

# 2014 ANNUAL REPORT



## Hudson Drinking Water System

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PREPARED BY





## Introduction

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The **Hudson Drinking Water System** (DWS# 220005385) is obligated to meet the requirements of Ontario's *Safe Drinking Water Act (the Act)* and the regulations therein, in addition to requirements associated with system approvals. 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 Ontario Regulation 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 and users of the Hudson Drinking Water System on the system's performance over the past calendar year (January 1, 2014 to December 31, 2014).

A summary of this drinking water system 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. This document can be found at the following website address:

<https://www.ontario.ca/document/technical-support-document-ontario-drinking-water-standards-objectives-and-guidelines>

Users of this drinking water system are also encouraged to contact a representative of Northern Waterworks Incorporated (NWI) for assistance in interpreting this Annual Report. Questions and comments may be directed to [info@nwi.ca](mailto:info@nwi.ca).

## Report Availability

In accordance with section 11 of O. Reg. 170/03 this Annual Report must be given, without charge, to every person who requests a copy. Effective steps must also be taken to advise users of water from the system that copies of the report are available, without charge, and of how a copy may be obtained. This Annual Report shall be made available for inspection by the public during regular business hours (where appropriate) at the following locations:

- (1) Municipal Office, Customer Service Desk, Sioux Lookout
- (2) Public Works Office, Sioux Lookout
- (3) Lost Lake Seniors Drop-In Centre, Hudson
- (4) Municipal Website ([www.siouxlookout.ca](http://www.siouxlookout.ca))
- (5) NWI Website ([www.nwi.ca/publications](http://www.nwi.ca/publications))

In accordance with Schedule 22 of O. Reg. 170/03, this Annual Report must be given to the members of the municipal council. Section 19 (Standard of care, municipal drinking-water system) of *the Act* also places certain responsibilities upon those municipal officials who oversee an accredited operating authority or exercise decision-making authority over a system. Such municipal officials would be exercising diligence by reviewing this Annual Report.



## System Overview

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### System Description

Classified as a large municipal residential system, this drinking water system (DWS) provides a potable water supply to the community of Hudson. This DWS is composed of the Low Lift Pumping Station (LLPS), the Hudson Water Treatment Plant (WTP), and the Hudson distribution system. The Hudson DWS is owned by the Corporation of the Municipality of Sioux Lookout and is operated by Northern Waterworks Incorporated (NWI). Potential pathogenic organisms are removed and inactivated by coagulation, flocculation, sedimentation, conventional filtration, and primary disinfection processes.

The LLPS draws surface water from Lost Lake, whereby low lift pumps transfer water from the source to the treatment units located at the WTP. In the process of coagulation, polyaluminum chloride (primary coagulant) is injected into the raw water immediately before it enters the treatment units. During the flocculation stage gentle mixing promotes the formation of floc masses within the coagulated water, which in turn facilitates settling in the sedimentation stage. In the sedimentation tanks, water flows upward through a maintained floc blanket and spills over weirs which direct flow to the filters.

Any suspended particles that did not settle in the sedimentation tanks are removed by passing water through two dual media filters (composed of anthracite and silica sand on a layer of support gravel). Chlorine gas (secondary disinfectant) and sodium hydroxide solution (pH/alkalinity adjustment) are subsequently added to the filter effluent water. In order to achieve primary disinfection, ultraviolet light is applied to filter effluent by means of two available UV reactors.

Disinfected water is held in the treated water storage reservoirs, and is subsequently transferred to the Hudson distribution system by the use of high lift pumps located at the WTP. Secondary disinfection requirements in the distribution system are achieved by the maintenance of a residual as free chlorine.



## System Overview (continued)

### System Expenses

In accordance with section 11 of O. Reg. 170/03, this Report must describe any major expenses incurred during the reporting period to install, repair or replace required equipment. Such major expenses for the Hudson DWS are summarized in **Table 1**. Other expenses have also been provided within the table, including those expenses related to equipment inspections and acquiring spare equipment or parts.

**TABLE 1: 2014 SYSTEM EXPENSES**

Item	Install	Repair	Replace	Inspection	Spare	Expense
Emergency High Lift Pump Repairs		✓				\$15,843.81
Rotork Actuator Valve			✓			\$8,421.09
SCADA Repairs & Upgrades	✓	✓				\$6,357.95
Turbidity Emitters/Transmitters (Filters 1 & 2)		✓				\$4,867.61
Desktop Turbidity Analyzer (Hach 2100 AN)			✓			\$2,800.23
Gas Chlorine Rebuild Kits/Spare Parts					✓	\$1,974.97
UV Lights					✓	\$1,740.20
Generator Load Testing & Inspection				✓		\$1,446.85
Hot Water Heater			✓			\$1,371.96



## Water Quality

In accordance with section 11 (Annual Reports) of O.Reg. 170/03, this Annual Report must summarize the results of tests required by regulations, approvals, and orders. The results of such water quality analyses are provided within the following sections.

### Operational Parameters

The Hudson DWS employs an extensive in-house testing program which includes analyses of water quality indicators beyond that required by *the Act*. Such analyses are conducted on source, treated, and process water, and include testing for turbidity, colour, pH, temperature, alkalinity, aluminum, and residual free chlorine. Approximately 3,600 routine in-house water quality tests were conducted with respect to this system in 2014.

In accordance with Schedule 6 of O. Reg. 170/03, filter effluent turbidity must be continuously monitored at the Hudson WTP. The results of continuous monitoring and in-house analyses are provided in **Table 2**.

**TABLE 2: OPERATIONAL PARAMETERS**<sup>1,2</sup>

Parameter	Units	Min.	Max.	Avg.
Turbidity (Filter 1)	NTU	0.020	0.040	0.031
Turbidity (Filter 2)	NTU	0.018	0.052	0.033
Free Chlorine Residual (Treated)	mg/L	0.98	1.29	1.19
Turbidity (Treated)	NTU	0.073	0.235	0.150
pH (Treated)	---	7.4	8.0	7.7

1. Minimum, maximum and average values for filter turbidity and free chlorine residual (treated) are derived from daily instantaneous readings of continuous monitoring equipment. Minimum and maximum values are expressed as minimum and maximum monthly averages, and results greater than the maximum value and less than the minimum value do occur within a given year. Any adverse results would be addressed within the Compliance section of this and future reports.
2. Minimum, maximum, and average values for the parameters turbidity (treated) and pH (treated) are derived from the results of in-house analyses (i.e. bench tests). Minimum and maximum values are expressed as the minimum and maximum monthly averages of these results.

### Conventional Filtration Performance

In accordance with the *Procedure for Disinfection of Drinking Water in Ontario*, conventional filters must meet certain performance criteria in order to claim removal credits for *Giardia* cysts, *Cryptosporidium* oocysts, and viruses. In addition to continuously monitoring filtrate turbidity and other requirements, filtrate turbidity must be less than or equal to 0.3 NTU in at least 95% of the measurements each month.

**Table 3** summarizes filter effluent turbidity compliance against the <0.3 NTU/95% performance criterion. Minimum and maximum values in the table correspond to the proportion of time that filtered water turbidity was less than or equal to 0.3 NTU in a given month in 2014.

**TABLE 3: CONVENTIONAL FILTER PERFORMANCE**

Filter	Min.	Max.	Criterion
Filter 1	99.75%	100%	<0.30 NTU in 95% of the measurements each month
Filter 2	99.73%	100%	
Combined	99.80%	100%	



## Water Quality (continued)

### Microbiological Parameters

Microbiological analyses are performed on source, treated, and distribution system water. A total of 260 routine water samples were collected for bacteriological analysis by an accredited laboratory in 2014, as required by Schedule 10 of O. Reg. 170/03. These water samples were collected on a weekly basis, and included tests for E. coli, total coliforms, and heterotrophic plate counts. Results from both routine and non-routine microbiological analyses are provided in **Table 4**. All results were below the associated Ontario Drinking Water Quality Standards.

**TABLE 4: MICROBIOLOGICAL SAMPLING RESULTS<sup>1</sup>**

Sample Type	# of Samples	Range of EC <sup>2</sup> Results (MPN/100mL)	Range of TC <sup>2</sup> Results (MPN/100mL)	# of HPC <sup>2</sup> Samples	Range of HPC Results (CFU/mL)
Raw Water	52	<1 - 3	<1 - 2420	---	---
Treated Water	52	absent	absent	52	0 - 700
Distribution – Routine	156	absent	absent	61	0 - 580
Distribution – Non-routine	6	absent	absent	---	---

1. The Ontario Drinking Water Quality Standard for E. Coli and Total Coliforms in a treated or distribution sample is 'not detectable'. The presence of either parameters in a treated or distribution sample is an exceedance.
2. EC = E. Coli; TC = Total Coliforms; HPC = Heterotrophic Plate Count.

### Nitrate and Nitrite

Treated water is tested for nitrate and nitrite concentrations on a quarterly basis in accordance with Schedule 13 of O. Reg. 170/03. Nitrate and nitrite results are provided in **Table 5**. All results were below the associated Ontario Drinking Water Quality Standards (ODWQS).

**TABLE 5: NITRATE AND NITRITE RESULTS**

Sample Date (2014)	Nitrate Result (mg/L)	Nitrite Result (mg/L)	Nitrate + Nitrite (mg/L)
February 18	0.033	<0.020	0.033
May 13	<0.030	<0.020	<0.030
August 19	<0.030	<0.020	<0.030
November 25	0.030	<0.020	0.030
ODWQS	10	1	10

### Lead Sampling

The Hudson DWS previously qualified for reduced lead sampling and ultimately became exempt from sampling at plumbing locations, in accordance with Schedule 15.1 of O.Reg. 170/03. Four (4) distribution system samples must now be collected every year and analyzed for pH and alkalinity. Additionally, these four distribution system samples must be analyzed for lead in every third 12-month period after the plumbing sample exemption was activated. **Table 6** summarizes the results of community lead sampling and related required tests. Lead analyses were not required in 2014.



## Water Quality (continued)

**TABLE 6: DISTRIBUTION LEAD SAMPLING RESULTS**

Sample Date (2014)	Sample Location	pH	Alkalinity (mg/L as CaCO <sub>3</sub> )	Lead Result (µg/L)
March 31	Hydrant, 42 2 <sup>nd</sup> Street	7.8	40	
March 31	Hydrant, Bernier Crescent & Mill Road	7.7	40	not
September 25	Hydrant, 42 2 <sup>nd</sup> Street	7.7	45	required <sup>1</sup>
September 25	Hydrant, Bernier Crescent & Mill Road	7.7	45	

1. Lead will be tested in distribution samples during the period corresponding to December 15, 2014 to April 15, 2015, and again during the period corresponding to June 15, 2015 to October 15, 2015.

### Inorganic Parameters

With the exception of the parameters sodium and fluoride, inorganic parameters are sampled on an annual basis in treated water in accordance with Schedules 13 and 23 of O. Reg. 170/03. With respect to the Hudson DWS, required annual sampling for inorganic parameters was conducted on February 18, 2014 (not including sodium and fluoride parameters). Inorganic parameter sampling results are provided in **Table 7**. All results were below the associated Ontario Drinking Water Quality Standards.

**TABLE 7: INORGANIC SAMPLING RESULTS**

Parameter (Treated Water)	Units	Result	ODWQS
Antimony	µg/L	<0.60	6
Arsenic	µg/L	<1.0	25
Barium	µg/L	<10	1000
Boron	µg/L	<50	5000
Cadmium	µg/L	<0.10	5
Chromium	µg/L	<1.0	50
Fluoride <sup>1</sup>	mg/L	<0.030	1.5
Mercury	µg/L	<0.10	1
Selenium	µg/L	<1.0	10
Sodium <sup>1</sup>	mg/L	2.06	20 <sup>2</sup>
Uranium	µg/L	<2.0	20

1. Treated water must be tested for sodium and fluoride concentrations once every 5 years. The most recent fluoride result pertains to a sample collected on April 17, 2012. The most recent sodium result pertains to a sample collected on January 12, 2010.
2. This value for the parameter sodium is not a water quality standard as prescribed in O. Reg. 169/03, although an exceedance of this value is associated with reporting requirements and corrective actions.

**TABLE 8: TTHM SAMPLING RESULTS**

Sample Date (2014)	TTHM Result (µg/L)
February 18	58.9
May 13	63.6
August 19	134
November 25	58.8
2014 Average	78.8
2013 Average	71.0
2012 Average	66.7
2011 Average	71.6
2010 Average	58.5
ODWQS	100 <sup>1</sup>

1. Compliance with the provincial standard for trihalomethane concentrations is determined by calculating a running annual average (with a Maximum Acceptable Concentration of 0.100 mg/L or 100 µg/L).

### Trihalomethanes

Trihalomethanes (THMs) are required to be sampled on a quarterly basis from the farthest point in the 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 annual average. In 2014, the running annual average was 78.8 µg/L. Total THM (TTHM) results are summarized in **Table 8**.



## Water Quality (continued)

### Organic Parameters

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 Hudson DWS, sampling for organic parameters was conducted on February 18, 2014. Organic parameter sampling results are provided in **Table 9**. All results were below the associated Ontario Drinking Water Quality Standards.

**TABLE 9: ORGANIC SAMPLING RESULTS**

Parameter (Treated Water)	Result (µg/L)	ODWQS (µg/L)	Parameter (Treated Water)	Result (µg/L)	ODWQS (µg/L)
Alachlor	<0.10	5	Diquat	<1.0	70
Aldicarb	<1.0	9	Diuron	<1.0	150
Aldrin + Dieldrin	<0.040	0.7	Glyphosate	<5.0	280
Atrazine + N-dealkylated metabolites	<0.20	5	Heptachlor + Heptachlor Epoxide	<0.20	3
Azinphos-methyl	<0.10	20	Lindane	<0.10	4
Bendiocarb	<0.20	40	Malathion	<0.10	190
Benzene	<0.50	5	Methoxychlor	<0.10	900
Benzo(a)pyrene	<0.010	0.01	Metolachlor	<0.10	50
Bromoxynil	<0.20	5	Metribuzin	<0.10	80
Carbaryl	<0.20	90	Monochlorobenzene	<0.50	80
Carbofuran	<0.20	90	Paraquat	<1.0	10
Carbon Tetrachloride	<0.50	5	Parathion	<0.10	50
Chlordane (Total)	<0.30	7	Pentachlorophenol	<0.50	60
Chlorpyrifos	<0.10	90	Phorate	<0.10	2
Cyanazine	<0.10	10	Picloram	<0.20	190
Diazinon	<0.10	20	Polychlorinated Biphenyls (PCBs)	<0.035	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	<5.0	50	Triallate	<0.10	230
2,4 -Dichlorophenol	<0.30	900	Trichloroethylene	<0.50	5
2,4-Dichlorophenoxy acetic acid	<0.20	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	<0.20	2





## Water Quality (continued)

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### Environmental Discharge Sampling

The Municipal Drinking Water Licence for the Hudson DWS contains requirements related to additional sampling associated with environmental discharges. Specifically, environmental discharge samples are collected quarterly from settling tank effluent and are analyzed for the parameter total suspended solids. This effluent is discharged to a disbursement field which has been designed for the management of residue produced during the normal operation of the WTP.

The results of environmental discharge sampling are provided in **Table 10**.

**TABLE 10: ENVIRONMENTAL DISCHARGE SAMPLING RESULTS**

Sample Date (2014)	20-Feb	13-May	19-Aug	26-Nov
TSS Result (mg/L)	120	292	252	97.3



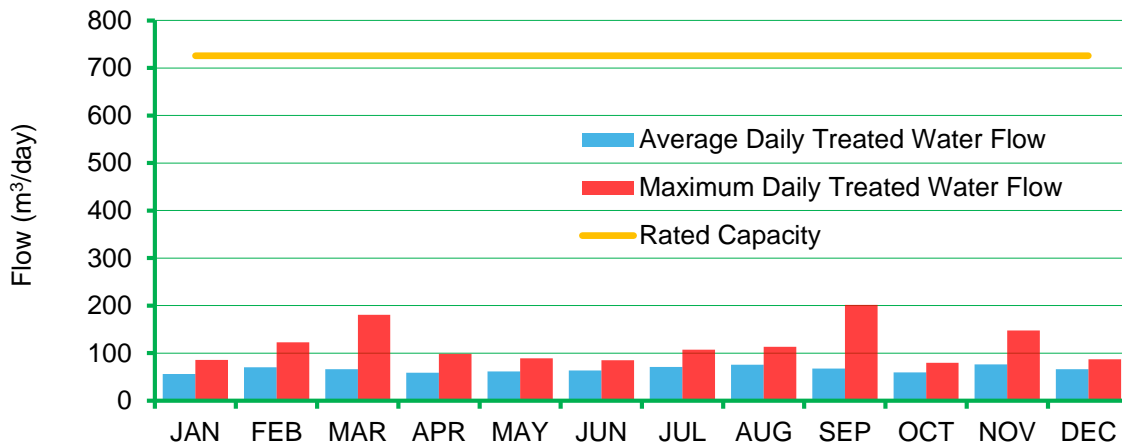
## Flows

### 2014 Flows

Throughout the reporting period, the Hudson DWS supplied 24,077 m<sup>3</sup> of treated water to consumers. On an average day in 2014, 66 m<sup>3</sup> of treated water was supplied to the community. The average daily flow in 2014 represents 9.1 % of the rated capacity of the Hudson WTP (726 m<sup>3</sup>/day). The maximum daily flow in 2014 was 201.8 m<sup>3</sup>/day, which represents 27.8 % of the rated capacity of the Hudson WTP.

The reader is asked to consult **Appendix A** for a complete summary of 2014 flow data. A comparison of average and maximum daily treated water flows with rated capacity is provided in **Figure 1**.

**FIGURE 1: 2014 AVERAGE AND MAXIMUM DAILY TREATED WATER FLOWS**

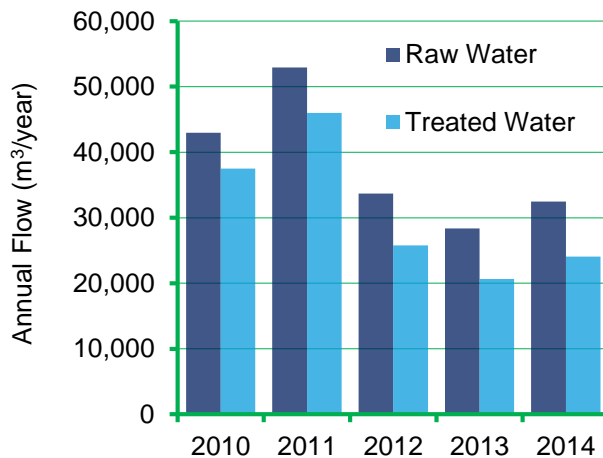


### Flow Comparisons

There was an increase in the amount of treated water supplied in 2014 when compared to the previous calendar year. In 2013, 20,642 m<sup>3</sup> of treated water was supplied to users of the Hudson DWS, compared to 24,077 m<sup>3</sup> in 2014. This represents a 16.6% increase in the amount of water supplied.

The reader is asked to consult **Appendix A** for a summary of historical flow data. Historical annual raw and treated water flows are provided in **Figure 2**.

**FIGURE 2: HISTORICAL ANNUAL FLOWS**





## Flows (continued)

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### Chemical Consumptions

In accordance with section 11 of O. Reg. 170/03, this Report must include a list of water treatment chemicals used by the system during the period covered by the report. **Table 11** summarizes total chemical consumptions and provides annual average dosages for each treatment chemical used at the Hudson WTP. All chemicals used in the treatment process are NSF/ANSI 60 certified for use in potable water, as required by system approvals.

**TABLE 11: CHEMICAL CONSUMPTIONS AND AVERAGE DOSAGES**

Treatment Chemical	Quantities Used			Average Dosages (mg/L)		
	2012	2013	2014	2012	2013	2014
polyaluminum chloride (SternPAC) (L)	3,252	2,787	3,160	38.4	39.0	38.7
sodium hydroxide <sup>1</sup> (L)	904	847	924	10.8	12.6	11.8
chlorine gas (kg)	110	91	116	4.27	4.43	4.81

1. Previous Annual Reports expressed quantities used of sodium hydroxide in kilograms. This and subsequent reports will express quantities used of sodium hydroxide in litres.



## Compliance

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Northern Waterworks Incorporated and the Municipality of Sioux Lookout employ an operational strategy that is committed to achieving the following goals:

- 1) Providing a safe and reliable supply of drinking water to the community of Hudson;
- 2) Meeting or exceeding all applicable legislative and regulatory requirements;
- 3) Maintaining and continually improving the operation and maintenance of the system; and,
- 4) Maintaining and operating the Hudson Drinking Water System in a responsible manner in accordance with documented quality management system policies and procedures.

The following sections will summarize incidents of adverse water quality and noncompliance that occurred during the reporting period. NWI is committed to employing timely and effective corrective actions to prevent recurrence of all identified incidents of adverse water quality and noncompliance.

### Incidents of Adverse Water Quality

In accordance with section 11 (Annual Reports) of O. Reg. 170/03, this Annual Report must summarize any reports made to the Ministry under subsection 18(1) (Duty to report adverse test results) of *the Act* or section 16-4 (Duty to report other observations) of Schedule 16 of O. Reg. 170/03. Additionally, this Annual Report must describe any corrective actions taken under Schedule 17 of O. Reg. 170/03 during the period covered by the report. There were no such incidents of adverse water quality in 2014 for the Hudson DWS.

### Incidents of Noncompliance

In accordance with Schedule 22 (Summary Reports for Municipalities) of O. Reg. 170/03, this Annual Report must list any requirements of the *Act*, the regulations, the system's approval, drinking water works permit, municipal drinking water licence, and any orders applicable to the system that were not met at any time during the period covered by the report (i.e. an incident of noncompliance). Additionally, this Annual Report must specify the duration of the failure and the measures that were taken to correct the failure. There were no known incidents of non-compliance in 2014 for the Hudson DWS.

## Appendix A – Flow Data

**TABLE A1: 2014 FLOWS<sup>1</sup>**

Month	Total Monthly Raw Water Volume (m <sup>3</sup> )	Total Monthly Treated Water Volume (m <sup>3</sup> )	Average Daily Treated Water Flow (m <sup>3</sup> /day)	Maximum Daily Treated Water Flow (m <sup>3</sup> /day)	Capacity Assessment (Average Flows)	Capacity Assessment (Maximum Flows)
Jan	2,429	1,739	56.1	85.4	7.7%	11.8%
Feb	2,618	1,961	70.0	122.8	9.6%	16.9%
Mar	2,792	2,056	66.3	180.3	9.1%	24.8%
Apr	2,473	1,766	58.9	98.1	8.1%	13.5%
May	2,642	1,911	61.6	89.2	8.5%	12.3%
Jun	2,551	1,903	63.4	85.0	8.7%	11.7%
Jul	2,720	2,198	70.9	107.0	9.8%	14.7%
Aug	3,143	2,347	75.7	113.5	10.4%	15.6%
Sep	2,664	2,022	67.4	201.8	9.3%	27.8%
Oct	2,625	1,838	59.3	79.4	8.2%	10.9%
Nov	2,984	2,292	76.4	147.6	10.5%	20.3%
Dec	2,826	2,044	65.9	87.1	9.1%	12.0%
Total	32,466	24,077	---	---	---	---
Avg.	2,706	2,006	66.0	---	9.1%	---

1. Highlighted values correspond to the annual average daily flow and the maximum daily flow encountered within the year. Also highlighted are the associated capacity assessment values.

**TABLE A2: HISTORICAL FLOWS<sup>1</sup>**

Year	Total Annual Raw Water Volume (m <sup>3</sup> )	Total Annual Treated Water Volume (m <sup>3</sup> )	Plant Efficiency	% Change in Total Raw Flow from Previous Year	% Change in Total Treated Flow from Previous Year
2007	---	34,663	---	---	---
2008	---	35,385	---	---	2.1%
2009	---	36,333	---	---	2.7%
2010	42,965	37,485	87.2%	---	3.2%
2011	52,922	45,980	86.9%	23.2%	22.7%
2012	33,668	25,760	76.5%	-36.4%	-44.0%
2013	28,380	20,642	72.7%	-15.7%	-19.9%
2014	32,466	24,077	74.2%	14.4%	16.6%

1. Data concerning annual total raw water volumes were unavailable for the preparation of this report for the years spanning 2007 – 2009.