2010

Vermilion Bay Water Treatment Plant

ANNUAL REPORT **2010**

Prepared by Northern Waterworks Inc.
P.O. Box 1160, 14 Young St.
Red Lake, Ontario, P0V 2M0
Tel: (807) 727-2424

Contents

Introduction

The Vermilion Bay Drinking Water System (DRINKING WATER SYSTEM# 210000997) is obligated to meet the requirements of Ontario's *Safe Drinking Water Act* and the regulations therein, in addition to requirements associated with the system's license 290-101and Drinking water works permit 290-201. Specifically, this system must meet extensive treatment and testing requirements in order to ensure that human health is protected.

This Annual Report has been prepared in accordance with both Schedule 22 and Section 11 of O. Reg. 170/03. In this manner, the Summary Reports for Municipalities required by Schedule 22 and the Annual Reports required by Section 11 have been consolidated into a single document. This Report is intended to brief the ownership of the Vermilion Bay Drinking Water System on the system's performance over the past calendar year (January 1st 2010 to December 31st 2010). This Annual Report will be available for inspection by any member of the public without charge at the Municipal Office.

A summary of this Drinking Water System (DWS) is difficult to produce without the use of technical terms, some of which the reader may not be familiar with. It is recommended that the reader refer to the Technical Support Document for Ontario Drinking Water Standards, Objectives, and Guidelines. Within this document the reader will find information on provincial water quality standards, objectives and guidelines, rationale for monitoring, and a brief description of water quality parameters. The Technical Support Document can be found at the following website address:

http://www.ontario.ca/drinkingwater/stel01_046947.pdf

Users of this Drinking Water System are encouraged to contact a representative of Northern Waterworks Inc. for further assistance in interpreting this Annual Report should they have any questions or concerns.

System Description

Classified as a large Municipal residential system, this drinking water system provides a potable water supply to the community of Vermilion Bay. This drinking water system is composed of a low lift station located at Eagle Lake supplying water to the Water Treatment Plant which services the Vermilion Bay water distribution system. This drinking water system is owned by the Corporation of the Municipality of Machin and operated by Northern Waterworks Inc. Potential pathogenic organisms are removed from the source water by pH adjustment, coagulation, flocculation, sedimentation, filtration and primary disinfection processes.

There are two low lift pumps situated in the low lift building which transfer the raw water from Eagle Lake to the treatment units located in the water treatment plant. In the process of pH adjustment Lime is injected and mixed through a ``static in-line mixer``, in the process of coagulation Poly Aluminium Chloride is injected just before the treatment units. A anionic polymer is then injected during the flash mixing stage in order to create a strong dense floc, which will facilitate settling during the sedimentation stage. In the sedimentation tanks, water flows upward through a maintained floc blanket and settling tubes and then enters Clarifier effluent tubes carrying the water to the filters. Any suspended particles that did not settle in the sedimentation tanks will be removed by the dual media filters (composed of anthracite and silica sand, on a layer of support gravel). Filter effluent water is then directed to a Non-Chlorinated water clear well and then transferred to the GAC (Granular activated carbon) filter tanks. The GAC filter tanks will then further remove any taste and odour components though gravity filtration. GAC filter effluent is then chlorinated using Sodium hypochlorite before it enters the treated water storage reservoirs.

The chlorinated water is held in the treated water reservoirs to allow for the necessary detention time to meet primary disinfection requirements. Treated water is then transferred to the Vermilion Bay distribution system by the use of high lift pumps located in the Vermilion Bay Water Treatment Plant. Upon leaving the treated water reservoirs there is the capability of adding additional disinfection by means of additional Sodium Hypochlorite injection points. Secondary disinfection requirements in the respective distribution systems are achieved by the maintenance of free chlorine residuals throughout the system.

System Expenses

Section 11 of O. Reg. 170/03 requires the description of any major expenses incurred during the reporting period to install, repair, or replace necessary equipment. In 2010, the Vermilion Bay Drinking Water System incurred an expense of $845.75 for a HACH Bench top Turbidity Analyzer, and $1536.76 for replacement pH Probes. In addition the Municipalities Public works department expended $36,000 for repairs to the distribution system which included replacing broken services curb stops and valve boxes.

Water Quality

The Vermilion Bay Water Treatment Plant consistently produced water of exceptional quality in 2010. The descriptions below provide brief summaries of the parameters tested in this Drinking water system, and the reader is asked to consult **Appendix A** for a complete summary of the 2010 water quality.

In-House Analyses

The Drinking Water System employs an extensive in-house analysis program that includes analyses of water quality indicators beyond that which is required in the *Safe Drinking Water Act*. There were over 5,000 routine independent in-house water quality tests conducted and over 70,000 water quality tests done by automated in-line analyzers with respect to this system in 2010.

Microbiological Analyses

Microbiological analyses are conducted on raw water source, treated, and distribution system water. A total of 239 water samples were collected for bacteriological analysis by an accredited laboratory in 2010, as required by Schedule 10 of O. Reg. 170/03. These routine water samples were collected on a weekly basis, and included tests for E. coli, total coliforms, and heterotrophic plate counts.

Organic Parameters and Trihalomethanes

Organic parameters are sampled on an annual basis in treated water in accordance with Schedules 13 and 24 of O. Reg. 170/03. These parameters include various acids, pesticides, herbicides, PCBs, volatile organics, and other organic chemicals. With respect to the Vermilion Bay Drinking Water System, sampling for organic parameters was conducted on February 22nd 2010.

Trihalomethanes (THMs) are sampled on a quarterly basis from the farthest point in the Vermilion Bay distribution system, in accordance with Schedule 13 of O. Reg. 170/03. Compliance with the provincial standard for trihalomethane concentrations is determined by calculating a running quarterly average which was .0526mg/l or 52.6ug/l (The Maximum Acceptable Concentration of 0.100 mg/L or 100 ug/L). In 2010, there were no exceedances for any organic parameter.

Inorganic Parameters and Nitrate/Nitrite

Inorganic parameters are sampled on an annual basis in treated water in accordance with Schedules 13 and 23 of O. Reg. 170/03. These parameters include various metals such as Antimony, Arsenic, Cadmium, Mercury, and Uranium. In addition to this required sampling, Northern Waterworks Inc. also sampled for various other metals in both source and treated water in 2010. With respect to the Vermilion Bay Drinking Water System, the required annual sampling for inorganic parameters was conducted on February 22nd 2010.

Treated water is also tested for nitrate and nitrite concentrations on a quarterly basis in accordance with Schedule 13 of O.Reg. 170/03. There were no exceedances for any inorganic parameter in 2010.

Community Lead Sampling

The DRINKING WATER SYSTEM conducted lead sampling from 26 locations in April of 2010. There were 2 exceedences. The DRINKING WATER SYSTEM again conducted lead sampling from 26 locations in September of 2010. There were 3 adverse results. Under direction of the Medical officer of Health, the DRINKING WATER SYSTEM made changes to increase the Alkalinity and pH of the water in order to assist in preventing corrosion in the house hold plumbing. Resampling of the Adverse locations was conducted in November of 2010 and results came back and confirmed exceedences at two of the three previous exceedences. We will continue with the provincial community lead testing program, in accordance with Schedule 15.1 of O. Reg 170/03. Consequently, the community lead testing program will resume in 2012.

Flow Statistics

2010 Flows

Throughout the reporting period of 2010, the Vermilion Bay Water Treatment Plant supplied 76412.0m^3 of treated water to consumers. On an average day in 2010, 209.35 m^3 of treated water was supplied. The average daily flow rate in 2010 represented 15.4 % of the rated capacity of the plant (1,360 m^3/day). The maximum daily flow rate in 2010 was 383.00 m^3, which represented 28% of the rated capacity of the plant. The reader is asked to consult **Appendix B** for a complete summary of the 2010 flow data.

Comparison and Outlook

As 2010 was the first full year of operations for Northern Waterworks Inc. We have not had time to assemble sufficient data to properly address operational comparisons and future forecasts.

Chemical Consumptions

The amount of water supplied between January 1 and December 31, 2010 was substantially less than what was proposed in the tender documents and as such Northern Waterworks Inc. provided a rebate to the municipality in the amount of $38,196.34 for the 2010 operational year. Now that we have more accurate baseline data the rates for chemical usage in the future will be adjusted accordingly there by reducing the operational cost to reflect actual usage costs. The table below summarizes all the water treatment chemicals used during the reporting period and their consumption data. All chemicals used in the treatment process are NSF 60 certified for use in potable water, as required by provincial regulations.

Chemical Consumption 2010		
Treatment Chemical	Quantity Used	Average Dosage (mg/l)
Sodium Hypochlorite	2261.97 L	4.17
Watercare (PACI)	4393.63 L	21.88
Polymer	13.39 kg	0.17
Lime	286.86 kg	3.60
Total (January 1st , 2010 to December 31st ,2010)		

Compliance

Compliance with the License and Permit to Operate

Northern Waterworks Inc. is the operating authority for the Vermilion Bay Water Treatment Plant for the Municipality of Machin, and complies with the terms and conditions of the License and Permit to operate issued by the Ministry of the Environment. Staffing is maintained at levels to ensure that adequate numbers of trained and licensed personnel are available for proper operations, during emergency or upset conditions, for vacation/sick relief, or to deal with equipment breakdown.

Contingency plans and operations manuals are established and located in the Vermilion Bay Water Treatment Plant, and are available to all staff members. Operations manuals include information necessary for the day-to-day operation and maintenance of the treatment and distribution systems, as well as information that may be required to be accessed quickly for various purposes. Contingency plans include information that may be required for proper operation of the system during emergency or upset conditions, and contains items such as emergency plans and contact lists.

The operational strategy of Northern Waterworks Inc. includes ensuring that permits, licenses and approvals are in place, ensuring efficient maintenance and operations, and ensuring that the quantiy and quality of water supplied to its customers meets or exceeds the minimum requirements as set out in the *Safe Drinking Water Act*. It is also our responsibility to ensure that permissible flow rates are not exceeded. Flow measuring devices for measuring the amount of water taken and the amount of water supplied are calibrated annually. Accuracy in these measurements ensures that treatment chemicals are precisely applied and that flows do not exceed the capacity at which the system is designed to be effective. These flows are recorded to provide current and historical information for decision making purposes, in addition to being used by the Ministry of the Environment to review and analyze treatment operations and ensure compliance with provincial regulations and guidelines.

Water quality analyzers are in place to continuously monitor water quality after critical treatment processes. Each filter is equipped with a filter effluent turbidity analyzer which monitors the amount of suspended particles in the water leaving the filter. A chlorine residual analyzer continuously monitors the free chlorine residual at the point where the filtered water enters the Treated water reservoir and also at the point where primary disinfection is complete. Each piece of equipment can be monitored from a remote location, is equipped with an alarm indicating adverse water quality, which will notify the operator on call of any alarms immediately and it is maintained in accordance with manufacturer's recommendations and the License/Permit to operate issued by the Ministry of the Environment.

A regular water sampling program is conducted to exceed the minimum requirements of O. Reg. 170/03 under the *Safe Drinking Water Act*. Raw water sampling is conducted to give operational staff the information required to effectively operate the treatment process. Samples are collected throughout the process to determine the effectiveness of treatment at each stage. Treated and distribution system sampling provide information regarding the quality of water delivered to consumers. All of these samples are analyzed by licensed staff or by an accredited laboratory.

The License/Permit to operate (issued February 22nd ,2010/February 14th ,2010) requires that the annual average concentration of decant effluent total suspended solids be below 15 mg/L. This effluent is returned to Vermilion Bay, and originates from the water consumed during plant processing purposes (such as filter backwashing, clarifier "desludging", and filter rinsing-to-waste). In 2010, the annual average concentration for decant effluent total suspended solids discharge was 0.80 mg/L.

Non-Compliance with the Certificate of Approval

There were no incidents of non-compliance during this reporting period.

Adverse Water Quality Incidents

Under O. Reg 170/03, notifications and corrective actions are required for any instances where a sample result shows that a parameter used to measure water quality exceeded a Maximum Acceptable Concentration, or where other observations indicate that the safety of the water may not be guaranteed. There were 3 such instances for the DRINKING WATER SYSTEM in 2010.

AWQI # 97821 was issued as a precaution during the fire incident on September 06th, 2010 Northern Waterworks contacted the NWHU (Northwestern Health Unit) and SAC (Spills Action Center) to warn of the potential that primary disinfection would not be met (if the reservoir level was drawn down too low). The situation was monitored and Northern Waterworks confirmed that at all times during the fire, primary disinfection was maintained. The MOE inspector (Carolyn Simpson and Paula Spencer) were contacted and they closed the file without any further notifications (verbal or written) being required.

AWQI-98763 October 20th , 2010 exceedances for lead in private residential plumbing samples resolved by providing consumer with hand delivered written notice of sampling results and also a verbal and written explanation of how to address the adverse water quality issue by flushing the tap prior to use. Additionally we increased the addition of lime in the treated water to improve the water balance and then resampled the affected residences in November as requested by the North West Health Unit.

AWQI-99260 November 29th , 2010 exceedances for lead in private residential plumbing samples resolved by providing consumer with hand delivered written notice of sampling results and also a verbal and written explanation of how to address the adverse water quality issue by flushing the tap prior to use.

Appendix A: Water Quality

MICROBIOLOGICAL PARAMETERS

Parameter (Sample Type)	Units	Number of Sample	Minimum	Maximum	ONDWS	Compliant ONDWS
E. Coli (Raw)	MPN/100m	52	0 (absent)	3	–	–
E. Coli (Treated)	MPN/100m	51	0 (absent)	0 (absent)	<1MPN/100	✓
E. Coli (Distribution)	MPN/100m	140	0 (absent)	0 (absent)	<1MPN/100	✓
Total Coliforms (Raw)	MPN/100m	52	0 (absent)	460	–	–
Total Coliforms (Treated)	MPN/100m	52	0 (absent)	0 (absent)	<1MPN/100	✓
Total Coliforms	MPN/100m	135	0 (absent)	0 (absent)	<1MPN/100	✓
HPC (Treated)	CFU/mL	52	0 (absent)	72	–	–
HPC (Distribution)	CFU/mL	104	0 (absent)	46	–	–

CHEMICAL AND PHYSICAL PARAMETERS (IN-HOUSE)

Parameter	Units	Number of Sample	Minimum	Maximum	Annual Average	Compliant ONDWS
Filter Effluent Turbidity	NTU	Continu	0.019	0.220	0.064	✓
Treated Water Turbidity	NTU	Continu	0.036*	1.915*	0.104	–
Residual Free Chlorine	mg/L	Continu	0.738	2.061	1.34	✓
Treated Water pH	pH units	Continu	6.0*	7.6*	7.1	–
Total Alkalinity	mg/L	250	12.8*	18.5*	13.3	–
Temperature	°C	250	4.5*	22.5*	10.4	–
Residual Aluminum	mg/L	250	0.010*	0.020*	0.016	–

INORGANIC PARAMETERS

Parameter (Treated Water)	Units	Number of Sample	Minimum	Maximum	ONDWS	Compliant ONDWS
Antimony	ug/L	1	<0.6	<0.6	6	✓
Arsenic	ug/L	1	<1.0	<1.0	25	✓
Barium	ug/L	1	<10	<10	1000	✓
Boron	ug/L	1	<50	<50	5000	✓
Cadmium	ug/L	1	<0.10	<0.10	5	✓
Chromium	ug/L	1	<1.0	<1.0	50	✓
Fluoride	mg/L	1	<0.030	<0.030	1.5	✓
Lead	ug/L	n/a	n/a	n/a	10	
Mercury	ug/L	1	<0.10	<0.10	1	✓
Nitrate	mg/L	4	<0.030	0.043	10	✓
Nitrite	mg/L	4	<0.020	<0.020	1	✓
Selenium	ug/L	1	<5.0	<5.0	10	✓
Sodium**	mg/L	1	6.95	6.95	20	✓
Uranium	ug/L	1	<5.0	<5.0	20	✓

*These values represent minimum and maximum monthly averages. The remaining values are instantaneous in nature.
**Sodium exceedances were not required to be reported in 2010. Refer to O. Reg. 170/03, Schedule 16, 16-3(1).

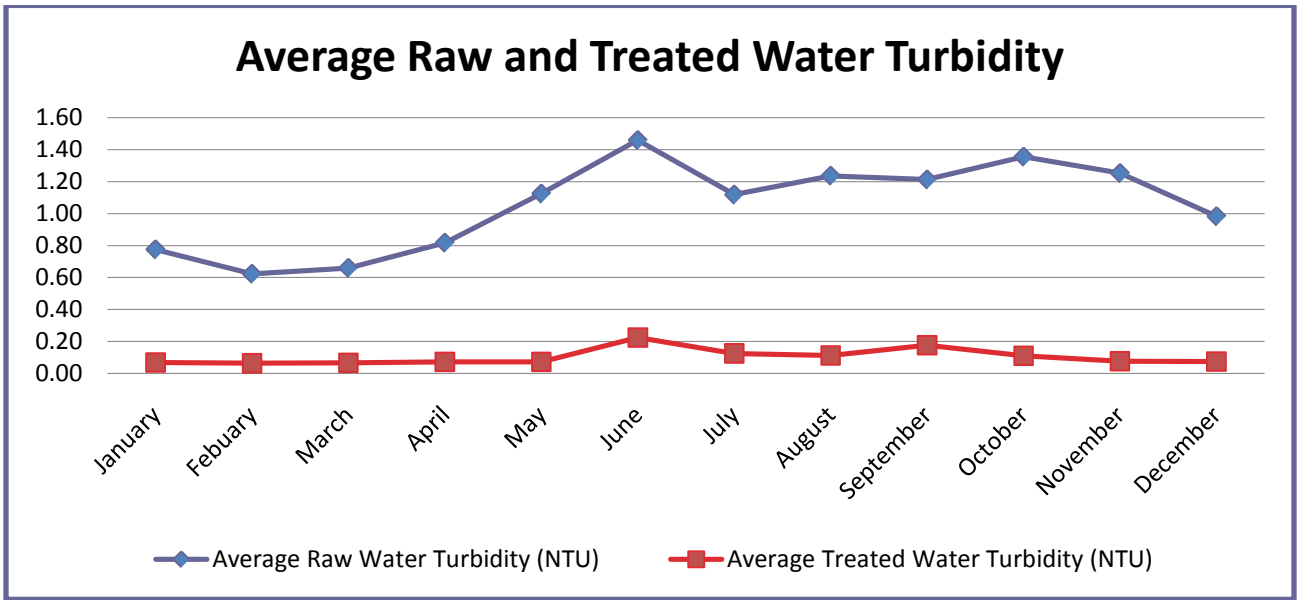
ORGANIC PARAMETERS

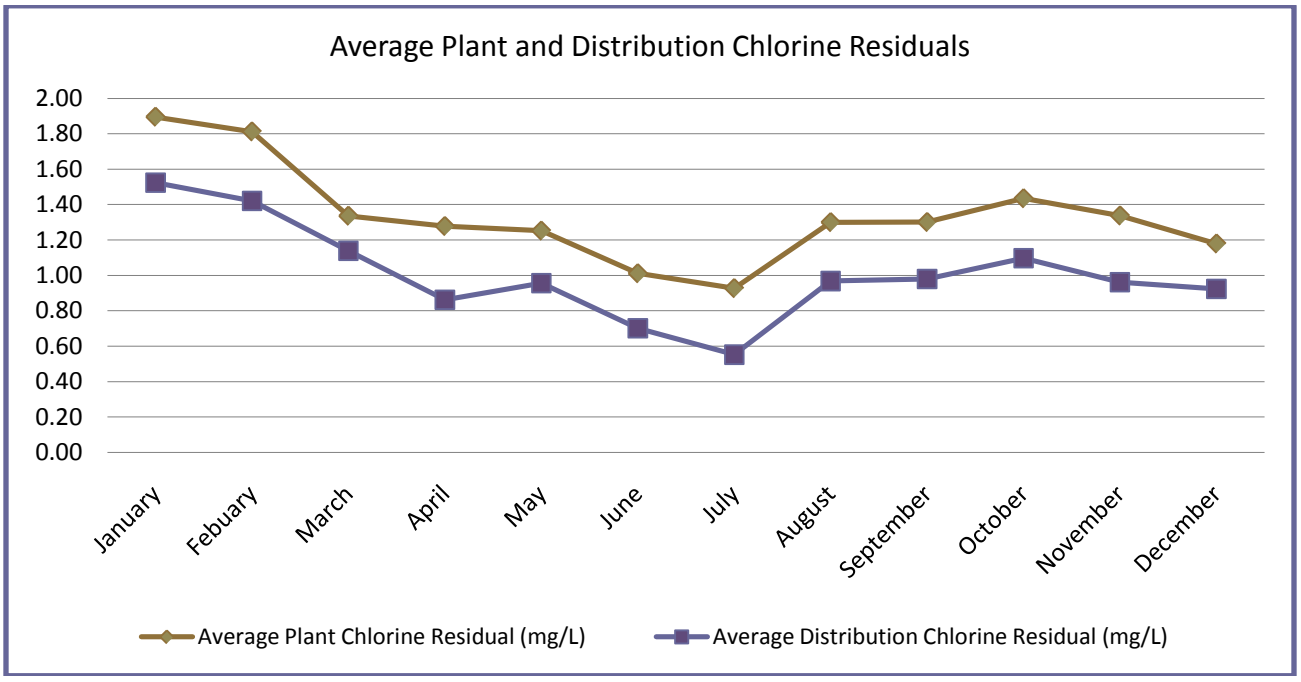
Parameter (Treated Water)	Result (ug/L)	ONDWS (ug/L)	Compliant ONDWS	Parameter (Treated Water)	Result (ug/L)	ONDWS (ug/L)	Compliant ONDWS
Alachlor	<0.10	5	✓	Diquat	<1.0	70	✓
Aldicarb	<1.0	9	✓	Diuron	<1.0	150	✓
Aldrin + Dieldrin	<0.04	0.7	✓	Glyphosate	<5.0	280	✓
Atrazine + N-dealkylated	<0.2	5	✓	Heptachlor + Heptachlor Epoxide	<0.10	3	✓
Azinphos-methyl	<0.10	20	✓	Lindane (Total)	<0.10	4	✓
Bendiocarb	<0.20	40	✓	Malathion	<0.10	190	✓
Benzene	<0.50	5	✓	Methoxychlor	<0.10	900	✓
Benzo(a)pyrene	<0.01	0.01	✓	Metolachlor	<0.10	50	✓
Bromoxynil	<0.2	5	✓	Metribuzin	<0.10	80	✓
Carbaryl	<0.2	90	✓	Monochlorobenzene	<0.50	80	✓
Carbofuran	<0.20	90	✓	Paraquat	<1.0	10	✓
Carbon Tetrachloride	<0.5	5	✓	Parathion	<0.10	50	✓
Chlordane (Total)	<0.3	7	✓	Pentachlorophenol	<0.50	60	✓
Chlorpyrifos	<0.1	90	✓	Phorate	<0.10	2	✓
Cyanazine	<0.10	10	✓	Picloram	<0.20	190	✓
Diazinon	<0.10	20	✓	Polychlorinated Biphenols (PCB's)	<0.02	3	✓
Dicamba	<0.20	120	✓	Prometryne	<0.10	1	✓
1,2-Dichlorobenzene	<0.50	200	✓	Simazine	<0.10	10	✓
1,4-Dichlorobenzene	<0.50	5	✓	Temephos	<0.10	280	✓
DDT + metabolites	<0.40	30	✓	Terbufos	<0.20	1	✓
1,2-Dichloroethane	<0.50	5	✓	Tetrachloroethylene	<0.50	30	✓
1,1-Dichloroethylene	<0.50	14	✓	2,3,4,6-Tetrachlorophenol	<0.50	100	✓
Dichloromethane	<0.50	50	✓	Triallate	<0.10	230	✓
2,4 -Dichlorophenol	<0.50	900	✓	Trichloroethylene	<0.50	5	✓
2,4-Dichlorophenoxy acetic acid	<100	100	✓	2,4,6-Trichlorophenol	<0.50	5	✓
Diclofop-methyl	<0.20	9	✓	2,4,5-Trichlorophenoxy acetic acid	<0.20	280	✓
Dimethoate	<0.10	20	✓	Trifluralin	<0.10	45	✓
Dinoseb	<0.20	10	✓	Vinyl Chloride	<0.50	2	✓

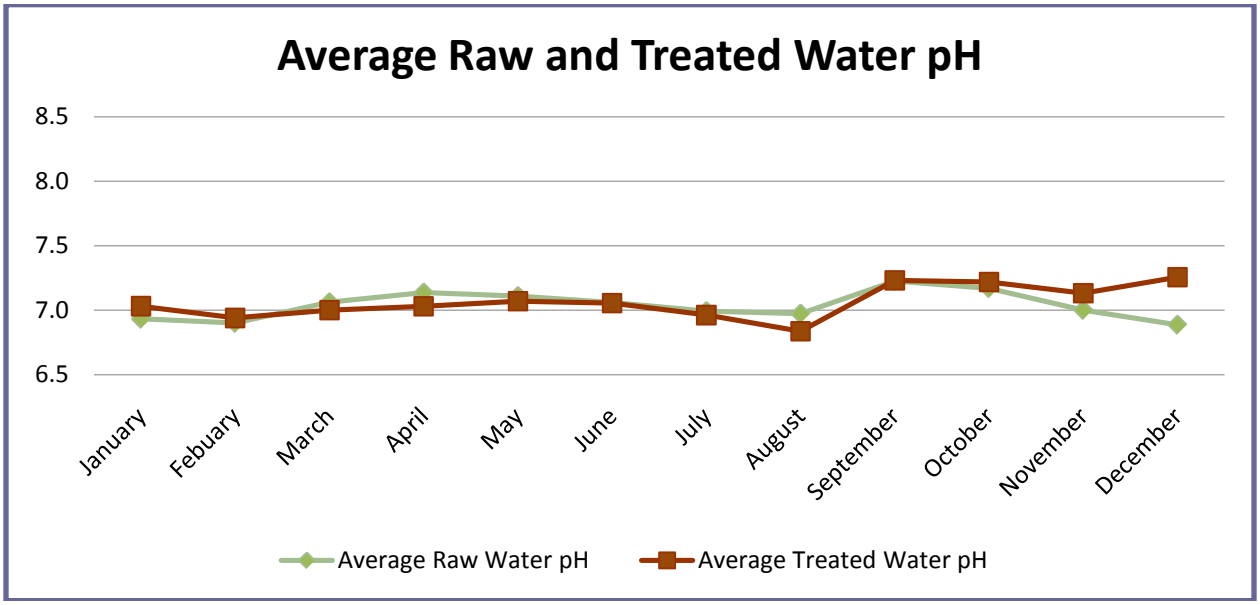
TRIHALOMETHANES

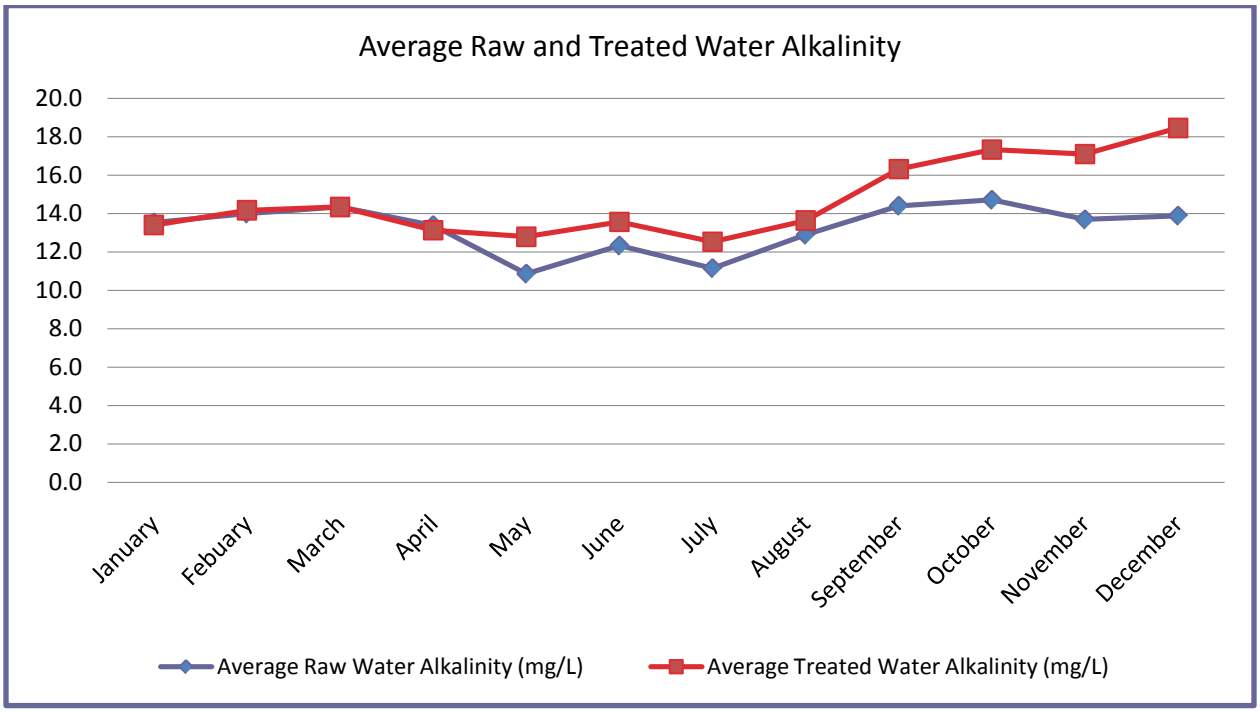
Sample Date (2010)	Total THMs Result	2010 Annual Average (ug/L)	2009 Annual Average	2008 Annual Average	2007 Annual Average	ONDWS (ug/L)	Compliant ONDWS
February	34.2	52.6	47.0			100	✓
May 06	47.1						
August 16	66.8						
Nov. 15	62.4						

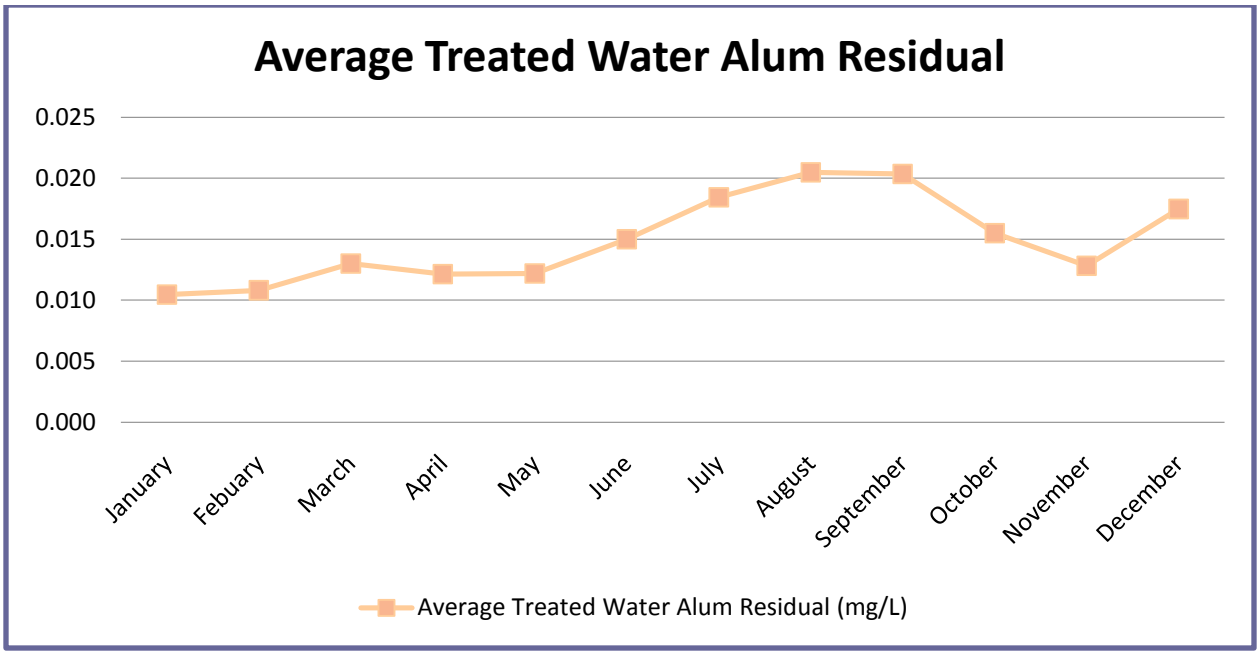
Appendix A: Water Quality






Average Raw and Treated Water pH
8.5
8.0
7.5
7.0
6.5
January
Febuary
March
April
May
June
July
August
September
October
November
December
Average Raw Water pH
Average Treated Water pH

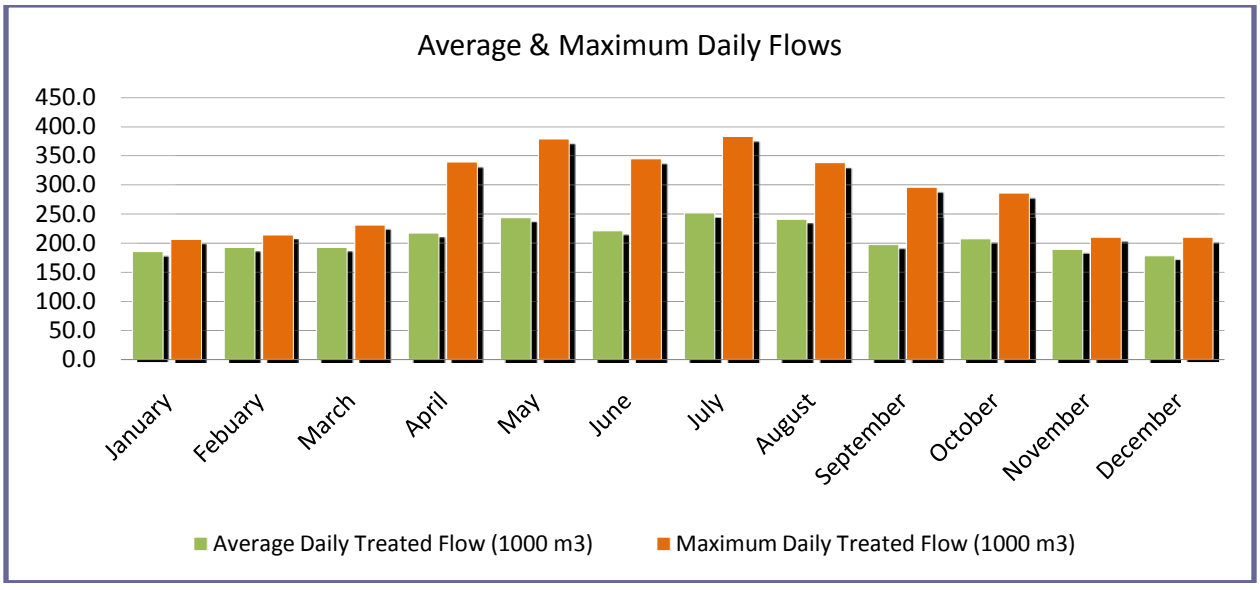

Average Raw and Treated Water Alkalinity
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
January
Febuary
March
April
May
June
July
August
September
October
November
December
Average Raw Water Alkalinity (mg/L)
Average Treated Water Alkalinity (mg/L)

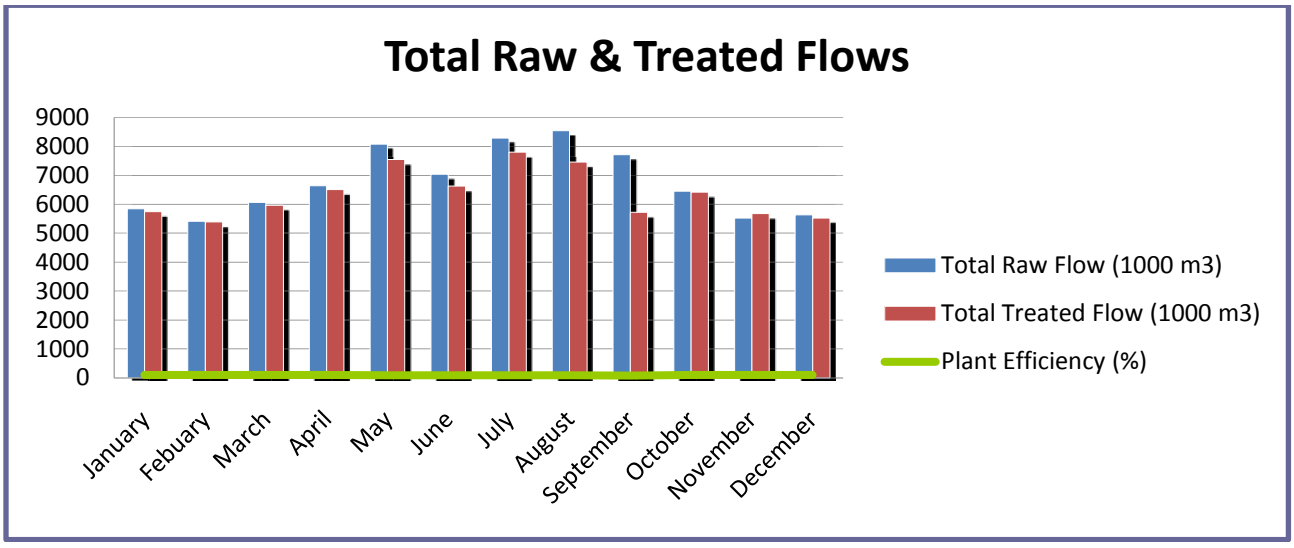

Average Treated Water Alum Residual
0.025
0.020
0.015
0.010
0.005
0.000
January
Febuary
March
April
May
June
July
August
September
October
November
December
Average Treated Water Alum Residual (mg/L)

Appendix B: Flow Statistics

2010 OVERALL FLOW STATISTICS

Month	Total Raw Water Flow (m^3)	Total Treated Water Flow (m^3)	Average Treated Water Daily Flow (m^3)	Maximum Treated Water Daily Flow (m^3)
January	5,842	5,750	185.48	206.00
February	5,418	5,388	192.43	214.00
March	6,063	5,972	192.65	231.00
April	6,638	6,510	217.00	339.00
May	8,080	7,545	243.39	379.00
June	7,040	6,628	220.93	345.00
July	8,288	7,799	251.58	383.00
August	8,538	7,464	240.77	338.00
September	7,714	5,725	197.41	296.00
October	6,454	6,424	207.23	286.00
November	5,520	5,679	189.30	210.00
December	5,632	5,528	178.32	210.00
Total	**81,227**	**76,412**	–	–
Average	**6768.92**	**6,367.67**	**209.71**	**286.42**




Total Raw & Treated Flows
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
January
Febuary
March
April
May
June
July
August
September
October
November
December
Total Raw Flow (1000 m3)
Total Treated Flow (1000 m3)
Plant Efficiency (%)