

## 2021 Year End Report: Bala Wastewater Treatment Plant (WWTP)



Environmental Compliance Approval: # 5049-B55KXT

Engineering and Public Works Department

70 Pine Street, Bracebridge, Ontario P1L 1N3

Phone: 705-645-6764

Toll-Free: 1-800-281-3483

Fax: 705-645-7599

Email: [publicworks@muskoka.on.ca](mailto:publicworks@muskoka.on.ca)

Website: [www.muskoka.on.ca](http://www.muskoka.on.ca)

## Introduction

The Bala Wastewater Treatment Plant (WWTP), 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 360 customer accounts.

The Plant operates under the MECP 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 550 meters cubed per day, and a peak flow of 2,036 meters cubed per day. Additionally, effluent limit criteria are as follows:

*Table 1 Effluent Limit Criteria*

<b>Effluent Parameter</b>	<b>Concentration</b>
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, postsecondary 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 meters cubed per day. The actual average daily flow for 2021 was 325 meters cubed per day, however, the 3 year average is 330 meters cubed per 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

On June 11<sup>th</sup> approx. 30 Liters of effluent was not disinfected due to a short-lived UV equipment failure.

On September 23<sup>rd</sup> approx. 62 meters cubed of mixed liquor bypassed the post-secondary filter due to heavy precipitation.

### Summary of Maintenance

Deficiencies identified following 2021 Capital upgrades including clarifier modifications were rectified.

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 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 in 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 2021 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*

<b>Influent Parameter</b>	<b>Minimum</b>	<b>4 Week Average Maximum</b>	<b>Annual Average</b>	<b>Average loading kg/day</b>
BOD5 (mg/L)	37	199	118.12	35.50
Suspended Solids (mg/L)	31	239	133.35	40.14
Total Phosphorus (mg/L)	0.61	4.34	2.24	0.66
TKN (mg/L)	5.8	36.5	20.35	6.06

Influent Parameter	Minimum	4 Week Average Maximum	Annual Average	Average loading kg/day
pH	7.24	8.92 max	7.85	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	3.25	2.27	0.72
Suspended Solids (mg/L)	2	4.50	2.90	1.31
Ammonia (mg/L)	0.10	1.0	0.22	0.12
E. Coli (#/100 mL)	0	1.25	0.17	N/A
Total Phosphorus (mg/L)	0.03	0.08	0.05	0.014
pH	6.85	7.68 (max)	6.90	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 2022 year, 24 hour composite samples will be collected on Wednesday rather than Tuesday of each week.

### 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 2021, and will continue to do so in 2022. It is not anticipated that there will be a significant increase in the total volume of bio solids produced in 2022.

### 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 two (2) customers connected to existing sewer laterals in 2021.

#### New Sewer Mains:

There was no new sewer main installed in 2021.

#### Sewer Main Replacements:

There were no sewer main replacements in 2021.

#### Low Pressure Sewer Breaks:

There were no low pressure sewer breaks in 2021.

#### Sewer Force Main Breaks:

There were no sewer force main breaks in 2021.

#### Main Line Sewer Blockage

There were no main line sewer blockages in 2021.

#### Sewer Lateral Blockage

There were no sewer lateral blockages on the municipal side in 2021.

#### Sewage Pump Stations:

All stations were cleaned using high velocity water pressure and debris was vacuumed out and hauled to an appropriate landfill site. ARV valves were inspected at each site and cleaned at River St SPS.

#### Sewer Force Mains:

All the low pressure sewage force mains within the collection system were flushed by operations staff through annual preventive maintenance for 2021.

#### Air Release Valves:

All eleven (11) air release vacuum valves connected to the sewage force mains in the collection system were inspected as part of annual preventive maintenance for 2021.

#### Sewer Flushing/Video Inspections:

Approximately 2,335 meters of various size sewer main was flushed and video inspected in 2021.

#### Sewer Locates:

Operations staff addressed 39 Ontario OneCall locate requests in 2021.

Table 4 Effluent Flow Summary - 2021

<b>Month</b>	<b>Plant Total Monthly (m<sup>3</sup>)</b>	<b>Average Day Flow (m<sup>3</sup>/d)</b>	<b>Maximum Day Flow (m<sup>3</sup>/d)</b>	<b>Minimum Day Flow (m<sup>3</sup>/d)</b>
<b>January</b>	6,761	225	280	180
<b>February</b>	5,131	183	212	161
<b>March</b>	12,431	401	662	201
<b>April</b>	9,122	304	420	235
<b>May</b>	8,245	266	390	189
<b>June</b>	6,262	209	403	145
<b>July</b>	12,027	388	627	259
<b>August</b>	8,520	275	346	224
<b>September</b>	10,977	366	848	198
<b>October</b>	11,429	369	445	282
<b>November</b>	11,834	394	467	279
<b>December</b>	15,877	512	775	395

Total Flow: 118,617m<sup>3</sup>

Average Day: 325m<sup>3</sup>

Maximum Day: 848m<sup>3</sup>

Minimum Day: 145m<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
9-Feb-21	BIPCPRS	107	212	7.78	1.68	3.39	100
11-May-21	BIPCPRS	110	203	8.17	0.32	2.20	127
10-Aug-21	BIPCPRS	140	234	7.85	1.80	1.91	84
9-Nov-21	BIPCPRS	63	207	8.00	0.17	0.10	91
<b>Yearly Average</b>		105	214	7.85	1.0	1.9	101
<b>Maximum</b>		140	234	8.92	1.8	3.4	127
<b>Minimum</b>		63	203	7.24	0.2	0.1	84



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
9-Feb-21	BIPCPRS	682	32.8	0.06	0.03	25.4	69
11-May-21	BIPCPRS	700	19.2	0.06	0.03	16.2	85
10-Aug-21	BIPCPRS	674	28.3	0.06	0.03	30.4	71
9-Nov-21	BIPCPRS	540	12.4	0.06	0.03	9.2	51
<b>Yearly Average</b>		649	23.2	0.06	0.03	20.3	69
<b>Maximum</b>		700	32.8	0.06	0.03	30.4	85
<b>Minimum</b>		540	12.4	0.06	0.03	9.2	51

Table 7 Chemical Usage Summary: Alum

Month	Average Dosage mg/L	Total kg (dry)
January	35.0	1,023.0
February	78.3	761.6
March	73.9	1,834.8
April	70.9	1,355.6
May	71.1	1,195.9
June	69.9	887.0
July	72.1	1,663.2
August	63.6	1,432.2
September	83.5	1,821.6
October	78.6	1,801.8
November	76.9	2,006.4
December	84.4	2,727.1
Average	71.3	1542.5

Total Yearly Kilograms: 18,510kg

Table 8 Chemical Usage Summary: Soda Ash

Month	Average Dosage mg/L	Total kg (dry)
January	7.3	153.0
February	16.9	129.0
March	31.2	238.0
April	30.2	213.0
May	31.4	200.0
June	40.7	185.0
July	27.8	242.0
August	26.0	398.0
September	28.9	216.0
October	18.4	162.0
November	14.5	166.0
December	15.0	230.0
Average	24	211.0

Total Yearly Kilograms: 2,532kg

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
9-Feb-21	BIPCPFE	5	56	7.34	0.03	0.08	<2
11-May-21	BIPCPFE	3	74	7.30	<0.03	0.05	<2
10-Aug-21	BIPCPFE	2	32	7.12	< 0.03	0.03	3
9-Nov-21	BIPCPFE	2	77	7.54	< 0.03	0.03	2
<b>Yearly Average</b>		3.0	59.8	7.3	0.0	0.0	2.5
<b>Maximum</b>		5.0	77.0	7.5	0.0	0.1	3.0
<b>Minimum</b>		2.0	32.0	7.1	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
9-Feb-21	BIPCPFE	583	1.4	20.2	0.22	0.3	68
11-May-21	BIPCPFE	688	<0.5	15.6	<0.03	<0.1	99
10-Aug-21	BIPCPFE	592	1	27.7	0.18	0.1	62
9-Nov-21	BIPCPFE	390	1.2	7	0.03	0.1	43
<b>Yearly Average</b>		563	1.2	17.5	0.14	0.17	68
<b>Maximum</b>		688	1.4	27.7	0.22	0.3	99
<b>Minimum</b>		390	1	6.6	0.03	0.1	43

Table 11 Effluent Loading and Concentration Summary 2021: 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	0.45	0.56
<b>February</b>	3.25	0.60	0.69
<b>March</b>	2.60	1.04	1.72
<b>April</b>	2.25	0.68	0.94
<b>May</b>	2.50	0.66	0.97
<b>June</b>	2.20	0.46	0.89
<b>July</b>	2.00	0.78	1.25
<b>August</b>	2.00	0.55	0.69
<b>September</b>	2.50	0.91	2.12
<b>October</b>	2.00	0.74	0.89
<b>November</b>	2.00	0.79	0.93
<b>December</b>	2.00	1.02	1.55
<b>Average Monthly</b>	2.28	0.72	N/A
<b>Effluent Objective</b>	10	N/A	N/A
<b>Non-Compliance</b>	15	8.25	N/A

Table 12 Effluent Loading and Concentration Summary 2021: Suspended Solids

<b>Month</b>	<b>Average mg/L</b>	<b>Average kg/day</b>	<b>Maximum Daily kg/day</b>
<b>January</b>	2.00	0.45	0.56
<b>February</b>	4.75	0.87	1.01
<b>March</b>	2.20	0.88	1.46
<b>April</b>	2.25	0.68	0.94
<b>May</b>	3.50	0.93	1.36
<b>June</b>	2.80	0.58	1.13
<b>July</b>	2.25	0.87	1.41
<b>August</b>	4.60	1.26	1.59
<b>September</b>	2.25	0.82	1.91
<b>October</b>	2.75	1.01	1.22
<b>November</b>	3.00	1.18	1.40
<b>December</b>	2.25	1.15	1.74
<b>Average Monthly</b>	2.88	0.89	N/A
<b>Effluent Objective</b>	10.00	N/A	N/A
<b>Non-Compliance</b>	15.00	8.25	N/A

Table 13 Effluent Loading and Concentration Summary 2021: 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>	0.10	0.027	0.039
<b>June</b>	0.10	0.021	0.040
<b>July</b>	0.10	0.039	0.063
<b>August</b>	0.12	0.033	0.042
<b>September</b>	0.10	0.037	0.085
<b>October</b>	0.10	0.037	0.045
<b>Average Monthly</b>	0.10	0.0321	0.0521
<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 2021: 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>	0.15	0.034	0.042
<b>February</b>	0.63	0.115	0.133
<b>March</b>	0.16	0.064	0.106
<b>April</b>	0.10	0.030	0.042
<b>November</b>	0.10	0.039	0.047
<b>December</b>	0.98	0.499	0.756
<b>Average Monthly</b>	0.35	0.13	0.187
<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 2021: 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>	0.80	4.00
<b>July</b>	0.00	0.00
<b>August</b>	1.00	5.00
<b>September</b>	0.00	0.00
<b>October</b>	0.00	0.00
<b>November</b>	0.00	0.00
<b>December</b>	0.00	0.00
<b>Average Monthly</b>	0.15	0.75
<b>Effluent Objective</b>	80.00	
<b>Non-Compliance</b>	100.00	

Table 16 Effluent Loading and Concentration Summary 2021: 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	0.008	0.002
<b>February</b>	0.08	0.015	0.003
<b>March</b>	0.04	0.016	0.011
<b>April</b>	0.05	0.014	0.006
<b>May</b>	0.05	0.014	0.005
<b>June</b>	0.06	0.012	0.005
<b>July</b>	0.05	0.018	0.012
<b>August</b>	0.09	0.024	0.008
<b>September</b>	0.04	0.015	0.012
<b>October</b>	0.03	0.011	0.005
<b>November</b>	0.03	0.012	0.006
<b>December</b>	0.03	0.015	0.012
<b>Average Monthly</b>	0.05	0.014	0.007
<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 2021

Month	Hauler	Liquid Volume m <sup>3</sup>	Destination
January			
February	ROHES	36.4	ROHES - Lagoon
March			
April	ROHES	145.6	ROHES - Lagoon
May	ROHES	109.2	ROHES - Lagoon
June	ROHES	109.2	ROHES - Lagoon
July	ROHES	72.8	ROHES - Lagoon
August	ROHES	145.6	ROHES - Lagoon
September	ROHES	72.8	ROHES - Lagoon
October	ROHES	109.2	ROHES - Lagoon
November	ROHES	72.8	ROHES - Lagoon
December			

Yearly Total Volume: 874m<sup>3</sup>  
 Yearly Average Volume: 97m<sup>3</sup>  
 Maximum Volume: 146m<sup>3</sup>

Table 18 Sludge Quality Analysis 2021

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	13	20	0.9	2
PO4(sol)(Dissolved Reactive Phosphorous)	<0.75	<0.75	<0.75	<0.75
TSS	17100	16800	15600	20200

## 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

Michael Spicer  
Director, Water and Wastewater Services

Stewart Hurd  
Manager of Water and Wastewater Operations