2023 Year End Report: Bala Wastewater Treatment Plant (WWTP)

Environmental Compliance Approval: # 5049-B55KXT

Engineering and Public Works Department

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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 451 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

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, 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 shutdowns, 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 2023 was 357 meters cubed per day, however, the 3-year average is 337 meters cubed per day, which represents 61% of the plant capacity. None of the individual system components exceeded the design flow rating.

Plant Operational Upsets or Process Failures

There were no plant upsets or process failures in 2023, overall treatment performance was extremely good all year.

Summary of Maintenance

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 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 was last completed in 2022 and is planned for 2027.

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 61% 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

No works performed in 2023.

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)	28.0	153.0	90.7	32.4
Suspended Solids (mg/L)	32.0	316.3	146.3	52.2
Total Phosphorus (mg/L)	0.54	3.39	1.85	0.66
TKN (mg/L)	5.5	34.0	15.7	5.6
pH	6.31	8.88 max	7.80	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

Effluent objectives were met at all times in 2023.

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)	2.0	2.3	2.0	0.7
Suspended Solids (mg/L)	2.0	4.8	2.6	0.9
Ammonia (mg/L)	0.10	0.13	0.10	0.04
E. Coli (#/100 mL)	0	0.3	0.0	N/A
Total Phosphorus (mg/L)	0.03	0.06	0.04	0.01
pH	6.54	7.60 (max)	6.91	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 2024 year, 24-hour composite samples will be collected on Monday rather than Thursday of each week as was done in 2023.

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 by a contractor for disposal in 2023 and will continue to do so in 2024. It is not anticipated that there will be a significant increase in the total volume of bio solids produced in 2024.

Summary of Complaints received throughout the reporting period.

There were no complaints received in the reporting period.

Bala Wastewater Collection Summary 2023

New or Replaced Sewer Mains

There was no new sewer main installed in Bala 2023.

New Sewer Services:

3 new customers connected to existing municipal services. 1016 Elm A & B and 1015 Currie St

Sewer Lateral Blockages:

2 Sewer Laterals blocked. 1020 Currie St and 1011 Victoria St lateral runs to River St

Sewer Pump Stations:

All stations were cleaned by high velocity water pressure. All debris was vacuumed out and hauled to the appropriate landfill site. ARV's in River and Musquash were inspected.

Main Line Sewer Blockages:

There were no main line sewer blockages in 2023.

Sewer Force Mains:

All the low-pressure sewage force mains within the collection system were flushed by field staff through our annual preventive maintenance program in 2023. 1 customer laterals had blockages on District CS.

Air Release Valves:

All eleven (11) of the air release vacuum valves connected to the sewage force mains in our collection system had a maintenance inspection 2023.

Sewer Flushing and Video Inspections:

Approximately 1185.6 meters of various size sanitary sewer mains were flushed using high pressure equipment.

Sewer Rehabilitation:

There was no MH rehab in Bala in 2023. 5 Autostable MH lids were installed for Muskoka Rd paving. Roads department contract.

Locates:

Field staff addressed 148 locates for Bala OneCall in 2023.

Table 4 Effluent Flow Summary - 2023

Month	Plant Total Monthly (m^3)	Average Day Flow (m^3/d)	Maximum Day Flow (m^3/d)	Minimum Day Flow (m^3/d)
January	13,420	433	1,048	200
February	7,643	273	414	189
March	11,599	374	643	225
April	17,772	592	1,292	400
May	11,693	377	553	272
June	9,000	300	427	241
July	9,679	312	469	255
August	8,642	279	350	206
September	7,708	257	330	213
October	11,602	374	828	184
November	9,572	319	398	259
December	12,026	388	480	310

Total Flow: 130,356m^3
Average Day: 357m^3
Maximum Day: 1,292m^3
Minimum Day:184m^3

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	Phosphate	Total Phosphorus mg/L	Suspended Solids mg/L
2-Feb-23	CA13131	96	169	0.08	1.68	123
4-May-23	CA12314	94	167	0.03	0.09	126
3-Aug-23	CA13243	168	39	0.39	3.47	87
2-Nov-23	CA13205	142	229	0.24	2.30	104
Yearly Average		125	151	0.185	1.885	110
Maximum		168	229	0.39	3.47	126
Minimum		94	39	0.03	0.09	87

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
2-Feb-23	CA13131	748	12.5	0.13	0.05	10.4	180
4-May-23	CA12314	592	11.4	0.06	0.03	9.1	73
3-Aug-23	CA13243	638	28.5	27.7	0.09	22.9	56
2-Nov-23	CA13205	666	17.0	0.06	0.03	14.1	49
Yearly Average		661	17.35	6.9875	0.05	14.125	89.5
Maximum		748	28.5	27.7	0.09	22.9	180
Minimum		592	11.4	0.06	0.03	9.1	49

Table 7 Chemical Usage Summary: Alum

Month	Average Dosage mg/L	Total kg (dry)
January	99.85	2,607.0
February	100.84	1,577.4
March	105.24	2,263.8
April	101.54	3,491.4
May	107.44	2,725.8
June	110.04	2,013.0
July	110.97	2,013.0
August	197.28	1,874.4
September	110.35	1,617.0
October	114.28	2,567.4
November	108.52	2,092.2
December	104.86	2,464.4
Average	114.27	2275.6

Total Yearly Kilograms: 27,307kg

Table 8 Chemical Usage Summary: Soda Ash

Month	Average Dosage mg/L	Total kg (dry)
January	26.59	345.3
February	38.18	252.5
March	30.49	298.4
April	25.03	450.6
May	28.85	332.0
June	47.40	372.2
July	64.18	570.6
August	96.13	637.8
September	76.89	559.4
October	62.11	734.4
November	37.64	353.1
December	35.68	391.3
Average	47.43	441.5

Total Yearly Kilograms: 5,298kg

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-Feb-23	CA13131	2	62	7.17	0.03	0.04	3
4-May-23	CA12314	2	77	7.70	< 0.03	0.03	2
3-Aug-23	CA13243	2	39	7.09	0.08	0.03	6
2-Nov-23	CA13205	2	100	7.76	< 0.03	0.03	2
Yearly Average		2	69.5	7.43	0.0425	0.0325	3.25
Maximum		2	100	7.76	0.08	0.04	6
Minimum		2	39	7.09	0.03	0.03	2

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
2-Feb-23	CA13131	710	0.5	13	0.03	0.1	710
4-May-23	CA12314	634	0.5	8.5	0.03	0.1	78
3-Aug-23	CA13243	639	0.6	27.2	0.09	0.1	56
2-Nov-23	CA13205	616	0.5	14.6	0.03	0.1	41
Yearly Average		649.75	0.525	15.8325	0.045	0.1	221.25
Maximum		710	0.6	27.2	0.09	0.1	710
Minimum		616	0.5	8.53	0.03	0.1	41

Table 11 Effluent Loading and Concentration Summary 2023: COBD5

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.00	0.87	2.10
February	2.00	0.55	0.83
March	2.00	0.75	1.29
April	2.00	1.18	2.58
May	2.00	0.75	1.11
June	2.00	0.60	0.85
July	2.30	0.72	1.08
August	2.00	0.56	0.70
September	2.00	0.51	0.66
October	2.00	0.75	1.66
November	2.00	0.64	0.80
December	2.00	0.78	0.96
Average Monthly	2.03	0.72	1.22
Effluent Objective	10	N/A	N/A
Non-Compliance	15	8.25	N/A

Table 12 Effluent Loading and Concentration Summary 2023: Suspended Solids

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.00	0.87	2.10
February	2.50	0.68	1.03
March	2.00	0.75	1.29
April	2.00	1.18	2.58
May	3.00	1.13	1.66
June	2.00	0.60	0.85
July	3.50	1.09	1.64
August	4.00	1.12	1.40
September	3.50	0.90	1.15
October	2.00	0.75	1.66
November	2.00	0.64	0.80
December	2.50	0.97	1.20
Average Monthly	2.58	0.89	1.45
Effluent Objective	10.00	N/A	N/A
Non-Compliance	15.00	8.25	N/A

Table 13 Effluent Loading and Concentration Summary 2023: Total Ammonia Nitrogen Summer

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
May	0.10	0.04	0.06
June	0.10	0.03	0.04
July	0.10	0.03	0.05
August	0.10	0.03	0.03
September	0.10	0.03	0.03
October	0.10	0.04	0.08
Average Monthly	0.1	0.03	0.05
Effluent Objective	0.5	0.275	0.275
Non-Compliance	5	2.75	2.75

Table 14 Effluent Loading and Concentration Summary 2023: Total Ammonia Nitrogen Winter

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	0.10	0.04	0.10
February	0.10	0.03	0.04
March	0.10	0.04	0.06
April	0.13	0.07	0.16
November	0.10	0.03	0.04
December	0.10	0.04	0.05
Average Monthly	0.10	0.04	0.08
Effluent Objective	2.00	1.1	1.1
Non-Compliance	10.00	5.5	5.5

Table 15 Effluent Loading and Concentration Summary 2023: 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	0.25	1.00
October	0.00	0.00
November	0.00	0.00
December	0.00	0.00
Average Monthly	0.02	0.08
Effluent Objective	80.00	
Non-Compliance	100.00	

Table 16 Effluent Loading and Concentration Summary 2023: Total Phosphorus

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	0.03	0.01	0.03
February	0.04	0.01	0.02
March	0.03	0.01	0.02
April	0.03	0.02	0.04
May	0.03	0.01	0.02
June	0.03	0.01	0.01
July	0.03	0.01	0.01
August	0.06	0.02	0.02
September	0.03	0.01	0.01
October	0.04	0.01	0.03
November	0.03	0.01	0.01
December	0.03	0.01	0.02
Average Monthly	0.04	0.01	0.02
Effluent Objective	0.30	0.165	0.165
Non-Compliance	0.30	0.165	0.165

Table 17 Liquid Sludge Production Summary 2023

Month	Hauler	Liquid Volume m^3	Destination
January			
February			
March			
April	ROHES	109.2	ROHES - Lagoon
May	ROHES	72.8	ROHES - Lagoon
June			
July	ROHES	182	ROHES - Lagoon
August	ROHES	109.2	ROHES - Lagoon
September			
October	ROHES	109.2	ROHES - Lagoon
November	ROHES	109.2	ROHES - Lagoon
December			

Yearly Total Volume: 692m^3
Yearly Average Volume: 115m^3
Maximum Volume: 182m^3

Table 18 Sludge Quality Analysis 2023

Parameter Sampled (mg/L)	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Date	Feb-23	May-23	Aug-23	Nov-23
Sample ID	CA13141	CA12308	CA13239	CA13219
Nitrate	24	5.6	3	3
Mercury	0.008	0.021	0.04	0.022
Chromium	0.11	0.19	0.16	0.24
Cobalt	0.02	0.03	0.02	0.05
Copper	3.5	5.8	4.3	5.9
Lead	0.2	0.3	0.2	0.20
Molybdenum	<0.05	< 0.070	0.05	0.07
Nickel	0.1	0.18	0.13	0.24
Selenium	<0.1	< 0.10	<0.1	<0.1
Arsenic	<0.1	< 0.1	<0.1	<0.1
Zinc	4	5	4	7
Cadmium	0.006	0.009	0.01	0.011
Ammonia+ Ammonium	8.0	5.8	89.6	12.8
Total Kjeldahl Nitrogen	598	751	834	622
Total Phosphorus	210	345	336	447
Total Solids	13400	16800	15700	17000
TSS	11800	15500	15500	15500
Nitrite	1.7	0.2	3	3
PO4(sol)(Dissolved Reactive Phosphorous)	<0.75	0.75	<0.75	<0.75

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 Currie
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