

## 2020 Year End Report: Bala Clean Water Plant (CWP)



Environmental Compliance Approval: # 5049-B55KXT

Engineering and Public Works Department

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## Introduction

The Bala Clean Water Plant (CWP), which services the Town of Bala, is owned and operated by the District Municipality of Muskoka. The plant is located at 1007 Tower Road, and was commissioned in 1996. It currently services 358 customer accounts.

The Plant operates under the MOE Environmental Compliance Approval (Sewage) # 5049-B55KXT, issued October 31 2018. Under the terms of the Certificate of Approval, the plant is permitted to treat an average daily flow of 550m<sup>3</sup>/day, and a peak flow of 2,036m<sup>3</sup>/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	0.30 mg/L
Total Ammonia Nitrogen Summer (May 15 to September 30)	5.0 mg/L
Total Ammonia Nitrogen Winter (October 01 to May 14)	10.0 mg/L
E. coli	100 CFU/100mL
pH	6.0-9.5 inclusive at all times

The plant is an extended aeration activated sludge treatment process, consisting of grit removal, post-secondary filtration and Ultra-Violet disinfection. The facility is also equipped with aerobic digesters for bio-solids stabilization prior to final disposal.

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 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 final effluent sample results for the MBR facilities met their effluent limits.

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

In all respects, test results of the treated effluent for the parameters of CBOD5, suspended solids, ammonia, 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. All sample test results of the final effluent were within levels outlined in the plant ECA (#5049-B55KXT).

### Quantity of Flow Summary

The plant has a daily average flow design capacity of 550 m<sup>3</sup>/day. The actual average daily flow for the 2020 was 307m<sup>3</sup>/day, however, the 3year average is 328m<sup>3</sup>/day, which represents 60% of the plant capacity. None of the individual system components exceeded the design flow rating.

### Plant Operational Upsets or Process Failures

Planned Bypass of the post-secondary filtration system was necessary during capital upgrades to the post-secondary filtration system (new cloth-media style) and occurred between August 5<sup>th</sup> – October 29<sup>th</sup>, 2020.

UV system intensity dropped to zero (0) (Dec 4<sup>th</sup>, 2020) following installation of new system and reported to SAC, report # 7585-BVZLU4. Replacement of breakers, GFI's and additional SCADA programming complete.

### Summary of Maintenance

Proposed Works including the addition of fine bubble aeration system, new blower for aeration process, replacement of post- secondary filtration system and UV disinfection system were carried out in 2020. In addition, clarifier upgrades, HVAC upgrades, new generator and transfer switch, valves, pumps, flowmeters and SCADA programming were done in 2020.

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.
- Monthly calibration verification of analytical equipment
- Annual servicing of emergency standby generators.
- Annual replacement of U.V. bulbs.

- Annual calibration of flow metering devices.
- Annual calibration verification of analytical equipment by third party.
- Annual cleaning of all sewage pumping stations.
- 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 60% and is in compliance with specified effluent parameter criteria. In addition, there has been no significant treatment process upsets and plant bypasses.

### Evaluation Summary of Proposed Work Requiring Approval under OWRA

ECA 5049-B55KXT was amended October 31, 2018 and allowed for Proposed Works including the following: Fine bubble aeration system, new blowers for aeration and sludge holding tanks, post-secondary filtration system(s) and UV disinfection system. These upgrades were carried out in 2020 and done to existing equipment as part of scheduled lifecycle replacement.

### 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)	42	298	141.5	40.73
Suspended Solids (mg/L)	68	457	179.21	52.07
Total Phosphorus (mg/L)	0.88	6.34	2.57	0.58
TKN (mg/L)	7.6	37.4	21.35	6.08
pH	6.78	8.70 max	7.55	N/A

## 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.

## 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.

*Table 3 Final Effluent Analysis Summary*

Parameter	Minimum	4 Week Average Maximum	Annual Average	Average Loading kg/day
COBD5 (mg/L)	2	3.75	2.3	0.99
Suspended Solids (mg/L)	2	5.75	2.97	1.28
Ammonia (mg/L)	0.10	0.3	0.19	0.06
E. Coli (#/100 mL)	0	3.1	0.53	N/A
Total Phosphorus (mg/L)	0.03	0.10	0.04	0.0065
pH	6.56	7.73 max	6.86	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 volume of biosolids hauled from the facility for disposal is outlined in the table provided. Dewatered biosolids from the plant was hauled to an approved landfill site. 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.

## Bala Wastewater Collection Summary

#### New Sewer Services:

A total of 7 customers connected to existing sewer laterals in 2020.

#### New Sewer Mains:

There was no new sewer main installed in 2020.

#### Sewer Main Replacements:

There were no sewer main replacements in 2020.

#### Low Pressure Sewer Breaks:

There were no low pressure sewer breaks in 2020.

#### Sewer Force Main Breaks:

There were no sewer force main breaks in 2020.

#### Main Line Sewer Blockage

There was one (1) sewer main blockage in 2020.

#### Sewer Lateral Blockage

There was one (1) sewer lateral blockage in 2020.

#### Service Low Pressure Sewer Blockages:

There was one (1) low pressure sewer blockage in 2020.

#### Frozen Sewer Force Mains:

There were no frozen sewer force mains 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:

Field staff Approximately 1,002 meters of sewer main was flushed and video inspected in 2020.

#### Sewer Locates:

Field staff addressed 203 written locate requests in 2020.

Table 4 Effluent Flow Summary - 2020

Month	Plant Total Monthly (m <sup>3</sup> )	Average Day Flow (m <sup>3</sup> /d)	Maximum Day Flow (m <sup>3</sup> /d)	Minimum Day Flow (m <sup>3</sup> /d)
January	10,121	326	560	244
February	7,125	246	284	213
March	15,619	504	865	226
April	12,515	417	650	289
May	9,779	315	393	231
June	8,395	280	344	233
July	7,561	244	316	190
August	7,931	256	328	190
September	6,486	216	298	162
October	8,164	263	347	209
November	8,115	270	370	192
December	10,395	335	555	274

Total Flow: 112,207m<sup>3</sup>  
 Average Day: 307m<sup>3</sup>  
 Maximum Day: 865m<sup>3</sup>  
 Minimum Day: 162m<sup>3</sup>

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

Sample Date	Sample Identification Number	BOD5 mg/L	Alkalinity (Total as CaCO3) mg/L	pH	Phosphate	Total Phosphorus mg/L	Suspended Solids mg/L
10-Feb-20	CA13208	173	20.7	8.7	0.17	1.95	164
11-May-20	CA12247	104	20.1	7.72	0.53	2.2	105
10-Aug-20	CA13393	253	205	7.58	1.27	4.23	279
9-Nov-20	CA13330	142	234	7.46	0.62	2.08	124
<b>Yearly Average</b>		168.0	120.0	7.9	0.6	2.6	168.0
<b>Maximum</b>		253.0	234.0	8.7	1.3	4.2	279.0
<b>Minimum</b>		104.0	20.1	7.5	0.2	2.0	105.0



Table 6 Influent Quarterly Analysis Summary – Weekly 24 Hour Composite Sample Part 2

Sample Date	Sample Identification Number	Conductivity mg/L	Total Kjeldahl Nitrogen mg/L	Nitrate Nitrogen mg/L	Nitrite Nitrogen mg/L	Total Ammonia Nitrogen mg/L	Chloride mg/L
10-Feb-20	CA13208	710	16.1	0.06	0.03	12.4	90
11-May-20	CA12247	663	19.6	0.06	0.03	14.9	78
10-Aug-20	CA13393	598	27.7	0.06	0.03	21.6	58
9-Nov-20	CA13330	655	17.9	0.06	0.03	16.2	55
<b>Yearly Average</b>		656.5	20.3	0.1	0.0	16.3	70.3
<b>Maximum</b>		710.0	27.7	0.1	0.0	21.6	90.0
<b>Minimum</b>		598.0	16.1	0.1	0.0	12.4	55.0

Table 7 Chemical Usage Summary: Alum

Month	Average Dosage mg/L	Total kg (dry)
January	24.7	1042.80
February	41.3	729.96
March	44.0	1297.56
April	58.7	1379.40
May	680.5	1317.36
June	66.6	1263.24
July	89.3	1280.40
August	57.4	1214.40
September	34.6	864.60
October	76.5	1342.44
November	37.7	1313.40
December	36.9	1960.20
Average	104.0	1250.5

Total Yearly Kilograms: 15,006kg

Table 8 Chemical Usage Summary: Soda Ash

<b>Month</b>	<b>Average Dosage mg/L</b>	<b>Total kg (dry)</b>
January	4.0	82.25
February	7.3	59.69
March	5.7	77.50
April	9.3	114.84
May	10.3	93.75
June	41.7	119.22
July	15.9	101.88
August	18.9	132.97
September	14.1	107.97
October	32.2	125.00
November	15.7	125.31
December	20.4	128.44
Average	16.3	105.7

Total Yearly Kilograms: 1,269kg

Table 9 Effluent Quarterly Analysis Summary – Weekly 24 Hour Composite Sample Part 1

Sample Date	Sample Identification Number	CBOD5 mg/L	Alkalinity (Total as CaCO3) mg/L	pH	Phosphate	Total Phosphorus mg/L	Suspended Solids mg/L
2/10/2020	CA13208	2	49	7.27	0.03	0.03	2
11-May-20	CA12247	2	50	6.99	0.03	0.05	2
10-Aug-20	CA13393	6	47	7.27	< 0.04	0.13	7
9-Nov-20	CA13330	2	82	7.61	< 0.03	0.03	2
<b>Yearly Average</b>		3.0	57.0	7.3	0.0	0.1	3.3
<b>Maximum</b>		6.0	82.0	7.6	0.0	0.1	7.0
<b>Minimum</b>		2.0	47.0	7.3	0.0	0.0	2.0

Table 10 Effluent Quarterly Analysis Summary – Weekly 24 Hour Composite Sample Part 2

Sample Date	Sample Identification Number	Conductivity mg/L	Total Kjeldahl Nitrogen mg/L	Nitrate Nitrogen mg/L	Nitrite Nitrogen mg/L	Total Ammonia Nitrogen mg/L	Chloride mg/L
10/Feb/20		437	1.1	9.11	0.03	0.1	61
11-May-20		560	0.5	11.8	0.07	0.4	73
10-Aug-20		524	0.5	0.03	15.9	0.1	58
9-Nov-20		617	2.0	0	17.9	0.1	54
<b>Yearly Average</b>		534.5	1.025	5.2425	8.475	0.175	61.5
<b>Maximum</b>		617	2	11.8	17.9	0.4	73
<b>Minimum</b>		524	0.5	0.03	8.475	0.1	54

Table 11 Effluent Loading and Concentration Summary 2020: COBD5

<b>Month</b>	<b>Average mg/L</b>	<b>Average kg/day</b>	<b>Maximum Daily kg/day</b>
<b>January</b>	2.00	0.65	1.12
<b>February</b>	2.00	0.49	0.57
<b>March</b>	2.00	1.01	1.73
<b>April</b>	2.00	0.83	1.30
<b>May</b>	2.00	0.63	0.79
<b>June</b>	2.40	0.67	0.83
<b>July</b>	3.50	0.85	1.11
<b>August</b>	3.50	0.90	1.15
<b>September</b>	2.00	0.43	0.60
<b>October</b>	2.00	0.53	0.69
<b>November</b>	2.00	0.54	0.74
<b>December</b>	2.20	0.74	1.22
<b>Average Monthly</b>	2.30	0.70	0.99
<b>Effluent Objective</b>	10	5.5	5.5
<b>Non-Compliance</b>	15	8.25	8.25

Table 12 Effluent Loading and Concentration Summary 2020: Suspended Solids

<b>Month</b>	<b>Average mg/L</b>	<b>Average kg/day</b>	<b>Maximum Daily kg/day</b>
<b>January</b>	2.50	0.82	1.40
<b>February</b>	2.00	0.49	0.57
<b>March</b>	2.40	1.21	2.08
<b>April</b>	2.50	1.04	1.62
<b>May</b>	2.25	0.71	0.88
<b>June</b>	2.60	0.73	0.90
<b>July</b>	2.25	0.55	0.71
<b>August</b>	5.80	1.48	1.90
<b>September</b>	4.50	0.97	1.34
<b>October</b>	4.00	1.05	1.39
<b>November</b>	2.80	0.76	1.04
<b>December</b>	2.00	0.67	1.11
<b>Average Monthly</b>	2.97	0.91	1.28
<b>Effluent Objective</b>	10.00	5.5	5.5
<b>Non-Compliance</b>	15.00	8.25	8.25

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

<b>Month</b>	<b>Average mg/L</b>	<b>Average kg/day</b>	<b>Maximum Daily kg/day</b>
<b>May</b>	0.20	0.063	0.079
<b>June</b>	0.16	0.045	0.055
<b>July</b>	0.58	0.140	0.182
<b>August</b>	0.10	0.026	0.033
<b>September</b>	0.30	0.065	0.089
<b>October</b>	0.10	0.026	0.035
<b>Average Monthly</b>	0.24	0.06	0.08
<b>Effluent Objective</b>	0.5	0.275	0.275
<b>Non-Compliance</b>	5	2.75	2.75



Table 14 Effluent Loading and Concentration Summary 2020: Total Ammonia Nitrogen Winter

<b>Month</b>	<b>Average mg/L</b>	<b>Average kg/day</b>	<b>Maximum Daily kg/day</b>
<b>January</b>	0.10	0.033	0.056
<b>February</b>	0.10	0.025	0.028
<b>March</b>	0.26	0.131	0.225
<b>April</b>	0.10	0.042	0.065
<b>November</b>	0.10	0.027	0.037
<b>December</b>	0.12	0.040	0.067
<b>Average Monthly</b>	0.14	0.06	0.09
<b>Effluent Objective</b>	2.00	1.1	1.1
<b>Non-Compliance</b>	10.00	5.5	5.5

Table 15 Effluent Loading and Concentration Summary 2020: Fecal Coliform

<b>Month</b>	<b>Geomean (#/100mL)</b>	<b>Maximum Daily (#/100mL)</b>
<b>January</b>	0.00	0.00
<b>February</b>	0.00	0.00
<b>March</b>	0.00	0.00
<b>April</b>	0.00	0.00
<b>May</b>	0.00	0.00
<b>June</b>	1.00	2.00
<b>July</b>	0.00	0.00
<b>August</b>	0.00	1.00
<b>September</b>	0.00	1.00
<b>October</b>	2.83	8.00
<b>November</b>	0.00	0.00
<b>December</b>	2.47	92.00
<b>Average Monthly</b>	0.53	8.67
<b>Effluent Objective</b>	80.00	
<b>Non-Compliance</b>	100.00	

Table 16 Effluent Loading and Concentration Summary 2020: Total Phosphorus

<b>Month</b>	<b>Average mg/L</b>	<b>Average kg/day</b>	<b>Maximum Daily kg/day</b>
<b>January</b>	0.04	0.013	0.007
<b>February</b>	0.03	0.007	0.002
<b>March</b>	0.04	0.020	0.017
<b>April</b>	0.05	0.019	0.012
<b>May</b>	0.04	0.013	0.005
<b>June</b>	0.04	0.011	0.004
<b>July</b>	0.03	0.007	0.002
<b>August</b>	0.09	0.023	0.008
<b>September</b>	0.06	0.013	0.004
<b>October</b>	0.04	0.011	0.004
<b>November</b>	0.03	0.008	0.003
<b>December</b>	0.03	0.011	0.01
<b>Average Monthly</b>	0.04	0.013702	0.006523
<b>Effluent Objective</b>	0.30	0.165	0.165
<b>Non-Compliance</b>	0.30	0.165	0.165

Table 17 Liquid Sludge Production Summary 2020

Month	Hauler	Liquid Volume m <sup>3</sup>	Destination
January	ROHES	126.00	ROHES - Lagoon
February		0	
March		0	
April	ROHES	145.60	ROHES - Lagoon
May	ROHES	182.00	ROHES - Lagoon
June	ROHES	72.8	ROHES - Lagoon
July	ROHES	182	ROHES - Lagoon
August	ROHES	109.2	ROHES - Lagoon
September	ROHES	72.8	ROHES - Lagoon
October	ROHES	36.4	ROHES - Lagoon
November	ROHES	109.2	ROHES - Lagoon
December	ROHES	36.4	ROHES - Lagoon

Yearly Total Volume: 1,072.40m<sup>3</sup>

Yearly Average Volume: 89.3 m<sup>3</sup>

Maximum Volume: 182m<sup>3</sup>

Minimum Volume: 0.00m<sup>3</sup>

Table 18 Sludge Quality Analysis 2020

Parameter Sampled (mg/L)	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Date	February 10	May 11	August 10	November 9
Sample ID	CA13208	CA12247	CA12229	CA13329
Nitrate	6.0	72	35	36
Mercury	0.045	0.051	0.011	0.059
Chromium	0.19	0.23	0.06	0.26
Cobalt	0.02	0.03	0.01	0.04
Copper	5.2	6.6	1.6	9.2
Lead	0.2	0.2	0.1	0.4
Molybdenum	0.05	0.07	0.05	0.11
Nickel	0.20	0.24	0.04	0.19
Selenium	<0.1	<0.1	0.1	<0.1
Arsenic	<0.1	<0.1	0.1	0.1
Zinc	4.0	5.0	1.0	8.0
Cadmium	0.006	0.008	0.005	0.016
Ammonia+ Ammonium	3.2	2.4	6.7	13.6
Total Kjeldahl Nitrogen	615	1000	222	1090
Total Phosphorus	330	390	87	640
Total Solids	10600	17000	5070	21700
NO2	0.7	4.9	2	18.0
Chloride	70	71	31	49
PO4(sol)(Dissolved Reactive Phosphorous)	0.75	0.75	0.75	<0.75
TSS	11000	15900	3960	20900
COD	8800	18600	3550	25200
BOD	2750	4940	272	3830

## 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

Marcus Firman, C.E.T.  
Director, Water and Wastewater Services

Stewart Hurd  
Manager of Water and Wastewater Operations