






2015 Annual Report

Sioux Lookout Urban Drinking Water System

	Introduction p. 2
	System Overview pp. 3 - 4
	Water Quality pp. 5 - 9
	Flow Monitoring pp. 10 - 11
	Compliance pp. 12 - 16

Prepared by:





INTRODUCTION

This consolidated Annual Report (the Report) has been prepared in accordance with both section 11 (Annual Reports) and Schedule 22 (Summary Reports for Municipalities) of Ontario Regulation 170/03 (Drinking Water Systems Regulation). This Report is intended to inform both the public and the municipal council on the operation of the system over the previous calendar year (January 1 to December 31, 2015).

Section 11 of O. Reg. 170/03 requires the development and adequate dissemination to the public of an annual report summarizing water quality monitoring results, adverse water quality incidents, system expenses, and chemicals used in the water treatment process.

Schedule 22 of O. Reg. 170/03 requires the development and dissemination to municipal council of an annual report summarizing incidents of regulatory non-compliance and associated corrective actions, in addition to providing flow monitoring results for the purpose of enabling the owner to assess the capability of the system to meet existing and planned demand.

Report Availability

In accordance with section 11 of O. Reg. 170/03 this 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 at the following locations:

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

In accordance with Schedule 22 of O. Reg. 170/03, this Annual Report must be given to the members of municipal council. Section 19 (Standard of care, municipal drinking-water system) of Ontario's *Safe Drinking Water Act* also places certain responsibilities upon those municipal officials who oversee an accredited operating authority or exercise decision-making authority over a system. The examination of this Report is one of the methods by which municipal officials may fulfil the obligations required by section 19 of O. Reg. 170/03.

System users and members of municipal council are strongly encouraged to contact a representative of Northern Waterworks Incorporated (NWI) for assistance in interpreting this Report. Questions and comments may be directed to the local NWI Supervisor or by email to compliance@nwi.ca.

SYSTEM OVERVIEW

The Sioux Lookout Urban Drinking Water System (DWS No. 220001405) must meet extensive treatment and testing requirements to ensure that human health is protected. The operation and maintenance of the system is governed by Ontario's *Safe Drinking Water Act* and the regulations therein, in addition to requirements within system-specific approvals.

System Description

The Sioux Lookout Urban Drinking Water System (DWS) is classified as a large municipal residential system, and it is composed of the Doc Moberly Low Lift Pumping Station (LLPS), the Sioux Lookout Water Treatment Plant (WTP), and the Sioux Lookout distribution system. The system is owned by the Corporation of the Municipality of Sioux Lookout and is operated and maintained by NWI. Potential pathogenic organisms are removed and inactivated by chemical coagulation, flocculation, membrane filtration, and disinfection using both free chlorine and UV irradiation.

Raw water flows by gravity from the intake structure located in Pelican Lake to an underground wet well located at the Doc Moberly LLPS. Pumps transfer water from the wet well and through a transmission line to the flocculation tanks at the WTP. At the Sioux Lookout WTP, aluminum sulphate (coagulant) and sodium hydroxide (pH adjustment) are injected and rapidly mixed into the raw water immediately upstream from the flocculation tanks. In the tanks water is gently mixed in order to promote floc formation, which will in turn facilitate membrane filtration. Flocculated water is then directed to the underground process reservoirs containing submerged membrane ultrafilters. Permeate (filtered water) is drawn through the membrane filters using a vacuum generated from pumps, effectively filtering impurities from the water. Permeate is then passed through one of two available UV reactors for disinfection and is injected with sodium hypochlorite (disinfectant), fluorosilicic acid (fluoridation), and sodium hydroxide (pH adjustment) as it is directed to the chlorine contact chamber and reservoir. The chlorine contact chamber uses a baffling system to allow chlorine to mix adequately with the water. The disinfected water is then held in the chlorine contact chamber and reservoir for a sufficient amount of time to achieve free chlorine primary disinfection.

Treated water is delivered from the reservoir to the Sioux Lookout distribution system by the use of pumps located at the Sioux Lookout WTP. The Sioux Lookout distribution system consists of approximately 34 km of water mains, 250 water main gate valves, 172 hydrants, a community standpipe for regulating pressure and providing extra storage, and a booster station serving the northeast portion of the system. Secondary disinfection requirements in the distribution system are achieved by the maintenance of a free chlorine residual.

The Sioux Lookout WTP also includes an independent membrane ultrafiltration unit designed to recover process wastewater. Wastewater generated from the primary filtration process is collected and delivered to the unit for treatment. Permeate may then be directed to one of multiple different locations in the treatment process, including introduction to the raw water stream, delivery to the UV reactors, transfer to the waste sump and sanitary sewer, and recirculation to an upstream location within the unit itself.

Water Treatment Chemicals

In accordance with section 11 of O. Reg. 170/03, this Report must include a list of all water treatment chemicals used by the system during the period covered by the report (**Table 1**). All chemicals used in the treatment process are NSF/ANSI 60 certified for use in potable water, as required by system approvals.

Table 1: Water treatment chemicals used in 2015.

Treatment Chemical	Application ¹
aluminum sulphate	coagulant
sodium hydroxide	pH adjustment, reducing agent
fluorosilicic acid	fluoridation
sodium hypochlorite	disinfectant, filter cleaning agent
citric acid	filter cleaning agent

1. Filter cleaning agents and reducing agents are used in smaller amounts during the cleaning of the primary and secondary membrane filters. These chemicals are not injected into the normal process water stream.

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. This Report also summarizes those expenses related to strengthening equipment inventories and to maintenance activities undertaken by subcontracted service providers. Major expenses incurred in 2015 include:

- replacement of a section of watermain at the intersection of Queen Street and Third Avenue;
- installation of a new section of watermain connecting Bay Street and Fourth Avenue sections;
- installation of filter-to-waste capability for the primary membrane filters;
- electrical networks thermal imaging inspection and report;
- replacement of waste tank submersible pump;
- replacement and the purchase of spare fluoride analyzer sensors;
- replacement and the purchase of spare valve actuators for the primary filters;
- purchase of a spare vacuum pump and motor;
- replacement of suspended unit heaters;
- repairing and upgrading automation systems, including optimizing alarm systems, correcting pace-to-flow dosing problems, and improving SCADA-generated reports;
- replacement of citric acid wash tank pump and motor;
- replacement of electric motor for blower;
- replacement of ventilation fans and motors in the sodium hypochlorite and fluoride rooms;
- replacement and the purchase of spare air control solenoid valves required for membrane integrity testing; and,
- calibration verification of flow measuring devices.

WATER QUALITY

In accordance with section 11 of O.Reg. 170/03, this Report must summarize the results of water quality tests required by regulations, approvals, and orders. The following sections use technical water quality 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>

Operational Parameters

In accordance with Schedule 7 (Operational checks) of O. Reg. 170/03, regulated operational parameters that must be monitored include raw water turbidity, filtrate turbidity, treated water fluoride residual, and the free chlorine residuals associated with primary and secondary disinfection. The Sioux Lookout Urban DWS employs a comprehensive monitoring program that extends beyond these regulated operational parameters to include additional tests conducted on source, process and treated water samples. **Table 2** summarizes water quality results for regulated and selected unregulated operational parameters. In accordance with Schedule 6 (Operational checks, sampling and testing – general) of O. Reg. 170/03, certain operational parameters are continuously monitored.

Table 2: Results summary for operational parameters.

Parameter (Sample Type) ¹	Sample Method ² (Minimum Frequency)	Units	Minimum Monthly Average	Maximum Monthly Average	Annual Average
Turbidity (Raw Water)	Grab (Twice-weekly)	NTU	0.29	0.76	0.52
Turbidity (Filter 1)	Continuous	NTU	0.024	0.040	0.028
Turbidity (Filter 2)	Continuous	NTU	0.021	0.027	0.023
Turbidity (Treated)	Continuous	NTU	0.11	0.13	0.12
pH (Treated)	Grab (Twice-weekly)	---	7.06	7.42	7.22
Fluoride Residual (Treated)	Continuous	mg/L	0.55	0.72	0.63
FRC (Treated)	Continuous	mg/L	1.97	2.24	2.14
FRC (Distribution)	Grab (Daily)	mg/L	1.25	1.77	1.56

1. FRC = free residual chlorine.

2. For continuously monitored parameters, all results are derived from daily instantaneous readings of continuous monitoring equipment. Grab samples are also collected and tested in order to verify the accuracy of monitoring equipment for all continuously monitored parameters.

Membrane Filtration Performance

In accordance with the *Procedure for Disinfection of Drinking Water in Ontario*, membrane filters must meet certain performance criteria in order to claim removal credits for *Cryptosporidium* oocysts. In addition to continuously monitoring filtrate turbidity, membrane filter integrity must be monitored and combined filtrate turbidity must be less than or equal to 0.1 NTU in at least 99% of the measurements each month. **Table 3** summarizes filtrate turbidity compliance against the <0.1 NTU/99% 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 0.1 NTU in a calendar month in 2015. The table also summarizes the results of daily membrane integrity testing by providing achieved log removal values (LRVs) for each filter. Membrane integrity tests and the corresponding log removal values are conducted to ensure that the membrane filtration units are performing as designed. In order to meet the manufacturer's guidelines and to guarantee pathogen removal, test results must typically achieve a LRV of at least 4.00.

Table 3: Membrane filter performance.

Membrane Filter	<0.10 NTU/99% Criterion		Log Removal Values		
	Monthly Min.	Monthly Max.	Monthly Min.	Monthly Max.	Annual Avg.
Filter Unit 1A	99.86% (Jan.)	100%	4.42	4.65	4.56
Filter Unit 1B	99.86% (Jan.)	100%	4.37	4.63	4.49
Filter Unit 2A	98.81% (Aug.)	100%	4.42	4.89	4.60
Filter Unit 2B	98.81% (Aug.)	100%	4.50	4.93	4.68
Combined Filters	99.31% (Aug.)	100%	4.43	4.72	4.58

Microbiological Parameters

Microbiological analyses are performed on source, treated, and distribution system water. A total of 312 routine water samples were collected for microbiological analysis by an accredited laboratory in 2015, as required by Schedule 10 (Microbiological sampling and testing) of O. Reg. 170/03. These water samples were collected on a weekly basis, and included tests for E. coli (EC), total coliforms (TC), and heterotrophic plate counts (HPC). Results from microbiological analyses are provided in **Table 4**.

Table 4: Microbiological sampling results.

Sample Type	# of EC/TC Samples	EC Results Range ¹ (MPN/100mL)	TC Results Range ¹ (MPN/100mL)	# of HPC Samples	HPC Results Range (CFU/mL)
Raw Water	52	<1 to 5	<1 to 291	---	---
Treated Water	52	absent	absent	52	0 to 45
Distribution	208	absent	present ²	60	0 to 56
Distribution (Non-routine)	60	absent	present ³	---	---

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 parameter in a treated or distribution sample is considered an exceedance.

2. One (1) routine distribution sample collected on December 1, 2015, tested present for TC (refer to AWQI No. 127592)

3. One (1) non-routine distribution sample collected on July 20, 2015, tested present for TC (refer to AWQI No. 125172)

Trihalomethanes

Trihalomethanes (THMs) are required to be sampled on a quarterly basis from a distribution system location that is likely to have an elevated potential for THM formation, in accordance with Schedule 13 (Chemical sampling and testing) of O. Reg. 170/03. 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). In 2015, the running annual average for the Sioux Lookout Urban DWS was 78.7 µg/L. Total THM results are summarized in **Table 5**. Due to previous exceedances the Sioux Lookout Urban DWS followed a special monitoring program in 2015, such that additional samples were tested for THMs.

Nitrate and Nitrite

Treated water is tested for nitrate and nitrite concentrations on a quarterly basis in accordance with Schedule 13 (Chemical sampling and testing) of O. Reg. 170/03. Nitrate and nitrite results are provided in **Table 6**. All results were below the associated Ontario Drinking Water Quality Standards.

Lead Sampling

The Sioux Lookout DWS previously qualified for reduced lead sampling and ultimately became exempt from sampling at plumbing locations, in accordance with Schedule 15.1 (Lead) of O.Reg. 170/03. Six (6) distribution system samples must now be collected every year and analyzed for pH and alkalinity. Additionally, these distribution system samples must be analyzed for lead in every third 12-month period after the plumbing sample exemption was activated. **Table 7** summarizes the results of community lead sampling and related required tests. All results were below the associated Ontario Drinking Water Quality Standard (ODWQS – 10 µg/L).

Table 5: Total trihalomethane results.

Sample Type	Treated	Distribution
Number of Samples	14	7
Minimum Result (µg/L)	22.3	58.6
Maximum Result (µg/L)	67.4	96.8
Results Avg. ¹ (µg/L)	39.9	74.1
Regulatory Avg. ² (µg/L)	---	78.7

1. The results average refers to the average THM concentration calculated across all samples.
2. The regulatory average refers to the 2015 annual average of calendar quarterly average results.

Table 6: Nitrate and nitrite results.

Sample Date (2015)	Nitrate Result (mg/L)	Nitrite Result (mg/L)	Nitrate + Nitrite (mg/L)
Feb. 17	0.076	<0.010	0.076
May 12	0.084	<0.010	0.084
Aug. 18	0.030	<0.010	<0.040
Nov. 17	0.060	<0.010	0.060
ODWQS	10	1	10

Table 7: Distribution lead sampling results.

Sample Date (2015)	Sample Location	pH	Alkalinity (mg/L as CaCO ₃)	Lead Result (µg/L)
March 18	Hydrant, First Ave. & Front St.	6.93	20	1.3
March 18	Hydrant, West Queen Street	7.00	20	<1.0
March 19	Hydrant, Bay Street	7.02	20	<1.0
September 29	Hydrant, Airport	7.08	20	<1.0
October 7	Hydrant, Wellington Street	7.14	20	<1.0
October 7	Hydrant, Sioux Mountain Public School	7.19	20	<1.0

Inorganic Parameters

With the exception of sodium and fluoride, inorganic parameters are sampled on an annual basis in treated water in accordance with Schedules 13 (Chemical sampling and testing) and 23 (Inorganic parameters) of O. Reg. 170/03. Sodium is sampled every five (5) years in treated water in accordance with Schedules 13 and 23 of O. Reg. 170/03. Although grab samples may be analyzed, regulatory testing for fluoride is achieved through the use of continuous monitoring equipment, in accordance with Schedule 6 of O. Reg. 170/03. The most recent inorganic parameter sampling results are provided in **Table 8**. All results were below the associated Ontario Drinking Water Quality Standards.

Table 8: Inorganic sampling results.

Parameter	Sample Date	Units	Result	ODWQS
Antimony	February 17, 2015	µg/L	<0.60	6
Arsenic	February 17, 2015	µg/L	<1.0	25
Barium	February 17, 2015	µg/L	<10	1000
Boron	February 17, 2015	µg/L	<50	5000
Cadmium	February 17, 2015	µg/L	<0.10	5
Chromium	February 17, 2015	µg/L	<1.0	50
Fluoride	February 17, 2015	mg/L	0.52 ¹	1.5
Mercury	February 17, 2015	µg/L	<0.10	1
Selenium	February 17, 2015	µg/L	<1.0	10
Sodium	February 17, 2015	mg/L	11.8	20 ²
Uranium	February 17, 2015	µg/L	<2.0	20

1. This result pertains to a grab sample.
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.

Organic Parameters

Organic parameters are sampled on an annual basis in treated water in accordance with Schedules 13 (Chemical sampling and testing) and 24 (Organic parameters) of O. Reg. 170/03. These parameters include various acids, pesticides, herbicides, PCBs, volatile organics, and other organic chemicals. Organic parameter sampling results are provided in **Table 9**. Sampling for the majority of organic parameters was conducted on February 17, 2015, with additional sampling occurring on February 25, 2015 and March 10, 2015. All results were below the associated Ontario Drinking Water Quality Standards.

Table 9: Organic parameter sampling results.

Parameter	Result (µg/L)	ODWQS (µg/L)	Parameter	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 ²	<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 ¹	<0.50	60
Chlorpyrifos	<0.10	90	Phorate	<0.10	2
Cyanazine	<0.10	10	Picloram ²	<0.20	190
Diazinon	<0.10	20	Polychlorinated Biphenyls (PCBs)	<0.035	3
Dicamba ²	<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 ¹	<0.50	100
Dichloromethane	<5.0	50	Triallate	<0.10	230
2,4 -Dichlorophenol ¹	<0.30	900	Trichloroethylene	<0.50	5
2,4-Dichlorophenoxy acetic acid ²	<0.20	100	2,4,6-Trichlorophenol ¹	<0.50	5
Diclofop-methyl	<0.20	9	2,4,5-Trichlorophenoxy acetic acid ²	<0.20	280
Dimethoate	<0.10	20	Trifluralin	<0.10	45
Dinoseb ²	<0.20	10	Vinyl Chloride	<0.20	2

1. Sampling for these organic parameters was conducted on February 25, 2015.

2. Sampling for these organic parameters was conducted on March 10, 2015.

FLOW MONITORING

In accordance with Schedule 22 (Summary Reports for Municipalities) of O. Reg. 170/03, this Annual Report must include certain information for the purpose of enabling the owner to assess the capability of the system to meet existing and planned uses. Specifically, this Report must include a summary of the quantities and flow rates of the water supplied during the report period, including monthly average and maximum daily flows. The Report must also include a comparison of flow monitoring results to the rated capacity and flow rates approved in the system's Municipal Drinking Water Licence.

Throughout the reporting period, the Sioux Lookout Urban DWS operated within its rated capacity and supplied a total 663,813 m³ of treated water. On an average day in 2015, 1,819 m³ (1,819,000 L) of treated water was supplied to the community. The average daily flow in 2015 represents 49.5% of the rated capacity of the Sioux Lookout WTP at a water temperature of 0 °C (3,675 m³/day), or 40.0% of the rated capacity at a water temperature of 20 °C (4,550 m³/day). The maximum daily flow in 2015 was 2,495 m³/day, which represents 67.9% of the rated capacity of the Sioux Lookout WTP at a water temperature of 0 °C, or 54.8% of the rated capacity at a water temperature of 20 °C. 2015 flow monitoring results are summarized in **Table 10** and **Figure 1**.

Table 10: 2015 total volumes, daily flows, and capacity assessments.

Month	Total Volumes (m ³)		Daily Flows (m ³ /day)		Capacity Assessments ¹	
	Raw Water	Treated Water	Average - Treated Water	Maximum - Treated Water	Average - Treated Water	Maximum - Treated Water
Jan	66,871	54,348	1,753	1,974	42.6%	48.0%
Feb	64,844	51,108	1,825	2,041	44.4%	49.6%
Mar	60,343	50,745	1,637	1,752	39.8%	42.6%
Apr	65,926	51,436	1,715	2,076	41.7%	50.5%
May	70,911	54,586	1,761	2,198	42.8%	53.4%
Jun	70,685	55,538	1,851	2,141	45.0%	52.1%
Jul	76,531	62,286	2,009	2,495	48.9%	60.7%
Aug	61,908	53,080	1,712	1,917	41.6%	46.6%
Sep	74,656	61,467	2,049	2,356	49.8%	57.3%
Oct	72,853	59,050	1,905	2,367	46.3%	57.6%
Nov	67,833	54,888	1,830	2,019	44.5%	49.1%
Dec	65,702	55,281	1,783	2,266	43.4%	55.1%
Total	819,063	663,813	---	---	---	---
Avg.	68,255	55,318	1,819	---	44.2%	---

- Capacity assessments compare average and maximum daily treated water flows to the rated capacity of the system. The production capacity of the membrane filtration units depends upon water temperature, and capacity values are stated for 0 and 20 °C. Production capacity is prorated accordingly for water temperatures between these two limits. For the purposes of capacity assessment determinations, the rated capacity is the mean (4,112.5 m³/day) of the upper (4,550 m³/day) and lower (3,675 m³/day) capacity limits.

Figure 1: 2015 average and maximum daily treated water flows.

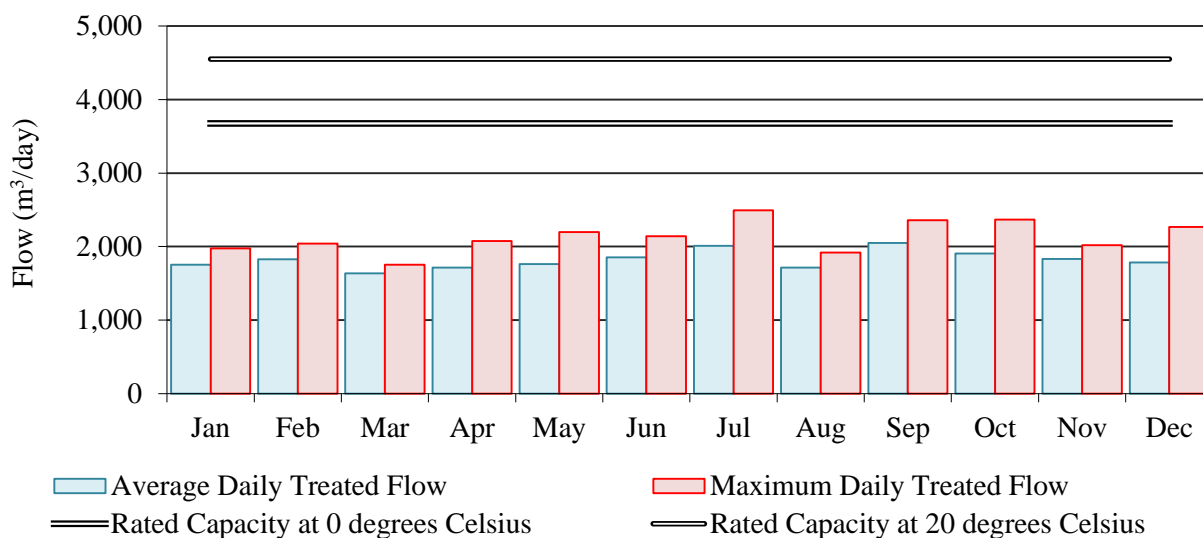


Table 11 summarizes recent historical flow monitoring results for the Sioux Lookout Urban DWS. There were increases within normal variation in the amounts of source water withdrawn and treated water supplied in 2015 when compared to 2014. Total annual volumes of treated water supplied in the near future may be expected to be between 600,000 m³ and 725,000 m³, which represents approximately 40% to 48% of the mean rated capacity of the Sioux Lookout WTP.

Table 11: Recent historical flow monitoring results.

Year	Total Volumes (m ³)		Daily Flows (m ³ /day)		Annual % Change	
	Raw Water	Treated Water	Average – Treated Water	Maximum – Treated Water	Raw Water	Treated Water
2006	---	702,510	1,925	---	---	---
2007	---	757,770	2,076	---	---	+7.9%
2008	---	735,920	2,011	---	---	-2.9%
2009	---	636,700	1,744	---	---	-13.5%
2010	923,850	687,640	1,884	---	---	+8.0%
2011	888,430	729,341	1,998	3,008	-3.8%	+6.1%
2012	979,670	785,457	2,146	2,837	+10.3%	+7.7%
2013	846,566	697,954	1,912	3,411	-13.6%	-11.1%
2014	710,645	606,465	1,662	2,385	-16.1%	-13.1%
2015	819,063	663,813	1,819	2,495	+15.3%	+9.5%

COMPLIANCE

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 Sioux Lookout;
- 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 Sioux Lookout Urban Drinking Water System in a responsible manner in accordance with documented quality management system policies and procedures.

The following sections will summarize incidents regulatory noncompliance and adverse water quality 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.

Regulatory Noncompliance

In accordance with Schedule 22 (Summary Reports for Municipalities) of O. Reg. 170/03, this 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 regulatory noncompliance). Additionally, this Report must specify the duration of the failure and the measures that were taken to correct the failure.

Three (3) incidents of regulatory noncompliance were identified during the most recent inspection by Ontario's Ministry of the Environment and Climate Change (MOECC) initiated on May 5, 2015. Information concerning the duration of failures and the measures taken to address those failures is provided for each item of non-compliance. The details of the noncompliance items and the actions required utilize some or all of the original wording contained within the inspection report. Updates concerning the status of actions required have been provided where appropriate.

- **Maximum water takings were not in accordance with those allowed under the PTTW.**

The maximum allowable water taking under Permit to Take Water No. 3606-6UJQ5L is 5,475 m³/day at a rate no greater than 3,802 L/min. The maximum volume of water taken over a 24-hour period during the inspection review period was 2,990 m³ on April 29, 2015; this represents 54.6% of the maximum allowable daily water taking. During the review of continuous flow data, it was noted that the flow rate exceeded the allowable 3,802 L/min for several days in April and May, 2015. When asked about these exceedances, the overall responsible operator (ORO) explained that during the exceedances, the new backwash recovery filtration unit was directing filter permeate back to the raw water intake pipe, upstream of the raw water flow meter.

Eventually, filter permeate from the backwash recovery unit will direct filter permeate to the clearwell; however, there will still be occasions where filter permeate is directed to the raw water intake piping when the backwash recovery unit is in "filter to waste" mode.

It is worth noting that the three low-lift pumps are each rated at 31.5 L/sec (or 1,890 L/min) and typically, only two low-lift pumps are in operation at any given time. With two pumps in operation, the maximum pumping capacity would be 3,780 L/min (less than the allowable 3,802 L/min). Although operators indicated that to their knowledge there were no occasions during the inspection review period where all three low lift pumps were engaged at the same time, there was no data available to support this.

Action(s) Required: By July 31, 2015, the Corporation of the Municipality of Sioux Lookout and Northern Waterworks Incorporated (NWI) must conduct the work necessary to accurately measure and record the continuous raw water flow rate and total daily water taking from the raw water source (i.e. Pelican Lake). By July 31, 2015, confirmation that the above required work is completed must be provided to the relevant Water Inspector.

Update: An report was provided to the Water Inspector by July 31, 2015, indicating that the required work was completed. However, additional inaccuracies in raw water flow reporting were discovered and were investigated by an automation service provider. Programming work involved developing a new parameter ('Lake Supply Flow') by continuously subtracting permeate flow from the total raw water flow when permeate is being directed to the incoming raw water stream. Following the programming work, NWI detected more inaccuracies with the measurement of raw water flow. Work to resolve this issue remains ongoing.

- **Records did not indicate that the treatment equipment was operated in a manner that achieved the design capabilities required under Ontario Regulation 170/03 or a Permit, Licence or Approval issued under Part V of the SDWA at all times that water was being supplied to consumers.**

Membrane filtration is provided at the Sioux Lookout WTP. The "Procedure for Disinfection of Drinking Water in Ontario" requires membrane filtration plants to maintain filter effluent turbidity of less than or equal to 0.1 NTU in 99% of the measurements taken each month. A review of filter effluent turbidity data for both filter trains showed that this requirement was not met for the entirety of the inspection review period. The percentage of readings which were less than or equal to 0.1 NTU for the month of November, 2014 was 95.00% and for the month of December, 2014 it was 98.36%. On both occasions a report of improper disinfection was made to the MOECC Spills Action Centre and the Northwestern Health Unit (NWHU).

Operators believe that a number of factors contributed to the elevated turbidity levels during the months of November and December, 2014:

1. During this time the wastewater recovery membrane unit was being installed at the WTP. This required multiple shut-downs and start-ups of the primary membranes. Each time the primary membranes were re-started, they would experience a brief turbidity spike which operators say contribute to air being trapped in the lines leading to the continuous turbidity analyzers.
2. During the commissioning of the wastewater recovery membranes, operators determined that there were times when the main membranes were running against a closed valve, upstream of the UV units. This caused water to become turbulent within the plant piping and in the membrane tanks and very likely caused particles on the walls of the piping and membrane tanks to become suspended, elevating turbidity levels.
3. Operators believe that one of their turbidity analyzers was not reading accurately during this time. During turbidity spikes, operators frequently collected grab samples and found that the turbidity in the grab sample was often times significantly lower than that of the continuous analyzer.

Action(s) Required: Northern Waterworks Inc. operators took several actions in an effort to address the elevated turbidity levels, which included:

1. Grab sampling during turbidity spikes to verify analyzer readings;
2. replacement of a vacuum valve which removes air from the filter permeate line to the turbidity analyzer;
3. removal of pumps and solenoid valves which may have been contributing to increased air in the system;
4. back pulse tanks were flushed to remove particles;
5. installation of a filter to waste system which received approval on May 5, 2015, through the issuance of a Schedule C to DWWP 236-202. This system will ensure that filter permeate is not directed to the next treatment stage while turbidity levels are above 0.1 NTU.

Since December, 2014, the Sioux Lookout DWS has been in compliance with filter performance criteria in accordance with The "Procedure for Disinfection of Drinking Water in Ontario". No further action is required at this time.

Update: Filter-to-waste capability was installed on the primary membrane filtration units subsequent to the inspection. The filter-to-waste system will help to ensure that filter permeate is not directed to the next treatment stage while turbidity levels are above a specified value.

- **The subsystem had been replaced or altered, since the issuance of the existing subsystem certificate of classification but the owner had not applied for the re-determination of the type and class of the subsystem or had not determined that the alteration(s) was not sufficient to trigger an application.**

During the inspection review period, two significant components were added to the treatment system:

1. Wastewater Recovery Membrane Unit - This new membrane unit is capable of filtering reject water and directing it to the next stages of treatment (i.e. UV, chlorination);
2. UV Units - Two new UV units have been installed with the intent of achieving primary disinfection, in addition to chlorination.

At the time of the inspection, the municipality had not applied for the re-determination of the type and class of the subsystem.

Action(s) Required: By June 30, 2015, the Corporation of the Municipality of Sioux Lookout must supply a completed application form to the Ontario Water Wastewater Certification Office and the undersigned Water Inspector for the re-determination of the type and class of the subsystem.

Update: The required application form was submitted to the appropriate parties on June 30, 2015. It is expected that the Sioux Lookout WTP will remain a Class III facility.

Adverse Water Quality Incidents

In accordance with section 11 (Annual Reports) of O. Reg. 170/03, this 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 Report must describe any corrective actions taken under Schedule 17 of O. Reg. 170/03 during the period covered by the report. The four (4) incidents of adverse water quality in 2015 are summarized below.

- **AWQI No. 122300 (January 16, 2015) & AWQI No. 122587 (February 20, 2015)**

NWI received multiple notices from the licensed laboratory that the total trihalomethane running annual average (RAA) concentration was greater than the Ontario Drinking Water Quality Standard of 100 µg/L. Annual average THM levels have exceeded the standard of 100 µg/L frequently since 2013. Corrective actions were performed in accordance with Schedule 17 of O. Reg. 170/03, and included continuing to follow an enhanced THM monitoring program and optimizing treatment processes at the Sioux Lookout WTP. Lab results received in the second quarter of 2015 indicated that the RAA for THMs was below the ODWQS. The RAA continued to be below the ODWQS for the remainder of 2015. The Notice of Issue Resolution was provided on May 22, 2015.

- **AWQI No. 125172 (July 22, 2015)**

NWI received notice from the licensed laboratory that a distribution water sample collected from a new watermain on July 20, 2015, tested present for the parameter of total coliforms. The issue was reported to the MOECC Spills Action Centre and the Northwestern Health Unit. Corrective action was performed in accordance with Schedule 17 of O. Reg. 170/03, and included flushing and collecting resamples. All resamples tested absent for E. coli and total coliform parameters. The Notice of Issue Resolution was provided on July 24, 2015.

- **AWQI No. 127592 (December 3, 2015)**

NWI received notice from the licensed laboratory that a routine distribution water sample collected on December 1, 2015, tested present for the parameter of total coliforms. The issue was reported to the MOECC Spills Action Centre and the Northwestern Health Unit. Corrective action was performed in accordance with Schedule 17 of O. Reg. 170/03, and included flushing and collecting resamples on July 21 and July 22. All resamples tested absent for E. coli and total coliform parameters. The Notice of Issue Resolution was provided on December 7, 2015.