L)</i>
Dec-Apr	7.22	268
Jun-Oct	7.59	270

^a – Samples collected on March 15, 2015 and October 7, 2015 respectively.

3.3.3 Organics

Treated water samples are collected every 60 months and tested for schedule 24 organic parameters. The most recent samples were collected on October 9, 2012. All parameters were found to be within compliance. Organics will be sampled and analyzed again on or before October 9, 2017. October 9, 2012 sample results can be found in **Table 8**.

Table 8 – Schedule 24 Results for Whitechurch Drinking Water System ^a

<i>Parameter</i>	<i>Result (µg/L)</i>	<i>Maximum Allowable Concentration (µg/L)</i>
Benzene	<0.32	5
Carbon Tetrachloride	<0.16	5
1,2-Dichlorobenzene	<0.41	200
1,4-Dichlorobenzene	<0.36	5
1,1-Dichloroethylene	<0.33	14
1,2-Dichloroethane	<0.35	5
Dichloromethane	<0.35	50
Monochlorobenzene	<0.3	80
Tetrachloroethylene	<0.35	30
Trichloroethylene	<0.44	50
Vinyl Chloride	<0.17	2
Diquat	<1	70
Paraquat	<1	10
Glyphosate	<6	280
Polychlorinated Biphenyls	<0.04	3
Benzo(a)pyrene	<0.004	0.01
2,4-dichlorophenol	<0.15	900
2,4,6-trichlorophenol	0.34	5
2,3,4,5-tetrachlorophenol	<0.14	100
Pentachlorophenol	<0.15	60
Alachlor	<0.02	5
Aldicarb	<0.01	9
Aldrin+Dieldrin	<0.01	0.7
Aldrin	<0.01	-
Dieldrin	<0.01	-
Atrazine+N-dealkylated metabolites	<0.01	5
Atrazine	<0.01	-
De-ethylated atrazine	<0.01	-
Azinphos-methyl	<0.02	20
Bendiocarb	<0.01	40
Carbaryl	<0.01	90
Carbofuran	<0.01	90

<i>Parameter</i>	<i>Result (µg/L)</i>	<i>Maximum Allowable Concentration (µg/L)</i>
Chlordane	<0.01	7
a-chlordane	<0.01	-
g-chlordane	<0.01	-
Oxychlordane	<0.01	-
Chlorpyrifos	<0.02	90
Cyanazine	<0.03	10
Diazinon	<0.02	20
(DDT)+Metabolites	<0.01	30
op-DDT	<0.01	-
pp-DDD	<0.01	-
pp-DDE	<0.01	-
pp-DDT	<0.01	-
Dimethoate	<0.03	20
Diuron	<0.03	150
Heptachlor-Heptachlor Epoxide	<0.01	3
Heptachlor	<0.01	-
Heptachlor epoxide	<0.01	-
Lindane	<0.01	4
Malathion	<0.02	190
Methoxychlor	<0.01	900
Metolachlor	<0.01	50
Metribuzin	<0.02	80
Parathion	<0.02	50
Phorate	<0.01	2
Prometryne	<0.03	1
Simazine	<0.01	10
Temephos	<0.01	280
Terbufos	<0.01	1
Triallate	<0.01	230
Trifluralin	<0.02	45
2,4-dichlorophenoxyacetic acid	<0.19	100
2,4,5-trichlorophenoxyacetic acid	<0.22	280
Bromoxynil	<0.33	5
Dicamba	<0.20	120
Diclofop-methyl	<0.40	9
Dinoseb	<0.36	10
Picloram	<1	190

^a – Samples collected on October 9, 2012.

3.3.4 Trihalomethanes

Distribution samples are taken every three months from representative points in the distribution system and tested for Trihalomethanes (THMs). In 2015, samples were collected during the months of February, May, August, and November. The Ontario Drinking Water Quality Standard (ODWQS) have set a Maximum Allowable Concentration (MAC) of 100 µg/L for this parameter and it is expressed as a running annual average. In 2015, the average THM was found to be 10.60 µg/L, which is within compliance.

Refer to **Table 9** for the summary of trihalomethane results. In 2016, samples will be collected in February, May, August, and November.

3.3.5 Nitrate & Nitrite

Four treated water samples are taken every three months and tested for nitrate and nitrite. In 2015, samples were collected during the months of February, May, August, and November. 1 mg/L for nitrites and 10 mg/L for nitrates. The analytical results were found to be within compliance.

Refer to **Table 9**. In 2016, samples will be collected in February, May, August, and November.

Table 9 – Nitrate, Nitrite and THM Results at Whitechurch Drinking Water System ^a

Date	Nitrate		Nitrite		THMs	
	# Samples	Result (mg/L)	# Samples	Result (mg/L)	# Samples	Result (µg/L)
Feb	1	0.021	1	<0.003	1	10
May	1	0.007	1	<0.003	1	12
Aug	1	<0.006	1	<0.003	1	23
Nov	1	<0.006	1	<0.003	1	11
Total	4		4		4	
Average		0.010		<0.003		14
Maximum		0.021		<0.003		23

^a – Results collected from January 1, 2015 – December 31, 2015.

3.3.6 Sodium

One water sample is collected from point of entry every 60 months and tested for Sodium. The Ontario Drinking Water Standards (ODWQS) have set a Maximum Acceptable concentration (MAC) of 200 mg/L for Sodium and requires the Medical Office of Health be notified if the concentration exceeds 20 mg/L. This sample was last collected on December 27, 2012. Refer to Table 10. The next water sample for Sodium will be collected and analyzed on or before December 27, 2017.

3.3.7 Fluoride

One water sample is collected from point of entry at least once in every 60 months and tested for Fluoride. The Ontario Drinking Water Quality Standards (ODWQS) have set a MAC of 1.5 mg/L. On May 12, 2015, a sample was collected for this analysis. The sample collected did not exceed the Maximum Allowable Concentration (MAC). The next water samples for Fluoride will be collected and analyzed on or before May 12, 2016. Refer to Table 10.

Table 10 – Sodium and Fluoride Results at Whitechurch Drinking Water System

	Sodium	Fluoride
	Result (mg/L)	Result (mg/L)
Treated Water	17.6 ^a	1.00 ^b
MAC	20	1.50

^a – Result collected on Dec. 27, 2012.

^b – Result collected on May 7, 2015.

3.3.8 Barium

One water sample is collected from point of entry at least once in every 3 months and tested for Barium. The Ontario Drinking Water Quality Standards (ODWQS) have set a MAC of 1000 µg/L. Samples were collected for this analysis in February, May, August, and November. The samples collected did not exceed the Maximum Allowable Concentration (MAC). Refer to Table 11.

Table 11 - Barium

Date	Result (µg/L)^a
Feb	864
May	811
Aug	855
Nov	805
Average	834
MAC	1000

^a - Results collected Feb. 17, May 5, Aug. 4, and Nov. 3, 2015.

4.0 WATER AND CHEMICAL USAGE

4.1 Chemical Usage

Refer to **Table 12**. From January 1, 2015 to December 31, 2015, 263.99 kg of sodium hypochlorite (NaOCl) was used to treat the water that was provided to the distribution system with an average dosage of 2.72 mg/L.

Table 12 – Sodium Hypochlorite and Sodium Silicate Usage at Whitechurch Drinking Water System ^a

<i>Date</i>	<i>Sodium Hypochlorite (12%)</i>		<i>Sodium Silicate (1:1)</i>	
	Usage (kg)	Average Dosage (mg/L)	Usage (kg)	Average Dosage (mg/L)
Jan	4.70	5.51	13.80	16.18
Feb	6.17	6.76	19.76	21.67
Mar	4.55	5.17	17.08	19.38
Apr	3.77	4.88	15.68	20.31
May	4.00	5.16	15.79	20.37
Jun	4.10	4.97	12.76	15.46
Jul	4.64	5.08	13.59	14.89
Aug	5.22	5.13	15.26	15.01
Sep	4.08	5.26	14.22	18.32
Oct	3.77	5.32	14.11	19.88
Nov	3.46	5.61	16.10	26.14
Dec	3.52	5.64	16.73	26.81
Total	51.98		184.88	
Average	4.33	5.37	15.41	19.54

^a – Results collected from January 1, 2015 – December 31, 2015.

4.2 Annual Volumes

A summary of the water supplied to the distribution system in 2015 is provided in **Table 12**. This Table provides a breakdown of the monthly volume provided to the distribution system.

Flow meters were calibrated by Coulter Water Meter Services and were found to be acceptable. The water meters will be calibrated again in July 2016.

Table 13 – Treated Water Volumes for Whitechurch Drinking Water System ^a

<i>Date</i>	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>	<i>Average</i>	<i>Maximum</i>	<i>Total</i>
Average Daily Volume (m³)	27.99	33.45	28.76	26.09	25.92	27.84	30.07	33.13	26.31	23.07	20.85	20.61	27.01		
Maximum Daily Volume (m³)	37.39	41.28	37.81	31.60	38.30	38.44	58.83	60.30	52.67	43.76	25.10	28.93		60.30	
Total Monthly Volume (m³)	867.58	936.42	891.50	782.71	803.52	835.18	932.11	1026.80	789.17	715.29	625.66	638.97			9,844.91

^a – Results collected from January 1, 2015 – December 31, 2015

5.0 IMPROVEMENTS TO SYSTEM AND ROUTINE AND PREVENTATIVE MAINTENANCE

The following summarizes water system improvements and routine and preventative maintenance for the Whitechurch Drinking Water System Supply:

Replaced SCADA autodialer in the Municipal Office.
Backflow device inspected and repaired on October 28, 2015.

6.0 MINISTRY OF THE ENVIRONMENT INSPECTIONS AND REGULATORY ISSUES

DWQMS Audit was conducted on June 25, 2015.
Flow meter calibration was performed on July 28, 2015.
The Ministry of the Environment and Climate Change conducted an inspection on Whitechurch Drinking Water System Supply between September 14 and October 19, 2015.
Extended wellhead on well # 2 and abandoned Observation Well on November 6, 2015.
Wellhead area was regarded on November 9, 2015.
Posted excavation warning at wellhouse on December 9, 2015.

AWQI # 123698 – May 23, 2015: Leak on chlorine board.
AWQI # 2 – December 13, 2015: Cracked fitting on chlorine board.