

# 2014 ANNUAL REPORT



## Sioux Lookout Urban Drinking Water System

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PREPARED BY





## Introduction

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The **Sioux Lookout Urban Drinking Water System** (DWS# 210001405) 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 Sioux Lookout Urban 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 Sioux Lookout. This DWS is composed of the Doc Moberly Low Lift Pumping Station (LLPS), the Urban Sioux Lookout Water Treatment Plant (WTP), and the Sioux Lookout distribution system (including an elevated storage tank and the Fifth Avenue Booster Pumping Station). The Sioux Lookout Urban 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, membrane filtration, and primary disinfection processes.

The LLPS draws surface water from Pelican Lake, whereby low lift pumps transfer water from the source to the flocculation tanks located at the WTP. Aluminum sulphate (primary coagulant) and sodium hydroxide (pH/alkalinity adjustment) are injected into the raw water upon transfer, and gentle mixing subsequently promotes the formation of floc masses in order to facilitate membrane filtration. Water is directed from the flocculation tanks to process reservoirs, in which there are submerged membrane filters. Permeate is drawn through the membrane filters via an applied vacuum and is directed to the treated water storage reservoirs. Sodium hypochlorite (disinfectant), fluorosilicic acid (fluoridation), and sodium hydroxide (pH/alkalinity adjustment) are added to filter effluent upon such transfer to the reservoirs.

The chlorinated water is held in the storage reservoirs to allow for the necessary time required to achieve primary disinfection. Treated water is then transferred from the reservoirs to the elevated storage tank and 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 Sioux Lookout Urban 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	Other	Expense
Process Wastewater Recovery & UV Disinfection Project <sup>1</sup>	✓						\$2,052,389.00
LRV Calculator Development (H2O Innovation)						✓	\$6,215.00
Automation Services (New Programming, Troubleshooting)	✓	✓					\$5,898.04
Blower Repairs		✓					\$5,390.86
Membrane Integrity Test Valves			✓				\$5,154.92
Membrane Repair Station	✓						\$4,932.85
Additional Sampling Costs						✓	\$4,258.98
Fluoride Chemical Metering Pumps			✓				\$4,156.85
Milltronics Sensor for Clearwell					✓		\$3,332.37
Actuators and Valves					✓		\$2,236.17
Floc Motor					✓		\$1,856.92
Generator Load Testing & Inspections				✓			\$1,704.15
Door Hardware			✓				\$1,462.70
10 HP Pump Motor			✓				\$1,447.06
Chain Hoist Installation	✓						\$1,367.30
SCBA Inspections				✓			\$1,280.51
Hot Water Tank			✓				\$1,015.02

1. This project involved the installation of an ultrafiltration unit designed to treat process wastewater and two parallel UV reactors designed to treat filtrate from both the primary and secondary (process wastewater recovery) membranes.



## 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 Sioux Lookout Urban 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, fluoride and residual free chlorine. Approximately 3,800 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 and the free chlorine residual required to achieve primary disinfection are continuously monitored at the Urban Sioux Lookout 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	0.022	1.290	0.033
Turbidity (Filter 2)	NTU	0.021	0.860	0.033
Free Chlorine Residual (Treated)	mg/L	1.34	2.52	2.05
Fluoride Residual (Treated)	mg/L	0.54	0.81	0.65
Turbidity (Treated)	NTU	0.041	0.065	0.054
pH (Treated)	---	6.95	7.21	7.08

1. Average values for filter turbidity, free chlorine residual (treated) and fluoride residual (treated) are derived from daily instantaneous readings of continuous monitoring equipment. Maximum values for filter turbidity pertain to values recorded while the filter is in production and directing water to the next stage of treatment. Minimum values for free chlorine and fluoride residual omit those values that are the result of maintenance performed on the continuous monitoring equipment.
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.

### 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, the integrity of the membranes must be monitored and filtrate turbidity must be less than or equal to

0.1 NTU in at least 99% of the measurements each month. **Table 3** summarizes filter effluent 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 given month in 2014.

**TABLE 3: MEMBRANE FILTER PERFORMANCE**

Filter	Min.	Max.	Criterion
Filter 1	<99%	99.98%	<0.10 NTU in 99% of the measurements each month
Filter 2	<99%	100%	
Combined	98.36% <sup>1</sup>	99.99%	

1. This value is associated with Adverse Water Quality Incidents #121834 & #122126.



## Water Quality (continued)

### Microbiological Parameters

Microbiological analyses are performed on source, treated, and distribution system water. A total of 312 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 - 11	<1 - 1050	---	---
Treated Water	52	absent	absent	52	0 - 10
Distribution – Routine	208	absent	absent	64	0 - 5
Distribution – Non-routine	30	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	0.091	<0.020	0.091
May 13	0.090	<0.020	0.090
August 19	0.056	<0.020	0.056
November 25	0.066	<0.020	0.066
ODWQS	10	1	10

### Lead Sampling

The Sioux Lookout Urban 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. 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 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 28	Hydrant, Sioux Mountain School	7.10	20	
March 30	Hydrant, 7 Bay Street	7.03	20	
April 4	Hydrant, 121 Forest Drive	6.80	20	not required <sup>1</sup>
October 14	Hydrant, 7 Bay Street	6.85	20	
October 14	Hydrant, Front Street & First Avenue	6.89	20	
October 14	Hydrant, Airport (Northern Airborne)	6.77	20	

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 Sioux Lookout Urban 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	0.562	1.5
Mercury	µg/L	<0.10	1
Selenium	µg/L	<1.0	10
Sodium <sup>2</sup>	mg/L	8.81	20 <sup>3</sup>
Uranium	µg/L	<2.0	20

1. In accordance with Schedule 6-4. (Form of sampling) of O. Reg. 170/03, sampling and testing for fluoride is achieved through the use of continuous monitoring equipment. The sample result for fluoride pertains to a grab sample that was collected and sent to an accredited lab for analysis on April 17, 2012.
2. Treated water must be tested for sodium concentrations once every 5 years. The most recent sodium result pertains to a sample collected on January 12, 2010.
3. 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.

### 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. Due to elevated THM levels in distal portions of the Sioux Lookout distribution system, increased monitoring was conducted in 2014 in an attempt to evaluate the efficacy of treatment process changes upon THM concentrations, to determine the nature of THM formation at various locations in the distribution system, and to evaluate the effectiveness of bleeders at specific locations. Efforts to reduce THM concentrations and the special monitoring program were agreed upon by NWI, the Municipality of Sioux Lookout, and the Ministry of the Environment and Climate Change (MOECC).



## Water Quality (continued)

Compliance with the provincial standard for trihalomethane concentrations (100 µg/L) is generally determined by calculating a running annual average. Due to the special monitoring program in place for the Sioux Lookout Urban DWS, the results for all samples collected in 2014 are provided in **Table 8**. Averages have been provided where appropriate.

**TABLE 8: TOTAL THM SAMPLING RESULTS**

Sample Date (2014)	Total THM Results (µg/L)							
	Treated	Distribution Location 1	Distribution Location 2	Distribution Location 3	Distribution Location 4	Distribution Location 5	Distribution Location 6	Distribution Location 7
January 13	35.5	---	---	---	---	---	---	---
January 17	49.6	---	---	---	---	---	---	---
January 28	50.7	---	---	---	---	---	---	---
February 18	45.7	104	---	53.9	---	---	---	---
March 11	32.9	---	---	---	---	---	---	---
April 8	42.0	84.4	121	---	64.7	53.4	56.5	---
May 13	---	77.4	66.7	---	---	---	---	---
June 18	49.3	103	96.3	---	---	---	---	---
July 15	73.4	126	115	---	---	---	---	144
August 19	91.6	131	105	---	---	---	---	---
September 2	56.4	---	---	---	---	---	---	---
September 22	47.7	106	96.1	---	---	---	---	---
October 16	41.5	111	---	---	---	---	---	---
November 18	35.5	82.8	---	---	---	---	---	---
December 17	34.9	80.2	---	---	---	---	---	---
Average	49.1	100.6	100.0	---	---	---	---	---

### 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 Sioux Lookout Urban 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.





## Water Quality (continued)

**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



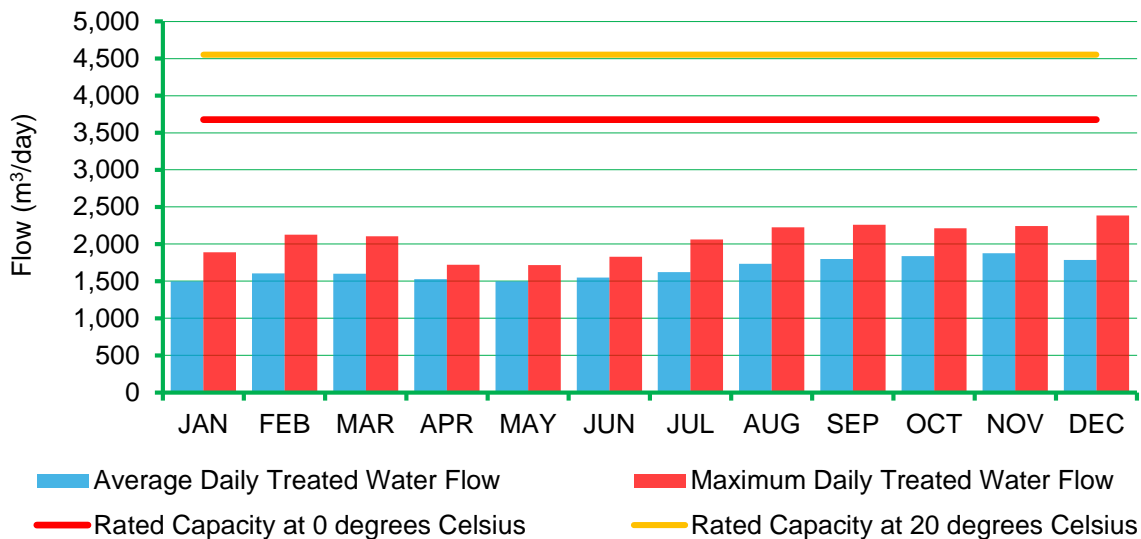
## Flows

### 2014 Flows

Throughout the reporting period, the Sioux Lookout Urban DWS supplied 606,465 m<sup>3</sup> of treated water to consumers. On an average day in 2014, 1,662 m<sup>3</sup> of treated water was supplied to the community. The average daily flow in 2014 represents 45.2% of the rated capacity of the Urban Sioux Lookout WTP at a water temperature of 0 °C (3,675 m<sup>3</sup>/day), or 36.5% of the rated capacity at a water temperature of 20 °C (4,550 m<sup>3</sup>/day). The maximum daily flow in 2014 was 2,385 m<sup>3</sup>/day, which represents 64.9 % of the rated capacity of the Urban Sioux Lookout WTP at a water temperature of 0 °C, or 52.4% of the rated capacity at a water temperature of 20 °C.

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 a significant reduction in the amount of treated water supplied in 2014 when compared to the previous calendar year. In 2013, 697,954 m<sup>3</sup> of treated water was supplied to users of the Sioux Lookout DWS, compared to 606,465 m<sup>3</sup> in 2014. This represents a 13.1% decrease in the amount of water supplied. The amount of treated water supplied in 2014 was the lowest annual volume in the previous nine years.

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**.

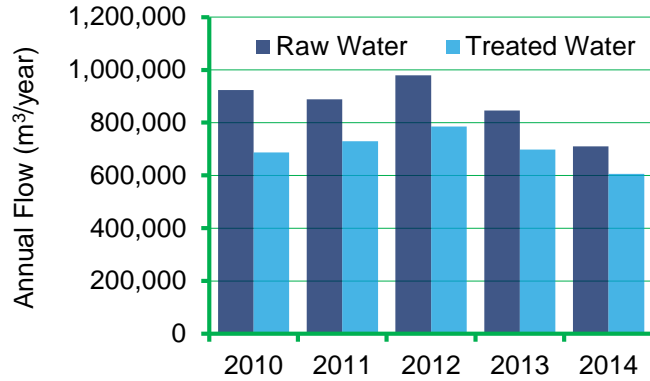


## Flows (continued)

### 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 10** summarizes total chemical consumptions and provides annual average dosages for each treatment chemical used at the Urban Sioux Lookout WTP. All chemicals used in the treatment process are NSF/ANSI 60 certified for use in potable water, as required by system approvals.

**FIGURE 2: HISTORICAL ANNUAL FLOWS**



**TABLE 10: CHEMICAL CONSUMPTIONS AND AVERAGE DOSAGES**

Treatment Chemical	Quantities Used (L)			Average Dosages (mg/L)		
	2012	2013	2014	2012	2013	2014
aluminum sulphate	88,723	69,342	77,005	58.4	52.8	68.8
sodium hydroxide	27,002	21,126	29,257	8.8	8.0	13.2
fluorosilicic acid	2,013	1,601	1,622	0.79	0.71	0.83
sodium hypochlorite	23,770	20,680	17,265	3.63	3.56	3.42



## 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 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 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. The eleven (11) incidents of adverse water quality in 2014 are summarized below.

**AWQI# 116151 (February 21, 2014);**  
**AWQI# 117517 (May 16, 2014);**  
**AWQI# 118205 (June 23, 2014);**  
**AWQI# 118998 (July 18, 2014);**  
**AWQI# 119776 (August 22, 2014);**  
**AWQI# 120660 (September 29, 2014);**  
**AWQI# 121270 (October 27, 2014); and,**  
**AWQI# 121651 (November 21, 2014)**

NWI received multiple notices from the licensed laboratory that the total trihalomethane running annual average concentration was greater than the Ontario Drinking Water Quality Standard of 100 µg/L. THM levels had previously exceeded the standard of 100 µg/L beginning in 2013.

Jar testing and adjustments to coagulant dosages were conducted at the Urban Sioux Lookout WTP in an effort to minimize THM formation at the facility. The results from the increased sampling program were also used to determine that elevated levels of THMs are most likely isolated to the extremities of the distribution system. For those distal locations experiencing elevated THM levels, bleeders were implemented in the second half of 2014 in an effort to reduce concentrations. Efforts to reduce THM formation at the WTP and within the distribution system will continue into 2015. These efforts will be coordinated between the Municipality of Sioux Lookout, NWI, and the MOECC.



## Compliance (continued)

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### **AWQI# 119645 (August 15, 2014)**

An adverse result occurred such that the free chlorine residual in a distribution sample was less than 0.05 mg/L. The premises was located on a dead-end line off of the main trunk line coming from the water tower. This incident was reported to the MOECC Spills Action Centre and to the Northwestern Health Unit.

Corrective action was performed in accordance with Schedule 17 of O. Reg. 170/03. This included verifying that the incident was isolated to the premises, flushing mains, restoring the disinfectant residual, and resampling and re-testing. Microbiological samples were collected and sent for analysis in the subsequent week. The Notice of Issue Resolution was provided on August 15, 2014.

### **AWQI# 121834 (December 2, 2014);**

### **AWQI# 122126 (January 2, 2015)**

An operational indicator of adverse water quality occurred following a failure to meet the performance criterion for membrane filtrate turbidity of <0.10 NTU in at least 99% of measurements for the months of November and December. In November 2014, combined filtrate turbidity was determined to be less than 0.1 NTU in 98.87% of measurements (AWQI# 121834). In December 2014, combined filtrate turbidity was determined to be less than 0.1 NTU in 98.36% of measurements (AWQI# 122126). The issues were reported to the MOECC Spills Action Centre and to the Northwestern Health Unit.

Short term corrective action included verifying the operation of turbidity monitoring equipment and upstream processes, cleaning various system components, changing valves and feed lines, and conducting automation upgrades. Consequently, the system achieved compliance with respect to the performance criterion in the month of January 2015. Long term corrective action includes installing filter-to-waste capability such that filtrate could be directed to waste or recirculated to upstream treatment processes in the event that turbidity exceeds 0.10 NTU. The Notice of Issue Resolution was provided on February 5, 2014.

## **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 three (3) known incidents of non-compliance in 2014 for the Sioux Lookout Urban DWS. These items were identified within the 2014-2015 Inspection Report by Ontario's Ministry of the Environment and Climate Change. Information concerning the duration of failures and the measures taken to address those failures will be provided for each item of non-compliance. The details of the noncompliance and the actions required utilize the original wording contained within the inspection report. Updates concerning the noncompliance items have been provided by NWI where necessary.



## Compliance (continued)

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**Item 1 - Records did not confirm that the water treatment equipment which provides chlorination or chloramination for secondary disinfection purposes was operated so that at all times and all locations in the distribution system the chlorine residual was never less than 0.05 mg/l free or 0.25 mg/l combined.**

**Details:** O. Reg. 170/03, Schedule 1, subsection 1-2(2) states that the owner of a drinking water system and the operating authority for the system shall ensure that if the drinking water system's water treatment equipment provides chlorination for secondary disinfection, the equipment is operated so that, at all times and at all locations within the distribution system, the chlorine residual is never less than 0.05 mg/L.

On November 6, 2013, a low chlorine residual of 0.02 mg/L occurred in the distribution system on Queen Street.

**Action(s) Required:** Operators immediately flushed the affected area and restored chlorination. Eventually, NWI installed a permanent bleeder at this location. Chlorine residual testing was done for several weeks after the bleeder was installed and chlorine residuals remained above 0.05 mg/L during the testing. No further action is required.

**Item 2 - All continuous monitoring equipment utilized for sampling and testing required by O. Reg. 170/03, or approval or order, were not equipped with alarms or shut-off mechanisms that satisfied the standards described in Schedule 6.**

**Details:** In accordance with paragraph 5., subsection (1) and paragraph 1., subsection (1.1), section 6-5., Schedule 6, O. Reg. 170/03, continuous monitoring equipment must have a feature that ensures that no water is directed to users in the event that the equipment malfunctions; or, the continuous monitoring equipment must cause an alarm to sound immediately at the WTP and at a location where an operator is present if the equipment malfunctions.

Through discussions with operators, it was determined that an alarm function has not been programmed into the facility's program logic controller (PLC) to address a turbidity analyzer malfunction. There is also no feature that would ensure that no water is directed to users in the event of turbidity analyzer malfunction. As such, the possibility exists that one or both of the turbidity analyzers could malfunction (e.g. turbidity bulb failure), resulting in a loss of continuous monitoring for turbidity while the filters are producing water.

**Action(s) Required:** On July 10, 2014, the ORO confirmed that Automation Now programmed a feature into the PLC that will ensure that each filter train will shut down in the event that a turbidity output is reading zero for turbidity (e.g. analyzer failure). Operators were able to test the changes by removing the signal wire going to the PLC; this caused the filter to shut down and the PLC sent out an alarm. No further action is required.



## Compliance (continued)

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**Item 3 - Where required continuous monitoring equipment, used for the monitoring of chlorine residual and/or turbidity triggered an alarm or an automatic shut-off, a qualified person did not respond in a timely manner and/or did not take appropriate actions.**

**Details:** During the inspection, the ORO and undersigned officer reviewed several "after hour" alarm conditions (e.g. low chlorine) that would have triggered an alarm and operator call-out. A review of the logbooks revealed that operators are not consistently recording the time that they respond to alarms and in some cases, there is no record of response in the logbook; therefore, it was not possible to determine whether or not operators are responding in a timely manner.

**Action(s) Required:** Effective immediately, operators must ensure that they record the time that they respond to alarm events and the actions they take upon responding. This issue will be re-assessed during the next inspection.

**Update:** Subsequent communication between operators, the ORO, and the Compliance Department emphasized recordkeeping requirements concerning alarm events.

## Appendix A – Flow Data

**TABLE A1: 2014 FLOWS<sup>1,2</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, 0 °C)	Capacity Assessment (Average Flows, 20 °C)	Capacity Assessment (Maximum Flows, 0 °C)	Capacity Assessment (Maximum Flows, 20 °C)
Jan	56,804	46,476	1,499	1,888	40.8%	33.0%	51.4%	41.5%
Feb	54,241	45,012	1,608	2,125	43.7%	35.3%	57.8%	46.7%
Mar	57,260	49,680	1,603	2,105	43.6%	35.2%	57.3%	46.3%
Apr	52,921	45,808	1,527	1,722	41.5%	33.6%	46.9%	37.8%
May	52,710	46,425	1,498	1,718	40.8%	32.9%	46.7%	37.8%
Jun	51,875	46,440	1,548	1,830	42.1%	34.0%	49.8%	40.2%
Jul	56,922	50,239	1,621	2,061	44.1%	35.6%	56.1%	45.3%
Aug	61,247	53,768	1,734	2,228	47.2%	38.1%	60.6%	49.0%
Sep	64,639	54,013	1,800	2,260	49.0%	39.6%	61.5%	49.7%
Oct	67,946	56,929	1,836	2,214	50.0%	40.4%	60.2%	48.7%
Nov	67,192	56,335	1,878	2,245	51.1%	41.3%	61.1%	49.3%
Dec	66,888	55,340	1,785	2,385	48.6%	39.2%	64.9%	52.4%
Total	710,645	606,465	---	---	---	---	---	---
Avg.	59,220	50,539	1,661	---	45.2%	36.5%	---	---

1. The production capacity of the membrane filtration units depends upon water temperature, and capacity values are stated for 0 and 20 °C within the Municipal Drinking Water Licence for the Sioux Lookout Urban DWS. Production capacity is prorated accordingly for water temperatures between these two limits.
2. 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
2006	n/a	702,510	---	---	---
2007	n/a	757,770	---	---	7.9%
2008	n/a	735,920	---	---	-2.9%
2009	n/a	636,700	---	---	-13.5%
2010	923,850	687,640	74.4%	---	8.0%
2011	888,430	729,341	82.1%	-3.8%	6.1%
2012	979,670	785,457	80.2%	10.3%	7.7%
2013	846,566	697,954	82.4%	-13.6%	-11.1%
2014	710,645	606,465	85.3%	-16.1%	-13.1%

1. Data concerning annual total raw water volumes were unavailable for the preparation of this report for the years spanning 2006 – 2009.