2023 Annual Report

Sioux Lookout Wastewater Treatment Plant

Prepared for: The Ministry of the Environment, Conservation and Parks

Prepared by: Northern Waterworks Inc. on behalf of the Municipality of Sioux Lookout

Date: March 28, 2024

Contents

1 Introduction

1.1 Annual Reporting Requirements

The Sioux Lookout Wastewater Treatment Plant (WWTP) is regulated by the terms and conditions provided within the amended Environmental Compliance Approval No. 1543-BNJR67 (the ECA), issued to the Corporation of the Municipality of Sioux Lookout on July 26, 2020. Prior to the issuance of this approval, the facility had been regulated under Certificate of Approval No. 3-0250-92-006, issued to the Town of Sioux Lookout on June 17, 1992.

This Report summarizes the facility's performance over the previous calendar year (January 1 to December 31, 2023) and it is intended 1) to provide a performance record for future references, 2) to ensure that the Ministry is made aware of problems as they arise and 3) to provide a compliance record for the terms and conditions outlined in the ECA. This Annual Report has been prepared in accordance with Condition 11 Paragraph 4 of the ECA and must contain, but shall not be limited to, the following information:

- a summary and interpretation of all Influent monitoring data, and a review of the historical trend of the sewage characteristics and flow rates (refer to sections 2.3 & 3);
- a summary and interpretation of all Final Effluent monitoring data, including concentrations, flow rates, loadings and a comparison to the design objectives and compliance limits in the Approval, including an overview of the success and adequacy of the sewage works (refer to sections 2.4, 3, 6.1 & 7);
- a summary of all operating issues encountered, and corrective actions taken (refer to section 6);
- a summary of all normal and emergency repairs and maintenance activities carried out on any major structure, equipment, apparatus, or mechanism forming part of the sewage works (refer to section 5.1);
- a summary of any effluent quality assurance or control measures undertaken (refer to section 2.2);
- a summary of the calibration and maintenance carried out on all Influent and Final Effluent monitoring equipment to ensure that the accuracy is within the tolerance of that equipment as required in the Approval or recommended by the manufacturer (refer to section 5.2);

- a summary of efforts made to achieve the design objectives in the Approval (refer to sections 2.4 & 3), including an assessment of the issues and recommendations for pro-active actions if any are required under the following situations:
    - when any of the design objectives are not achieved more than 50% of the time in a year, or there is an increasing trend in deterioration of Final Effluent quality (refer to sections 2.4 & 6.1);
    - when the Annual Average Daily Influent Flow reaches 80% of the Rated Capacity (refer to section 3);

- a tabulation of the volume of sludge generated, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed (refer to section 4);

- a summary of any complaints received, and any steps taken to address the complaints (refer to section 6.2);

- a summary of all Bypasses, Overflows, other situations outside Normal Operating Conditions, spills within the meaning of Part X of EPA, and abnormal discharge events (refer to section 6.3);

- a summary of all *Notice of Modifications to Sewage Works* completed under Paragraph 1.d. of Condition 10, including a report on status of implementation of all modifications (refer to section 5.3);

- a summary of efforts made to achieve conformance with Procedure F-5-1, including but not limited to projects undertaken and completed in the sanitary sewer system that result in overall Bypass/Overflow elimination including expenditures and proposed projects to eliminate Bypass/Overflows with estimated budget forecast for the year following that for which the report is submitted (refer to section 5.4);

- any changes or updates to the schedule for the completion of construction and commissioning of the Proposed Works (refer to section 5.5); and,

- a summary of any deviation from the monitoring schedule and reasons for the current reporting year, and a schedule for the next reporting year (refer to section 2.1).

1.2 System Description

The Sioux Lookout Wastewater Treatment Plant and associated collection system are owned by the Corporation of the Municipality of Sioux Lookout and were operated, maintained, and managed by Northern Waterworks Inc. for the entire reporting period. The sewage works consist of separate sanitary sewers, sewage pumping stations and associated force-mains, and an extended aeration wastewater treatment plant. Sanitary sewers collect wastewater and direct it to multiple pumping stations located throughout the community, which in turn deliver the wastewater 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 WWTP for treatment.

The Sioux Lookout Wastewater Treatment Plant utilizes an extended aeration wastewater treatment process that relies upon a combination of physical, biological, and chemical processes to treat incoming wastewater. The overall goal of the treatment process is to reduce or remove contaminants from influent wastewater (raw sewage) to a level that will not adversely impact or impair receiving waters, including preventing the introduction of pathogens that could affect downstream users.

The facility has a rated capacity of 2,840 m^3/day (average daily flow) with an approved peak flow rate of 9,230 m^3/day. Major components include a mechanical and stationary bar screen for debris removal, a grit removal system, two circular secondary treatment units each containing an aeration reactor, secondary clarifier, and two-stage aerobic digester, an effluent UV disinfection chamber, and an outfall sewer discharging final effluent to Pelican Lake. The facility also includes a sludge dewatering (filter belt press) system and a control building housing a laboratory, an emergency diesel generator set, air supply equipment, control and metering systems, and piping, heating, and ventilation systems. The gas chlorination system used for effluent disinfection was replaced with a UV disinfection system in 2020, resulting in the issuance of an amended Environmental Compliance Approval.

2 Water Quality

2.1 Monitoring Programs Summary

The minimum requirements for the sampling and testing of raw sewage and final effluent parameters are provided within Condition 9 (Monitoring and Recording) of the ECA. Samples are collected by licenced operators and submitted to an accredited laboratory for analysis on a biweekly basis (once every two weeks) for influent (raw sewage) parameters and on a weekly basis for effluent (treated) parameters. Sampling and testing at the facility are also conducted in accordance with the Ministry's Procedure F-10-1 (*Procedures for sampling and analysis requirements for municipal and private sewage treatment works – liquid waste streams only*) and with the federal *Wastewater Systems Effluent Regulations* (WSER).

In accordance with Condition 11 Paragraph 4.n., this report must provide a summary of any deviation from the monitoring schedule and a schedule for the next reporting year. Beginning on December 1, 2020, and as per request from the Ministry Water Inspector, the frequency of effluent pH sampling and testing was increased from weekly to twice weekly in response to recurring objective and compliance limit exceedances and continued in 2022 & 2023. No other deviations from the monitoring schedule occurred during the reporting period.

2.2 Quality Assurance & Control

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 1 summarizes those parameters that were routinely tested for operational control or quality assurance purposes during the reporting period. This table is intended to provide a summary of effluent quality assurance measures undertaken in the reporting period as required by Condition 11 Paragraph 4.e. of the ECA.

Control measures that may be implemented in response to test results include adjusting the rate of return activated sludge flow, altering the volume of solids removed from the treatment process (i.e., waste activated sludge), modifying UV dosages to optimize disinfection, modifying the operation of air supply equipment, and conducting plant cleaning and maintenance.

Table 1: Summary of operational control and quality assurance testing - 2023					
Parameter	Units	No. of Tests Conducted	Min. Result	Max. Result	Annual Average
Influent Monitoring					
pH	---	56	7.0	7.9	7.3
Effluent Monitoring					
Dissolved Oxygen	mg/L	142	4.74	9.54	6.71
pH	---	104	6.1	8.0	6.8
Temperature	°C	147	5.3	19.3	12.4
UVT	%/1cm	51	53.3	72.0	64.7
Total Alkalinity	mg/L	52	20	100	37
Process Monitoring - Treatment Unit 1					
Aeration Inlet DO	mg/L	144	0.47	10.45	5.35
Aeration Outlet DO	mg/L	145	0.76	11.30	6.16
5 Minute Settling Volume	mL	138	160	980	709
30 Minute Settling	mL	138	120	770	404
Aeration pH	---	139	5.4	7.1	6.1
Clarifier Sludge Depth	feet	224	1.0	9.0	2.6
Clarifier DO	mg/L	145	0.29	9.32	3.56
Clarifier Temperature	°C	144	5.9	19.3	11.5
Aeration Total Suspended	mg/L	96	2315	10140	6412
Return Activated Sludge	mg/L	96	2590	17320	12658
Effluent TSS	mg/L	96	1	46	13.9
Process Monitoring - Treatment Unit 2					
Aeration Inlet DO	mg/L	145	0.35	11.12	5.98
Aeration Outlet DO	mg/L	145	0.57	11.6	6.34
5 Minute Settling Volume	mL	138	170	990	692
30 Minute Settling	mL	138	70	850	364
Aeration pH	---	138	2.5	7.0	6.1
Clarifier Sludge Depth	feet	223	1.0	7.5	2.1
Clarifier DO	mg/L	145	0.35	9.60	3.71
Clarifier Temperature	°C	145	5.1	19.3	11.3
Aeration TSS	mg/L	96	2990	9340	5687
Return Activated Sludge	mg/L	96	4160	23790	13049
Effluent TSS	mg/L	96	1	42	11.5

2.3 Influent & Sludge Monitoring Results

In accordance with Condition 11 Paragraph 4.a., this report must provide a summary and interpretation of all influent monitoring data, including a review of historical trends of sewage characteristics. Table 2 provides a summary of the influent monitoring results for 2023 shown as monthly averages. Table 3 provides a summary of recent historical influent monitoring results, including results for the current reporting period.

Table 2: Influent sampling results 2023

Sample Date	pH	TSS (mg/L)	TKN (mg/L)	Total P (mg/L)	BOD5 (mg/L)
January	7.4	149	27.4	3.07	124
February	7.5	137	38.2	2.79	95
March	7.5	201	27.9	4.91	129
April	7.7	99	18.4	1.47	69
May	7.4	197	25.1	2.71	107
June	7.0	99	22.1	2.46	82
July	7.2	191	26.6	2.78	118
August	7.1	149	23.9	2.63	116
September	7.2	270	27.1	3.86	137
October	7.2	158	23.4	2.30	73
November	7.2	227	29.4	4.08	155
December	7.3	89	25.3	2.32	92

Table 3: Influent monitoring results summary

Year	No.	Total Suspended Solids			Biochemical Oxygen Demand			Total Phosphorus			Total Kjeldahl Nitrogen			pH			
		Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	No.	Min	Max	Avg
2016	26	38	329	193	57	174	118	1.28	6.00	3.34	18.5	39.5	26.4	n/a	n/a	n/a	n/a
2017	26	86	405	252	58	301	137	2.56	7.10	4.22	22.6	39.0	28.8	n/a	n/a	n/a	n/a
2018	26	82	448	222	72	204	132	2.65	6.50	4.22	23.9	40.3	31.1	n/a	n/a	n/a	n/a
2019	27	117	451	238	83	238	131	2.15	11.5	3.85	15.9	55.4	27.3	n/a	n/a	n/a	n/a
2020	34	99	362	218	63	200	121	2.11	6.19	3.62	20.3	45.6	28.1	52	5.6	7.7	7.2
2021	26	105	325	199	83	153	120	1.42	7.05	3.44	22.5	39.1	27.8	55	5.2	7.5	7.3
2022	26	59	3320	299	43	159	95	1.31	7.57	3.01	12.6	31.8	23.8	52	6.6	7.7	7.4
2023	26	63	283	164	60	158	108	1.39	6.29	2.95	16.8	49.0	26.2	56	7.0	7.9	7.3

Sludge samples are collected annually and tested for total solids, total phosphorus, and metals in accordance with the Ministry's Procedure F-10-1 (*Procedures for sampling and analysis requirements for municipal and private sewage treatment works – liquid waste streams only*). Annual sludge sample results are provided in Table 4

Table 4: Annual Sludge Sample Results			
nitrate (as N) mg/kg	113	molybdenum ug/g	5.16
nitrate + nitrite (as N) mg/kg	113	nickel ug/g	6.91
nitrite (as N) mg/kg	<0.095	phosphorus ug/g	24600
aluminum ug/g	64200	potassium ug/g	1460
antimony ug/g	1.1	selenium ug/g	2.83
arsenic ug/g	3.16	silver ug/g	1.33
barium ug/g	62.8	sodium ug/g	401
beryllium ug/g	<0.10	strontium ug/g	13.4
bismuth ug/g	26.4	sulfur ug/g	5700
boron ug/g	12.6	thallium ug/g	<0.050
cadmium ug/g	0.423	tin ug/g	13.5
calcium ug/g	3130	titanium ug/g	87.9
chromium ug/g	13.1	tungsten ug/g	0.58
cobalt ug/g	1.13	uranium ug/g	2.09
copper ug/g	277	vanadium ug/g	7.07
iron ug/g	8330	zinc ug/g	187
lead ug/g	8.65	zirconium ug/g	25.5
lithium ug/g	<2.0	moisture %	89.5
magnesium ug/g	1020	solids, total %	9.28
manganese ug/g	50.7	ammonia, total (as N) mg/kg	3620
mercury ug/g	0.633		

2.4 Effluent Monitoring Results & Comparison with Performance Criteria

In accordance with Condition 11 Paragraph 4.b., this report must include a summary and interpretation of all Final Effluent monitoring data, including concentrations, flow rates, loadings and a comparison to the design objectives and compliance limits in this Approval. Compliance limits are provided in Condition 7 (Compliance Limits) and Schedule C of the ECA, and the facility must be operated and maintained such that the effluent compliance limits are not exceeded. Compliance limits are expressed as a maximum monthly average concentration

for the parameters carbonaceous biochemical oxygen demand (CBOD5), total suspended solids, total ammonia nitrogen and total phosphorus, as a maximum monthly geometric mean density for the parameter E. coli, and as a single sample result range for the parameter pH. Effluent limits expressed as maximum monthly average loadings also exist for the parameters carbonaceous biochemical oxygen demand, total suspended solids, total ammonia nitrogen and total phosphorus.

Similar to compliance limits, best efforts must be applied to design, construct, operate and maintain the facility to ensure that the design objectives provided in Condition 6 (Design Objectives) are achieved. Design objectives are set at more stringent values than compliance limits and they are expressed in the same manner. Best efforts must also be applied to ensure that the effluent from the facility is essentially free of floating and settleable solids and does not contain oil or any other substances in amounts sufficient to create a visible film or sheen or foam or discolouration on the receiving waters. Design objectives related to flow rates are discussed in section 3.

Table 5 summarizes effluent monitoring results for regulated parameters and compares them to the relevant compliance limits and design objectives. During the reporting period, the design objective for the parameter effluent pH was not consistently achieved however the compliance limit was maintained. Refer to section 6.1 for more information concerning effluent compliance limit and design objective exceedances.

Table 5: Effluent monitoring results summary and comparison with compliance limits and design objectives - 2023[1]

Month	CBOD5		TSS		Total P		TAN		E. coli	pH[2]	
	MAC (mg/L)	MADL (kg/d)	MAC (mg/L)	MADL (kg/d)	MAC (mg/L)	MADL (kg/d)	MAC (mg/L)	MADL (kg/d)	MGMD (MPN/100mL)	Min. Result	Max. Result
Objective	15	42.6	15	42.6	0.5	1.42	<5.0	14.2	150	6.5	8.5
Limit	25	71.0	25	71.0	1.0	2.84	5.0	14.2	200	6.0	9.5
Jan	2.1	4.0	7.0	13.3	0.208	0.40	0.76	1.4	76	6.3	6.6
Feb	2.7	5.1	8.6	16.3	0.266	0.50	0.47	0.9	10	6.5	7.3
Mar	2.1	4.5	7.4	15.7	0.229	0.49	3.58	7.6	69	6.5	7.0
Apr	2.6	5.9	3.3	7.5	0.106	0.24	4.61	10.5	85	6.7	7.4
May	2.9	6.2	4.7	10.0	0.365	0.78	1.47	3.1	17	6.3	7.0
Jun	2.4	4.8	3.6	7.2	0.075	0.15	0.05	0.1	10	6.3	6.6
Jul	2.2	4.2	6.8	13.1	0.235	0.45	0.07	0.1	12	6.1	6.6
Aug	2.1	3.9	5.7	10.6	0.174	0.32	0.10	0.2	13	6.6	7.2
Sep	2.0	4.5	7.7	17.3	0.218	0.49	0.14	0.3	13	6.7	7.6
Oct	3.5	8.1	5.8	13.3	0.214	0.49	0.17	0.4	49	6.7	8.0
Nov	6.0	13.8	20.3	46.8	0.574	1.32	0.03	0.1	118	6.5	7.3
Dec	2.4	5.1	6.6	14.1	0.198	0.42	0.21	0.4	26	6.7	7.2

1. CBOD5 = five-day total carbonaceous biochemical oxygen demand; TSS = total suspended solids; Total P = total phosphorus; TAN = total ammonia nitrogen; TRC = total residual chlorine; MAC = monthly average concentration; MADL = monthly average daily loading; MGMD = monthly geometric mean density.
2. Regulatory testing for effluent pH is achieved through the in-house testing program.

3 Flow Monitoring

Condition 6 Paragraph 1.c. of the ECA requires that the facility be designed and operated to ensure that the annual average daily influent flow is within the rated capacity (2,840 m^3/day). Table 6 summarizes influent and effluent flow monitoring results, the latter of which is used to determine effluent parameter loadings. Throughout the reporting period, 859,751 m^3 of influent was introduced to the facility. On an average day in 2023, 2,355 m^3 of influent was introduced, representing 78% of the rated capacity. The maximum amount of influent introduced to the facility on a given day in 2023 was 3,426 m^3, which represents 37% of the peak flow rate (9,230 m^3/day).

Table 6: Flow monitoring results summary - 2023

Month	Influent Flows				Effluent Flows		
	Total Volume (m^3)	Average Daily Flow (m^3/day)	Capacity Assessment (%)	Maximum Daily Flow (m^3/day)	Total Volume (m^3)	Average Daily Flow (m^3/day)	Maximum Daily Flow (m^3/day)
Jan	68,302	2,203	78%	2,419	69,140	2,230	2,550
Feb	62,059	2,216	78%	2,584	62,140	2,219	2,750
Mar	67,210	2,168	76%	2,738	70,950	2,289	3,060
Apr	76,855	2,562	90%	3,350	80,140	2,671	3,580
May	84,709	2,733	96%	3,255	82,430	2,659	3,270
Jun	73,824	2,546	90%	3,426	78,680	2,623	3,160
Jul	74,443	2,401	85%	2,700	77,380	2,496	2,850
Aug	73,628	2,375	84%	2,777	76,050	2,453	3,170
Sep	70,314	2,344	83%	2,642	68,440	2,281	2,650
Oct	72,696	2,345	83%	3,046	70,280	2,267	3,460
Nov	69,289	2,310	81%	2,538	69,900	2,330	2,540
Dec	66,422	2,214	78%	2,719	68,800	2,293	2,940
Total	859,751	---	---	---	874,330	---	---
Average	71,646	2,355	83%	---	72,861	2,395	3,580

Recent historical influent wastewater flows for the Sioux Lookout Wastewater Treatment Plant are summarized in Table 7. In accordance with Condition 11 Paragraph 4.g.ii. of the ECA, this report must also include an assessment of the issues and recommendations for proactive actions if the annual average daily influent flow reaches 80% of the facility's rated capacity.

Recent historical flows have either approached or exceeded this 80% threshold, and it is anticipated that the treatment facility will require an expansion of capacity by the addition of a third treatment unit. Upgrades to the outfall sewer and sludge management facilities may also be required. The addition of a third identical CTU would increase the rated capacity of the facility to 4,260 m^3/day. With this theoretical expansion, the average daily influent flow experienced in 2023 would have represented 55% of the increased rated capacity (versus 83% of the current rated capacity).

Table 7: Recent historical influent flow monitoring results

Year	Total Volume (m^3)	Average Daily Flow (m^3)	Capacity Assessment (%)	Maximum Daily Flow (m^3)	Annual % Change
2011	778,100	2,132	75%	4,340	-13.1%
2012	908,700	2,483	87%	4,200	+16.8%
2013	815,300	2,234	79%	4,200	-10.3%
2014	745,600	2,043	72%	3,600	-8.5%
2015	784,000	2,148	76%	4,600	+5.2%
2016	755,800	2,065	73%	2,900	-3.6%
2017	764,700	2,095	74%	3,200	+1.2%
2018	719,500	1,971	69%	2,700	-5.9%
2019	832,288	2,280	80%	3,863	+15.7%
2020	794,712	2,171	76%	3,598	-4.5%
2021	784,143	2,148	76%	4,166	-1.3%
2022	940,626	2,577	91%	6,044	20.0%
2023	859,751	2,355	83%	3426	-8.6%

4 Solids Management

In accordance with Condition 11 Paragraph 4.h. of the ECA, this report must provide a tabulation of the volume of sludge generated, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed. A tabulation of the amount of dewatered sludge generated and removed in the reporting period is provided in Table 8.

Table 8: Solids management summary - 2023

Month	Waste Activated Sludge (WAS)			Dewatered Sludge	
	Total WAS Volume Processed – CTU No. 1 (m^3)	Total WAS Volume Processed – CTU No. 2 (m^3)	Total WAS Volume Processed – Combined (m^3)	Total Mass of Dewatered Sludge Removed (kg)	Total Volume of Dewatered Sludge Removed (m^3)
Jan	267	313	580	110,720	110
Feb	230	242	472	75,800	77
Mar	226	275	501	101,070	110
Apr	204	323	527	72,550	80
May	245	340	585	107,650	110
Jun	237	316	553	99,900	107
Jul	253	319	572	95,909	96
Aug	315	366	681	94,220	104
Sep	300	346	646	71,920	77
Oct	509	114	623	86,390	82
Nov	372	353	725	68,174	69
Dec	337	330	667	69,890	82
Total	3,495	3,637	7,132	1,054,193	1102
Average	291	303	594	87,849	92

The volume of solids in the treatment process is controlled by directing activated sludge (i.e., waste activated sludge) to the respective two-stage aerobic digesters at the Sioux Lookout Wastewater Treatment Plant. Sludge is then transferred to a dewatering system for further processing, such that the 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 Sioux Lookout Sludge Lagoon located at the Hidden Lake Landfill site (approval no. 9378-7P5KHR), where it is mixed with sand and used as site cover. Dewatered sludge is classified as dewatered processed organic waste and is hauled by Northern Waterworks Inc. under amended Environmental Compliance Approval no. 5924-5NPKL7. In situations when the dewatering system is out of service, stabilized activated sludge may be removed directly from the aerobic digesters using a vacuum truck. Sludge management methods and disposal areas to be utilized over the next reporting period are not expected to change.

Approximately 1102 m^3 of dewatered solids were removed from the facility in 2023, which was the result of processing 7,132 m^3 of waste activated sludge. The amount of dewatered sludge generated and removed from the facility in 2024 is anticipated to be between 800 m^3 and 1,600 m^3. A summary of recent historical solids management information is provided in Table 9.

Table 9: Recent historical solids management summary

Year	Waste Activated Sludge Processed			Dewatered Sludge	
	Total Volume – CTU 1 (m^3)	Total Volume – CTU 2 (m^3)	Total Volume – Combined (m^3)	Total Mass (kg)	Total Volume (m^3)
2016	3,281	3,983	7,264	1,068,573	1,182
2017	3,714	3,928	7,642	969,824	1,039
2018	2,679	4,161	6,840	1,161,490	1,261
2019	2,708	3,234	5,942	870,300	987
2020	2,743	3,042	5,785[1]	980,460	1,091
2021	3,404	3,868	7,272	1,049,680	1,165
2022	3,015	4,618	7,633	912,229	919
2023	3,495	3,637	7,132	1,054,193	1,102

1. Between June 3 and June 18, 2020, approximately 296 m^3 of stabilized activated sludge was removed directly from the aerobic digesters using a vacuum truck while the trailer used to haul dewatered sludge was out of service. This volume is included in the total waste activated sludge volume processed in the calendar year.

5 Maintenance and Modifications

5.1 Planned Maintenance, Repairs & Minor Modifications

In accordance with Condition 11 Paragraph 4.d. of the ECA, this report must include a summary of all normal and emergency repairs and maintenance activities carried out on any major structure, equipment, apparatus, or mechanism forming part of the sewage works. A planned maintenance program is employed 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, air supply equipment, UV reactors, monitoring equipment, alarm systems, safety equipment and other treatment components.

Additional significant maintenance activities and minor repairs and modifications that occurred at the treatment facility during the reporting period are summarized in Table 10.

Table 10: Summary of maintenance activities, repairs, and minor modifications - 2023

Date	Task
4-Jan-23	Automation now on site to begin install of new panel for Moran lift station.
18-Jan-23	The sump pump in the grit room was replaced.
30-Jan-23	Moran pump #1was changed and controls were swapped between pumps
4-Mar-23	Vacuum break valve in Airport Lift Station replaced
3-May-2023	Automation now completed change of new panel at Moran lift station
18-May-2023	Kone Cranes completed inspections of hoists at the WWTP.
2-Aug-23	Switched UV bulb sleeves with new ones and cleaned the old ones. Changed the sleeves again on the 10th, 14th and 28th. Continuing to clean them as required.
27-Sep-23	The chain came off the conveyor in the press room. Replaced the sprocket with new bolts and reattached

Table 10: Summary of maintenance activities, repairs, and minor modifications - 2023	
Date	Task
10-Oct-23	Floc motor in the press room was replaced.
11-Sep-23	Calibration verification for the influent and effluent flow measuring devices was conducted by a representative from Synergy Controls Corporation.
18-Sep-23	The four (4) backflow prevention devices at the treatment facility and one (1) device at the Robert Street Lift Station were inspected and tested by a qualified technician from Clow Darling. The devices passed the testing protocol.
10-17-Oct-2023	CTU2 drained and cleaned. All fine bubble diffusers replaced. Planetary drive in CTU2 replaced on Oct 12
13-Dec-23	Motor and brake system replaced on rag remover.
25-Dec-2023	Bar screen motor was not working. Took apart and determined that there was an issue with the brake sticking on. Manually adjusted the brake and motor was operational again.

5.2 Flow Monitoring Equipment Calibration and Maintenance

In accordance with Condition 11 Paragraph 4.f. of the ECA, this report must include a summary of the calibration and maintenance carried out on all Influent and Final Effluent monitoring equipment to ensure that the accuracy is within the tolerance of that equipment as required by the ECA or recommended by the manufacturer. Flow measurement devices are inspected daily, and calibration is verified annually. Calibration or replacement may be indicated if devices fail the calibration verification protocol.

Influent flow measurement equipment at the facility includes one (1) 229 mm throat Parshall flume located downstream of the bar screen and the degritting tank at the influent works. Effluent flow measurement equipment includes one (1) V-notch weir with an ultrasonic water level sensor located at the outlet of the UV disinfection chamber. On September 11, 2023 calibration verification for the flow measuring devices was conducted by a representative from Synergy Controls Corporation. The flow measuring devices passed the calibration verification protocol.

5.3 Summary of Notifications of Modifications to Sewage Works

In accordance with Condition 11 Paragraph 4.k. of the ECA, this report must include a summary of all *Notices of Modifications to Sewage Works* completed under Paragraph 1.d. of Condition 10, including a report on the status of implementation of all modifications. As the Owner of the system, the Municipality of Sioux Lookout may make pre-authorized modifications to the sewage works in accordance with Schedule E (Limited Operational Flexibility – Protocol for Pre-Authorized Modifications to Municipal Sewage Works) of the ECA. As per Paragraph 4 of Schedule E, certain pre-authorized modifications require the completion of the *Notice of Modifications to Sewage Works* form. This form must be completed with a declaration from a Professional Engineer and the Owner prior to the scheduled implementation date, and the completed form and all supporting information must remain on-site for future inspection.

There were no pre-authorized modifications requiring a *Notification of Modifications to Sewage Works* form were completed during the reporting period.

5.4 Summary of Efforts Made to Achieve Conformance with Procedure F-5-1

In accordance with Condition 11 Paragraph 4.l., this report must include a summary of efforts made to achieve conformance with Procedure F-5-1 including but not limited to projects undertaken and completed in the sanitary sewer system that result in overall bypass/overflow elimination. The summary must include expenditures and proposed projects to eliminate bypass/overflows with estimated budget forecast for the subsequent calendar year.

5.4.1 Guidelines for Wastewater Treatment

Ministry Guideline F-5 and Procedure F-5-1 take the approach that all sewage treatment works shall provide secondary treatment or equivalent as the "normal" level of treatment unless individual receiving water assessment studies indicate the need for higher levels of treatment. In setting the "normal" level of treatment as secondary, various factors were considered, including: minimization of adverse health-related and environmental effects, aesthetic nuisance and toxic effects of effluent discharges from heavily populated areas to rivers and streams or to littoral zones of lakes where intensive water use and re-use occur; minimization of potential interference of effluent discharges with other water uses; possibility of more stringent future phosphorus removal requirements and the capability of secondary sewage treatment processes to be upgraded to meet such requirements; relatively low additional cost and significant additional benefits of secondary

treatment over primary treatment with respect to removal of conventional contaminants and, potentially, the removal of hazardous trace organics.

The Sioux Lookout Wastewater Treatment Plant provides secondary treatment and achieves the effluent criteria for an extended aeration facility (without total phosphorus removal) provided in Table 1 of Procedure F-5-1.

5.4.2 Guidelines for Wastewater Collection

Procedure F-5-1 also includes measures for reducing the frequency and volume of sewage discharged from nominally separate sewers, including providing adequate sewer and pumping station capacity, stand-by equipment, stand-by power, reserve storage capacity in sewers, and/or at treatment facilities and adequate capacity in sewage treatment works. Where existing sewer systems are found to experience excessive infiltration/inflow problems, which result in unacceptable frequencies or quantities of raw sewage and/or primary effluent by-passing, and where the above measures alone are either impractical or uneconomical to reduce the by-passing to acceptable levels, staged programs should be developed for the ultimate containment of these flows by a combination of the above measures and the reduction of infiltration/inflow to the sewer systems. Overflows in the Sioux Lookout wastewater collection system remain infrequent.

5.5 Status of Proposed Works

In accordance with Condition 11 Paragraph 4.m. of the ECA, this report must describe any changes or updates to the schedule for the completion of construction and commissioning of major processes and/or equipment groups in the Proposed Works. The Proposed Works include the UV disinfection system and the pH/alkalinity adjustment chemical feed system. Both systems were put into service at the end of 2021. There are no further Proposed Works in the approval.

6 Operating Problems

In accordance with Condition 11 Paragraph 4.c. of the ECA, this report must provide a description of all operating issues encountered and corrective actions taken during the reporting period. For the purposes of this report, operating problems may be indicated by 1) effluent compliance limit and design objective exceedances, 2) customer complaints, 3) significant infrastructure, equipment, and process failures and 4) bypasses, overflows, deviations from normal operating conditions, spills, and abnormal discharge events.

6.1 Compliance Limit and Design Objective Exceedances

6.1.1 pH

The effluent pH is regulated as a single sample result range with a limit range of 6.0 to 9.5 and a design objective range of 6.5 to 8.5.

Prior to the commissioning of the supplementary pH/alkalinity adjustment (sodium hydroxide) chemical feed system on January 11, 2022, there was no significant operational control with respect to affecting pH changes as a result of nitrification. In 2021 there were numerous pH samples below the compliance limit (37%) and the majority of pH samples were below the objective limit (97%). A goal of the sewage treatment program in 2022 was to eliminate all effluent pH compliance limit exceedances and to minimize design objective exceedances by monitoring and adjusting applied sodium hydroxide dosages. This goal was achieved with no pH results below the compliance limit and 21% of the pH samples below the objective limit. This goal was achieved in 2023 with no pH results below the compliance limit and 14% of the pH samples below the objective limit.

6.2 Complaints

In accordance with Condition 11 Paragraph 4.i. of the ECA, this report must provide a summary of any complaints received and any steps taken to address the complaints.

No complaints related to the operation and maintenance of the sewage works were received during the reporting period.

6.3 Bypasses, Overflows, Deviations from Normal Operating Conditions, Spills and Abnormal Discharge Events

In accordance with Condition 11 Paragraph 4.j. of the ECA, this report must provide a summary of all bypasses, overflows, other situations outside Normal Operating Conditions, spills within the meaning of Part X of the EPA, and abnormal discharge events.

6.3.1 Bypasses

A bypass means a diversion of sewage around one or more unit processes within the treatment facility, excluding preliminary treatment processes, whereby diverted sewage flows are returned to the treatment facility upstream of the effluent sampling location and are discharged to the environment through the approved effluent disposal facilities. Bypasses are prohibited except in emergency situations or in situations where the event is planned and is a direct and unavoidable result of a planned repair or maintenance procedure. Special reporting, monitoring and recordkeeping protocols apply during a bypass event. Notably, the Sioux Lookout Wastewater Treatment Plant lacks a dedicated overflow or bypass sewer.

No bypass events occurred during the reporting period.

6.3.2 Overflows

An overflow means a discharge to the environment from the sewage works at designed locations other than the approved effluent disposal facilities or via the effluent disposal facilities downstream of the final effluent sampling points. Overflows are prohibited except in emergency situations or in situations where the event is planned and is a direct and unavoidable result of a planned repair or maintenance procedure. Special reporting, monitoring and recordkeeping protocols apply during an overflow event. Due the configuration of the Sioux Lookout Wastewater Treatment Plant, overflow events would generally only occur in the wastewater collection system.

No overflow events occurred during the reporting period.

6.3.3 Deviations from Normal Operating Conditions

A Normal Operating Condition means the condition when all unit processes in a treatment train, excluding preliminary treatment processes, are operating within their design capacity. A situation outside of a Normal Operating Condition means that a unit process is operating

above its design capacity. Examples of situations outside Normal Operating Conditions may include flows that exceed the peak flow rate (either as a result of hydraulic overloading or because a treatment unit is removed from service), observable and significant changes to influent water quality that exceed the treatment capabilities of the facility, or a failure of air supply equipment to provide sufficient air to the process as designed. Despite these situations, there is no physical diversion of sewage flows around any treatment process.

No situations outside of Normal Operating Conditions occurred during the reporting period.

6.3.4 Spills

Spills are releases of pollutants into the natural environment from or out of a structure, vehicle or other container that is abnormal in quality or quantity in light of all the circumstances of the discharge. Concerning the Sioux Lookout sewage works, spills include the releases of all pollutants other than raw sewage or partially treated sewage, which are otherwise classified as Class I spills and are exempt from Part X of the Environmental Protection Act as per O. Reg. 675/98. Specifically, spills of raw sewage or partially treated sewage are discharges (bypasses and overflows) that are authorized by and are conducted in accordance with an environmental compliance approval.

One (1) spill event occurred at King and 8th avenue to King and First Ave during the reporting period. On October 19, 2023, the tailgate opened due to pressure of the load in the trailer. Sludge was spilled along the roadway. The total amount of spilled material could not be determined. Material was cleared using the municipal sweeper truck and hand sweeping were required.

6.3.5 Abnormal Discharge Events

Abnormal discharge events include any other abnormal events not otherwise classified as a bypass, overflow, or spill.

There were no abnormal discharge events during the reporting period.

6.4 Significant Infrastructure, Equipment and Process Failures

Operating problems associated with significant equipment, infrastructure and process failures that occurred during the reporting period are summarized in Table 11. The table excludes failures otherwise associated with a compliance limit or design objective exceedance, customer

complaint, or plant bypass, overflow, spill, or abnormal discharge event. The table also excludes minor equipment faults or power supply interruptions that otherwise do not significantly impact the treatment process.

Table 11: Summary of significant equipment, infrastructure, and process failures - 2023

Event Date	Event Description
	No significant failures in 2023

7 Conclusion

In accordance with Condition 11 Paragraph 4.b. of the ECA, this report must include an overview of the success and adequacy of the sewage treatment program. Importantly, all owners of mechanical sewage treatment plants are encouraged to submit Municipal Utility Monitoring Program forms to the Ministry. These forms summarize monitoring data and are completed for every calendar month. All such forms were completed and submitted to the Ministry for the entire reporting period.

Flow monitoring and water quality results suggest a successful and adequate sewage treatment program. Daily influent flows introduced to the sewage works were below the average and peak flow rated capacities of the treatment facility. The Sioux Lookout Wastewater Treatment Plant was capable of consistently achieving all effluent compliance limits throughout the reporting period.