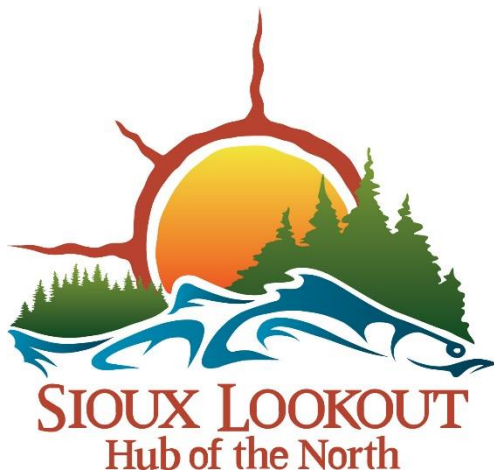


# Sioux Lookout Water Pollution Control Plant

---

## 2014 Annual Performance Report



Prepared for: The Corporation of the Municipality of Sioux Lookout  
Prepared by: Northern Waterworks Incorporated

### Contents

---

|   |  |   |  |
|---|--|---|--|
| 1 | Introduction<br>Page 1                           | 6 | Solids Handling<br>Pages 7 - 8                         |
| 2 | System Description<br>Page 2                     | 7 | Maintenance Activities & Modifications<br>Pages 8 - 10 |
| 3 | Water Quality Monitoring Programs<br>Pages 2 - 4 | 8 | Operating Problems<br>Page 10                          |
| 4 | Water Quality Monitoring Results<br>Pages 4 - 5  | 9 | Conclusion<br>Page 11                                  |
| 5 | Flow Monitoring Results<br>Pages 5 - 7           |   | Appendix A: Monitoring Results<br>Pages 12 - 13        |

## 1 Introduction

The Sioux Lookout Water Pollution Control Plant (the Works) is obligated to meet the terms and conditions specified within Certificate of Approval Number 3-0250-92-006 (the Certificate). This Annual Performance Report shall summarize the system's performance over the past calendar year (January 1 to December 31, 2014). The Sioux Lookout Water Pollution Control Plant (WPCP) is owned by the Corporation of the Municipality of Sioux Lookout and was operated by Northern Waterworks Incorporated (NWI) for the duration of the reporting period.

This Report has been prepared in accordance with Condition 17 of the Certificate, and it is intended (1) to provide a performance record for future references, (2) to ensure that the Ministry of the Environment and Climate Change (MOECC) is made aware of problems as they arise, and (3) to provide a compliance record for all the terms and conditions outlined in the Certificate. This report must contain, but shall not be limited to, the following information:

- (a) A summary of all monitoring and compliance reports submitted in the reporting period, including an overview of the success and adequacy of the sewage treatment program (**section 9**);
- (b) A comprehensive interpretation of all monitoring data and analytical data collected relative to the works during the reporting period and a comparison to the effluent quality and quantity criteria (**sections 4 & 5**);
- (c) A summary of any effluent quality assurance or control measures undertaken during the reporting period (**section 3**);
- (d) A summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works (**section 7**);
- (e) A description of any operating problems encountered and corrective actions taken during the reporting period (**section 8**);
- (f) A summary of any proposed alteration, extension or replacement in the process or operation of the Works to be completed over the next reporting period which may require approval under the Ontario Water Resources Act (**section 7**);
- (g) A tabulation of the volume of sludge generated in the reporting period and an outline of anticipated volumes to be generated over the next reporting period (**section 6**);
- (h) An outline of the sludge handling methods and disposal areas to be utilized over the next reporting period (**section 6**);
- (i) An evaluation of the calibration and maintenance procedures conducted on all monitoring equipment (**section 7**); and,
- (j) An evaluation for the need for modifications to the Works to improve performance and reliability and to minimize upsets and bypasses (**section 7**).

## 2 System Description

The Sioux Lookout WPCP is a component of the sewage works facilities that service the community of Sioux Lookout. The entirety of the sewage works consists of sanitary sewers, force-mains, sewage pumping stations (lift stations), and an extended aeration water pollution control plant. Sanitary sewers collect wastewater and direct it to multiple lift stations located throughout the community. The lift stations subsequently transfer wastewater through force-mains to the Robert Street Sewage Pumping Station. This pumping station includes an underground wet well and two variable speed submersible pumps for transferring wastewater via force-main to the Sioux Lookout WPCP for treatment. This station also includes a standby power system.

Designed for the treatment and disposal of sewage, the Sioux Lookout WPCP has an average daily rated capacity of 2,840 m<sup>3</sup>/day with a peak flow rated capacity of 9,230 m<sup>3</sup>/day. The facility consists of a mechanical and stationary bar screen for the removal of large particles, a grit removal system, two circular treatment units each containing an aeration tank, clarifier, and aerobic sludge digester, and a chlorine contact chamber for disinfection prior to discharge to Pelican Lake. The Sioux Lookout WPCP also includes a control building containing a laboratory, a gas chlorination chemical feed system, a standby power system, blowers, control and metering systems, piping, and heating and ventilation systems. As an extended aeration facility, the Sioux Lookout WPCP utilizes a biological treatment method that relies on microorganisms to process the incoming wastewater.

## 3 Water Quality Monitoring Programs

Samples are collected by licensed operators and submitted to an accredited laboratory for analysis on a biweekly basis. Minimum requirements concerning the sampling and testing of raw sewage and final effluent parameters are contained within Condition 15 (Monitoring and Reporting) of the Certificate. Additionally, the sampling program has been designed to comply with the federal *Wastewater Systems Effluent Regulations* (WSER). **Table 1** summarizes the sampling program employed at the Sioux Lookout WPCP.

In addition to analyses conducted by an accredited laboratory, an in-house testing program is employed at the Sioux Lookout Water Pollution Control Plant. Licenced operators conduct in-house testing to determine the operational performance of the various stages of the treatment process and for quality assurance purposes as it concerns final effluent parameters. **Table 2** summarizes those parameters that were tested for operational control or quality assurance purposes during the reporting period. This table is intended to provide a summary of effluent quality assurance and control measures undertaken in the reporting period, as required by Condition 17(c) of the Certificate.

**Table 1: Sampling Program Overview**

| Parameter                              | Sample Type <sup>1</sup> | Frequency |
|--|--------------------------|-----------|
| <u>Influent Monitoring</u>             |                          |           |
| BOD5                                   | Composite                | Biweekly  |
| Suspended Solids                       | Composite                | Biweekly  |
| Total Kjeldahl Nitrogen                | Composite                | Biweekly  |
| Total Phosphorus                       | Composite                | Biweekly  |
| Chemical Oxygen Demand <sup>2</sup>    | Composite                | Biweekly  |
| Volatile Organic Acids <sup>2</sup>    | Composite                | Biweekly  |
| pH <sup>2</sup>                        | Composite                | Biweekly  |
| <u>Effluent Monitoring</u>             |                          |           |
| BOD5                                   | Composite                | Biweekly  |
| CBOD5 <sup>3</sup>                     | Composite                | Biweekly  |
| Suspended Solids                       | Composite                | Biweekly  |
| Total Ammonia Nitrogen                 | Composite                | Biweekly  |
| Total Kjeldahl Nitrogen                | Composite                | Biweekly  |
| Nitrate                                | Composite                | Biweekly  |
| Nitrite                                | Composite                | Biweekly  |
| Total Phosphorus                       | Composite                | Biweekly  |
| Orthophosphate, Dissolved <sup>2</sup> | Composite                | Biweekly  |
| Chemical Oxygen Demand <sup>2</sup>    | Composite                | Biweekly  |
| Volatile Organic Acids <sup>2</sup>    | Composite                | Biweekly  |
| pH                                     | Composite                | Biweekly  |
| Field Temperature                      | Grab                     | Biweekly  |
| Field Total Residual Chlorine          | Grab                     | Biweekly  |
| <i>E. Coli</i>                         | Grab                     | Biweekly  |
| Un-ionized Ammonia <sup>4</sup>        | Calculation              | Biweekly  |

1. A composite sample refers to a sample that is collected over a time period of at least 24 consecutive hours. The sample is made up of at least 24 discrete samples taken approximately one hour apart, with the volume of each sample being proportional to the sewage flow at the time the discrete sample is taken. A grab sample refers to an individual sample of sufficient size collected at a randomly selected time.
2. These influent and effluent parameters are not a component of the mandatory sampling program required by the Certificate of Approval.
3. The final effluent parameter CBOD5 is not a component of the mandatory sampling program required by the Certificate of Approval. However, effluent CBOD5 must be tested on a monthly basis in accordance with the federal *Wastewater Systems Effluent Regulations*.
4. The final effluent parameter un-ionized ammonia is not a component of the mandatory sampling program required by the Certificate of Approval. However, effluent un-ionized ammonia was required to be calculated on a monthly basis during the first half of 2014, in accordance with the federal *Wastewater Systems Effluent Regulations*. Un-ionized ammonia is calculated by the laboratory using the total ammonia concentration, pH and field temperature.

**Table 2:** Testing Program Overview (Operational Control & Quality Assurance)<sup>1</sup>

| Process Step       | Analyzed Parameters   |
|--------------------|---|
| Influent           | Dissolved Oxygen, pH, Temperature   |
| Aeration (x2)      | 30 Minute Settling Volume, pH, Settling Observations, Microscopic Observations, Dissolved Oxygen (Aeration Influent), Dissolved Oxygen (Aeration Effluent), Aeration Suspended Solids, Return Activated Sludge Suspended Solids |
| Clarification (x2) | Sludge Blanket Depth, Dissolved Oxygen, Temperature   |
| Effluent           | Dissolved Oxygen, pH, Temperature, Suspended Solids, Free Residual Chlorine, Total Residual Chlorine  |

1. All samples collected for the in-house testing program are grab samples.

## 4 Water Quality Monitoring Results

**Table 3** summarizes all relevant objectives and compliance limits for final effluent parameters. Effluent objectives are prescribed within Condition 11 of the Certificate, and the Works must be designed, constructed, and operated so as to achieve these objectives. Compliance limits are prescribed within Condition 12 of the Certificate, and any exceedance constitutes non-compliance.

**Table 3:** Effluent Objectives and Compliance Limits (Performance Criteria)

| Final Effluent Parameter | Average Monthly Concentration <sup>1</sup> |                | Average Monthly Loading <sup>2</sup> |            |
|--------------------------|--|----------------|--------------------------------------|------------|
|                          | Objective                                  | Compliance     | Objective                            | Compliance |
| BOD5                     | 10 mg/L                                    | 25 mg/L        | 28.4 kg/d                            | 71 kg/d    |
| Suspended Solids         | 10 mg/L                                    | 25 mg/L        | 28.4 kg/d                            | 71 kg/d    |
| Total Residual Chlorine  | 0.5 mg/L                                   | 1.2 mg/L       | ---                                  | ---        |
| E. Coli <sup>3</sup>     | 150 MPN/100 mL                             | 200 MPN/100 mL | ---                                  | ---        |

1. Average monthly concentration is defined within the Certificate as the arithmetic mean of the concentrations of all daily discharges sampled or measured, or both, during the period of one month.
2. Average monthly loading is defined within the Certificate as the value obtained by multiplying the average monthly concentration with the average (daily) flow over the same period of time.
3. The objective and compliance limit indicated for the parameter E. Coli is expressed as the geometric mean density. The objective and compliance limit refer to the geometric mean density for all E. Coli results for any calendar month.

In accordance with Condition 17(b) of the Certificate, this report must provide a comprehensive interpretation of all monitoring and analytical data collected relative to the Works during the reporting period, complete with a comparison to the effluent quality criteria. **Table 4** summarizes and compares average monthly concentrations, average monthly loadings and monthly geometric mean densities (E. Coli) with associated effluent objectives and compliance limits. Individual sample results for all influent and effluent parameters are provided within **Appendix A**.

**Table 4: 2014 Comparison of Effluent Quality with Performance Criteria<sup>1</sup>**

| Month | BOD5       |            |                     |           | Suspended Solids |            |                     |           | TRC        |                    |           | E. Coli         |                    |           |
|-------|------------|------------|---------------------|-----------|------------------|------------|---------------------|-----------|------------|--------------------|-----------|-----------------|--------------------|-----------|
|       | AMC (mg/L) | AML (kg/d) | Objectives Achieved | Compliant | AMC (mg/L)       | AML (kg/d) | Objectives Achieved | Compliant | AMC (mg/L) | Objective Achieved | Compliant | GMD (MPN/100mL) | Objective Achieved | Compliant |
| Jan.  | 3.4        | 5.2        | ✓                   | ✓         | 11.3             | 17.4       | ✗                   | ✓         | 0.75       | ✗                  | ✓         | 13              | ✓                  | ✓         |
| Feb.  | 6.1        | 9.8        | ✓                   | ✓         | 19.3             | 30.9       | ✗                   | ✓         | 1.16       | ✗                  | ✓         | 1               | ✓                  | ✓         |
| Mar.  | 9.4        | 14.1       | ✓                   | ✓         | 16.7             | 25.2       | ✗                   | ✓         | 1.17       | ✗                  | ✓         | 1               | ✓                  | ✓         |
| Apr.  | 5.8        | 12.4       | ✓                   | ✓         | 12.2             | 26.2       | ✗                   | ✓         | 0.65       | ✗                  | ✓         | 20              | ✓                  | ✓         |
| May.  | 5.3        | 13.4       | ✓                   | ✓         | 12.3             | 31.0       | ✗                   | ✓         | 0.58       | ✗                  | ✓         | 272             | ✗                  | ✗         |
| Jun.  | 5.4        | 14.1       | ✓                   | ✓         | 8.3              | 21.6       | ✓                   | ✓         | 0.59       | ✗                  | ✓         | 14              | ✓                  | ✓         |
| Jul.  | 2.0        | 4.5        | ✓                   | ✓         | 6.0              | 13.5       | ✓                   | ✓         | 0.64       | ✗                  | ✓         | 1               | ✓                  | ✓         |
| Aug.  | 2.0        | 3.6        | ✓                   | ✓         | 4.8              | 8.6        | ✓                   | ✓         | 0.52       | ✗                  | ✓         | 14              | ✓                  | ✓         |
| Sep.  | 2.0        | 3.5        | ✓                   | ✓         | 6.4              | 11.2       | ✓                   | ✓         | 0.52       | ✗                  | ✓         | 1               | ✓                  | ✓         |
| Oct.  | 2.9        | 5.5        | ✓                   | ✓         | 13.8             | 26.8       | ✗                   | ✓         | 0.58       | ✗                  | ✓         | 5               | ✓                  | ✓         |
| Nov.  | 2.4        | 4.6        | ✓                   | ✓         | 15.6             | 30.6       | ✗                   | ✓         | 0.43       | ✓                  | ✓         | 3               | ✓                  | ✓         |
| Dec.  | 4.6        | 8.0        | ✓                   | ✓         | 18.3             | 31.4       | ✗                   | ✓         | 0.43       | ✓                  | ✓         | 3               | ✓                  | ✓         |

1. BOD5 = Biochemical Oxygen Demand; TRC = Total Residual Chlorine; AMC = Average Monthly Concentration; AML = Average Monthly Loading; GMD = Geometric Mean Density.

Concerning the effluent parameter BOD5, all objectives and limits were achieved for the entire reporting period.

Concerning the effluent parameter suspended solids, compliance limits were achieved for the entire reporting period. However, the objective for average monthly concentration was exceeded in eight (8) months in 2014. Additionally, the objective for average monthly loading was exceeded in four (4) months in 2014.

Concerning the effluent parameter total residual chlorine, compliance limits were achieved for the entire reporting period. However, the objective for average monthly concentration was exceeded in ten (10) months in 2014.

Concerning the effluent parameter E. Coli, the objective and compliance limit for geometric mean density were exceeded for one (1) month in 2014.

## 5 Flow Monitoring Results

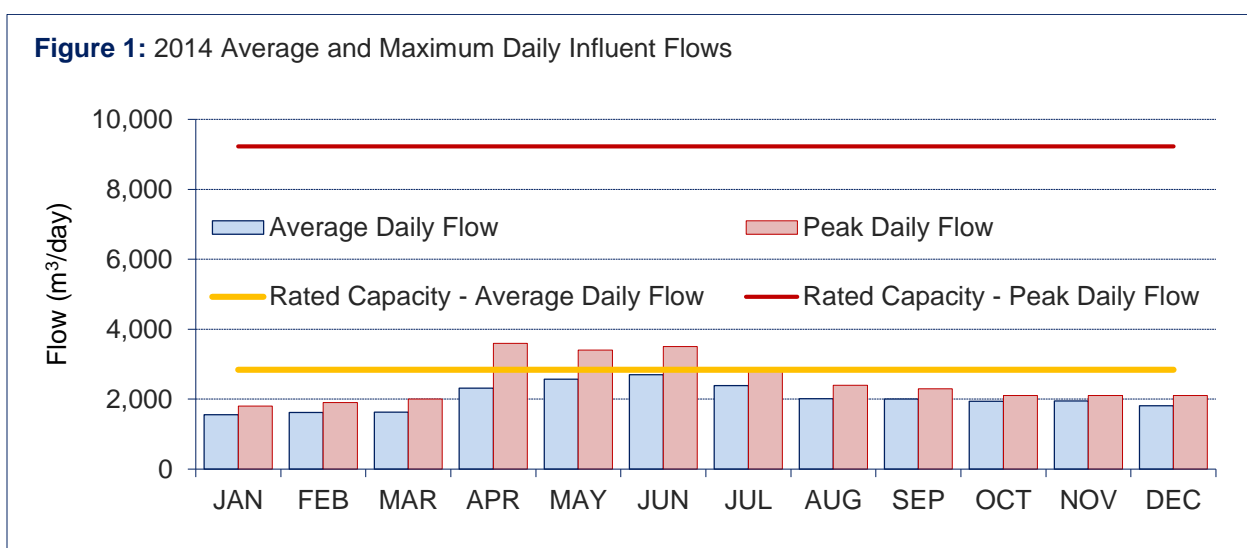
Condition 13(a) of the Certificate states that the sewage works has been approved to treat sewage at an average flow of 2,840 m<sup>3</sup>/day, with a peak flow rate of 9,230 m<sup>3</sup>/day. Condition 13(b) states that the introduction of sewage flows in excess of the peak flow rate is not approved under the Certificate. Condition 13(c) states that the introduction of sewage flows in excess of the average daily flow for any consecutive period of time greater than one year is not approved.

**Table 5** and **Figure 1** summarize and compare average and maximum daily flows to the limits provided in the Certificate. Throughout the reporting period, 745,600 m<sup>3</sup> of influent was introduced to the Works. On an average day in 2014, 2,043 m<sup>3</sup> of influent was introduced to the Works, representing 71.9% of the average daily rated capacity of the Sioux Lookout WPCP. The peak volume of influent introduced to the Works on a given day in 2014 was 3,600 m<sup>3</sup>/day, representing 39.0% of the peak flow rated capacity.

**Table 5: 2014 Flows & Comparisons with Rated Capacity<sup>1,2</sup>**

| Month | Influent Wastewater                    |  |                                     |                                       |                                  | Effluent                               |  |                                       |
|-------|--|--|-------------------------------------|---------------------------------------|----------------------------------|--|--|---------------------------------------|
|       | Total Monthly Volume (m <sup>3</sup> ) | Average Daily Flow (m <sup>3</sup> /day) | Capacity Assessment (Average Flows) | Peak Daily Flow (m <sup>3</sup> /day) | Capacity Assessment (Peak Flows) | Total Monthly Volume (m <sup>3</sup> ) | Average Daily Flow (m <sup>3</sup> /day) | Peak Daily Flow (m <sup>3</sup> /day) |
| Jan.  | 48,300                                 | 1,558                                    | 54.9%                               | 1,800                                 | 19.5%                            | 47,760                                 | 1,541                                    | 1,800                                 |
| Feb.  | 45,300                                 | 1,618                                    | 57.0%                               | 1,900                                 | 20.6%                            | 44,760                                 | 1,599                                    | 1,830                                 |
| Mar.  | 50,400                                 | 1,626                                    | 57.2%                               | 2,000                                 | 21.7%                            | 46,840                                 | 1,511                                    | 1,960                                 |
| Apr.  | 69,400                                 | 2,313                                    | 81.5%                               | 3,600                                 | 39.0%                            | 64,360                                 | 2,145                                    | 3,280                                 |
| May.  | 79,800                                 | 2,574                                    | 90.6%                               | 3,400                                 | 36.8%                            | 78,190                                 | 2,522                                    | 3,420                                 |
| Jun.  | 80,900                                 | 2,697                                    | 95.0%                               | 3,500                                 | 37.9%                            | 78,070                                 | 2,602                                    | 3,550                                 |
| Jul.  | 74,000                                 | 2,387                                    | 84.1%                               | 2,900                                 | 31.4%                            | 70,310                                 | 2,268                                    | 3,230                                 |
| Aug.  | 62,500                                 | 2,016                                    | 71.0%                               | 2,400                                 | 26.0%                            | 55,860                                 | 1,802                                    | 2,610                                 |
| Sep.  | 60,100                                 | 2,003                                    | 70.5%                               | 2,300                                 | 24.9%                            | 52,540                                 | 1,751                                    | 2,090                                 |
| Oct.  | 60,200                                 | 1,942                                    | 68.4%                               | 2,100                                 | 22.8%                            | 60,150                                 | 1,940                                    | 2,260                                 |
| Nov.  | 58,500                                 | 1,950                                    | 68.7%                               | 2,100                                 | 22.8%                            | 58,790                                 | 1,960                                    | 2,240                                 |
| Dec.  | 56,200                                 | 1,813                                    | 63.8%                               | 2,100                                 | 22.8%                            | 53,340                                 | 1,721                                    | 2,460                                 |
| Total | 745,600                                | ---                                      | ---                                 | ---                                   | ---                              | 710,970                                | ---                                      | ---                                   |
| Avg.  | 62,133                                 | 2,043                                    | 71.9%                               | ---                                   | ---                              | 59,248                                 | 1,948                                    | ---                                   |

1. Capacity assessments compare average and peak daily flows to the rated capacities provided within the Certificate.
2. Outlined results correspond to the annual average daily flow and to the peak daily flow achieved within the calendar year.



**Table 6** summarizes recent historical influent wastewater flows. There was an 8.5% reduction in the total amount of wastewater introduced to the Works in 2014 when compared to the previous calendar year. 815,300 m<sup>3</sup> of influent wastewater was introduced to the Sioux Lookout WPCP in 2013, compared to a total of 745,600 m<sup>3</sup> in 2014.

**Table 6:** Recent Historical Influent Wastewater Flows

| Year | Total Annual Volume (m <sup>3</sup> ) | % Change in Total Annual Flow from Previous Year | Average Daily Flow (m <sup>3</sup> /day) | Capacity Assessment (Average Flows) | Peak Daily Flow (m <sup>3</sup> /day) | Capacity Assessment (Peak Flows) |
|------|---------------------------------------|--|--|-------------------------------------|---------------------------------------|----------------------------------|
| 2010 | 895,300                               | ---  | 2,453                                    | 86.4%                               | ---                                   | ---                              |
| 2011 | 778,100                               | -13.1%   | 2,132                                    | 75.1%                               | 4,340                                 | 47.0%                            |
| 2012 | 908,700                               | 16.8%  | 2,483                                    | 87.4%                               | 4,200                                 | 45.5%                            |
| 2013 | 815,300                               | -10.3%   | 2,234                                    | 78.7%                               | 4,200                                 | 45.5%                            |
| 2014 | 745,600                               | -8.5%  | 2,043                                    | 71.9%                               | 3,600                                 | 39.0%                            |

## 6 Solids Handling

### 6.1 Solids Handling Methods

In accordance with Condition 17(h) of the Certificate, this report must provide an outline of the sludge handling methods and disposal areas that will be utilized over the next reporting period. The amount of solids in the treatment process is controlled by directing activated sludge (i.e. waste activated sludge) to the respective aerobic digesters at the Sioux Lookout WPCP. Sludge is subsequently transferred to a dewatering system for further processing, such that solids are concentrated and much of the water present is removed and returned to the influent works. Dewatered sludge is then hauled by trailer to the Hidden Lake Landfill Site, where solids are mixed with sand and used as cover for the site. Sludge handling methods and disposal areas to be utilized over the next reporting period are not expected to change.

### 6.2 Solids Handling Tabulation

In accordance with Condition 17(g) of the Certificate, this report must provide a tabulation of the volume of sludge generated in the reporting period, in addition to providing an outline of anticipated volumes to be generated over the next reporting period. A tabulation of the amount of sludge generated in the reporting period is provided in **Table 7**. In 2014, approximately 1,119 m<sup>3</sup> of dewatered solids were removed from the Sioux Lookout WPCP. This equates to 331 trailer hauls and 947,719 kg of sludge. This amount of solids was the result of dewatering 4,968 m<sup>3</sup> of waste activated sludge. The amount of dewatered sludge generated and removed from the facility in 2015 is anticipated to be similar to the amounts removed in 2014.



**Table 7: 2014 Solids Handling Tabulation**

| Month | Waste Activated Sludge (WAS) |                             |                                | Dewatered Sludge        |  |                           |
|-------|------------------------------|-----------------------------|--------------------------------|-------------------------|--|---------------------------|
|       | CTU 1 WAS (m <sup>3</sup> )  | CTU 2 WAS (m <sup>3</sup> ) | Combined WAS (m <sup>3</sup> ) | Number of Trailer Hauls | Total Volume Generated (m <sup>3</sup> ) | Total Mass Generated (kg) |
| Jan.  | 105                          | 161                         | 266                            | 16                      | 54.1                                     | 42,770                    |
| Feb.  | 135                          | 295                         | 430                            | 24                      | 81.1                                     | 55,800                    |
| Mar.  | 135                          | 265                         | 400                            | 32                      | 108.2                                    | 76,280                    |
| Apr.  | 137                          | 201                         | 338                            | 33                      | 111.5                                    | 84,310                    |
| May.  | 208                          | 148                         | 356                            | 26                      | 87.9                                     | 70,289                    |
| Jun.  | 158                          | 128                         | 286                            | 20                      | 67.6                                     | 61,840                    |
| Jul.  | 184                          | 185                         | 369                            | 33                      | 111.5                                    | 92,720                    |
| Aug.  | 218                          | 232                         | 450                            | 31                      | 104.8                                    | 103,810                   |
| Sep.  | 284                          | 279                         | 563                            | 33                      | 111.5                                    | 117,900                   |
| Oct.  | 257                          | 307                         | 564                            | 44                      | 148.7                                    | 135,920                   |
| Nov.  | 143                          | 214                         | 357                            | 8                       | 27.0                                     | 25,110                    |
| Dec.  | 352                          | 237                         | 589                            | 31                      | 104.8                                    | 80,970                    |
| Total | 2,316                        | 2,652                       | 4,968                          | 331                     | 1,118.8                                  | 947,719                   |

## 7 Maintenance Activities & Modifications

### 7.1 Maintenance Summary

The Sioux Lookout WPCP employs a planned maintenance program that ensures that the sewage works and related equipment that are installed or used to achieve compliance are properly operated and maintained. Licenced operators perform routine maintenance on all equipment including pumps, blowers, monitoring equipment, standby power systems, gas chlorination equipment, and alarm systems. Both routine and non-routine (i.e. emergency repairs) maintenance activities are conducted in accordance with manufacturers' instructions.

In accordance with Condition 17(d) of the Certificate, this report must include a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works. Maintenance activities performed during the reporting period include:

- (1) All lift stations were cleaned and assessed, including the Robert Street lift station;
- (2) Pumps were replaced at the Pelican Park lift station;
- (3) The Programmable Logic Controller at the Moran lift station was replaced;
- (4) The breaker for CTU #1 at the WPCP was replaced, which included completing rewiring from the main panel; and,
- (5) An electric actuating valve was installed on the sludge line between the sludge press and bypass pump.

## 7.2 Monitoring Equipment Calibration & Maintenance

Condition 13(d) of the Certificate requires the installation, maintenance, and operation of a sufficient number of flow measurement devices. These devices must be calibrated at regular intervals not exceeding one year to ensure their accuracy within  $\pm 5\%$  of the full scale reading. Flow meters are required to measure a) the quantity of sewage being conveyed to and through the sewage treatment plant and b) the quantity of untreated sewage being bypassed to the disinfection facility. Flow monitoring equipment indicated in the Certificate includes one (1) 229 mm throat dimension Parshall flume at the influent works and one (1) V-notch weir for measuring plant effluent flow.

In accordance with Condition 17(i) of the Certificate, this report must include an evaluation of the calibration and maintenance procedures conducted on all monitoring equipment. NWI considers adequate the calibration and maintenance procedures conducted on all monitoring equipment. Calibration and maintenance activities performed during the reporting period include:

- (1) Annual inspection and calibration verification for the influent wastewater flow measuring device was conducted on August 28;
- (2) Annual inspection and calibration verification for the effluent flow measuring device was conducted on August 26; and,
- (3) Beginning in the final quarter of 2014, cleaning, inspection and quality assurance was conducted on a monthly basis for the handheld colorimeter used to determine chlorine residuals.

## 7.3 Proposed Alterations, Extensions, or Replacements

In accordance with Condition 17(f) of the Certificate, this report must provide a summary of any proposed alteration, extension, or replacement in the process or operation of the works to be completed over the next reporting period which may require approval under the *Ontario Water Resources Act*. Such anticipated alterations, extension, or replacements for the Sioux Lookout WPCP include the following:

- (1) Automation (SCADA/PLC) upgrades at the Sioux Lookout WPCP; and,
- (2) The installation of new gas chlorinators at the Sioux Lookout WPCP, complete with flow-proportional dosing capability.

## 7.4 Modifications to Improve Operational Performance

In accordance with Condition 17(j) of the Certificate, this report must provide an evaluation for the need for modifications to the Works to improve performance and reliability and to minimize upsets and bypasses. For the purposes of this report, modifications intended to improve performance include suggestions for the provision of infrastructure. Modifications that may improve the performance and reliability of the sewage treatment program include:

- (1) Various lift station upgrades to address the findings of the 2014 assessment;
- (2) The installation of a new power line at the Pelican Park lift station;
- (3) The replacement of the pump base and rail system at the Pelican Marina lift station;
- (4) Blower upgrades at the WPCP to improve energy efficiency;
- (5) A new bar screen conveyor auger and liner;
- (6) New monitoring instruments including a composite sampler and a handheld dissolved oxygen meter; and,
- (7) Equipment inspections including backflow prevention device inspections, thermal inspections for electrical equipment, and generator inspections.

## 8 Operating Problems

In accordance with Condition 17(e) of the Certificate, this report must provide a description of any operating problems encountered and corrective actions taken during the reporting period. Operating problems include but are not limited to spills, bypass events, compliance limit exceedances, rated capacity exceedances, and any other contraventions of Conditions specified within the Certificate. Such operating problems for the reporting period include the following:

- (1) *Potential fuel spill and intrusion into the wastewater collection system.*

The Sioux Lookout Municipal Fire Department reported a fuel leak at a household within the community on March 13. The Department indicated that there was a possibility that fuel had entered the wastewater collection system, and NWI operators subsequently reported a slight fuel odour and sheen at the WPCP. Sampling results did not reveal a major fuel spill, and the spill did not appear to have a significant impact upon treatment performance.

- (2) *The sewage works did not demonstrate compliance with the E. Coli effluent parameter limit.*

The prescribed effluent limit for E. Coli is 200 MPN/100 mL, expressed as a monthly geometric mean density. In May 2014, the geometric mean density was 272 MPN/100 mL. The cause of the exceedance is unknown, although it may have been caused by a sampling error. Sampling procedures were modified and the subsequent monthly geometric mean density result for E. Coli was 14 MPN/100 mL. There were no other exceedances for the remainder of the reporting period.

## 9 Conclusion

In accordance with Condition 10(a) of the Certificate, this report must provide a summary of all monitoring and compliance reports submitted in the reporting period, including an overview of the success and adequacy of the sewage treatment program. All owners of mechanical sewage treatment plants are encouraged to submit Municipal Utility Monitoring Program forms to the MOECC. These forms summarize monitoring data and are completed for every calendar month. All such forms were completed and submitted to the MOECC for the entirety of the reporting period.

Analytical and flow monitoring data suggest an adequate sewage treatment program, with the notable exceptions of effluent suspended solids and total residual chlorine results. Under normal operations, the Sioux Lookout WPCP was capable of consistently meeting all other objectives and compliance limits for the final effluent parameters biochemical oxygen demand and E. Coli. Additionally, all flows introduced to the sewage works were below the average daily and peak daily rated capacities for the Sioux Lookout WPCP.

For eight (8) months in 2014, the Sioux Lookout WPCP was unable to achieve the effluent objective for the average monthly concentration (10 mg/L) for suspended solids (SS). SS results are used to calculate the amount of solids discharged to receiving waters, and as a water quality parameter greater SS results suggest higher pollutant loadings. A goal of the sewage treatment program in 2015 is to reduce SS concentrations to a point that is consistently below the effluent objective.

For ten (10) months in 2014, the Sioux Lookout WPCP was unable to achieve the effluent objective for the average monthly concentration (0.50 mg/L) for total residual chlorine (TRC). TRC results are often compared with E. Coli results to confirm that harmful organisms have been destroyed or inactivated. Additionally, TRC results are used to ensure that excessive amounts of chlorine compounds are not discharged to receiving waters. In 2014, TRC average monthly concentrations varied from 0.43 mg/L to 1.17 mg/L. Improved operational procedures were implemented in 2014, and effluent TRC concentrations decreased throughout the year. A goal of the sewage treatment program in 2015 is to maintain average monthly TRC concentrations at a level below the effluent objective, as was achieved in November and December, 2014.

## Appendix A: Monitoring Results (Influent)

**Table A1:** 2014 Influent Monitoring Results<sup>1</sup>

| Sample Date (dd/mm) | BOD5 (mg/L) | SS (mg/L) | TKN (mg/L) | Total P (mg/L) | COD (mg/L) | VOA (mg/L) | pH   |
|---------------------|-------------|-----------|------------|----------------|------------|------------|------|
| 02/01               | 149         | 128       | 42.2       | 4.66           | 366        | 12         | 7.33 |
| 14/01               | 137         | 429       | 52.2       | 8.67           | 785        | 17         | 6.91 |
| 28/01               | 148         | 124       | 33.0       | 3.34           | 338        | 12         | 7.09 |
| 11/02               | 88          | 227       | 40.5       | 4.39           | 418        | 26         | 7.05 |
| 25/02               | 103         | 216       | 41.1       | 4.19           | 415        | <10        | 7.04 |
| 11/03               | 96          | 227       | 35.7       | 4.42           | 410        | <10        | 7.06 |
| 25/03               | 174         | 241       | 33.9       | 3.56           | 304        | 18         | 7.09 |
| 08/04               | 104         | 287       | 28.6       | 3.12           | 317        | 11         | 6.82 |
| 23/04               | 78          | 78        | 23.8       | 2.03           | 226        | <10        | 6.96 |
| 06/05               | 68          | 120       | 22.8       | 2.06           | 183        | <10        | 7.06 |
| 20/05               | 94          | 167       | 25.2       | 3.08           | 270        | 11         | 7.07 |
| 03/06               | 76          | 166       | 24.6       | 2.73           | 241        | 10         | 6.97 |
| 17/06               | 114         | 216       | 20.5       | 3.49           | 233        | <10        | 6.71 |
| 02/07               | 70          | 97        | 20.1       | 2.16           | 224        | 10         | 7.16 |
| 15/07               | 120         | 188       | 27.0       | 3.39           | 287        | 11         | 7.26 |
| 29/07               | 119         | 256       | 20.9       | 3.68           | 288        | <10        | 7.19 |
| 12/08               | 117         | 198       | 26.6       | 3.91           | 281        | 10         | 7.12 |
| 28/08               | 110         | 160       | 22.3       | 2.99           | 329        | 24         | 7.05 |
| 09/09               | 72          | 182       | 28.2       | 3.57           | 434        | 12         | 7.19 |
| 23/09               | 42          | 117       | 24.0       | 2.68           | 299        | 11         | 7.25 |
| 07/10               | 152         | 309       | 30.1       | 4.11           | 516        | 17         | 7.15 |
| 21/10               | 137         | 257       | 28.7       | 4.32           | 596        | 31         | 7.20 |
| 04/11               | 87          | 241       | 26.2       | 3.56           | 411        | 18         | 6.98 |
| 19/11               | 95          | 186       | 22.3       | 2.64           | 280        | 14         | 7.02 |
| 02/12               | 99          | 182       | 24.9       | 3.97           | 478        | 25         | 7.25 |
| 16/12               | 116         | 176       | 24.5       | 3.03           | 364        | 14         | 6.89 |
| 30/12               | 90          | 125       | 23.0       | 2.19           | 248        | <10        | 7.03 |

1. BOD5 = five day total biochemical oxygen demand; SS = suspended solids; TKN = total Kjeldahl nitrogen; Total P = total phosphorus; COD = chemical oxygen demand; VOA = volatile organic acids.

## Appendix A: Monitoring Results (Effluent)

**Table A2:** 2014 Effluent Monitoring Results<sup>1</sup>

| Sample Date (dd/mm) | BOD5 (mg/L) | CBOD5 (mg/L) | SS (mg/L) | TAN (mg/L) | Un-ionized Ammonia (mg/L) | TKN (mg/L) | Nitrate (mg/L) | Nitrite (mg/L) | Total P (mg/L) | OP (mg/L) | COD (mg/L) | VOA (mg/L) | pH   | Field Temp. (°C) | Field TRC (mg/L) | EC (MPN/100mL) |
|---------------------|-------------|--------------|-----------|------------|---------------------------|------------|----------------|----------------|----------------|-----------|------------|------------|------|------------------|------------------|----------------|
| 02/01               | <2.0        | <2.0         | 7.7       | 0.983      | 0.000245                  | 3.45       | 16.7           | <0.050         | 0.254          | 0.0491    | 37.6       | <10        | 6.02 | ---              | 0.55             | <1             |
| 14/01               | 5.8         | 7.6          | 14.3      | 6.67       | 0.0262                    | 10.4       | 12.0           | 0.039          | 0.517          | 0.1280    | 66.7       | <10        | 6.96 | ---              | 0.63             | >2420          |
| 28/01               | 2.4         | <2.0         | 11.9      | 0.606      | 0.000128                  | 2.94       | 14.2           | <0.020         | 0.358          | 0.0684    | 46.3       | <10        | 5.84 | ---              | 1.08             | <1             |
| 11/02               | 3.4         | 4.2          | 12.6      | 0.839      | 0.000724                  | 3.69       | 12.4           | <0.020         | 0.356          | 0.0168    | 50.1       | <10        | 6.15 | ---              | 1.13             | <1             |
| 25/02               | 8.8         | 7.0          | 26.0      | 6.54       | 0.0182                    | 11.4       | 10.1           | <0.10          | 0.733          | 0.0725    | 69.7       | <10        | 6.92 | ---              | 1.19             | 1              |
| 11/03               | 6.3         | <5.5         | 15.7      | 1.24       | 0.000809                  | 4.32       | 14.5           | <0.020         | 0.442          | 0.0935    | 61         | <10        | 6.22 | ---              | 1.18             | <1             |
| 25/03               | 12.4        | 7.6          | 17.6      | 3.36       | 0.00356                   | 6.30       | 13.1           | <0.10          | 0.405          | 0.1130    | 49         | <10        | 6.51 | ---              | 1.16             | <1             |
| 08/04               | 3.4         | 3.3          | 8.9       | 6.79       | 0.018                     | 10.1       | 8.9            | 0.090          | 0.421          | 0.0851    | 52         | <10        | 6.98 | ---              | 0.61             | 2              |
| 23/04               | 8.2         | 3.5          | 15.5      | 4.46       | 0.022                     | 7.28       | 8.3            | 0.457          | 0.455          | 0.0928    | 54         | <10        | 7.02 | 6.8              | 0.68             | 201            |
| 06/05               | 5.0         | 4.0          | 11.5      | 2.85       | 0.0212                    | 4.91       | 6.8            | 0.215          | 0.243          | 0.0518    | 33         | <10        | 7.26 | 7.6              | 0.60             | 91             |
| 20/05               | 5.6         | 4.6          | 13.1      | 0.692      | 0.00358                   | 3.26       | 10.1           | 0.113          | 0.332          | 0.0518    | 44         | 11         | 7.27 | 20.8             | 0.55             | 816            |
| 03/06               | 5.5         | 2.6          | 10.0      | 0.162      | 0.00096                   | 1.93       | 14.4           | 0.035          | 0.111          | 0.0381    | 31         | <10        | 7.03 | 11.0             | 0.36             | 186            |
| 17/06               | 5.3         | 2.3          | 6.6       | 0.246      | 0.00253                   | 1.75       | 9.9            | 0.021          | 0.168          | 0.0230    | 37         | <10        | 6.97 | 11.7             | 0.81             | 1              |
| 02/07               | <2.0        | 2.1          | 5.6       | 0.051      | 0.0004                    | 1.52       | 11.0           | <0.020         | 0.134          | 0.0195    | 33         | <10        | 7.40 | 14.3             | 0.85             | <1             |
| 15/07               | <2.0        | <2.0         | 2.6       | 0.174      | 0.00187                   | 2.15       | 12.5           | <0.020         | 0.115          | 0.0375    | 34         | <10        | 7.89 | 19.4             | 0.71             | <1             |
| 29/07               | <2.0        | <2.0         | 9.7       | 0.127      | 0.00067                   | 1.61       | 12.6           | <0.020         | 0.241          | 0.0227    | 34         | <10        | 7.45 | 19.6             | 0.35             | 3              |
| 12/08               | <2.0        | <2.0         | 6.0       | 0.128      | 0.001                     | 1.40       | 16.9           | <0.020         | 0.202          | 0.0206    | 36         | <10        | 7.38 | 17.2             | 0.53             | 11             |
| 28/08               | 2.0         | <2.0         | 3.5       | 0.797      | 0.00102                   | 1.36       | 22.4           | <0.10          | 0.105          | 0.0256    | 29         | 15         | 6.96 | 18.4             | 0.51             | 18             |
| 09/09               | <2.0        | <2.0         | 8.7       | 0.239      | 0.000517                  | 1.86       | 18.1           | <0.020         | 0.268          | 0.0283    | 42         | <10        | 6.90 | 17.1             | 0.48             | 2              |
| 23/09               | <2.0        | <2.0         | 4.1       | 0.200      | 0.000464                  | 1.38       | 18.1           | <0.10          | 0.170          | 0.0220    | 44         | <10        | 7.18 | 16.8             | 0.56             | 1              |
| 07/10               | 3.2         | <2.0         | 13.8      | 0.558      | ---                       | 1.58       | 17.1           | <0.020         | 0.288          | 0.0165    | 36         | <10        | 7.06 | 15.3             | 0.65             | 12             |
| 21/10               | 2.5         | 2.9          | 13.8      | 0.190      | ---                       | 1.35       | 15.9           | <0.10          | 0.389          | 0.0180    | 39         | <10        | 7.10 | 14.2             | 0.51             | 2              |
| 04/11               | <2.0        | <2.0         | 11.3      | 0.195      | ---                       | 1.70       | 17.5           | <0.10          | 0.266          | 0.0119    | 32         | <10        | 7.04 | 12.9             | 0.45             | 7              |
| 19/11               | 2.7         | 5.8          | 19.9      | 0.185      | ---                       | 2.08       | 18.0           | <0.10          | 0.433          | 0.0134    | 37         | 17         | 6.35 | 10.0             | 0.40             | 1              |
| 02/12               | 4.2         | 5.4          | 21.7      | 0.301      | ---                       | 2.46       | 13.9           | <0.050         | 0.458          | 0.0095    | 48         | <10        | 6.97 | 8.3              | 0.47             | 8              |
| 16/12               | 7.7         | 6.2          | 27.0      | 4.78       | ---                       | 5.64       | 10.2           | 0.063          | 0.614          | 0.0215    | 66         | 14         | 7.02 | 8.4              | 0.44             | 4              |
| 30/12               | <2.0        | <2.0         | 6.1       | 0.597      | ---                       | 2.04       | 17.3           | <0.050         | 0.280          | 0.0110    | 36         | <10        | 5.88 | 6.9              | 0.37             | 1              |

1. BOD5 = five day total biochemical oxygen demand; CBOD5 = carbonaceous biochemical oxygen demand; SS = suspended solids; TAN = total ammonia nitrogen; TKN = total Kjeldahl nitrogen; Total P = total phosphorus; OP = orthophosphate-dissolved (as P); COD = chemical oxygen demand; VOA = volatile organic acids; TRC = total residual chlorine; EC = Escherichia coli.