ONTARIO CLEAN WATER AGENCY
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2023 Annual Performance Report for the Cobalt Constructed Wetlands & Sewage Collection System

January 1, 2023 to December 31, 2023

PREPARED BY

Ontario Clean Water Agency
on behalf of the Town of Cobalt

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Executive Summary

The Cobalt Constructed Wetlands is located at 9 Hudson Bay Road in the Town of Cobalt and serves the residents of Cobalt. The Wetlands is classified as a Class 1 wastewater treatment system that is not governed by an Environmental Compliance Approval (ECA). The system currently operates under Provincial Officer's Order 1-MV9KT issued October 22, 2021 and Director's Order 1-ROGQN issued January 26, 2022. The Director's Order does not identify flow compliance limits, but the Cobalt Wetlands Operations Manual prepared by KMK Consultants Limited (December 20, 2022) indicates that the design capacity of the plant is 1,060 m^3/day.

The wetlands receives municipal sewage from the Cobalt sewage collection system and provides primary settling within the maintenance forebay before entering the constructed wetlands with the final effluent discharging to Sasaginaga Creek.

The Cobalt Sewage Collection System is a Class 1 wastewater collection system under Ontario Regulation 129/04 and follows the requirements of Environmental Compliance Approval (ECA) No. 206-W601 for Municipal Sewage Collection Systems issued on August 2, 2023.

This report summarizes the requirements of the Director's Order and the Approval and describes the operational performance of the system to ensure the production of quality effluent.

The Cobalt Constructed Wetlands currently does not operate with specified compliance limits except for pH which is required to be maintained between 6.0 and 9.5 inclusively. However, concentrations for Biochemical Oxygen demand (25 mg/L), Total Suspended Solids (25 mg/L) and Total Phosphorus (1.5 mg/L) will be used as guidelines. Based on these parameters, the wetlands produced a good quality effluent falling well below these guidelines.

The system did not meet the design capacity of 1060 m^3/day having an annual average daily flow of 1435 m^3, which is 135% of the capacity. The total volume of influent flow measured in 2023 was 523,614 m^3 compared to the effluent flow of 676,743 m^3.

All requirements specified in the system's Order and any issues experienced at the facility are further explained throughout the report.

Introduction

Item No. 10, part 7 of Director's Order 1-ROGQN issued for the Cobalt Constructed Wetlands on January 26 2022 requires the owner to prepare a performance report on a calendar year basis. The report is to be submitted to the District Manager of the Ministry of the Environment, Conservation and Parks by March 31st of the calendar year following the period being reported on. The report must contain, but 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;
- a summary and interpretation of all final effluent monitoring data, including concentration, flow rates, and loadings;
- a summary of all operating issues encountered and corrective actions taken;
- 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 Works;
- a summary of any effluent quality assurance or control measures undertaken;
- 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; and,
- a summary of any complaints received, including odour complaints, and any steps taken to address the complaints.

Condition 4.0(4.6) of ECA No. 206-W601 for the Cobalt Sewage Collection System requires the Owner to prepare and submit an annual performance report to the Ministry of the Environment's Director on or before March 31st of each year and covers a period from January 1st to December 31st of the preceding calendar year. This report must include, but is not limited to the following information;

- If applicable, includes a summary of all required monitoring data along with an interpretation of the data and any conclusion drawn from the data evaluation about the need for future modifications to the Authorized System or system operations;
- Includes a summary of any operating problems encountered and corrective actions taken;
- Includes a summary of all calibration, maintenance, and repairs carried out on any major structure, Equipment, apparatus, mechanism, or thing forming part of the Municipal Sewage Collection System;
- Includes a summary of any complaints related to the Sewage Works received during the reporting period and any steps taken to address the complaints.

- Includes a summary of all Alterations to the Authorized System within the reporting period that are authorized by this Approval including a list of Alterations that pose a Significant Drinking Water Threat;
- Includes a summary of all Collection System Overflow(s) and Spill(s) of Sewage, including: dates, volumes and durations. If applicable, loadings for total suspended solids, BOD_5, total phosphorus, and total Kjeldahl nitrogen, and sampling results for *E.coli*, disinfection, if any and any adverse impact(s) and any corrective actions, if applicable;
- Includes a summary of efforts made to reduce Collection System Overflows, Spills, STP Overflows, and/or STP Bypasses, including the following items, as applicable:
    a) A description of projects undertaken and completed in the Authorized System that result in overall overflow reduction or elimination including expenditures and proposed projects to eliminate overflows with estimated budget forecast for the year following that for which the report is submitted.
    b) Details of the establishment and maintenance of a PPCP, including a summary of project progresses compared to the PPCP's timelines.
    c) An assessment of the effectiveness of each action taken.
    d) An assessment of the ability to meet Procedure F-5-1 or Procedure F-5-5 objectives (as applicable) and if able to meet the objectives, an overview of next steps and estimated timelines to meet the objectives.
    e) Public reporting approach including proactive efforts.

The two reports have been merged into one and is presented as the 2023 Annual Performance Report. The report was prepared by the Ontario Clean Water Agency (OCWA) on behalf of the Town of Cobalt and is based on information kept on record by OCWA.

1 System Description

Sewage System Name:	**Cobalt Constructed Wetlands**
Sewage System Works Number:	120002745
Sewage System Address:	9 Hudson Bay Road, Town of Cobalt, District of Timiskaming, ON
Sewage System Owner:	Corporation of the Town of Cobalt
Provincial Officer's Order:	1-MV9KT, issued October 22, 2021
Director's Order:	1-ROGQN, issued January 26, 2022
Sewage Collection ECA:	206-W601, issued August 2, 2023
Reporting Period:	January 1, 2023 to December 31, 2023

Capacity of Works:	1060 m^3/day (as per Operations Manual)
Service Area:	Town of Cobalt
Service Population:	1260
Effluent Receiver:	Sasaginaga Creek
Major Process:	Constructed Wetlands with 3 Cells with Settling & Filtration

The Cobalt Constructed Wetlands is a municipal sewage works owned by the Town of Cobalt and operated by the Ontario clean Water Agency. It is classified as a Class 1 Wastewater Treatment Facility that serves the Town Cobalt. The Operations Manual for the Wetlands indicates a rated capacity for the system as 1060 m^3/day and, under normal operating conditions and a retention time of 13 days.

The Cobalt Constructed Wetlands receives municipal sewage from a gravity fed collection system via an inlet chamber with a parshall flume, two grit channels, and a composite sampler. From the inlet chamber sewage flows into the maintenance forebay and then to the three wetland cells which are operated in series.

The cells contain cattails to filter the water and berms to direct the flow through the system. Corrugated plastic baffles are used within the wetlands to limit short circuiting. The effluent outlet chamber includes a bar screen, weir and a composite sampler, all housed under covered structures. The effluent discharges to Sasaginaga Creek which joins Farr Creek and eventually flows into Lake Temiskaming.

The Wetlands were constructed within 5.0 hectares of native soils and have an overall depth of 1.0 to 1.2 meters, with the water level controlled by the outlet structure.

The Cobalt sewage collection system consists of separate sewers, combined sewers and one (1) pumping station located at the Town's water treatment plant that directs grey water to the Wetlands.

Grey Water Pumping Station is a 2400 mm diameter duplex station located approximately 500 meters West of Pyrite Street in Cobalt. It consists of two (2) submersible non-clog pumps each rated at 16 L/s at a total dynamic head (TDH) of 14 meters and a Flyght control panel with level and pump controls. A 180 kW standby generator is located adjacent to the water treatment plant and supplies power to the station during power outages. The station pumps directly to the sanitary sewer system.

2 Monitoring Program

2.1 Monitoring Program as Outlined in the Environmental Compliance Approval

Table 1: Analytical Parameters

BOD_5	Five Day Biochemical Oxygen Demand – is measured in an unfiltered sample; includes carbonaceous and nitrogenous oxygen demand. It refers to the amount of oxygen consumed by organic matter in a specific volume of water at a specific temperature over a 5 day period. High BOD_5 in effluent means a large quantity of oxygen was needed to break down the organic matter and identifies a large amount of organic matter in the effluent indicating inadequate treatment.
TSS	Total Suspended Solids – the dry weight of suspended particles that are not dissolved in water and can be filtered. TSS is composed of settleable solids and non-settleable solids depending on the size, shape and weight of the solid particles. Settable solids are large sized particles that tend to settle more rapidly in a given period of time.
TP	Total Phosphorus – a measure of all phosphorus found in a sample, whether it is dissolved or particulate. TP is commonly used to determine the health of water bodies. Excess TP stimulates algae and weed growth that may cause fluctuations in dissolved oxygen in the receiving waters.
TAN	Total Ammonia Nitrogen – the total amount of nitrogen in the forms of Ammonium (NH_4) and Ammonia (NH_3). Ammonia is one of several forms of nitrogen that exist in aquatic environments and can cause direct toxic effects on aquatic life. High levels of ammonia can corrode and damage critical pieces of infrastructure.
TKN	Total Kjeldahl Nitrogen – measures both total organic nitrogen and ammonium. Excess nitrogen in water bodies can lead to harmful algal blooms and other negative impacts on aquatic ecosystems.

Table 1: Analytical Parameters

Alkalinity	Alkalinity is an acid neutralizing agent that resists changes in pH. Wastewater systems which include biological processes function best at an optimal pH and alkalinity is needed to ensure pH remains in the optimal range.
pH	pH – expresses the degree or intensity of both acidic and alkaline reactions on a scale from 0 to 14 with 7 being neutral, number less than 7 signify increasingly greater acidic solutions, and numbers greater than 7 signify increasingly basic or alkaline reactions. Very high or very low pH levels can be corrosive to pipes, screening equipment and pumps, can damage biological processes and form undesirable toxic gases or heavy metals.
DO	Dissolved Oxygen – the amount of oxygen that is available in water to sustain life, including living bacteria.
Total Coliforms	A group of bacteria that are naturally found on plants and in soils, water, and in the intestines of humans and warm blooded animals.
Fecal Coliforms	A group of the total coliforms that are present in the intestine and faeces of warm blooded animals.
E. coli	*Escherichia coli* – Thermally tolerant forms of Escherichia bacteria that can live in the intestines of humans and warm-blooded animals. There are hundreds of *E. coli* strains and most are relatively harmless, however a notorious exception is *E. coli* strain 0157:H7, an emerging pathogen that produces a powerful toxin and can cause severe illness. *E. coli* is used as the most widely adopted indicator of faecal pollution in water and wastewater.
Sulphate	Is part of sulphur compounds which potentially inhibit plant growth and microbial activities in receiving water and it is important to reduce concentrations in wastewater to acceptable levels before discharging to the aquatic environment.
Hydrogen Sulphide	Sulfide is considered to be the main product of sulfate reduction, and can severely inhibit ammonium/carbon removal and plant photosynthesis, which decreases the treatment efficiency of the wetlands.

Table 2: Sampling Requirements for the Raw Sewage (Influent)

Parameter	Type of Sample	Minimum Frequency
BOD_5	24 hour composite	monthly
TSS	24 hour composite	monthly
TP	24 hour composite	monthly
TKN	24 hour composite	monthly

Parameter	Type of Sample	Minimum Frequency
TAN	24 hour composite	monthly

Table 3: Sampling Requirements for the Final Effluent

Parameter	Type of Sample	Minimum Frequency
BOD_5	24 hour composite	weekly
TSS	24 hour composite	weekly
TP	24 hour composite	weekly
TKN	24 hour composite	weekly
TAN	24 hour composite	weekly
Alkalinity	24 hour composite	weekly
pH	24 hour composite	weekly
Temperature	grab	weekly
Dissolved Oxygen	grab	weekly
E. coli	grab	weekly
Total Coliforms	grab	weekly
Fecal Coliforms	grab	weekly
Sulfate	24 hour composite	monthly
Hydrogen Sulfide	24 hour composite	monthly
Sulfur	24 hour composite	monthly
Arsenic, Copper, Iron, Lead, Nickel, Zinc	24 hour composite	bi-annually*

** April 15 - May 15 & August 15 - September 15*

Table 4: Sampling Requirements for Upstream and Downstream Discharge Points

Parameter	Type of Sample	Minimum Frequency
BOD_5	grab	monthly
TSS	grab	monthly
TP	grab	monthly
TAN	grab	monthly
pH	grab	monthly

Parameter	Type of Sample	Minimum Frequency
Temperature	grab	monthly
Dissolved Oxygen	grab	monthly
E. coli	grab	monthly
Total Coliforms	grab	monthly
Fecal Coliforms	grab	monthly
Sulfate	grab	monthly
Hydrogen Sulfide	grab	monthly
Sulfur	grab	monthly
Arsenic, Copper, Iron, Lead, Nickel, Zinc	grab	bi-annually*

** April 15 - May 15 & August 15 - September 15*

3 Interpretation of Monitoring and Analytical Data

3.1 Influent Flow

The influent flow is a measurement based on the total volume of wastewater taken in each day. The system uses a parshall flume for raw sewage flow measurement installed at the inlet works.

The design capacity of the Cobalt Wetlands is 1060 m^3/day (average daily flow) as indicated the Operations Manual (KMK, December 20, 2022). The average daily flow is defined as the total sewage flow of influent to the sewage treatment system during a calendar year divided by the number of days during which sewage was flowing to the sewage treatment plant that year.

The average daily flow measured for 2023 was 1435 m^3/day which is 135% of the design capacity. A peak flow of 6926 m^3 occurred on April 14th during periods of heavy rainfall. This was the highest peak flow since 2020 (7825 m^3).

The total amount of wastewater received by the wetlands in 2023 was 523,614 m^3.

Figure 1 compares the monthly influent flow rates recorded in 2023 to the design capacity of the plant.

Flow trends are critical to assessing the adequacy of size of the treatment system. Figure 2 shows both the annual average and annual peak values for the last 8 years plotted against the design capacity of the wastewater system.

3.1.1 Monthly Influent Flows

Table 5: Comparison of the Monthly Influent Flows to the Rated Capacity

Month	Total Influent Flow (m^3/d)	Maximum Influent Flow (m^3/d)	Average Daily Influent Flow (m^3/d)	% of the Avg. Day Rated Capacity (1060 m^3/d)
January	40,454	1904	1305	123%
February	35,214	1616	1258	118%
March	37,830	1417	1220	115%
April	97,049	6926*	3235	300%
May	62,746	5074*	2024	190%
June	35,595	2014	1186	111%
July	28,018	2009	904	85%
August	28,145	1891	908	85%
September	39,873	4945*	1329	125%
October	61,564	5245*	1986	187%
November	32,679	1698	1089	102%
December	24,446	1019	789	74%

* High flows occurred in April and May due to rapid snow melt and heavy rains. High flows in September and October due to very heavy rainfall.

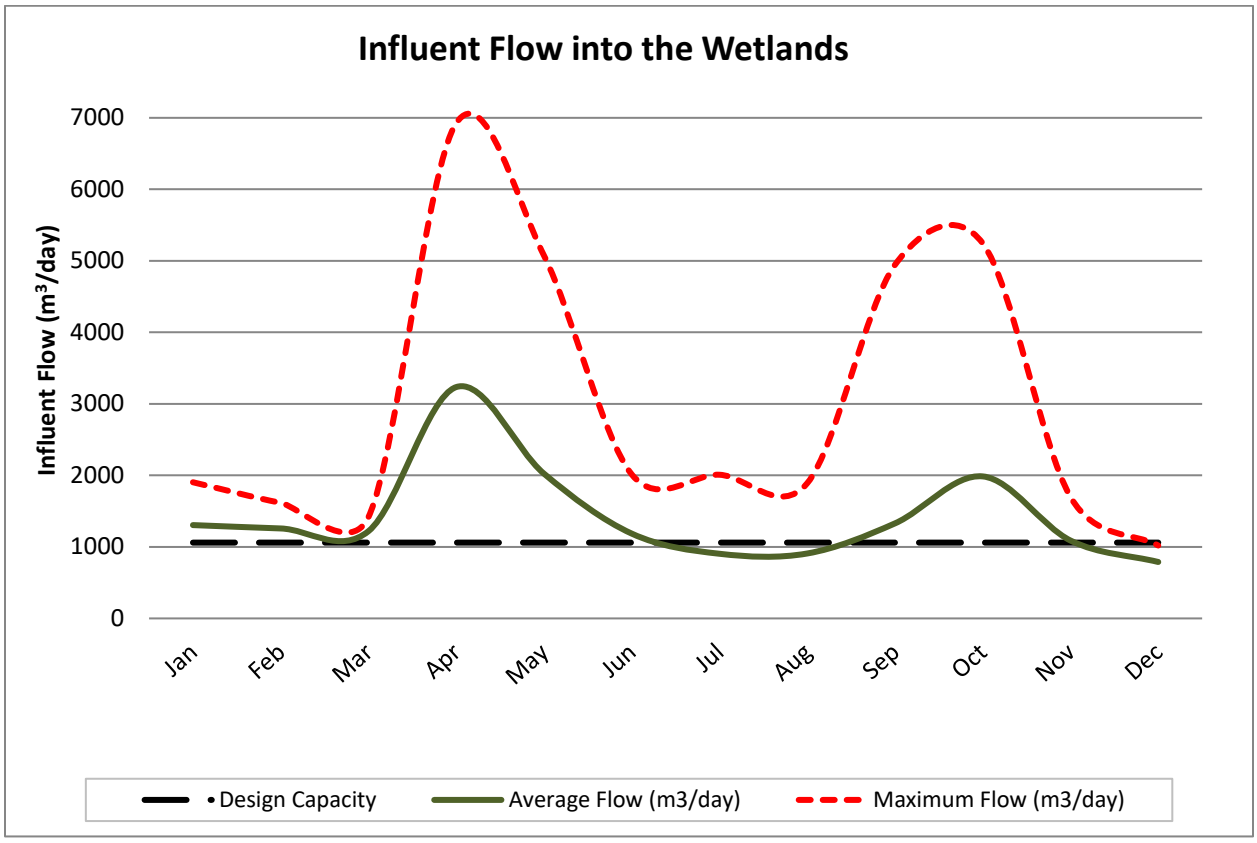

Figure 1 – 2023 Influent Flow into the Cobalt Wetlands

3.1.2 Annual Influent Flows

Table 6: Comparison of the Annual Influent Flow to the Rated Capacity

Design Capacity (m^3/day)	1060	Maximum Flow Capacity (m^3/day)	N/A
2023 Average Flow (m^3/day)	1435	2023 Maximum Flow (m^3/day)	6926
Percent of Capacity (%)	135%	Percent of Capacity (%)	N/A
Total volume of wastewater treated in 2023		523, 614 m^3	

3.1.3 Historical Influent Flows

Table 7: Comparison of Historical Influent Flows (2016 to 2023)

Year	Total Influent Flow (m^3/d)	Maximum Influent Flow (m^3/d)	Average Day Flow (m^3/d)	% Average of Rated Capacity (1060 m^3/d)
2023	523,614	6,926	1,435	135%
2022	386,073	2,792	1,058	100%
2021	267,242	1,157	732	69%
2020	337,341	7,825	923	87%
2019	294,152	2,341	806	76%
2018	222,421	1,899	643	61%
2017	263,051	1,813	721	68%
2016	318,860	1,472	874	83%

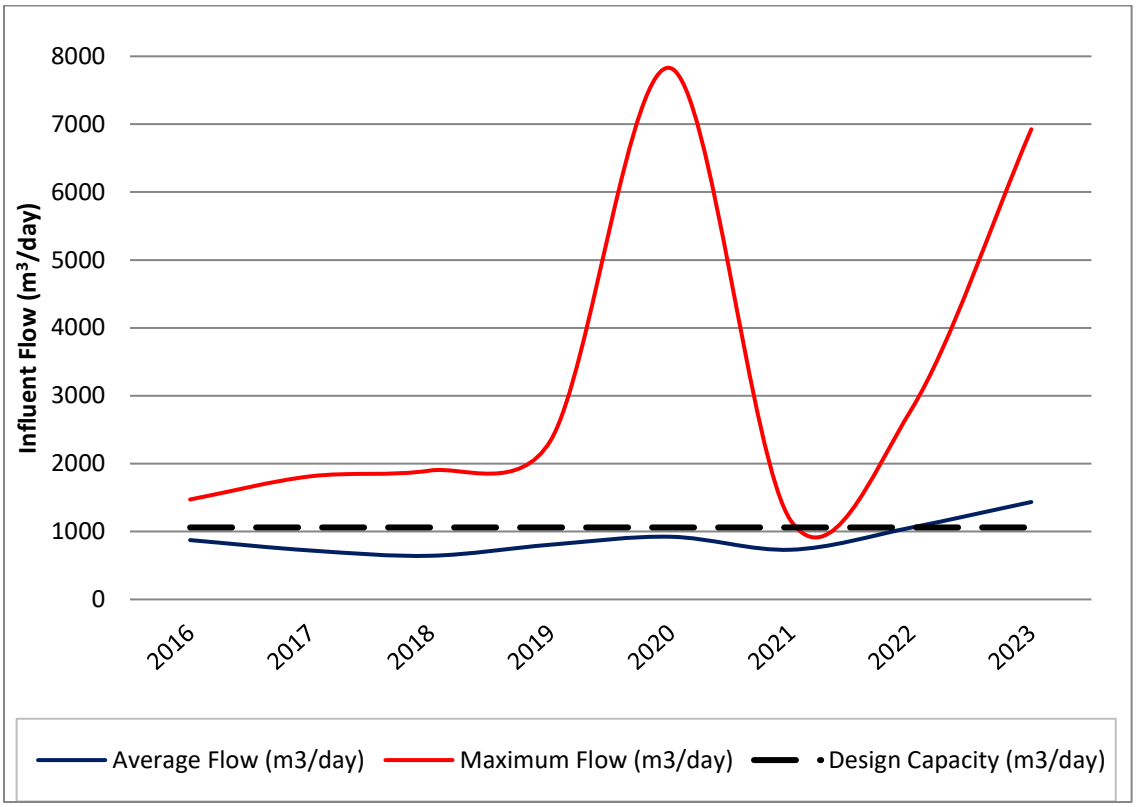

Figure 2 – Historical Influent Flow Trends (2016 to 2023)

3.2 Effluent Flows

The effluent flow passes through a 1200 mm wide rectangular weir gate located at outlet building which measures flow discharging to Sasaginaga Creek. The monthly effluent flows are provided in Table 8 and trended in Figure 3.

Table 8: Monthly Effluent Flow for 2023

Month	Average Flow (m^3/day)	Maximum Flow (m^3/day)	Total Flow (m^3)
January	1551	2454	48,080
February	1451	1767	40,618
March	1474	1698	40,618
April	4275	12,206	128,239
May	2581	5772	80,000
June	1382	3383	41,475
July	1373	4498	42,574
August	1145	3093	35,506
September	1684	7189	50,505
October	2551	6301	79,090
November	1625	2487	48,756
December	1168	1385	36,198
2023	**1854**	**12,206**	**676,743**

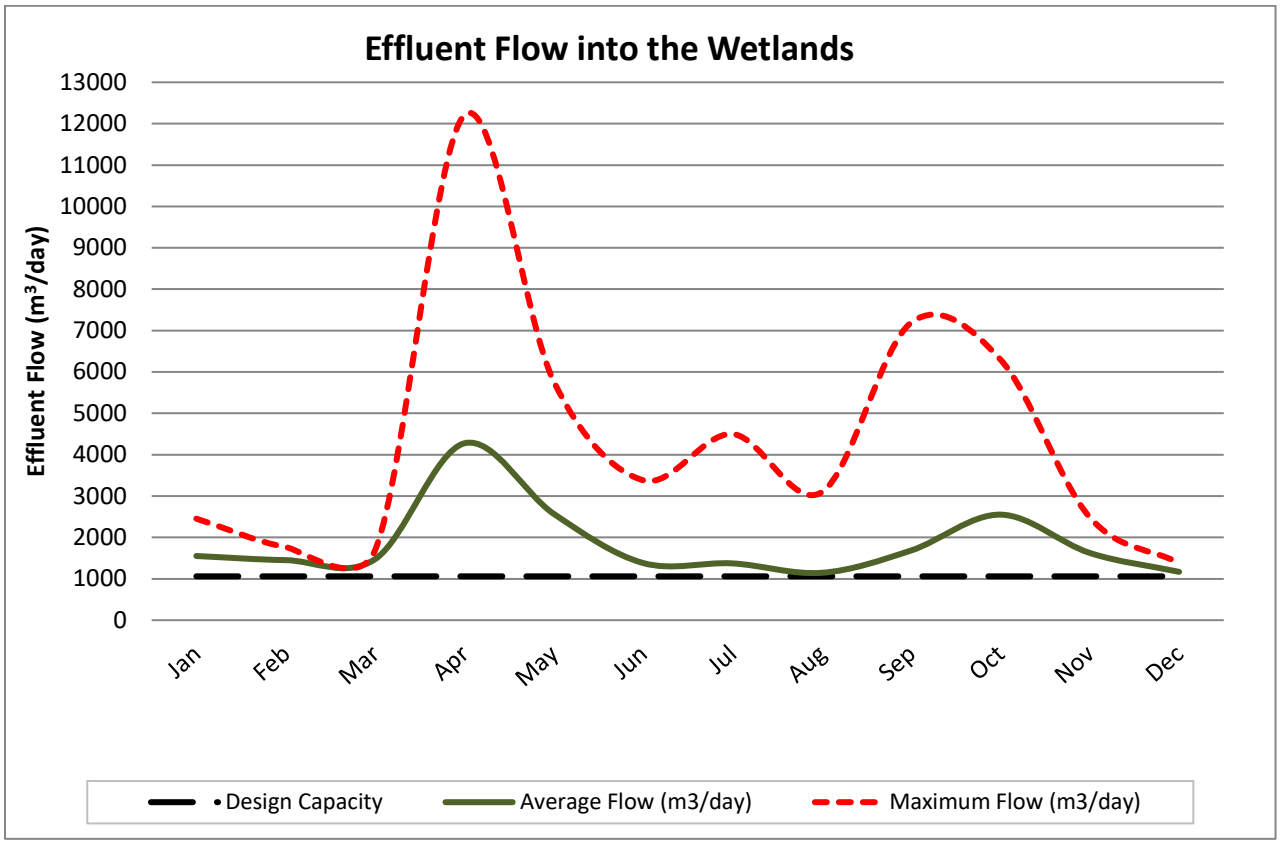

Figure 3 –2023 Effluent Flow into the Cobalt Wetlands

3.3 Influent Verses Effluent Flows

The total volume of influent flow measured in 2023 was 523,614 compared to the effluent flow of 676,743 m^3 which is 23% higher than influent flow.

Influent and effluent flows are continuously recorded and the differences in the total flow volumes are being monitored until resolutions are implemented to improve the issue.

The comminutor was removed in 2022 when it was determined not to be the appropriate technology for the system. It failed multiple times or plugged resulting in unaccounted wastewater bypassing the forebay and flow meter. Historical data in Table 10 reveals that removing this unit improved the issue, but other options are still needed to improve the discrepancies in the flow which are described in Section 8 of this report.

Table 9 and Figure 4 compare the 2023 influent flows to the effluent flows.

Table 10 and Figure 5 compare the influent and effluent flows from 2016 to 2023.

Table 9: Influent and Effluent Flow Comparison for 2023

2023	Influent Flow (m^3/month)	Effluent Flow (m^3/month)	Flow Difference (Effluent – Influent)	% Percent Difference
January	40,454	48,080	7626	16
February	35,214	40,618	5404	13
March	37,830	45,703	7873	17
April	97,050	128,239	31,189	24
May	62,746	80,000	17,254	22
June	35,595	41,474	5879	14
July	28,018	42,574	14,556	34
August	28,145	35,506	7,361	21
September	39,873	50,505	10,632	21
October	61,564	79,090	17,526	22
November	32,679	48,756	16,077	33
December	24,446	36,198	11,752	32
TOTAL	**523,614**	**676,743**	**153,129**	**23%**

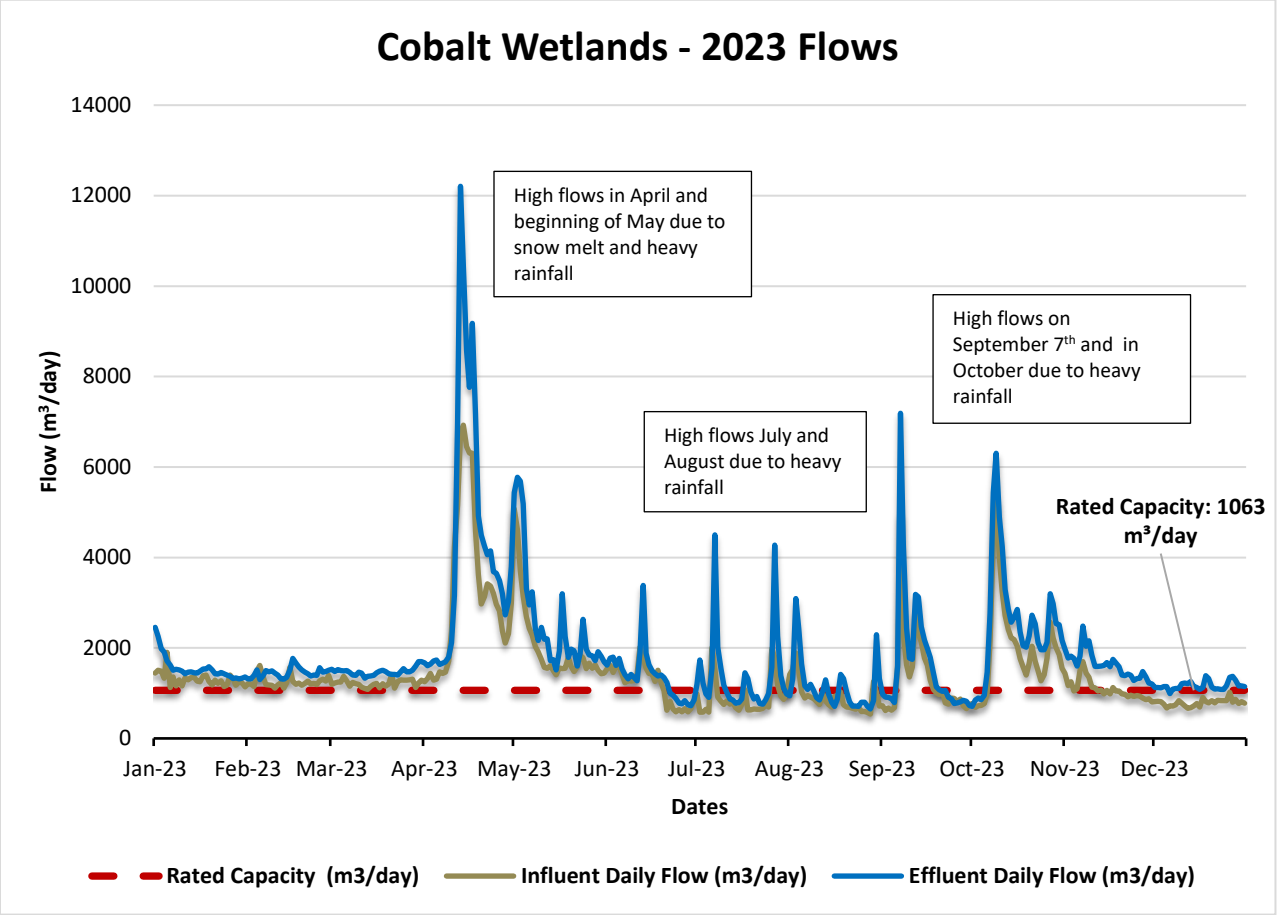

Figure 4 – Comparison of Influent and Effluent Flows (2023)

Table 10: Comparison of Historical Influent and Effluent Flows (2016 to 2023)

Year	Total Influent Flow (m^3/d)	Total Effluent Flow (m^3/d)	Difference (m^3/d)	% Difference
2023	523,614	676,743	153,129	23%
2022	386,073	668,395	282,322	42%
2021	267,242	591,549	335,407	56%
2020	337,341	526,387	249,741	53%
2019	294,152	587,081	292,929	50%
2018	222,421	370,072	147,652	40%
2017	263051	641,731	378,680	59%
2016	318,860	663,442	344,582	52%

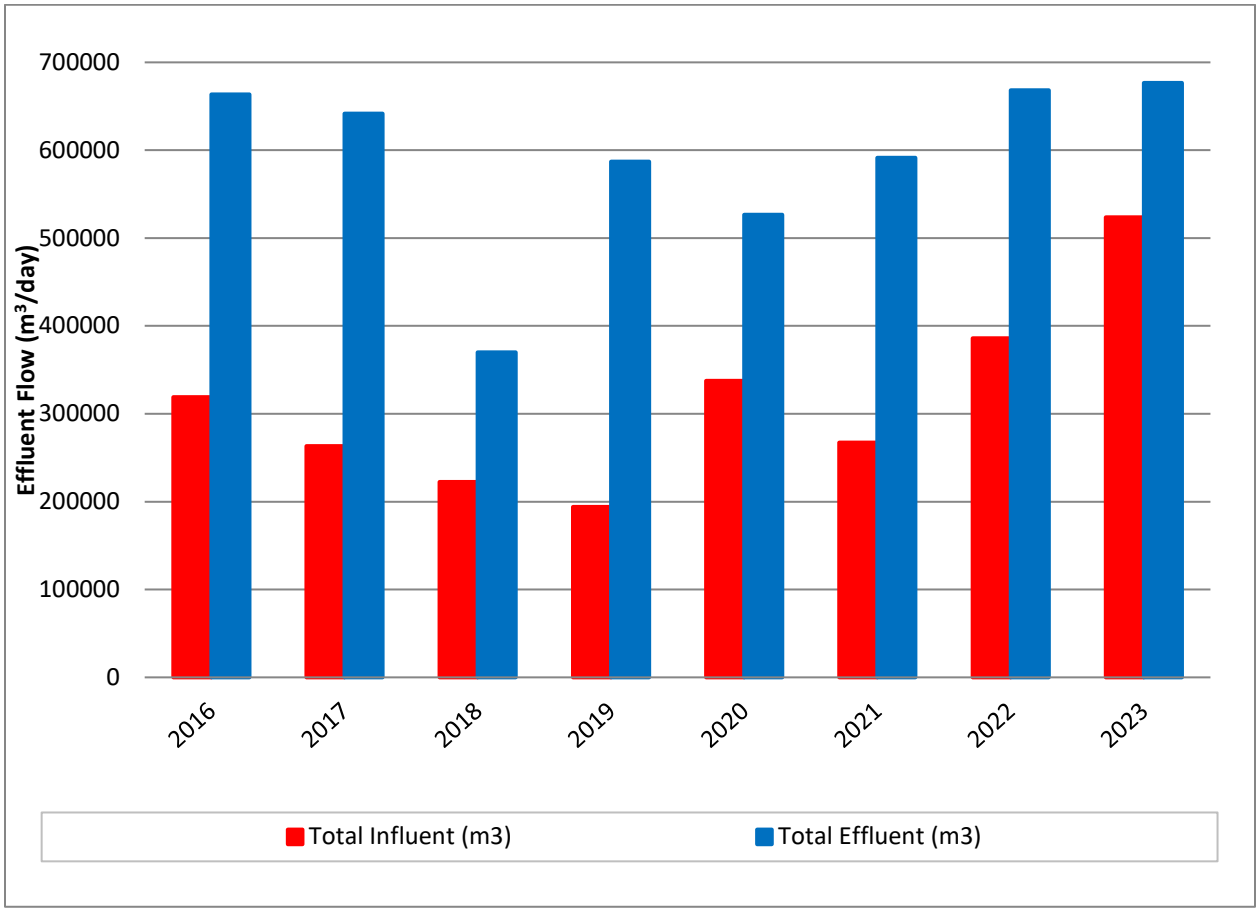

Figure 5 – Comparison of Influent and Effluent Flows (2016 to 2023)

3.4 Influent (Raw Sewage) Quality

Influent samples are required to be collected on a monthly basis. This section summaries the annual average and annual maximum concentrations of analytical parameters for 2023. A summary of the monthly monitoring data is available in Appendix A.

Table 11: Influent Concentrations

Parameter	Annual Average	Annual Maximum
BOD_5 (mg/L)	228	395
TSS (mg/L)	293	1150
TP (mg/L)	7.62	34.1
TAN (mg/L)	14.4	32.5
TKN (mg/L)	26.7	51.2

3.4.1 Historical Trends of Influent Characteristics

The characteristics of the raw wastewater influence the design and efficacy of the wastewater treatment process.

Table 12: Influent - Comparison of Historical Results (Annual Averages)

Parameter	2017	2018	2019	2020	2021	2022	2023
BOD_5 (mg/L)	59	64	56	24	31	93	228
TSS (mg/L)	62	55	65	47	46	76	293
TP (mg/L)	1.4	1.5	2.4	1.1	1.2	2.5	7.6
TAN (mg/L)	7.7	11	17	9.5	7.4	7.4	14
TKN (mg/L)	13	15	20	14	13	15	27

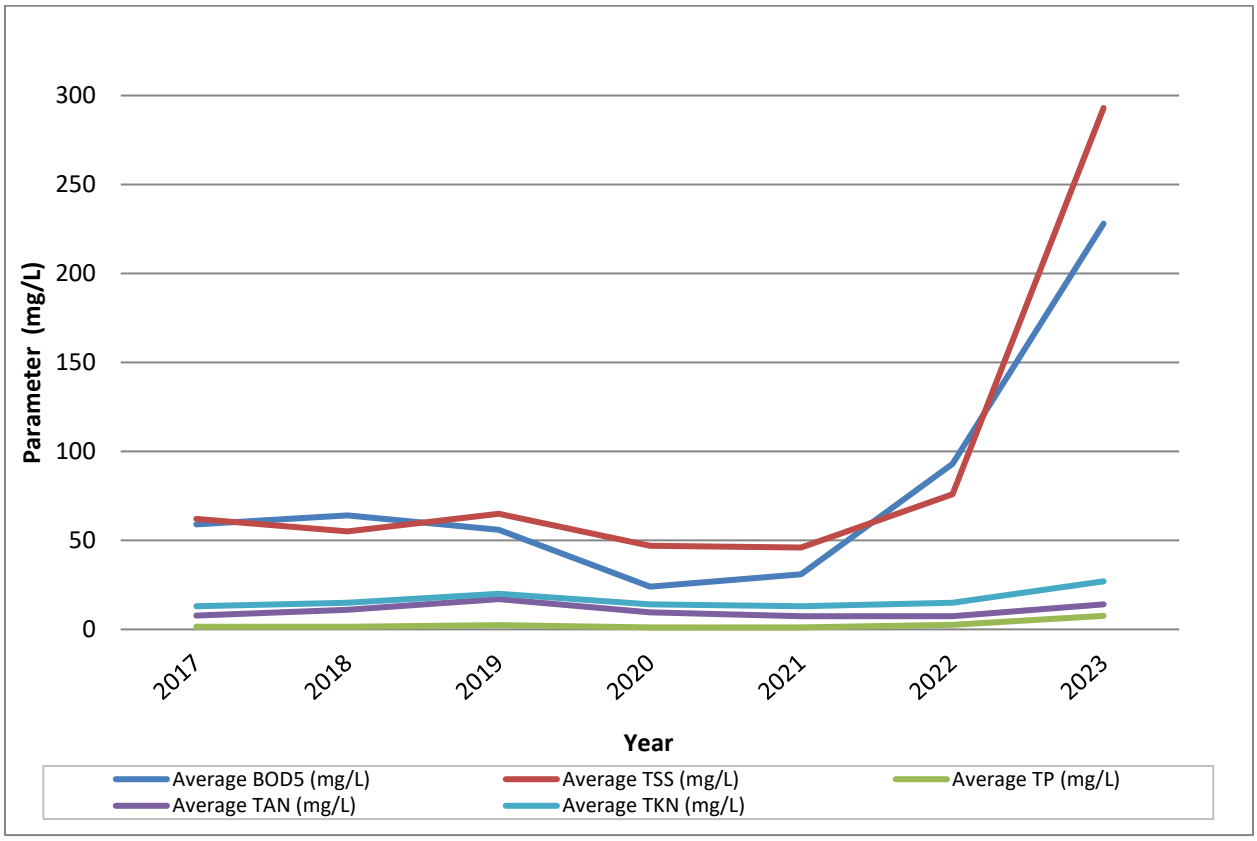

Figure 6 – Historical Trends of Average Influent Concentrations (2017 to 2023)

The above trends show that the average concentrations of all parameters increased at the end of 2022 and into 2023, with BOD_5 and TSS increasing significantly. An investigation was

conducted and determined that the sample line feeding the influent sampler was drawing material from the bottom of the chamber rather than from the influent stream. The sample line was relocated to collect more representative influent samples.

3.5 Effluent Quality

Effluent samples are collected and tested as specified in Schedule A of Director's Order 1-ROGQN. This section summaries the results of the effluent quality samples. While effluent quality is assessed based on these parameters; there is currently no compliance limits in place for any of these parameters with the exception of pH which is required to be maintained between 6.0 and 9.5 at all times. However, a memo from the Ministry's Regional Surface Water Assessment Department, dated November 4, 2019 indicates that a discharge concentration of 25 mg/L BOD_5, 25 mg/L TSS and 1.5 mg/L TP could lead to adverse impacts to the aquatic habitat downstream of the discharge point. These values will be used as guidelines in this report. Table 13 shows that the BOD_5, TSS and TP levels fell well below the guidelines and the pH complied with the compliance range.

Appendix A includes a Monthly Process Data Report which summarizes the effluent monitoring and analysis conducted at the facility during the reporting period.

It should be mentioned that monthly sampling and testing of sulphur was not completed as required for January, February March and May. Refer to Appendix B for details of the non-compliance.

Table 13: Effluent Concentrations

Parameter	Minimum	Maximum	Average	Guidelines
BOD_5 (mg/L)	< 0.8	13	< 3.9	25*
TSS (mg/L)	< 1	7.5	< 2.2	25*
TP (mg/L)	0.103	0.705	0.353	1.5*
TAN (mg/L)	0.25	10	4.4	N/A
TKN (mg/L)	1.5	14	6.2	N/A
Alkalinity (mg/L)	65	238	132	N/A
pH (units)	6.16	8.38	7.02	6.0 to 9.5
Temperature °C	0.5	23	9.6	N/A
Dissolved Oxygen (mg/L)	1.34	8.17	3.29	N/A
E. coli (cfu/100mL)	< 12	50,000	< 4842	N/A
Fecal Coliforms (cfu/100mL)	< 5	37,000	< 3973	N/A
Total Coliforms (cfu/100mL)	90	132,000	19,774	N/A
Sulphate (mg/L)	4.1	16	8.0	N/A

Parameter	Minimum	Maximum	Average	Guidelines
Hydrogen Sulfide (mg/L)	< 0.02	0.07	< 0.02	N/A
Sulfur (mg/L)	2.0	19	7.6	N/A
Arsenic (mg/L)	0.041	0.105	0.073	N/A
Copper (mg/L)	0.002	0.006	0.004	N/A
Iron (mg/L)	0.26	0.57	0.42	N/A
Lead (mg/L)	0.0004	0.0006	0.0005	N/A
Nickel (mg/L)	0.003	0.003	0.003	N/A
Zinc (mg/L)	0.002	0.008	0.005	N/A

"<" means values include results that were less than the laboratory's method detection limit

cfu ≡ colony forming units.

3.5.1 Effluent Loadings

The monthly effluent loadings for BOD_5, TSS and TP are required to be calculated in kilograms, but no loading limits are specified in the Director's Order (No. 1-ROGON). The monthly effluent loadings are provided in Table 14 and trended in Figures 7 to 9.

Table 14: Monthly Effluent Loadings

Parameter	BOD_5 (kg)	TSS (kg)	TP (kg)
January	250	168	23.4
February	203	91	25.6
March	352	110	29.7
April	497	321	49.2
May	162	80	13.8
June	202	88	9.76
July	118	138	8.11
August	151	57	4.83
September	157	139	9.95
October	235	138	16.2
November	88	73	14.7
December	122	52	21.0

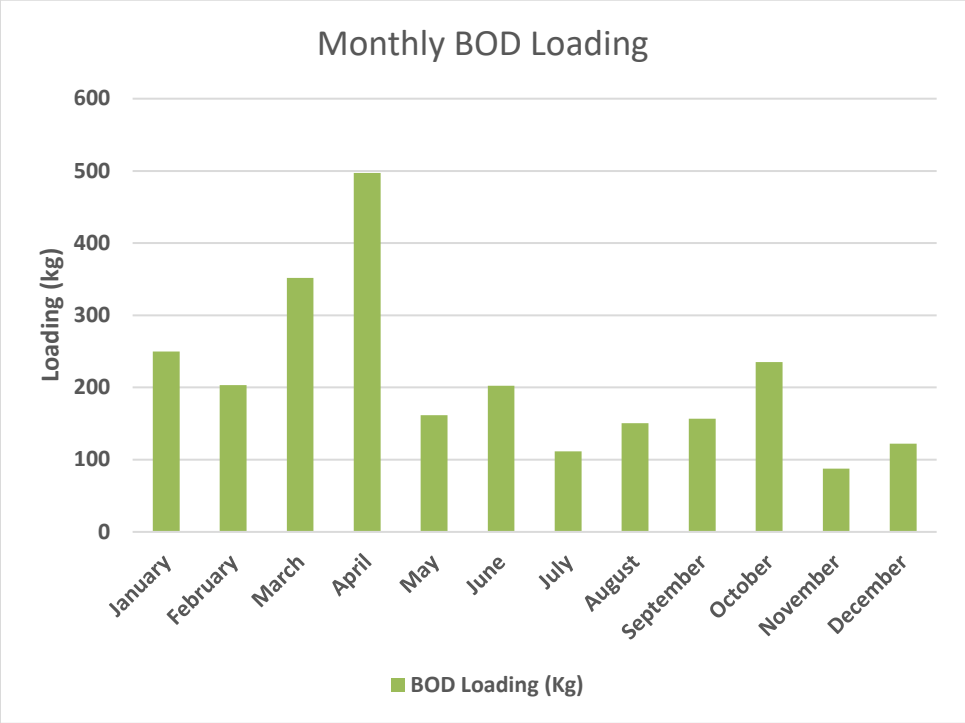

Figure 7 – Monthly BOD_5 Loadings

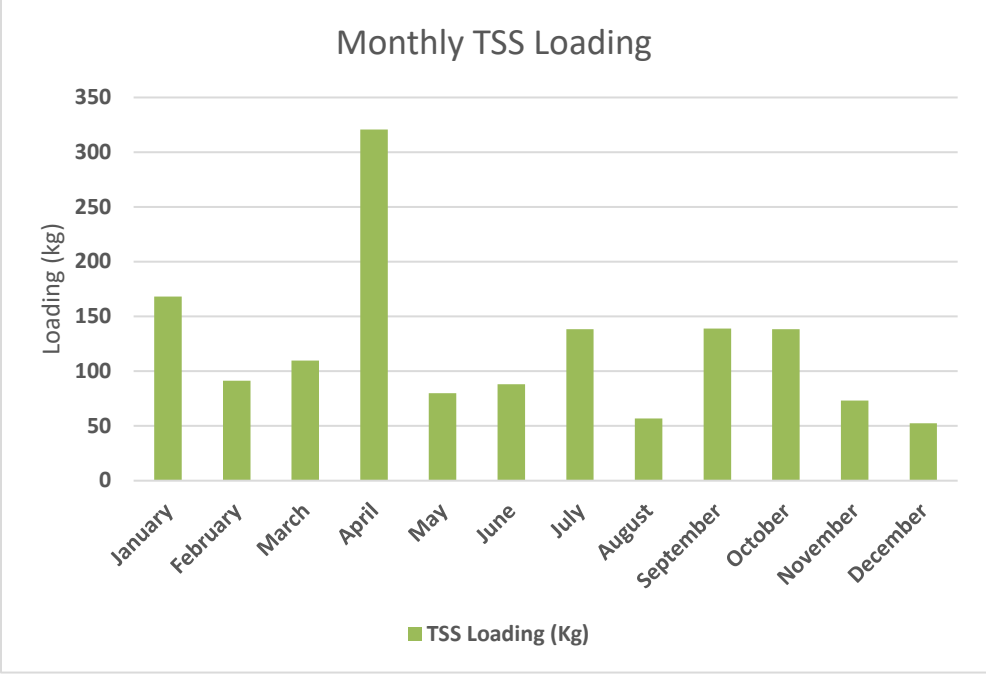

Figure 8 – Monthly TSS Loadings

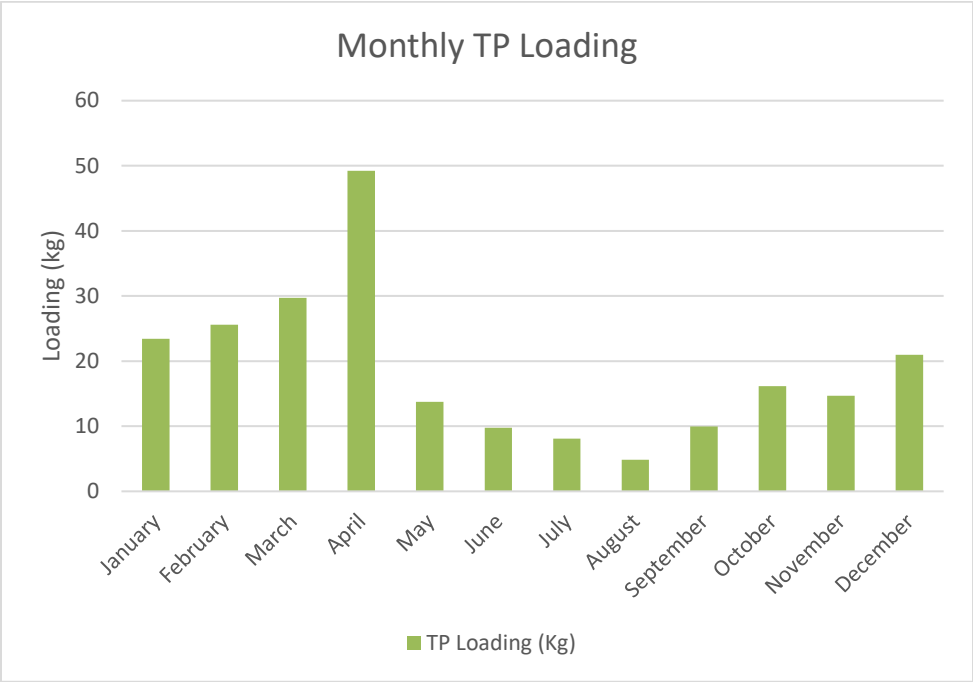

Figure 9 – Monthly TP Loadings

3.5.2 Historical Trends of Effluent Characteristics

Table 15 compares effluent concentrations from 2017 to 2023. Results for BOD_5, TSS and TP remained below the guidelines of 25, 25 and 1.5 mg/L respectively.

Table 15: Effluent - Comparison of Historical Results (Annual Averages)

Parameter	2017	2018	2019	2020	2021	2022	2023
BOD_5 (mg/L)	6.4	10	5.6	5.0	5.0	4.5	3.9
TSS (mg/L)	3.5	3.6	3.0	4.4	3.8	2.0	2.2
TP (mg/L)	0.43	0.51	0.55	0.52	0.51	0.296	0.353
TAN (mg/L)	6.4	8.6	8.1	7.4	8.2	4.7	4.4
TKN (mg/L)	7.8	9.6	9.4	9.6	10	6.9	6.2
Alkalinity (mg/L)	125	149	151	145	135	120	73
pH (units)	7.1	6.9	6.8	6.8	6.84	7.08	7.02
Temperature °C	9.1	7.9	7.8	8.4	9.9	9.9	9.6
Dissolved Oxygen (mg/L)	2.71	1.64	2.57	2.32	2.5	2.92	3.29
E. coli (cfu/100mL)	6,002	14,536	7,557	15,254	17,191	14,197	4,842
Total Coliforms (cfu/100mL)	22,326	73,965	29,224	37,870	56,545	44,328	19,774
Fecal Coliforms (cfu/100mL)	5,160	56,122	4,456	20,435	14,864	10,085	3,973

Parameter	2017	2018	2019	2020	2021	2022	2023
Sulphate (mg/L)	10.9	9.08	8.67	8.83	7.60	7.20	7.97
Hydrogen Sulfide (mg/L)	0.103	0.09	0.028	0.029	0.04	0.04	0.07
Sulfur (mg/L)	3.5	3.3	3.2	3.8	2.7	N/A	7.6
Arsenic (mg/L)	0.062	0.048	0.066	0.077	0.049	0.058	0.073
Copper (mg/L)	0.0023	0.0014	0.0012	0.0024	0.0013	0.0020	0.0040
Iron (mg/L)	0.41	0.46	0.63	0.46	0.44	0.32	0.42
Lead (mg/L)	0.0003	0.0005	0.0005	0.0004	0.0005	0.0006	0.0005
Nickel (mg/L)	0.0039	0.0031	0.0041	0.0038	0.0031	0.0025	0.0030
Zinc (mg/L)	0.0087	0.004	0.003	0.006	0.0068	0.0053	0.0050

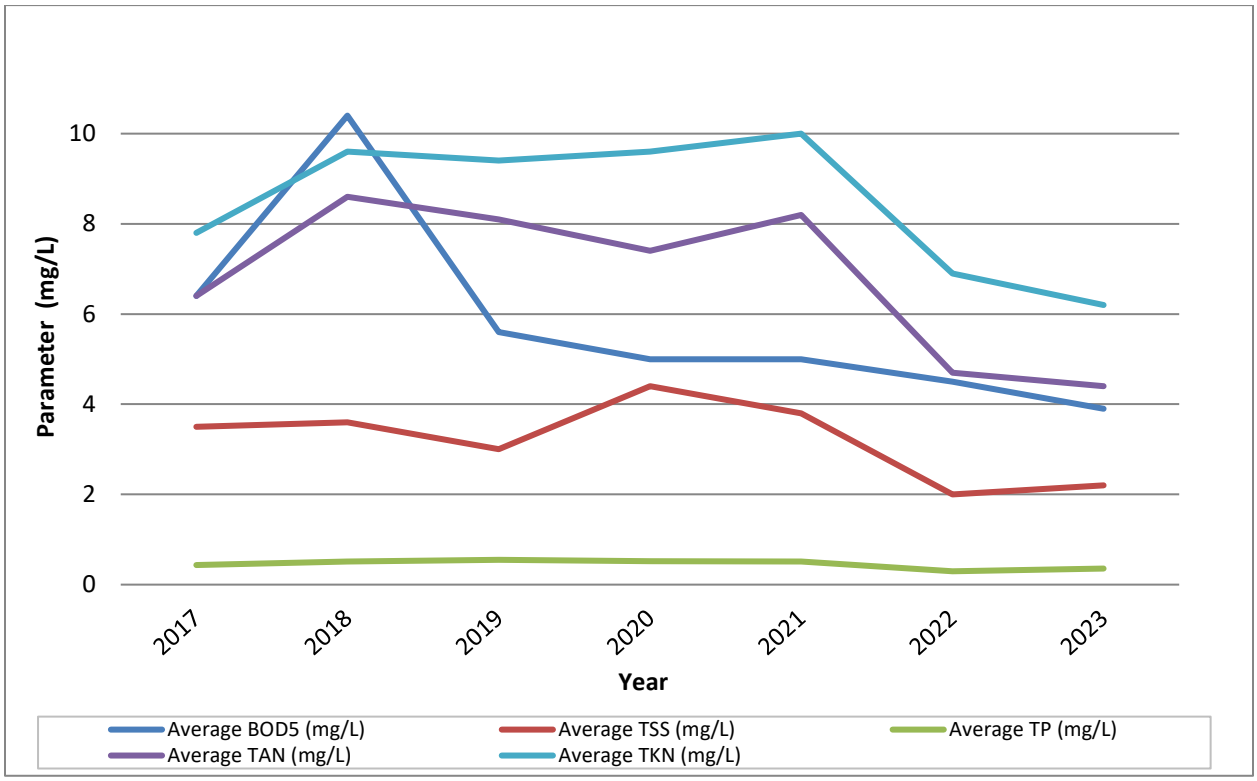

Figure 10 – Historical Trends of Average Effluent Concentrations (2017 to 2023

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3.6 Sewage Treatment Program Success and Adequacy

The Performance Summary shows the efficiency of the wetlands performance through pollutant removal rates from raw sewage through to the final effluent for BOD_5, TSS, and TP. The table

below demonstrates that the Wetlands treatment process is performing very well and is significantly reducing the amount of pollutants in the effluent.

Table 16: Performance Summary

Parameter	Influent (annual average)	Effluent (annual average)	% Removal
BOD_5 (mg/L)	228	< 3.9	98%
TSS (mg/L)	293	< 2.2	99%
TP (mg/L)	7.62	0.353	95%

4 Effluent Quality Assurance and Control Measures Undertaken

The following activities are included in regular operator and supervisory activities to assure high level performance of the wastewater treatment operations including high effluent quality and accurate flow monitoring:

- Operational staff have current and appropriate level of certification for the operation of the facility and continue to learn and achieve knowledge of the process and equipment Experienced staff has a high level of regulatory competence. New staff receives on-going training to achieve operational knowledge and regulatory competence.
- The wetlands site is inspected by a certified OCWA operator regularly during the work week.
- Certified operators conduct daily reviews of selected data from continuous monitoring equipment which is captured by a remote monitoring system.
- In-house tests; pH, temperature and DO, are conducted by licensed operators for monitoring purposes using standard methods for Water and Wastewater.
- Samples are collected as required and analyzed by Testmark Laboratories located in Kirkland Lake, Ontario. Analysis of the samples is conducted in accordance with the Standard Council of Canada (SCC), in cooperation with the Canadian Association for Laboratory Accreditation Inc. (CALA). Quality control procedures are method specific and include laboratory duplicate samples, spiked blanks and spiked duplicates.
- A sampling system which includes an excel sample calendar, which is updated at the beginning of each year, and a chain of custody binder are used to ensure all samples are collected as per the requirements identified in the system's ECA.

- Operations and Compliance staff review facility round sheets and laboratory reports to monitor the routine operation of the treatment system and ensure compliance with the ECA.
- All process and laboratory data is logged in a process data management system.
- Routine maintenance is scheduled and tracked to completion using OCWA's Workplace Maintenance System (WMS). Instrumentation equipment is tested and maintained as per manufacturer's recommendations.
- All flow and effluent quality data is reviewed by the Overall Responsible Operator and Compliance staff to identify any changes in concentrations and/or emerging trends. All non-compliances are reported to Ministry's Spills Action Center (SAC) and the local MECP inspector.

5 Sasaginaga Creek Monitoring

Samples for Sasaginaga Creek are sampled and tested monthly as specified in Schedule A of Director's Order 1-ROGQN. Table 17 and Table 18 summarize the results for 2023.

It should be noted that monthly sampling and testing of sulphur was not completed as required. Refer to Appendix B for details of the non-compliance.

Table 17: Sasaginaga Creek – Upstream of Discharge Point

Parameter	Min	Max	Average
BOD_5 (mg/L)	< 0.5	2.1	< 1.1
TSS (mg/L)	< 1	5	< 1.7
TP (mg/L)	0.02	0.108	0.042
TAN (mg/L)	< 0.01	1.09	< 0.12
pH (units)	6.20	7.98	7.35
Temperature °C	0.2	25	9.8
Dissolved Oxygen (mg/L)	9.6	13	11
E. coli (cfu/100mL)	< 5	290	< 71
Fecal Coliforms (cfu/100mL)	< 5	260	70
Total Coliforms (cfu/100mL)	15	1900	761
Sulphate (mg/L)	3.5	13	6.3
Hydrogen Sulfide (mg/L)	< 0.02	< 0.02	< 0.02
Sulfur (mg/L)	2.1	14	5.1
Arsenic (mg/L)	0.071	0.320	0.196
Copper (mg/L)	0.003	0.007	0.005
Iron (mg/L)	0.18	0.2	0.19

Parameter	Min	Max	Average
Lead (mg/L)	0.0001	0.0009	0.0005
Nickel (mg/L)	0.006	0.018	0.012
Zinc (mg/L)	0.005	0.013	0.009

Table 18: Sasaginaga Creek – Downstream of Discharge Point

Parameter	Min	Max	Average
BOD_5 (mg/L)	< 1.0	6.7	< 3.0
TSS (mg/L)	< 1	25	< 5
TP (mg/L)	0.049	0.290	0.145
TAN (mg/L)	0.12	7.07	1.72
pH (units)	7.10	7.76	7.43
Temperature °C	0.2	24.7	10.5
Dissolved Oxygen (mg/L)	8.0	15	10
E. coli (cfu/100mL)	5	62,000	5818
Fecal Coliforms (cfu/100mL)	< 5	50,000	< 4817
Total Coliforms (cfu/100mL)	40	67,000	8998
Sulphate (mg/L)	4.8	8.1	6.2
Hydrogen Sulfide (mg/L)	< 0.02	0.12	< 0.03
Sulfur (mg/L)	2.4	12	6.3
Arsenic (mg/L)	0.077	0.210	0.144
Copper (mg/L)	0.002	0.006	0.004
Iron (mg/L)	0.20	0.65	0.43
Lead (mg/L)	0.0003	0.0008	0.0006
Nickel (mg/L)	0.006	0.011	0.009
Zinc (mg/L)	0.005	0.011	0.008

6 Forebay Management

6.1 Monthly Forebay Sludge Monitoring

The Maintenance Forebay area acts as a settling chamber allowing solids which pass through the inlet chamber to settle before entering the wetlands. Sampling of the Forebay contents began in January 2023 and is conducted monthly to monitor the BOD_5, TSS, TP, TAN and TKN concentrations. This monitoring plan was implemented to help determine a clean out frequency for the Forebay. Results are provided in Table 19 and graphed in Figure 11.

Table 19: Monthly Forebay Results

Parameter	BOD_5 (mg/L)	TSS (mg/L)	TP (mg/L)	TAN (mg/L)	TKN (mg/L)
January	26	17	1.2	6.4	10
February	19	13	0.54	5.3	14
March	43	15	0.73	5.8	13
April	18	15	0.46	1.1	5.0
May	1	27	0.77	2.3	11
June	51	47	0.95	4.4	10
July	48	147	1.7	14	18
August	22	17	0.78	8.9	13
September	0.5	27	0.81	8.5	11
October	13	20	0.67	1.8	3.3
November	13	18	0.54	4.1	7.4
December	36	28	1.5	6.3	17

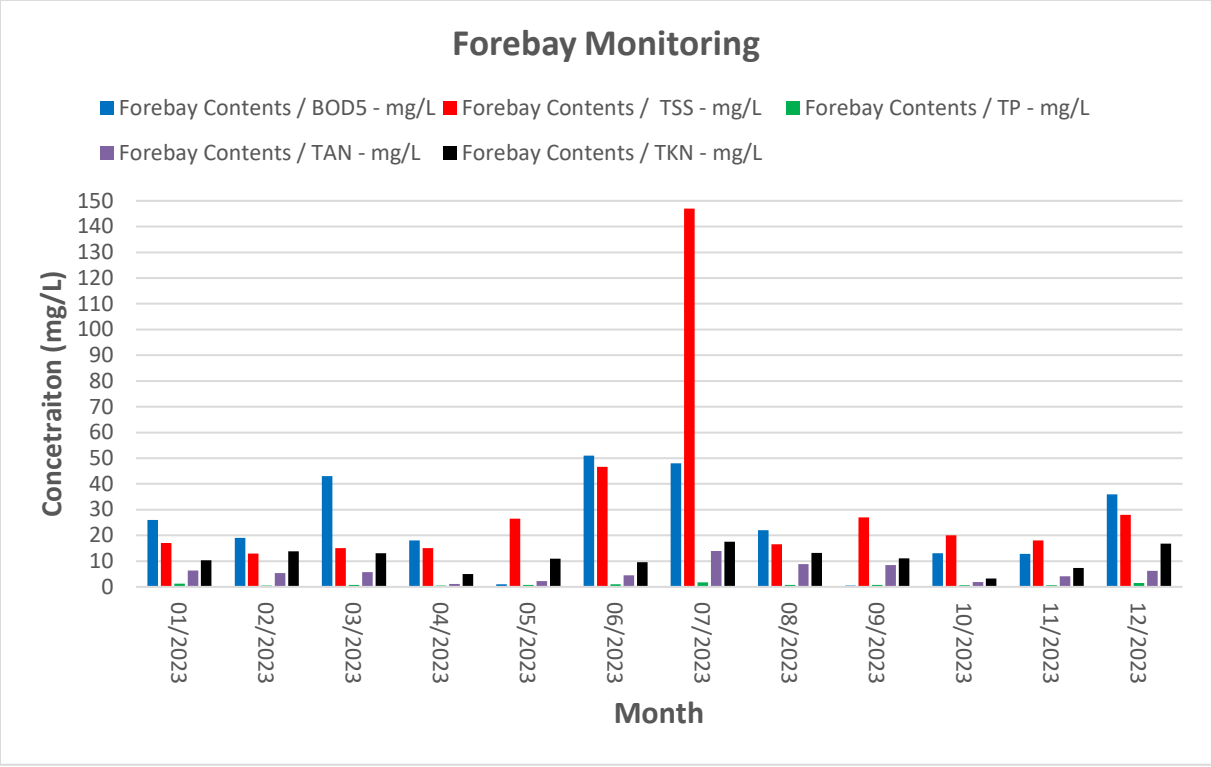

Figure 11 – 2023 Forebay Monitoring

6.2 Forebay Sludge Levels

Item 6 of the Director's Order requires a Management Plan for the sludge which includes measuring the sludge levels annually and monitoring the sludge generation. Sludge depths were measured in November 2022 using 5 sample points. Sludge and water depths were measured during this reporting period on November 3, 2023 using 12 sample points.

It is anticipated that the sludge volume generated in 2024 will be similar or slightly less to volumes in 2022 and 2023 as sludge will be removed at the beginning of 2024 as explained in Section 6.3.

Table 20: Forebay - Sludge Depths

Date	Sample Points	Average Depths (m)		Sludge Volume (m^3)	% Capacity
		Water	Sludge		
Nov. 14, 2022	6	N/A	0.27	28	27%
Nov. 3, 2023	12	0.15	0.33	35	33%

Estimated operating depth = 1 m, Area = 105 m2, Operating Capacity = 105 m3

6.3 Forebay Maintenance

No sludge/septage was removed from the maintenance forebay in 2023. The clean-out is delayed to early 2024 to allow for the replacement of two (2) control valves in the inlet and outlet chambers of the forebay. These valves were not received before the end of 2023.

In order to replace the valves, sludge/septage from the forebay and chambers need to be removed. The sludge/septage removal and the valve replacement work would be done at the same time to be most feasible for the Town.

7 Maintenance Procedures Performed on the Works

7.1 Routine Maintenance and Repairs

Routine maintenance schedules are entered in OCWA's computerized Workplace Management System (WMS). This is a comprehensive maintenance program that is based on a pro-active and preventive approach. This program includes but is not limited to running weekly, monthly, and annually checks as required or as recommended by manufacturer's instructions. All routine and preventative maintenance was conducted in 2023.

- Flow meters were calibrated once 2023 to an accuracy of +/-15%.
- Influent and effluent flows were recorded continuously and operational staff ensured that the flow meters and chart recorders were working properly.

- The weir, effluent chamber and bar screen were inspected at least twice a week and any debris/obstructions was removed as required. Once temperatures dropped to below 0°C, inspections were increased to three times per week.
- Any ice was removed from the influent and effluent flow measuring devices.
- The effluent building and chamber were kept clean and easily accessible.
- The equipment used to prevent freezing (heat trace in still well, effluent building heater and wind break) were maintained and kept in good repair.
- If the effluent weir is adjusted at all it would be calibrated immediately to ensure accurate measurements. The weir was not adjusted in 2023.

Refer to Appendix C for a maintenance summary which includes routine and preventative work and capital projects.

7.2 Emergency Repairs

There were no emergency repairs performed in 2023.

7.3 Calibration of Monitoring Equipment

Influent and effluent monitoring equipment is at least every 12 months as per the Director's Order. Flow meters are calibrated annually to ensure a required accuracy of +/- 15%.

Routine maintenance was conducted as scheduled by qualified Instrumentation Technicians during the reporting period. Refer to Table 21 for calibrations conducted in 2023.

Table 21: Calibration Summary

Instrument	Calibration Date	% Accuracy
Raw Flow Meter	April 13, 2023	99.8%
Effluent Flow Meter	April 13, 2023	99.3%

8 Operating Problems & Corrective Actions

Operating problems encountered during 2023 are summarized below.

1. **Difference in Influent & Effluent Flows**

   The effluent flows are higher than the influent flows. The effluent weir used to measure the effluent flow has high percentage of error, especially at lower flows. Also, the comminutor which failed and plugged up regularly would cause wastewater to overflow into the bypass channel and circumvent the influent flow meter. The comminutor was removed from service in July 2022 as it was deemed to be the incorrect technology for the system by WT Infrastructure. It was eventually removed at the end 2022.

The influent and effluent flows have been continuously monitored and the differences in the total flow volumes have improved in 2023 as shown in Table 10 and Figure 5 of Section 3.3, but other options are still needed to improve the discrepancies in the flows.

A new 90 degree V-notch weir with an ultrasonic level senor is being considered in 2024 to replace the current rectangular weir gate. According the WT Infrastructure, a V-notice weir will provide more accurate results with significant low and high flow variations.

2. **Control Valves**

Two control valves; one located at the Forebay Inlet Chamber and once at the Forebay Outlet Chamber are seized and require replacement. These valves are necessary to ensure the influent flow meter will not be bypassed when conducting the annual removal of sludge/septage from the Forebay and are planned to be replaced in early 2024.

9 Abnormal Discharge Events

9.1 Overflow, Bypass and Spill Events

No abnormal discharge events occurred at the wetlands or in the collection system during the reporting period.

9.2 Efforts Made to Reduce System Overflows and Bypasses

There are no designed bypass or overflow points in the collection system.

Planned bypasses of the maintenance Forebay are required when cleaning out the sludge/septage from the Forebay. MECP approval is requested during these projects.

Overflow points are located between Cell 1 and 2 and between Cell 2 and 3 of the wetlands, but no events have occurred. Regular maintenance and inspection of the system and surrounding environment prevent the occurrence of overflows.

9.3 Summary of Alterations to the System to Reduce Overflows

There have been no projects done in 2023 to reduce overflows/bypasses/spills.

10 Complaints

No complaints were received during the reporting period.

11 Proposed Alterations to the Works

Major alterations planned for 2024:

1. Replacement of two (2) seized control valves at the forebay; one located in the Forebay Inlet Chamber and once in the Forebay Outlet Chamber. These valves are necessary to ensure the influent flow meter will not be bypassed when cleaning sludge/septage from the forebay.

2. Replacement of the rectangular effluent weir gate with a V-notch weir to more accurately measure the effluent stream from the Wetlands to Sasaginaga Creek.

12 Other Information

Additional time has been granted by the MECP to allow the Town of Cobalt to complete the Assimilative Capacity Study of Sasaginaga Creek required under the Director's Order. The amended compliance date is July 31, 2024.

APPENDIX A
Monthly Process Data Report

Cobalt Constructed Wetlands
2023 Monthly Process Data Report

INFLUENT	01/2023	02/2023	03/2023	04/2023	05/2023	06/2023	07/2023	08/2023	09/2023	10/2023	11/2023	12/2023	Total	Avg	Max	Min
S-1 Raw / Biochemical Oxygen Demand: BOD5 - mg/L																
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	12			
Max Lab	392	380	395	8.5	130	354	336	307	318	20	65	31			395	
Mean Lab	392	380	395	8.5	130	354	336	307	318	20	65	31		228		
Min Lab	392	380	395	8.5	130	354	336	307	318	20	65	31				8.5
S-1 Raw / Total Suspended Solids: TSS - mg/L																
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	12			
Max Lab	173	180	106	23	200	330	810	1150	340	9	168	28			1150	
Mean Lab	173	180	106	23	200	330	810	1150	340	9	168	28		293		
Min Lab	173	180	106	23	200	330	810	1150	340	9	168	28				9
S-1 Raw / Total Phosphorus: TP - mg/L																
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	12			
Max Lab	3.74	34.1	7.91	0.669	3.59	5.47	8.05	16.5	7.68	0.52	2.5	0.732			34.1	
Mean Lab	3.74	34.1	7.91	0.669	3.59	5.47	8.05	16.5	7.68	0.52	2.5	0.732		7.62		
Min Lab	3.74	34.1	7.91	0.669	3.59	5.47	8.05	16.5	7.68	0.52	2.5	0.732				0.52
S-1 Raw / Total Ammonia Nitrogen - mg/L																
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	12			
Max Lab	24.3	26.9	32.3	2.69	2.6	20	16.3	9.68	32.5	0.94	4.82	0.04			32.5	
Mean Lab	24.3	26.9	32.3	2.69	2.6	20	16.3	9.68	32.5	0.94	4.82	0.04		14.4		
Min Lab	24.3	26.9	32.3	2.69	2.6	20	16.3	9.68	32.5	0.94	4.82	0.04				0.04
S-1 Raw / Total Kjeldahl Nitrogen: TKN - mg/L																
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	12			
Max Lab	30.7	43.2	45	6.2	14.4	38.6	40.9	51.2	26.4	1.7	11.6	10.5			51.2	
Mean Lab	30.7	43.2	45	6.2	14.4	38.6	40.9	51.2	26.4	1.7	11.6	10.5		26.7		
Min Lab	30.7	43.2	45	6.2	14.4	38.6	40.9	51.2	26.4	1.7	11.6	10.5				1.7

EFFLUENT	01/2023	02/2023	03/2023	04/2023	05/2023	06/2023	07/2023	08/2023	09/2023	10/2023	11/2023	12/2023	Total	Avg	Max	Min
S-4/S-5 Eff / Biochemical Oxygen Demand: BOD5 - mg/L																
Count Lab	4	4	5	4	5	4	4	5	4	4	5	4	52			
Max Lab	6.3	6.7	9	7.3	3.1	13	< 3.5	6.1	3.4	5.9	2.5	5.3			13	
Mean Lab	5.2	5.0	7.7	3.9	2.0	4.9	< 2.6	4.2	3.1	3.0	1.8	3.4		< 3.9		
Min Lab	3.8	3.1	5.1	1.4	1.2	1.6	< 0.8	2.7	2.8	1.1	1.4	2.5				< 0.8
S-4/S-5 Eff / Total Suspended Solids: TSS - mg/L																
Count Lab	4	4	5	4	5	4	4	5	4	4	5	4	52			
Max Lab	< 7.5	< 5.0	3.0	< 5.0	< 1.0	5.0	4.5	< 3.5	< 4.5	< 3.0	< 3.5	< 2.3			7.5	
Mean Lab	< 3.5	< 2.3	2.4	< 2.5	< 1.0	2.1	3.3	< 1.6	< 3.0	< 1.8	< 1.5	< 1.5		< 2.2		
Min Lab	< 1.0	< 1.0	1.5	< 1.0	< 1.0	1.0	1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0				< 1.0
S-4/S-5 Eff / Total Phosphorus: TP - mg/L																
Count Lab	4	4	5	4	5	4	4	5	4	4	5	4	52			
Max Lab	0.692	0.663	0.705	0.64	0.227	0.262	0.228	0.15	0.228	0.252	0.476	0.599			0.705	
Mean Lab	0.595	0.63	0.65	0.384	0.172	0.235	0.191	0.136	0.197	0.204	0.301	0.579		0.353		
Min Lab	0.48	0.598	0.608	0.214	0.103	0.188	0.143	0.123	0.159	0.12	0.22	0.561				0.103
S-4/S-5 Eff / Total Ammonia Nitrogen - mg/L																
Count Lab	4	4	5	4	5	4	4	5	4	4	5	4	52			
Max Lab	8.9	8.0	8.3	8.0	2.5	1.5	3.6	4.7	5.0	4.3	5.5	10.1			10.1	
Mean Lab	7.5	7.9	8.0	4.2	0.9	1.1	3.1	3.2	4.1	3.1	2.9	7.1		4.4		
Min Lab	6.27	7.47	7.55	1.74	0.25	0.75	2.74	1.51	3.28	1.88	1.7	1.04				0.25
S-4/S-5 Eff / Total Kjeldahl Nitrogen: TKN - mg/L																
Count Lab	4	4	5	4	5	4	4	5	4	4	5	4	52			
Max Lab	8.9	14	12.8	13.1	6.7	4.3	7.3	10.7	6.5	8	4.5	9.2			14	
Mean Lab	7.6	10.9	11.4	6.9	3.7	3.4	6.1	5.9	4.4	3.8	2.8	8.1		6.2		
Min Lab	6.5	9.5	10.4	3.5	2.2	2.1	5.5	3.2	3	1.5	2.2	6.9				1.5
S-4/S-5 Eff / Alkalinity (as CaCO3) - mg/L																
Count Lab	4	4	5	4	5	4	4	5	4	4	5	4	52			
Max Lab	123	127	110	205	124	238	125	142	158	160	165	168			238	
Mean Lab	114	121	107	119	114	151	121	134	147	150	149	157		132		
Min Lab	100	117	105	65	97	115	118	123	130	137	131	145				65
S-4/S-5 Eff / pH Field: Lab Upload - ---																
Max IH	7.90	7.20	6.66	7.30	7.80	8.38	7.12	6.90	6.91	7.10	7.43	7.46			8.38	
Mean IH	7.07	6.86	6.55	6.76	7.37	7.63	6.81	6.80	6.84	7.04	7.30	7.28		7.02		
Min IH	6.50	6.64	6.44	6.16	6.77	7.26	6.66	6.70	6.71	6.97	7.11	7.06				6.16
S-4/S-5 Eff / Temperature Field: Lab Upload - °C																
Max IH	4.4	2.8	8.5	4.5	21.5	21.6	23.0	18.0	21.9	16.4	8.8	4.7			23.0	
Mean IH	2.4	1.9	3.7	2.7	13.9	18.6	19.7	16.6	14.9	10.9	5.8	3.9		9.6		
Min IH	0.5	0.9	1.8	1.3	7.1	16.0	17.8	13.5	11.3	8.0	3.5	3.1				0.5
S-4/S-5 Eff / Dissolved Oxygen: DO Field: Lab Upload - mg/L																
Max IH	5.1	7	2.67	6.27	8.17	3.78	3.8	3.9	2.39	2.6	3.32	3.4			8.17	
Mean IH	3.14	4.41	2.23	5.13	5.21	2.88	2.62	3.59	2.13	2.19	2.91	2.79		3.29		
Min IH	1.34	2.6	1.89	4.38	3.07	1.68	1.52	2.6	1.85	1.68	2.34	1.93				1.34
S-4/S-5 Eff / E. Coli: EC - cfu/100mL																
Count Lab	4	4	5	4	5	4	4	5	4	4	5	4	52			
Max Lab	13000	13000	13000	9000	< 60	200	400	2800	6000	5000	16000	50000			50000	
Mean Lab	5750	4900	7640	3929	< 28	110	210	722	1720	1650	5360	27500		< 4843		
Min Lab	1000	1500	3200	15	< 15	40	80	12	180	200	800	17000				< 12
S-4/S-5 Eff / Fecal Coliform: FC - cfu/100mL																
Count Lab	4	4	5	4	5	4	4	5	4	4	5	4	52			
Max Lab	4200	3500	8400	16000	< 60	170	600	5400	4400	9000	9600	37000			37000	
Mean Lab	2295	1980	6120	4803	< 22	105	280	1596	2085	2665	3732	23100		< 3973		
Min Lab	400	920	1800	5	< 5	25	90	200	140	260	800	4400				< 5
S-4/S-5 Eff / Total Coliform: TC - cfu/100mL																
Count Lab	4	4	5	4	5	4	4	5	4	4	5	4	52			
Max Lab	37000	39000	49000	72000	2800	1900	3200	> 30000	70000	44000	34000	132000			132000	
Mean Lab	19950	14800	29200	26875	1028	923	2285	> 7920	19625	13925	20800	85000		> 19774		
Min Lab	2000	5600	18000	1400	400	90	840	> 200	900	3100	5000	55000				> 90
S-4/S-5 Eff / Sulphate: SO4 - mg/L																
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	12			
Max Lab	8.8	6.8	6.5	16	12.3	4.2	4.1	4.5	5.4	10.2	10	6.8			16	
Mean Lab	8.8	6.8	6.5	16	12.3	4.2	4.1	4.5	5.4	10.2	10	6.8		8.0		
Min Lab	8.8	6.8	6.5	16	12.3	4.2	4.1	4.5	5.4	10.2	10	6.8				4.1
S-4/S-5 Eff / Hydrogen Sulphide: H2S - mg/L																
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	12			
Max Lab	< 0.02	< 0.02	0.07	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02			0.07	
Mean Lab	< 0.02	< 0.02	0.07	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02		
Min Lab	< 0.02	< 0.02	0.07	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				< 0.02
S-4/S-5 Eff / Sulphur: S - mg/L																
Count Lab	0	0	0	1	0	1	1	1	1	1	1	1	8			
Max Lab				11.6		9.9	2.0	6.3	2.1	19.0	4.8	5.0			19.0	
Mean Lab				11.6		9.9	2.0	6.3	2.1	19.0	4.8	5.0		7.6		
Min Lab				11.6		9.9	2.0	6.3	2.1	19.0	4.8	5.0				2.0
S-4/S-5 Eff / Arsenic: As - µg/l																
Count Lab	0	0	0	1	0	0	0	0	1	0	0	0	2			
Lab Result				105					41					73	105	41
S-4/S-5 Eff / Copper: Cu - µg/l																
Count Lab	0	0	0	1	0	0	0	0	1	0	0	0	2			
Lab Result				2					6					4	6	2
S-4/S-5 Eff / Iron: Fe - mg/L																
Count Lab	0	0	0	1	0	0	0	0	1	0	0	0	2			
Lab Result				0.26					0.57					0.42	0.57	0.26
S-4/S-5 Eff / Lead: Pb - µg/l																
Count Lab	0	0	0	1	0	0	0	0	1	0	0	0	2			
Lab Result				0.6					0.4					0.5	0.6	0.4
S-4/S-5 Eff / Nickel: Ni - µg/l																
Count Lab	0	0	0	1	0	0	0	0	1	0	0	0	2			
Lab Result				3					3					3	3	3
S-4/S-5 Eff / Zinc: Zn - µg/l																
Count Lab	0	0	0	1	0	0	0	0	1	0	0	0	2			
Lab Result				8					2					5	8	2

Cobalt Constructed Wetlands
2023 Monthly Process Data Report

SASAGINAGA CREEK - DOWNSTREAM	01/2023	02/2023	03/2023	04/2023	05/2023	06/2023	07/2023	08/2023	09/2023	10/2023	11/2023	12/2023	Total	Avg	Max	Min
S-3 Down / Biochemical Oxygen Demand: BOD5 - mg/L																
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	12			
Max Lab	2.6	4.4	6.7	1.4	< 1	2.6	2.2	2.6	6.7	1.5	1.3	2.8			6.7	
Mean Lab	2.6	4.4	6.7	1.4	< 1	2.6	2.2	2.6	6.7	1.5	1.3	2.8		< 3.0		
Min Lab	2.6	4.4	6.7	1.4	< 1	2.6	2.2	2.6	6.7	1.5	1.3	2.8				< 1.0
S-3 Down / Total Suspended Solids: TSS - mg/L																
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	12			
Max Lab	< 1	< 1	< 1	5	2	25	2	10	< 1	2	1.5	8.5			25	
Mean Lab	< 1	< 1	< 1	5	2	25	2	10	< 1	2	1.5	8.5		< 5		
Min Lab	< 1	< 1	< 1	5	2	25	2	10	< 1	2	1.5	8.5				< 1
S-3 Down / Total Phosphorus: TP - mg/L																
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	12			
Max Lab	0.185	0.281	0.290	0.060	0.049	0.219	0.144	0.105	0.154	0.071	0.050	0.126			0.290	
Mean Lab	0.185	0.281	0.290	0.060	0.049	0.219	0.144	0.105	0.154	0.071	0.050	0.126		0.145		
Min Lab	0.185	0.281	0.290	0.060	0.049	0.219	0.144	0.105	0.154	0.071	0.050	0.126				0.049
S-3 Down / Total Ammonia Nitrogen - mg/L																
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	12			
Max Lab	1.09	3	3.44	0.17	0.12	0.74	0.9	1.04	1.71	0.76	0.57	7.07			7.07	
Mean Lab	1.09	3	3.44	0.17	0.12	0.74	0.9	1.04	1.71	0.76	0.57	7.07		1.72		
Min Lab	1.09	3	3.44	0.17	0.12	0.74	0.9	1.04	1.71	0.76	0.57	7.07				0.12
S-3 Down / pH Field: Lab Upload - ---																
Max IH	7.10	7.50	7.30	7.30	7.19	7.72	7.66	7.40	7.32	7.30	7.60	7.76			7.76	
Mean IH	7.10	7.50	7.30	7.30	7.19	7.72	7.66	7.40	7.32	7.30	7.60	7.76		7.43		
Min IH	7.10	7.50	7.30	7.30	7.19	7.72	7.66	7.40	7.32	7.30	7.60	7.76				7.10
S-3 Down / Temperature Field: Lab Upload - °C																
Max IH	0.5	0.9	0.5	4.9	21.1	19.3	21.7	19.0	24.7	9.1	4.0	0.2			24.7	
Mean IH	0.5	0.9	0.5	4.9	21.1	19.3	21.7	19.0	24.7	9.1	4.0	0.2		10.5		
Min IH	0.5	0.9	0.5	4.9	21.1	19.3	21.7	19.0	24.7	9.1	4.0	0.2				0.2
S-3 Down / Dissolved Oxygen: DO Field: Lab Upload - mg/L																
Max IH	10.7	8.6	8.9	11.7	10.1	9.4	15.4	10.3	8.0	8.1	11.1	11.5			15.4	
Mean IH	10.7	8.6	8.9	11.7	10.1	9.4	15.4	10.3	8.0	8.1	11.1	11.5		10.3		
Min IH	10.7	8.6	8.9	11.7	10.1	9.4	15.4	10.3	8.0	8.1	11.1	11.5				8.0
S-3 Down / E. Coli: EC - cfu/100mL																
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	12			
Max Lab	1300	62000	4000	30	5	100	85	60	20	500	120	1600			62000	
Mean Lab	1300	62000	4000	30	5	100	85	60	20	500	120	1600		5818		
Min Lab	1300	62000	4000	30	5	100	85	60	20	500	120	1600				5
S-3 Down / Fecal Coliform: FC - cfu/100mL																
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	12			
Max Lab	580	50000	3300	50	< 5	340	340	80	180	1100	150	1680			50000	
Mean Lab	580	50000	3300	50	< 5	340	340	80	180	1100	150	1680		< 4817		
Min Lab	580	50000	3300	50	< 5	340	340	80	180	1100	150	1680				< 5
S-3 Down / Total Coliform: TC - cfu/100mL																
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	12			
Max Lab	4400	67000	22000	1100	40	500	900	1200	140	3800	1100	5800			67000	
Mean Lab	4400	67000	22000	1100	40	500	900	1200	140	3800	1100	5800		8998		
Min Lab	4400	67000	22000	1100	40	500	900	1200	140	3800	1100	5800				40
S-3 Down / Sulphate: SO4 - mg/L																
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	12			
Max Lab	6.2	6.1	6.2	4.9	4.8	8.1	5.8	6.7	7.8	7.7	5	5.3			8.1	
Mean Lab	6.2	6.1	6.2	4.9	4.8	8.1	5.8	6.7	7.8	7.7	5	5.3		6.2		
Min Lab	6.2	6.1	6.2	4.9	4.8	8.1	5.8	6.7	7.8	7.7	5	5.3				4.8
S-3 Down / Hydrogen Sulphide: H2S - mg/L																
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	12			
Max Lab	< 0.02	< 0.02	0.12	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02			0.12	
Mean Lab	< 0.02	< 0.02	0.12	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.03		
Min Lab	< 0.02	< 0.02	0.12	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				< 0.02
S-3 Down / Sulphur: S - mg/L																
Count Lab	0	0	0	1	0	1	1	1	1	1	1	1	8			
Max Lab				6.3		11.9	2.4	7	2.9	12.3	2.8	4.5			12.3	
Mean Lab				6.3		11.9	2.4	7	2.9	12.3	2.8	4.5		6.3		
Min Lab				6.3		11.9	2.4	7	2.9	12.3	2.8	4.5				2.4
S-3 Down / Arsenic: As - µg/l																
Count Lab	0	0	0	1	0	0	0	0	1	0	0	0	2			
Max Lab				77					210						210	
Mean Lab				77					210					144		
Min Lab				77					210							77
S-3 Down / Copper: Cu - µg/l																
Count Lab	0	0	0	1	0	0	0	0	1	0	0	0	2			
Max Lab				6					2						6	
Mean Lab				6					2					4		
Min Lab				6					2							2
S-3 Down / Iron: Fe - mg/L																
Count Lab	0	0	0	1	0	0	0	0	1	0	0	0	2			
Max Lab				0.2					0.65						0.65	
Mean Lab				0.2					0.65					0.43		
Min Lab				0.2					0.65							0.20
S-3 Down / Lead: Pb - µg/l																
Count Lab	0	0	0	1	0	0	0	0	1	0	0	0	2			
Max Lab				0.8					0.3						0.8	
Mean Lab				0.8					0.3					0.6		
Min Lab				0.8					0.3							0.3
S-3 Down / Nickel: Ni - µg/l																
Count Lab	0	0	0	1	0	0	0	0	1	0	0	0	2			
Max Lab				6					11						11	
Mean Lab				6					11					9		
Min Lab				6					11							6
S-3 Down / Zinc: Zn - µg/l																
Count Lab	0	0	0	1	0	0	0	0	1	0	0	0	2			
Max Lab				11					5						11	
Mean Lab				11					5					8		
Min Lab				11					5							5

APPENDIX B
Non-compliance Report

Incident of Non-Compliance

Revised 2014-06-18, Rev. 2

Ontario Clean Water Agency
Agence Ontarienne Des Eaux

Facility Cobalt Constructed Wetlands **OCWA Org #** 6022

Operator Rebecca Marshall **DWS/Works #** 120002745

X Incident of non-compliance ☐ PTTW exceedance ☐ MDWL exceedance ☐ ECA exceedance (check one)

Incident Monthly sampling/analysis for sulfur was not completed as required.

Date June 8th, 2023 **Time**

Legislation Director's Order # 1-ROGQN (2022 01 26)

Details

It was discovered, on June 8, 2023, that the sulfur analysis on the monthly Effluent, Upstream and Downstream samples was missed on six occasions in 2022 (June, July, August, October, November and December) and four occasions in 2023 (January, February, March and May).

Cause: When the chain of custodies were updated, after the new directors order was issued with new sampling requirements, Sulfur did not get added to the monthly chain of custody form and therefore the analysis was missed.

Resolution

The monthly chain of custody was updated on June 8th 2023 to include sulfur in the monthly Effluent, Upstream and Downstream sample analysis.

Contact: Scott Hanselman

Date June 8th, 2023 **Time**

Details Sent Incident Report via email

Contact:

Date **Time**

Details

Operator Signature: Rebecca Marshall **Date** In June 8th, 2023

Please fax completed form to: PCT at 705 567 7974 (April, Ilona, Rebecca or Yvan)
Local MOE Fax: 705 497 6866 (North Bay), 705 235 1520 (Timmins), 705 942 6327 (Sault Ste Marie)
MOE SAC Tel: 1 800 268 6060 Fax: 1 800 268 6061

PCTs	Entered in OPEX	By:
	Entered in Incidents & Events Summary	By:

APPENDIX C
Maintenance Summary

ONTARIO CLEAN WATER AGENCY
AGENCE ONTARIENNE DES EAUX

Workorder Summary Report

Report Start Date:	Jan 1, 2023 12:00 AM
Report End Date:	Dec 31, 2023 11:59 PM
Location:	6022*
Work Order Type:	CALL,CAP,CORR,EMER,OPER,PM
Work Order Class:	

				WorkOrder		PM Schedule		Workorder Details					
WO #	Asset ID	Asset Description	Location Description	Type	Class	FEQ	Units	Work Order Description	Status	Schedule Start	Actual Start	Actual Finsh	WorkLog Detail
3176134			6022, Cobalt Wetlands	OPER	Inspection	1	YEARS	Daily O&M Activities WasteWater Treatment (1y) 6022	COMP	1/1/23 12:00 AM	1/2/24 01:46 PM	1/2/24 01:46 PM	
3192697			6022, Cobalt Wetlands	PM	Administrative	1	MONTHS	Cobalt Wetlands Monthly Report to MECP	CLOSE	1/1/23 12:00 AM	2/15/23 08:49 AM	2/15/23 08:49 AM	
3227357	0000115320	SAMPLER RAW	6022, Cobalt Wetlands	PM	Refurbish/ Replace/Repair	1	YEARS	Sampler Raw Inspection/Program (1Y) 6022	CLOSE	2/1/23 12:00 AM	10/23/23 07:57 PM	10/23/23 07:57 PM	- Inspect sampler operation. Replace peristaltic pump hose and take a test sample. Program is still running. - Remove old sampler line in wet well. Replace line and clean strainer. Remove old junction box from wall and install a 1" sweep instead to guide the tube and heat trace better. Take a test sample to verify proper operation.
3236945			6022, Cobalt Wetlands	PM	Administrative	1	MONTHS	Cobalt Wetlands Monthly Report to MECP	CLOSE	2/1/23 12:00 AM	5/1/23 09:03 AM	5/1/23 09:03 AM	
3279982			6022, Cobalt Wetlands	PM	Compliance	1	MONTHS	Cobalt Wetlands Monthly Report to MECP	CLOSE	3/1/23 12:00 AM	5/1/23 09:03 AM	5/1/23 09:03 AM	
3316530	0000115322	METER FLOW	6022, Cobalt Wetlands	PM	Calibration	1	YEARS	Raw Flow Meter Inspection Notify PCT (1y) 6022	CLOSE	4/1/23 12:00 AM	4/14/23 08:00 AM	4/14/23 08:00 AM	-Verified calibration by measuring distance from transducer face to liquid level as there was too much flow to put the calibration standard in the flume. Compared this measurement to a LIT shot. Verified flow on recorder.
3316539	0000293641	RECORDER DATA LOGGER EFFLUENT	6022, Cobalt Wetlands	PM	Refurbish/ Replace/Repair	1	YEARS	Recorder Chart Inspection EFF (1y) 6022	CLOSE	4/1/23 12:00 AM	4/14/23 08:14 AM	4/14/23 08:14 AM	-Verified calibration of all channels by comparing Datalogger display value to the desired display value generated by loop calibrator at 0, 25, 50, 75 and 100%.

ONTARIO CLEAN WATER AGENCY
AGENCE ONTARIENNE DES EAUX

Workorder Summary Report

Report Start Date:	Jan 1, 2023 12:00 AM
Report End Date:	Dec 31, 2023 11:59 PM
Location:	6022*
Work Order Type:	CALL,CAP,CORR,EMER,OPER,PM
Work Order Class:	

				WorkOrder		PM Schedule		Workorder Details					
WO #	Asset ID	Asset Description	Location Description	Type	Class	FEQ	Units	Work Order Description	Status	Schedule Start	Actual Start	Actual Finsh	WorkLog Detail
3318204	0000277415	METER FLOW EFFLUENT	6022, Cobalt Wetlands	PM	Calibration	1	YEARS	Meter Flow Effluent Inspection/ Calibration Notify PCT (1Y) 6022	CLOSE	4/1/23 12:00 AM	4/14/23 08:07 AM	4/14/23 08:07 AM	-Verified distance from transducer face to laser level with tape measure. Verified accuracy of FIT with tape measure in stillwell from laser to liquid level. Subtract transducer face measurement from liquid measurement. Verified data logger calibration while there.
3327979	0000277432	RECORDER DATA LOGGER Raw Cobalt Wetlands 6022	6022, Cobalt Wetlands	PM	Refurbish/ Replace/Repair	1	YEARS	Sampler Inspection Annual (1Y) 6022	CLOSE	4/1/23 12:00 AM	4/14/23 08:12 AM	4/14/23 08:12 AM	-Verified calibration of all channels by comparing Datalogger display value to the desired display value generated by loop calibrator at 0, 25,50,75 and 100 %.
3329188			6022, Cobalt Wetlands	PM	Administrative	1	MONTHS	Cobalt Wetlands Monthly Report to MECP	CLOSE	4/1/23 12:00 AM	5/29/23 07:54 AM	5/29/23 07:54 AM	Cobalt Wetlands Monthly Report to MECP - Completed and submitted to MECP and owner by Rebecca
3374815			6022, Cobalt Wetlands	PM	Administrative	1	MONTHS	Cobalt Wetlands Monthly Report to MECP	CLOSE	5/1/23 12:00 AM	6/11/23 01:30 PM	6/11/23 01:30 PM	Cobalt Wetlands Monthly Report to MECP - Completed May 23, 2023 by R Marshall
3422372			6022, Cobalt Wetlands	PM	Compliance	1	MONTHS	Cobalt Wetlands Monthly Report to MECP	CLOSE	6/1/23 12:00 AM	6/26/23 07:14 AM	6/26/23 07:14 AM	Cobalt Wetlands Monthly Report to MECP - Finalize and submit report to MECP, Owner, OCWA Engineers, Story Environmental
3470840			6022, Cobalt Wetlands	PM	Compliance	1	MONTHS	Cobalt Wetlands Monthly Report to MECP	CLOSE	7/1/23 12:00 AM	7/28/23 08:29 AM	7/28/23 08:29 AM	Cobalt Wetlands Monthly Report to MECP - Report completed and submitted to MECP, Owner, Engineer's and Management

ONTARIO CLEAN WATER AGENCY
AGENCE ONTARIENNE DES EAUX

Workorder Summary Report

Report Start Date:	Jan 1, 2023 12:00 AM
Report End Date:	Dec 31, 2023 11:59 PM
Location:	6022*
Work Order Type:	CALL,CAP,CORR,EMER,OPER,PM
Work Order Class:	

				WorkOrder		PM Schedule		Workorder Details					
WO #	Asset ID	Asset Description	Location Description	Type	Class	FEQ	Units	Work Order Description	Status	Schedule Start	Actual Start	Actual Finsh	WorkLog Detail
3514675			6022, Cobalt Wetlands	PM	Compliance	1	MONTHS	Cobalt Wetlands Monthly Report to MECP	CLOSE	8/1/23 12:00 AM	9/2/23 09:58 AM	9/2/23 09:58 AM	Cobalt Wetlands Monthly Report to MECP - Complete draft report and send to new ORO and Regional Supervisor for review. Cobalt Wetlands Monthly Report to MECP - Finalized and submitted report to MECP, Owner, Engineers and Management
3561380			6022, Cobalt Wetlands	PM	Compliance	1	MONTHS	Cobalt Wetlands Monthly Report to MECP	CLOSE	9/1/23 12:00 AM	9/29/23 11:12 AM	9/29/23 11:12 AM	Cobalt Wetlands Monthly Report to MECP - Monthly report finalized and submitted to MECP, Storey Environmental, Owner and Management
3611042			6022, Cobalt Wetlands	PM	Compliance	1	MONTHS	Cobalt Wetlands Monthly Report to MECP	CLOSE	10/1/23 12:00 AM	10/27/23 04:23 PM	10/27/23 04:23 PM	Cobalt Wetlands Monthly Report to MECP - Report finalized and submitted to the MECP
3654354			6022, Cobalt Wetlands	PM	Compliance	1	MONTHS	Cobalt Wetlands Monthly Report to MECP	CLOSE	11/1/23 12:00 AM	11/27/23 08:58 AM	11/27/23 08:58 AM	Cobalt Wetlands Monthly Report to MECP - Finalized and submitted the Cobalt WLs monthly report
3665515		Cobalt Wetlands		CAP	Compliance	0		Research/Develop Significant Drinking Water Threat Assessment Report (Town of Cobalt)	CLOSE	11/1/23 01:53 PM	11/1/23 01:53 PM	11/2/23 01:53 PM	SDWTA - Research - Research client specific details required for the development of the Significant Drinking Water Threat Assessment Report required under their Stormwater/Sanitary CLI ECA. SDWTA - Develop New Document - Develop new SDWTA report for the client. To be a working document that requires updating on any annual basis.
3695686			6022, Cobalt Wetlands	PM	Compliance	1	MONTHS	Cobalt Wetlands Monthly Report to MECP	COMP	12/1/23 12:00 AM	12/20/23 08:02 AM	12/20/23 08:02 AM	Cobalt Wetlands Monthly Report to MECP - Finalize and submit the Cobalt Wetlands monthly report