

2020 Year End Report: Baysville Clean Water Plant (CWP)



Environmental Compliance Approval: # 8132-7QXPCV

Engineering and Public Works Department

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Introduction

The Baysville Clean Water Plant (CWP), which services the Village of Baysville, is owned and operated by the District Municipality of Muskoka. The plant is located at 2825 Highway 117, and was commissioned in September 2006. It services a population of approximately 348 people.

The Plant operates under the MOE Environmental Compliance Approval (Sewage) # 8132-7QXPCV, issued August 04, 2009. Under the terms of the Certificate of Approval, the plant is permitted to treat an average daily flow of 475m³/day. Additionally, effluent limit criteria are as follows:

Table 1 Effluent Limit Criteria

Effluent Parameter	Concentration
CBOD	15 mg/L
Total Suspended Solids	15 mg/L
Total Phosphorous	1.00 mg/L
Total Ammonia Nitrogen Summer (May 01 to November 30)	4.0 mg/L
Total Ammonia Nitrogen Winter (December 01 to April 30)	10.0 mg/L
E. coli	Geometric Mean Density 80 Organisms/100 mL
pH	6.00 to 9.50 inclusive, at all times.

The plant is a Sequencing Batch Reactor (SBR) package plant, consisting of equalization basins, tertiary filters, aeration blowers, and sludge holding tanks. Disinfection is accomplished by ultra violet. The facility is also equipped with aerated sludge digesters for bio-solids stabilization.

Waste sludge from the plant process is digested aerobically at the plant and periodically hauled off site for disposal.

General Information

A review of the District of Muskoka's infrastructure needs is conducted annually by the Director of Water and Sewer Services, Area Manager and Chief Operator, and recommendations for maintenance, rehabilitation and renewal programs are considered.

Efforts to eliminate the discharge of untreated or partially treated wastewater to receiving waters are being accomplished by a long term financial commitment to correct excessive infiltration into the wastewater collection system by means of sewer main rehabilitation / replacement, manhole rehabilitation and pumping station rehabilitation programs.

The treatment facility is capable of effective operation during emergencies; maintenance shut downs, and power failures. This is achieved through such measures as preventive maintenance of duty / standby units, the duplication of major treatment components, the provision of standby power sources and extensive use of the SCADA systems. All pumping stations and treatment control systems use SCADA (Supervisor control and Data Acquisition), in combination with Data Highway Plus, and programmable logic controllers.

All operators are qualified to operate the systems efficiently and effectively in order to achieve the highest level of treatment at all times. A commitment to provide Operator training and certification is being sustained.

Regulatory sampling is carried out to meet the requirements outlined in the ECA, and additional in house operational sampling beyond these regulatory requirements is being performed on a routine basis. These efforts have resulted in an effective treatment process which ensures that effluent discharges consistently meet effluent objectives and are environmentally safe

All data in this report is a compilation of test results received from SGS Canada and their accredited laboratory, Lakefield Research. All in-plant sampling, analysis and recording of results conforms, in order of precedence, to the following 3 standards: Ministry's Procedure F-10-1, "Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works", Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" and the American Water Works Association/Water Environment Federation (AWWA/WEF) publication "Standard Methods for the Examination of Water and Wastewater".

Executive Summary

Despite significant operational efforts by Operators to meet effluent objectives and maintain compliance with the limits specified in the plant ECA (#8132-7QXPCV), the plant struggled to consistently meet the effluent objectives set out in the ECA for the first quarter of 2020. Beginning October 26, 2019, the Birch Glen WWTP failed to meet the compliance limit for effluent Total Ammonia, and briefly for CBOD, Total Suspended Solids and Total Phosphorous which resolved in November 2019. This was a result of a sudden, excessive pH and alkalinity increase in the influent loadings that caused immediate failure of the plants biological process. Plant process tanks were emptied and seed sludge was brought to site from other plants in Muskoka to restart the biological process. The plant process then progressively improved and effluent CBOD and Total Phosphorous removal was restored to effluent objective levels in early November 2019. Due to cooler temperatures in the late fall and through the winter 2020, Total Ammonia Nitrogen effluent residuals remained above effluent concentration and objective limits through January and February while the microbiological population responsible for nitrification regenerated in the process. In March 2020, Total Ammonia Nitrogen levels were improved such that they were in compliance with effluent limits, but, remained slightly elevated over objective limits until significant recovery in April when effluent quality was within limits and objectives. In October, another sudden, excessively high pH event occurred in the influent causing a serious disturbance to the biological process. This resulted in Total Ammonia Nitrogen concentration increase in the final effluent above the compliance and objective limit in October and remained about the objective limit in November. Full recovery and compliance with effluent limits and objectives was restored through December. Operations staff worked closely with Ministry of the Environment Conservation and Parks (MECP) throughout this period and all exceedances were reported to Ontario Spills Action Centre forthwith.

In 2020, test results of the treated effluent for the parameters of CBOD5, suspended solids, total phosphorous, and E. Coli are in compliance with the limits outlined in the ECA regarding monthly allowable concentrations and total effluent loading throughout the entire year.

Overall, the plant treatment processes performed satisfactorily and are deemed to be adequate

Quantity of Flow Summary

The plant has a daily average flow design capacity of 475 m³/day. The actual average daily flow for the 2020 was 122 m³/day, however, the 3 year average is 122 m³/day, which represents 26% of the plant capacity. None of the individual system components exceeded the design flow rating.

Plant Operational Upsets or Process Failures

The plant experienced a process upset in late October 2019 which was detrimental to the nitrification process. Influent with high pH and Alkalinity was the root cause. The upset resulted in the plant failing to meet the Total Ammonia Nitrogen limit for the last quarter of 2019 and through the first quarter of 2020 and failure again to meet Total Ammonia Nitrogen limits again in October through November 2020 due to

another process upset caused by sudden, significant increase in influent pH.

Summary of Maintenance

In 2020, the coagulant chemical feed pumps were replaced, two programmable logic controller processors and some associated controller cards were replaced due to failure.

All equipment information at this plant is entered into a computer database. From this information, a scheduled preventive maintenance program has been established. The maintenance program includes (and not limited to):

- Monthly testing of emergency testing (under load) of the standby generators.
- Annual servicing of emergency standby generators.
- Annual calibration of flow metering devices.
- Annual cleaning of all sewage pumping stations if required.
- Marine inspection of effluent outfall and diffuser completed in 2017. (5-year cycle)

All flow meter and analytical calibration verifications indicated all equipment was within calibration tolerances as required the ECA.

Evaluation of the Need for Improvement Works

The treatment facility is operating at a plant capacity of 26% and is in compliance with specified effluent parameter criteria aside from the plant upsets of known origin. As a result, there is no need for improvements to the existing works.

Evaluation Summary of Proposed Work Requiring Approval under OWRA

Since the treatment facility is operating satisfactorily there is no anticipated works requiring an ECA amendment for 2020.

Interpretation of Analytical Results

All sample results for Raw Sewage and Final Effluent are reported in this section. Other tables in this report include Chemical Usage, Biosolids Quality, and Biosolids Quantity.

Raw Sewage

The information reported in the Raw Sewage sample results summary table consists of test results of analysis conducted on composite samples of the plant influent flow as required by the plant ECA. Samples are sent for analysis to Lakefield Research, as well as analysis conducted on site using Standard Methods or equivalent. Weekly analysis has been performed and reported as specified under the terms outline in the ECA.

Influent Analysis

Table 2 Influent Analysis

Influent Parameter	Minimum	4 Week Average Maximum	Annual Average	Average loading kg/day
BOD5 (mg/L)	59	723.5	356.0	43.4
Suspended Solids (mg/L)	78	664.5	317.2	38.7
Total Phosphorus (mg/L)	0.92	8.27	5.44	0.66
Total Ammonia Nitrogen (mg/L)	0.5	58.5	41.1	5.01
pH	6.54	7.49	7.17	

Effluent Analysis

The information reported in the Final Effluent sample results summary table 3 consists of test results of analysis conducted on final effluent composite samples. Bacteriological samples, however, consisted of grab samples. Weekly analysis has been performed and reported as specified under the terms outlined in the ECA.

Effluent Objective Analysis

The effluent objectives were met during all sample periods for CBOD5, Suspended Solids, E.Coli, Total Phosphorous and pH. Total Ammonia Nitrogen concentration as described earlier were above objective limits in January, February, March, October and November in 2020 due to two separate plant upset incidents.

Final Effluent Analysis Summary

All final effluent samples tested for CBOD5, suspended solids, ammonia, E. Coli, and total phosphorous were below non-compliance limits outlined in the ECA. Total Ammonia Nitrogen limits were exceeded in January, February, October and November as described previously.

Table 3 Final Effluent Analysis Summary

Parameter	Minimum	4 Week Average Maximum	Annual Average	Average Loading kg/day
CBOD5 (mg/L)	2	4.3	2.3	0.28
Suspended Solids (mg/L)	2	4.3	2.8	0.34
Ammonia (mg/L)	0.10	17.5	3.74	0.46
E. Coli (#/100 mL)	0	0	0	N/A
Total Phosphorus (mg/L)	0.03	0.10	0.04	0.005
pH	7.07	7.85	7.55	N/A

Average daily flow comparisons by day of week ensure ECA requirements for scheduled sampling are taken at a time, and in a location characteristic of the quality and quantity of the sewage stream over the

time period being monitored. Average daily flow rates by day of the week compare the flow to the average daily flow for the entire year. This data is used to determine if a particular day of the week is best to ensure samples are taken to meet the requirements of scheduled monitoring sections of the ECA's. Sampling plans are reviewed and updated yearly based on the previous yearly flow data.

Final Effluent Sampling Summary

All samples were collected following the frequency and methods required by the facility approval. For the coming year, 2021, no changes to the sampling plan are being considered at this time.

Biosolids Generation

The quality and of biosolids hauled from the facility for disposal is outlined in the table provided. Private contractors were used by the District of Muskoka to transfer all material for disposal in 2020, and will continue to do so in 2021. It is not anticipated that there will be a significant increase in the total volume of bio solids produced in 2021.

Summary of Complaints received throughout the reporting period

There were no complaints received in the reporting period.

Baysville Wastewater Collection Summary

New Sewer Services:

A total of 2 customers connected to existing sewer laterals in 2020.

New Sewer Mains:

There were no new sewer mains installed in 2020

Sewer Main Replacements:

No sewer mains were replaced in 2020.

Low Pressure Sewer Breaks:

There were no low pressure sewer breaks in 2020.

Sewer Force Main Breaks:

There were no sewer forcemain breaks in 2020.

Sewer Force Main Replacement

No sewer force mains were replaced in 2020.

Main Line Sewer Blockage

There were no sewer main blockages in 2020.

Sewer Lateral Blockage

There were no sewer lateral blockages in 2020.

Service Low Pressure Sewer Blockages:

There were no low pressure sewer blockages in 2020.

Frozen Sewer Force Mains:

No sewer force mains froze in 2020.

Frozen Sewer Service Laterals:

No sewer service laterals froze in 2020.

Frozen Low Pressure Sewer Services:

No low pressure sewer services froze in 2020.

Sewer Flushing/Video:

There was no sewer main flushing or video required in 2020.

Sewer Locates:

Field staff addressed 17 written locate requests in 2020.

Table 4 Effluent Flow Summary - 2020

Month	Plant Total Monthly (m³)	Average Day Flow (m³/d)	Maximum Day Flow (m³/d)	Minimum Day Flow (m³/d)	Lagoons Monthly Flow (m³)	Facility Total Monthly Flow (m³)
January	2,686	87	220	44	N/A	2,686
February	2,378	82	173	35	N/A	2,378
March	3,701	119	264	66	N/A	3,701
April	3,565	119	166	61	N/A	3,565
May	3,522	114	149	68	N/A	3,522
June	3,629	121	186	74	N/A	3,629
July	4,259	137	176	83	N/A	4,259
August	4,189	135	197	61	N/A	4,189
September	3,851	128	199	62	N/A	3,851
October	4,305	139	256	64	N/A	4,305
November	4,295	143	214	83	N/A	4,295
December	2,992	97	153	43	N/A	2,992

Total Flow: 43,373m³
 Average Day: 119m³
 Maximum Day: 264m³
 Minimum Day: 35m³

Table 5 Influent Quarterly Analysis Summary – Weekly 24 Hour Composite Sample Part 1

Sample Date	Sample Identification Number	BOD5 mg/L	Total Phosphorus mg/L	Total Kjeldahl Nitrogen mg/L	Total Ammonia Nitrogen mg/L	Suspended Solids mg/L
03-Mar-20	CA13042	382	5.42	40.4	34.9	457
12-May-20	CA12258	241	5.38	47.6	45.1	288
04-Aug-20	CA13094	215	4.24	76.0	64.3	78
03-Nov-20	CA13135	292	3.98	36.8	34.8	187
Yearly Average		283	4.80	50.2	44.8	253
Maximum		382	5.4	76.0	64.3	457
Minimum		215	4.0	36.8	34.8	78

Table 6 Chemical Usage Summary: Clarion

Month	Average Dosage mg/L	Total kg (dry)
January	34.3	89.4
February	32.1	86.5
March	25.8	83.5
April	21.3	71.2
May	21.7	70.5
June	24.6	87.6
July	24.7	97.4
August	21.4	83.3
September	21.4	76.6
October	28.6	112.7
November	39.5	143.0
December	43.0	115.5
Average	28.2	93.1

Total Yearly Kilograms: 1,117.3

Table 7 Chemical Usage Summary: Soda Ash

Month	Average Dosage mg/L	Total kg (dry)
January	26.4	79.9
February	26.4	77.3
March	22.7	85.7
April	20.8	77.8
May	21.8	82.5
June	23.0	91.5
July	33.7	153.9
August	41.1	185.5
September	41.1	167.0
October	41.1	184.9
November	41.1	175.9
December	43.7	136.8
Average	31.9	124.9

Total Yearly Kilograms: 1,498.6

Table 8 Effluent Quarterly Analysis Summary – Weekly 24 Hour Composite Sample Part 1

Sample Date	Sample Identification Number	CBOD5 mg/L	pH	Total Phosphorus mg/L	Suspended Solids mg/L
03-Mar-20	CA13042	2	7.43	0.05	2
12-May-20	CA12258	2	7.31	0.03	2
04-Aug-20	CA13094	2	7.67	0.03	3
03-Nov-20	CA13135	2	7.93	0.05	9
Yearly Average		2	7.59	0.04	4
Maximum		2	7.93	0.05	9
Minimum		2	7.31	0.03	2

Table 9 Effluent Quarterly Analysis Summary – Weekly 24 Hour Composite Sample Part 2

Sample Date	Sample Identification Number	Total Kjeldahl Nitrogen mg/L	Nitrate Nitrogen mg/L	Nitrite Nitrogen mg/L	Total Ammonia Nitrogen mg/L
03-Mar-20	CA13042	6.0	2.00	0.06	5.5
12-May-20	CA12258	0.7	2.18	0.03	0.1
04-Aug-20	CA13094	1.3	1.85	0.03	0.8
03-Nov-20	CA13135	8.7	1.19	0.03	8.3
Yearly Average		4.2	1.8	0.34	3.7
Maximum		8.7	2.0	0.06	8.3
Minimum		0.7	1.2	0.03	0.1

Table 10 Effluent Loading and Concentration Summary 2020: CBOD5

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.00	0.17	0.44
February	2.00	0.16	0.35
March	2.00	0.24	0.53
April	2.00	0.24	0.33
May	2.75	0.31	0.41
June	2.20	0.27	0.41
July	3.50	0.48	0.62
August	2.25	0.30	0.44
September	2.00	0.26	0.40
October	2.00	0.28	0.51
November	2.00	0.29	0.43
December	2.00	0.19	0.31
Average Monthly	2.00	0.27	0.43
Effluent Objective	5.00	2.38	2.38
Non-Compliance	15.00	7.13	7.13

Table 11 Effluent Loading and Concentration Summary 2020: Suspended Solids

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.25	0.19	0.49
February	2.60	0.21	0.45
March	2.00	0.24	0.53
April	1.75	0.21	0.29
May	0.75	0.09	0.11
June	2.40	0.29	0.45
July	2.75	0.38	0.48
August	4.00	0.54	0.79
September	2.40	0.31	0.48
October	4.25	0.59	1.09
November	3.83	0.55	0.82
December	2.50	0.24	0.38
Average Monthly	2.62	0.32	0.53
Effluent Objective	5.00	2.38	2.38
Non-Compliance	15.00	7.13	7.13

Table 12 Effluent Loading and Concentration Summary 2020: Total Ammonia Nitrogen Summer

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
May	0.38	0.04	0.06
June	0.10	0.01	0.02
July	0.23	0.03	0.04
August	0.50	0.07	0.10
September	0.30	0.04	0.06
October	1.40	0.19	0.36
November	3.20	0.46	0.68
Average Monthly	0.87	0.12	0.19
Effluent Objective	1.00	0.48	0.48
Non-Compliance	4.00	1.90	1.90

Table 13 Effluent Loading and Concentration Summary 2020: Total Ammonia Nitrogen Winter

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	14.91	1.29	3.28
February	10.02	0.82	1.73
March	4.18	0.50	1.10
April	0.10	0.01	0.02
December	0.30	0.03	0.05
Average Monthly	5.90	0.53	1.24
Effluent Objective	4.00	1.90	1.90
Non-Compliance	10.0	4.75	4.75

Table 14 Effluent Loading and Concentration Summary 2020: Fecal Coliform

Month	Geomean (#/100mL)	Maximum Daily (#/100mL)
January	0.00	0.00
February	0.00	0.00
March	0.00	0.00
April	0.00	0.00
May	0.00	0.00
June	0.00	0.00
July	0.00	0.00
August	0.00	0.00
September	0.00	0.00
October	0.00	0.00
November	0.00	0.00
December	0.00	0.00
Average Monthly	0	0
Effluent Objective	50 Organisms/100mL	80 Organisms/100mL
Non-Compliance	50 Organisms/100mL	80 Organisms/100mL

Table 16 Effluent Loading and Concentration Summary 2020: Total Phosphorus

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	0.03	0.003	0.007
February	0.03	0.002	0.005
March	0.03	0.004	0.009
April	0.03	0.004	0.005
May	0.07	0.007	0.010
June	0.03	0.004	0.006
July	0.03	0.004	0.005
August	0.03	0.004	0.006
September	0.08	0.010	0.016
October	0.04	0.006	0.010
November	0.03	0.004	0.006
December	0.04	0.004	0.006
Average Monthly	0.04	0.005	0.008
Effluent Objective	0.30	0.143	0.143
Non-Compliance	1.00	0.475	0.475

Table 17 Sludge Quality Analysis 2020

Parameter Sampled (mg/L)	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Date	Mar-20	May-20	Aug-20	Nov-20
Sample ID	CA13044	CA12257	CA13087	CA13087
Mercury	0.002	0.006	0.004	0.004
Potassium	55	112	84	51.000
Chromium	0.54	1.3	1	1.3
Cobalt	0.03	0.06	0.05	0.05
Copper	3.5	7.3	5.5	5.3
Lead	<0.1	0.2	0.2	0.20
Molybdenum	0.08	0.19	0.16	0.18
Nickel	0.31	0.77	0.61	0.79
Selenium	<0.1	<0.1	<0.1	<0.1
Arsenic	<0.1	<0.1	<0.1	<0.1
Zinc	5	10	8	7
Cadmium	0.012	0.026	0.016	0.018
Ammonia	1.9	1.9	<1	1.1
Total Kjeldahl Nitrogen	429	843	738	482
Total Phosphorus	240	601	540	450
Total Solids	9750	16400	15500	13700
Nitrate	22	68	1	229
Nitrite	0.6	2.4	<0.2	<0.2

Certification of Reports

I certify that the information in this document and all attachments are correct, accurate, and complete to the best of my knowledge

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