

Chapleau Sewage Treatment Lagoon

Annual Performance Report

Prepared by Ontario Clean Water Agency, Northeastern Ontario Hub
January 1, 2017 to December 31, 2017



Ontario Clean Water Agency
Agence Ontarienne Des Eaux

Annual Sewage Performance Report

Reporting Period	January 1, 2017 to December 31, 2017
Sewage System Name	Chapleau Sewage Treatment Lagoon
Sewage System Address	300 Strathcona Street, Chapleau, ON P0M 1K0
Sewage System Owner	Corporation of the Township of Chapleau
Sewage System Number	110002149
Environmental Compliance Approval No.	6830-5SQK4C, issued October 30, 2003

Facility Description

Capacity of Works	4550 m ³ /day
Service Area	Township of Chapleau, District of Sudbury
Service Population	2300
Effluent Receiver	Nebskwashi River
Major Process	Two Cell Aerated Lagoon

The Chapleau sewage treatment lagoon consists of a grit removal channel where heavier inorganic wastes are settled and manually removed before entering a two cell aerated lagoon. There are two blowers supplying air to a fine bubble tubular aeration system with separate distribution grids located in each cell. Cell 1 is 96 m x 72 m and Cell 2 is 112 m x 65 m, with a combined storage capacity of approximately 28,000 m³/day. The lagoons service the Township of Chapleau and are continuously discharged into the Nebskwashi River. The system is designed to operate at a rated capacity of 4550 m³/day.

The sewage effluent is disinfected on a seasonal basis from May 1 to October 31 with gaseous chlorine. An open channel flow meter to measure the treated chlorinated effluent is located in the chlorine contact chamber.

1.0 Monitoring Data

1.1 Monitoring Program as Outlined in the Environmental Compliance Approval

BOD ₅ = Five-day biochemical oxygen demand measured in an unfiltered sample <i>E. coli</i> = <i>Escherichia coli</i> TSS = Total Suspended Solids TP = Total Phosphorus TKN = Total Kjeldahl Nitrogen TCR = Total Chlorine Residual

1.1.1 Raw Sewage (Influent)

Parameter	Type of Sample	Minimum Frequency
BOD ₅	composite*	monthly
Total Suspended Solids	composite*	monthly
Total Phosphorous	composite*	monthly
TKN	composite*	monthly

*Historically grab samples have been taken, for both influent and effluent testing, as the system is not equipped with a 24hr automatic sampler and therefore not capable of collecting a composite sample as required by the ECA.

1.1.2 Final Effluent

Parameter	Type of Sample	Minimum Frequency
BOD ₅	composite*	monthly
Total Suspended Solids	composite*	monthly
Total Phosphorous	composite*	monthly
<i>E. coli</i>	grab	monthly
pH	grab	weekly
Temperature	grab	weekly

*Historically grab samples have been taken, for both influent and effluent testing, as the system is not equipped with a 24hr automatic sampler and therefore not capable of collecting a composite sample as required by the ECA.

Note: *E. coli* samples are collected May 1 to October 31.

1.2 Data

1.2.1 Influent Flow Data

Month	Average Flow (m ³ /day)	Maximum Flow (m ³ /day)	Total Volume (m ³)
January	1,559	6,208	48,335
February	1,654	3,620	46,318
March	1,359	1,659	42,143
April	2,138	2,657	64,154
May	2,740	3,968	84,933
June	1,632	2,219	48,965
July	1,212	1,643	37,574
August	1,798	2,557	55,738



Month	Average Flow (m ³ /day)	Maximum Flow (m ³ /day)	Total Volume (m ³)
September	1,476	3,247	44,279
October	1,320	2,300	40,931
November	1,389	1,761	41,666
December	1,456	2,186	45,143

1.2.2 Summary of Influent Flow

	Flow (m ³ /day)	Rated Capacity (m ³ /day)	% Capacity	Exceedance
Average	1,644	4,550	36	No
Maximum	6,208	-	-	-

1.2.3 Raw Sewage (Influent)

Parameter (mg/L)	Average	Maximum
Total Phosphorous	1.11	2.04
TKN	10.9	15.7
BOD ₅	83	180
Total Suspended Solids	81.9	156

1.2.4 Effluent

Parameter (mg/L)	Annual Average	Range of Results (min – max)	Compliance Limit
BOD ₅	12	3.5 - 21	Limit - annual average 30 Objective - maximum 25
Total Suspended Solids	10.4	<1 – 15.5	Limit - annual average 40 Objective - maximum 30
Total Phosphorous	0.418	0.129 – 0.663	N/A
Temperature (°C)	11.8	0.2 – 24.3	N/A
pH (units)	6.93	6.01 – 7.85	6.0 – 9.5
<i>E. coli</i> (cfu/100 mL)	35 MGM	<5 - 900	monthly geometric mean 200

Note: *E. coli* results are from the disinfection period (May 1 – October 31).
Monthly geometric mean (MGM) is used rather than an arithmetic mean

1.3 Sewage Treatment Program Success and Adequacy

The Performance Summary details results and efficiency of the plant's performance demonstrating pollutant removal rates from raw sewage concentrations through to final effluent for BOD₅, suspended solids and total phosphorus.

1.3.1 Performance Summary

Parameter (mg/L)	Influent	Effluent	% Removal
Total Phosphorous	1.11	0.418	61
BOD ₅	83	12	86
Total Suspended Solids	81.9	10.4	87

Note: calculations are based on the annual averages

1.4 Interpretation of Monitoring and Analytical Data

The Chapleau sewage treatment lagoon operated within its required capacity. Table 1.2.1 *Influent Flow Data* summarizes the flow data for 2017. The average and maximum daily flows are presented for each month. The Environmental Compliance Approval outlines that the owner shall use best effort to operate the works within the rated capacity of 4550 m³/day. Average flows from the plant were measured at 1,644 m³/day; which represents approximately 36 % of the total design capacity of the system.

The effluent quality is based on the biochemical oxygen demand, total suspended solids, *E. coli* and pH levels. The annual averages for all parameters are listed in table 1.2.4 *Effluent*.

Biological Oxygen Demand (BOD₅) is the amount of oxygen used by micro-organisms as they decompose organic matter in the effluent sample for five days. High BOD₅ 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. In 2017, the average BOD₅ of 12 mg/L complied with the limit of 30 mg/L and the maximum result of 21 mg/L was well below the effluent objective of 25 mg/L.

Total Suspended Solids (TSS) in effluent are 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. In 2017, the average TSS of 10.4 mg/L complied with the limit of 40 mg/L. The effluent objective of 30 mg/L was not exceeded as the maximum result was 15.5 mg/L.

Escherichia coli (*E. coli*) is a common bacterium that lives in human and animal intestines, where it is present in large numbers. 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. The compliance limit for *E. coli* is a monthly geometric mean limit of 200 cfu/100 mL during the disinfection period (May 1-October 31). In 2017, the *E. coli* monthly geometric mean was not exceeded.

The pH of a solution is an indication of its acidic and basic properties and measured on a scale ranging between 0 and 14. 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. The ECA outlines the compliance criteria for effluent pH to be maintained within the limits of 6.0 and 9.5, inclusive, at all times. In 2017, the pH ranged from 6.01 – 7.85.

Refer to Appendix A for the Monthly Process Data Report, which summarizes the monitoring and sampling analysis conducted at the facility.

2.0 Operating Problems and Corrective Actions

There were no significant operating problems or corrective actions during the reporting period. Preventative maintenance was performed on a regular basis to help identify problems before they occur.

3.0 Maintenance Procedures Performed on the Works

Routine maintenance is done as per OCWA's Work Management System software program. This is a comprehensive maintenance program that is based on a pro-active, preventive approach. This program includes but not limited to running checks weekly, monthly, and annually as required or as recommended by manufacturer's instructions.

Operational Highlights:

- Power outage affecting Riverside Pumping Station and Lagoon
- Individual sample result exceeded *E. coli* objective, resamples collected
- Calibrations
- DSI Vac Truck in to clean out Dufferin and Lisgar Pumping Stations

Major maintenance and upgrades that took place during 2017 include:

- DSI cleaned outside waste pits and manholes
- Brushing at the lagoon
- Geo-Dredging done at lagoon Cell#1

- Isolated Cell #1(Directed all flow to Cell #2 with MOECC Approval AECOM)
- Start to drain Cell #1
- Geo-Dredging into remove sludge in Cell #1

4.0 Effluent Quality Assurance and Control Measures Undertaken

The facilities mechanical elements are in good repair. Each member of the operational staff possesses a high level of process knowledge and regulatory competence.

Samples are collected as required and analyzed by Testmark Laboratories Limited located in Kirkland Lake, Ontario. Licensed operators conduct in-house tests for monitoring purposes using Standard Methods of Water and Wastewater procedures.

Any bypass or upset events that occur are tested, monitored and reported to the Spills Action Center (SAC).

5.0 Calibration and Maintenance of all Monitoring Equipment

The flow-monitoring program, maintained in the Work Management System (WMS) incorporates a calibration of all monitoring devices once a year. This helps ensure their accuracy within plus or minus 15 % of actual rate of flow.

All monitoring equipment is calibrated based on the manufacturer's recommendations and conducted by a qualified Instrumentation Technician. Refer to Table 5.1 for a summary of calibrations conducted in 2017.

5.1 Calibration Summary

Date	Instrument	% Accuracy
July 24, 2017	Influent/Effluent Flow Meter	99.4
November 22, 2017	pH meter	96 – 99
May 24, 2017	Pocket colorimeter	91 – 96

6.0 Sludge Summary

Sludge was removed from the lagoon and pumped into geotubes. It is estimated that the dry quantity sludge volume dredged in 2017 into the geotubes is 99 BDT (bone dry tonnes) or 99 m³.



7.0 Complaints

No complaints were received during the reporting period.

8.0 Bypass, Spill, and Abnormal Discharge Events

There were no bypasses, spills nor abnormal discharge events for 2017

Appendix A: Monthly Process Data

CHAPLEAU WASTEWATER TREATMENT LAGOON													
	01/2017	02/2017	03/2017	04/2017	05/2017	06/2017	07/2017	08/2017	09/2017	10/2017	11/2017	12/2017	
Raw Sewage / Flow - m³/d													
Count IH	31	28	31	30	31	30	31	31	30	31	30	31	
Max IH	6208	3620	1659	2657	3968	2219	1643	2557	3247	2300	1761	2186	
Mean IH	1559	1654	1359	2138	2740	1632	1212	1798	1476	1320	1389	1456	
Min IH	932	373	1102	1596	1876	1285	1012	1064	541	564	25	311	
Total IH	48335	46318	42143	64154	84933	48965	37574	55738	44279	40931	41666	45143	
Raw Sewage / Biochemical Oxygen Demand: BOD5 - mg/L													
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	
Mean Lab	92	98	120	180	43	44	49	50	45	120	52	98	
Raw Sewage / Total Kjeldahl Nitrogen: TKN - mg/L													
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	
Mean Lab	14.7	15.7	12.8	11.9	6.81	7.56	11.3	8.95	9.71	15.4	6.71	9.23	
Raw Sewage / Total Phosphorus: TP - mg/L													
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	
Mean Lab	1.53	1.17	1.91	0.826	0.557	0.674	1.08	0.722	0.811	2.04	0.852	1.17	
Raw Sewage / Total Suspended Solids: TSS - mg/L													
Count Lab	1	1	1	1	1	1	1	1	1	1	1	1	
Mean Lab	59	57	156	140	58	57	46	54	48	150	60	98	
Effluent / Flow - m³/d													
Count IH	31	28	31	30	31	30	31	31	30	31	30	31	
Max IH	6208	3620	1659	2657	3968	2219	1643	2557	3247	2300	1761	2186	
Mean IH	1559	1654	1359	2138	2740	1632	1212	1798	1476	1320	1389	1456	
Min IH	932	373	1102	1596	1876	1285	1012	1064	541	564	25	311	
Total IH	48335	46318	42143	64154	84933	48965	37574	55738	44279	40931	41666	45143	
Effluent / Biochemical Oxygen Demand: BOD5 - mg/L													
Count Lab	1	1	1	1	1	1	1	1	2	2	1	1	
Max Lab	21	19	15	13	12	12	12	11	7.2	15	10	11	
Min Lab	21	19	15	13	12	12	12	11	3.5	11	10	11	
Effluent / Carbonaceous Biochemical Oxygen Demand: CBOD5 - mg/L													
Count Lab	1	1	1	1	1	1	1	1	2	2	1	1	
Max Lab	21	21	14	14	9.9	9.4	13	12	5.5	16	8.8	12	
Min Lab	21	21	14	14	9.9	9.4	13	12	5.2	16	8.8	12	

Chapleau Sewage Treatment Lagoon

CHAPLEAU WASTEWATER TREATMENT LAGOON													
	01/2017	02/2017	03/2017	04/2017	05/2017	06/2017	07/2017	08/2017	09/2017	10/2017	11/2017	12/2017	
Effluent / Total Phosphorus: TP - mg/L													
Count Lab	1	1	1	1	1	1	1	1	2	2	1	1	
Max Lab	0.635	0.663	0.604	0.499	0.442	0.276	0.485	0.277	0.236	0.471	0.322	0.351	
Min Lab	0.635	0.663	0.604	0.499	0.442	0.276	0.485	0.277	0.129	0.464	0.322	0.351	
Effluent / Total Suspended Solids: TSS - mg/L													
Count Lab	1	1	1	1	1	1	1	1	2	2	1	1	
Max Lab	13.5	9.5	11	11.5	9.5	10	5	15.5	3	15	15	14.5	
Min Lab	13.5	9.5	11	11.5	9.5	10	5	15.5	1	12	15	14.5	
Effluent / E. Coli: EC - cfu/100mL													
Count Lab	0	0	0	0	1	1	1	2	2	2	0	0	
Max Lab					5	150	35	900	215	200			
GMD					5	150	35	67	33	45			
Min Lab					5	150	35	< 5	5	10			
Effluent / Temperature - °C													
Count IH	12	7	14	11	21	20	16	18	14	14	11	6	
Max IH	6.1	6.2	2.8	8.8	16.9	21.6	24.3	20.9	20.7	17.3	8.5	4.8	
Mean IH	2.3	3.1	1.6	6.6	11.9	18.9	20.9	19.5	17.4	13.2	4.1	2.0	
Min IH	0.6	1	0.3	4.9	8.3	14.9	9.8	17.9	15.6	9.2	2.2	0.2	
Effluent / pH - ----													
Count IH	12	7	14	11	21	20	16	18	14	14	11	6	
Max IH	7.21	7.25	7.47	7.38	7.49	7.28	7.49	7.53	7.5	7.7	7.85	7.67	
Mean IH	6.24	6.77	6.77	6.44	6.79	6.84	7.06	7.29	7.27	6.97	7.43	7.46	
Min IH	6.04	6.15	6.10	6.14	6.01	6.19	6.52	6.87	6.89	6.46	6.48	7.04	
Effluent / Dissolved Oxygen: DO - mg/L													
Count IH	12	7	14	11	21	20	16	18	14	8	6	5	
Max IH	8.8	7.3	7.7	9.9	9.5	7.4	10.1	9.9	9	11.5	11.8	9.1	
Mean IH	6.2	4.9	6.5	8.3	7.4	5.3	6.0	7.8	6.8	8.2	9.1	7.7	
Min IH	3.6	3	4.8	6.6	3.3	0.48	4.2	6.1	5.3	4.6	4.6	5.2	