

2022 Year End Report: Gravenhurst Wastewater Treatment Plant (WWTP)



Environmental Compliance Approval: # 7847-ABVPD3

Engineering and Public Works Department

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Introduction

The Gravenhurst Wastewater Treatment Plant, which services the Town of Gravenhurst, is owned and operated by the District Municipality of Muskoka. The plant is located at 1083 Muskoka Beach Road and was commissioned in May 1993. It is capable of servicing a population of 9,500 people.

The Beach Road Plant receives influent wastewater from a gravity sewer main, which runs underneath Muskoka Beach Road. Most of the wastewater is from the James St. Sewage Pumping Station which is located on the site of the original Gravenhurst sewage treatment plant in central Gravenhurst. In addition, the collection system contains fourteen other sewage pumping stations. The pumping stations serve residential areas of Gravenhurst as well as customers as diverse as the Taboo Resort and Beaver Creek Correctional Institution. The wastewater treatment plant also has a septage receiving facility, which processes septic and holding tank wastes that are trucked in.

The Plant operates under the MECP Environmental Compliance Approval (ECA) # 7847-ABVPD3, issued September 9, 2016. Under the terms of the Environmental Compliance Approval, the plant is permitted to treat an average daily flow of 5,165 m³/day, and a peak flow of 13,791 m³/day. Effluent limit criteria are as follows:

Table 1 Effluent Limit Criteria

Effluent Parameter	Concentration	Total Effluent Loading
CBOD	10 mg/L	51.65 kg/day
Total Suspended Solids	10 mg/L	51.65 kg/day
Total Phosphorous	5 mg/L	1.6 kg/day
Total Ammonia Nitrogen Summer (May 15 to September 30)	5 mg/L	51.65 kg/day
Total Ammonia Nitrogen Winter (October 01 to May 14)	10 mg/L	25.8 kg/day
E. coli	100 organisms/100mL for any month	N/A
pH	To be between 6.0 and 9.5 at all times	N/A

The treatment process is conventional activated sludge with tertiary filtration and ultra-violet disinfection before discharge of the effluent to Lake Muskoka. Biosolids from the primary and secondary plant processes are to anaerobic digesters. The stabilized biosolids are then dewatered with a centrifuge. The centrifuge cake is hauled off site for disposal at Lystek's Organic Material Recovery Centre in Southgate, Ontario.

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 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 always achieve the highest level of treatment. 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 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 2022 reporting 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 (#7847-ABVPD3).

Quantity of Flow Summary

The plant has a daily average flow design capacity of 5,165 meters cubed per day. The actual average daily flow for the 2022 was 2,747 meters cubed per day, however, the 3-year average is 2,876 meters cubed per day, which represents 56% of the plant capacity. None of the individual system components exceeded the design flow rating.

Plant Operational Upsets or Process Failures

An emergency repair was completed by a sub-contractor on failed RAS/WAS pipe within the

basement of the plant. This repair incorporated fabricating and installing a 40" replacement section of failed 4" ductile iron suction pipe on the RAS pump suction pipeline with flanged stainless-steel pipe. Additionally, a custom stainless-steel tee, 6"x36" was also, fabricated and installed to replace a failed section of ductile iron pipe and Victaulic couplers. At this same time the contractor replaced 3 plug valves also along the WAS process pipeline. These pipe failures did not cause any adverse effect on the treatment process.

Summary of Maintenance

There were no significant plant upgrades on major infrastructure in 2022.

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 (but is not limited to):

- Monthly testing (under load) of the emergency standby generators.
- Annual servicing of emergency standby generators.
- Annual replacement of U.V. bulbs.
- Annual infrared inspection of Motor Control panels.
- Annual calibration of flow metering devices.
- Annual cleaning of all sewage pumping stations.
- Marine inspection of effluent outfall and diffuser completed in 2022. (5-year cycle)

Evaluation of the Need for Improvement Works

The treatment facility is operating at a plant capacity of 56% and is in compliance with specified effluent parameter criteria. In addition, there has been no significant treatment process upsets or plant bypasses. Even so, there is a planned major capital project beginning this year with a start date expected late summer/early fall 2023. This project will include life-cycle process equipment replacements with a focus on energy savings, Green House Gas and process optimization.

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 SGS Canada Inc in Lakefield, 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)	48	242	147	390
Suspended Solids (mg/L)	55	335	234	601
Total Phosphorus (mg/L)	0.95	4.25	2.80	7.16
TKN (mg/L)	2.20	31.3	16.48	43.19
pH	6.69	7.84	7.38	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	3.5	2	5.96
Suspended Solids (mg/L)	2	3.25	2	6.66
Total Phosphorus (mg/L)	0.03	0.05	0.03	0.08
Ammonia (mg/L)	0.1	0.15	0.11	0.32
E. Coli (#/100 mL)	0	31.75	0.42	N/A
pH	6.95	7.60	7.38	N/A

Final Effluent Sampling Summary

All samples were collected following the frequency and methods required by the facility approval. For the coming year, 2023, 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 are hauled off site for disposal at Lystek's Organic Material Recovery Centre in Southgate, Ontario. A contractor was used by the District of Muskoka to transfer all material for disposal in 2022 and will continue to do so in 2023. It is not anticipated that there will be a significant increase in the total volume of bio solids produced in 2023.

Biosolids Co-Treatment

The treatment plant has the capability to co-treat additional wastes through the Hauled Waste Receiving Facility, which located on site at headworks of the plant. Septage and holding tank waste are hauled in by vacuum trucks, and dumped into the 76 cubic meter tank, which is then blended into the plant influent flow. Biosolids and water treatment sludge generated by smaller municipal treatment facilities may be processed in this fashion as well. Tables summarizing the septage analytical characteristics and monthly loading rates of the hauled wastes that have been co-treated at the plant in 2022 are included in this report.

Co-Treatment Flow Summary

The plant ECA (Sewage) #7847-ABVPD3, issued September 9, 2016, states that the monthly average quantity of septage and holding tank waste being co-treated at the plant shall not exceed 20 m³/day. The certificate further stipulates that the monthly average volume of biosolids being co-treated shall not exceed a monthly average flow of 20 m³/day, and that volumes of water treatment plant sludges being co-treated shall not exceed a monthly average flow of 20 m³/day as well.

The highest monthly average for septage was 11.53 meters cubed per day in June 2022 with no problems observed with processing this volume; samples of the septage waste were collected monthly. The highest monthly average for biosolids was 4.6 meters cubed per day which occurred in August. There were no operational issues with the volume and quality of the biosolids hauled in in 2022. All required analytical results were received from the operator of the local non-municipal wastewater treatment plant (The Marriott Resort). No water plant sludges were received in 2022.

Summary of Complaints received throughout the reporting period

There were no complaints received in the reporting period.

Gravenhurst Wastewater Collection Summary 2022

New and replaced Sanitary Sewer:

There was 179.1m of new sanitary sewer main constructed on Muskoka Bay Blvd.

New Sewer Services:

32 new customers connected to existing municipal services in 2022.

Sewer Lateral Blockages:

10 lateral blockages occurred on the municipal side, which were cleared by Operations.

Sewer Pump Stations:

All maintenance was completed for SPS in Gravenhurst. Pump upgrade in Wagner St SPS completed in September.

Main Line Sewer Blockages:

There were 4 main line sewer blockages. Mains cleaned and inspected.

Sewer Force Mains:

All low-pressure sewage force mains within the collection system were flushed by field staff through our annual preventive maintenance program.

Air Release Valves:

All twenty (22) of the air release vacuum valves connected to the sewage force mains in our collection system were removed, cleaned, tested and reinstalled for the yearly maintenance inspection.

Sewer Flushing and Video Inspections:

Approximately 8438.2 meters of various size sanitary sewer mains were flushed using high pressure equipment. The two 250mm depressed (siphon) sewer mains from our Knister sewage pump station were swabbed from the collection chamber located in the Brydon Bay Road easement, through to the receiving chamber on Brydon Bay Road.

Sewer Rehabilitation:

There was MHF54 constructed on GHSAN0091 sewer main. MHF28 and MHF27 Sewer Backups constant problems have been eliminated, since the rehab.

Locates:

Field staff addressed 547 locate requests.

Table 4 Effluent Flow Summary – 2022

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	81,968	2,644	2,886	2,444		81,968
February	77,263	2,759	2,329	4,037		77,263
March	105,496	3,403	2,589	4,785		105,496
April	117,006	3,900	4,662	3,373		117,006
May	93,242	3,008	3,601	2,547		93,242
June	80,120	2,671	3,090	2,272		80,120
July	78,853	2,544	2,802	2,312		78,853
August	77,091	2,487	2,830	2,224		77,091
September	68,880	2,296	2,618	2,060		68,880
October	73,757	2,379	2,881	2,095		73,757
November	68,687	2,290	2,903	2,071		68,687
December	80,470	2,596	4,647	2,205		80,470

Total Flow: 1,002,833
Average Day: 2,747
Maximum Day: 4,662
Minimum Day: 2,060

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

Sample Date	Sample Identification Number	BOD5 mg/L	Total Kjeldahl Nitrogen mg/L	Total Phosphorus mg/L	Suspended Solids mg/L
15-Feb-22	CA12579	224	48.1	7.20	437
10-May-22	CA12531	92	4.4	1.20	78
16-Aug-22	CA12616	161	16.2	2.62	308
15-Nov-22	CA13613	133	13.6	1.89	224
Yearly Average		152	20.6	3.23	262
Maximum		224	48.1	7.20	437
Minimum		92	4.4	1.20	78

Table 7 Chemical Usage Summary: Alum

Month	Average Dosage mg/L	Total kg (dry)
January	104.7	8,580.0
February	111.0	8,580.0
March	81.3	8,580.0
April	73.3	8,580.0
May	92.0	8,580.0
June	107.1	8,580.0
July	108.8	8,580.0
August	111.3	8,580.0
September	124.6	8,580.0
October	116.3	8,580.0
November	124.9	8,580.0
December	106.6	8,580.0

Total Yearly Kilograms:102,960

Table 8 Chemical Usage Summary: Soda Ash

Month	Average Dosage mg/L	Total kg (dry)
January	85.4	7,000.0
February	103.5	8,000.0
March	94.8	10,000.0
April	68.4	8,000.0
May	85.8	8,000.0
June	124.8	10,000.0
July	114.1	9,000.0
August	142.7	11,000.0
September	130.7	9,000.0
October	108.5	8,000.0
November	116.5	8,000.0
December	111.8	9,000.0

Total Yearly Kilograms: 105,000 kg

Table 9 Chemical Usage Summary: Polymer

Month	Average Dosage mg/L	Total kg (dry)
January	148.2	100
February	208.1	100
March	140.9	125
April	190.3	175
May	195.3	200
June	166.0	200
July	163.8	175
August	212.2	200
September	222.5	275
October	165.1	175
November	181.1	175
December	254.1	150

Total Yearly Kilograms: 2,050 kg

Table 10 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	Total Phosphorus mg/L	Suspended Solids mg/L
15-Feb-22	CA12579	2	70	7.39	0.03	2
10-May-22	CA12531	4	68	7.30	0.04	2
16-Aug-22	CA12616	3	76	6.98	0.06	2
15-Nov-22	CA13613	2	56	7.13	0.04	2
Yearly Average		3	69	7.35	0.04	2
Maximum		4	70	7.39	0.04	2
Minimum		2	68	6.98	0.03	2

Table 11 Effluent Quarterly Analysis Summary – Weekly 24-Hour Composite Sample Part 2

Sample Date	Sample Identification Number	Nitrate Nitrogen mg/L	Nitrite Nitrogen mg/L	Total Ammonia Nitrogen mg/L
15-Feb-22	CA12579	20.9	0.03	0.1
10-May-22	CA12531	17.0	0.03	0.1
16-Aug-22	CA12616	28.6	0.03	0.1
15-Nov-22	CA13613	29.8	0.03	0.1
Yearly Average		20.9	0.03	0.1
Maximum		20.9	0.03	0.1
Minimum		17.0	0.03	0.1

Table 12 Effluent Loading and Concentration Summary 2022: COBD5

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.00	5.29	5.29
February	2.00	5.52	5.52
March	2.00	6.81	6.81
April	3.00	11.70	23.40
May	2.40	7.22	12.03
June	2.00	5.34	5.34
July	2.00	5.09	5.09
August	2.20	5.47	7.46
September	2.00	4.59	4.59
October	2.00	4.76	4.76
November	2.00	4.58	4.58
December	2.00	5.19	7.79
Average Monthly	2.13	5.96	7.72
Effluent Objective	5	25.82	
Non-Compliance	10	51.65	

Table 13 Effluent Loading and Concentration Summary 2022: Suspended Solids

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.50	6.61	7.93
February	2.00	5.52	5.52
March	3.20	10.89	13.61
April	3.00	11.70	15.60
May	2.40	7.22	12.03
June	2.50	6.68	10.68
July	2.00	5.09	5.09
August	2.20	5.47	7.46
September	2.00	4.59	4.59
October	2.25	5.95	7.14
November	2.20	5.04	6.87
December	2.00	5.19	5.19
Average Monthly	2.35	6.66	8.48
Effluent Objective	5.00	25.82	
Non-Compliance	10.00	51.65	

Table 14 Effluent Loading and Concentration Summary 2022: Total Ammonia Nitrogen Summer

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
May	0.10	0.3	0.3
June	0.10	0.27	0.27
July	0.10	0.25	0.25
August	0.10	0.25	0.25
September	0.10	0.23	0.23
October	0.10	0.24	0.24
Average Monthly	0.10	0.26	0.26
Effluent Objective	1	5.16	
Non-Compliance	5	25.8	

Table 15 Effluent Loading and Concentration Summary 2022: Total Ammonia Nitrogen Winter

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	0.10	0.26	0.26
February	0.15	0.41	0.83
March	0.10	0.34	0.34
April	0.10	0.39	0.39
November	0.10	0.23	0.23
December	0.10	0.26	0.26
Average Monthly	0.11	0.32	0.39
Effluent Objective	1.00	5.16	
Non-Compliance	10.00	51.65	

Table 16 Effluent Loading and Concentration Summary 2022: Fecal Coliform

Month	Geomean (#/100mL)	Maximum Daily (#/100mL)
January	0	0
February	1	2
March	0	0
April	32	122
May	1	3
June	3	12
July	0	0
August	4	18
September	2	4
October	3	6
November	0	0
December	0	0
Average Monthly	4	14
Effluent Objective	0.00	
Non-Compliance	80.00	

Table 17 Effluent Loading and Concentration Summary 2022: Total Phosphorus

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	0.03	0.08	0.08
February	0.03	0.08	0.08
March	0.03	0.10	0.1
April	0.03	0.12	0.117
May	0.03	0.09	0.09
June	0.03	0.08	0.09
July	0.03	0.08	0.08
August	0.03	0.07	0.07
September	0.03	0.07	0.07
October	0.03	0.07	0.07
November	0.03	0.07	0.07
December	0.03	0.08	0.08
Average Monthly	0.03	0.08	0.08
Effluent Objective	0.30	1.55	
Non-Compliance	0.30	1.55	

Table 18 Dewatered Sludge Production Summary 2022

Month	Hauler	Liquid Volume m ³	Cake Weight tonnes	Destination
January	WESSUC	675	21.27	Lystek
February	WESSUC	481	45.44	Lystek
March	WESSUC	887	70.67	Lystek
April	WESSUC	919	71.05	Lystek
May	WESSUC	1024	73.79	Lystek
June	WESSUC	1205	110.79	Lystek
July	WESSUC	1068	64.41	Lystek
August	WESSUC	942	62.72	Lystek
September	WESSUC	1236	55.56	Lystek
October	WESSUC	1060	52.11	Lystek
November	WESSUC	966	70.06	Lystek
December	WESSUC	590	54.33	Lystek

Yearly Total Volume: 752.20 m3
Yearly Average Volume: 62.68 tonnes
Maximum Volume: 110.79 tonnes
Minimum Volume: 21.27 tonnes

Table 19 Sludge Quality Analysis 2022

Parameter Sampled (mg/L)	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Date	Feb. 15/22	May 10/22	Aug 16/22	Nov 15/22
Sample ID	CA12580	CA12532	CA12617	CA13614
Nitrate	0.3	0.3	0.3	0.3
Mercury	0.009	0.005	0.008	0.003
Chromium	0.33	0.32	0.4	0.005
Cobalt	0.04	0.05	0.06	0.02
Copper	11	7.6	10	4.2
Lead	0.3	0.1	0.2	0.10
Molybdenum	0.14	< 0.160	0.24	0.05
Nickel	0.28	0.23	0.29	0.1
Selenium	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	< 0.1	< 0.1	< 0.1	< 0.1
Zinc	11	7	11	4
Cadmium	0.012	0.008	0.016	0.005
Ammonia	626	680	556	406
Total Kjeldahl Nitrogen	1250	1400	1270	715
Total Phosphorus	550	460	281	109
Total Solids	17900	18600	18300	5880
TSS	15100	17200	18700	5400
Nitrite	0.2	0.2	0.2	0.2
PO4	53.3	136	281	170

Table 20 Septage Quality and Quantity 2022

Month	BOD5 Mg/L	TSS Mg/L	Total Solids Mg/L	COD Mg/L	TP Mg/L	TKN Mg/L	Volume Septage M³	Volume Biosolids M³
January	223	867	1490	490	7.4	52	40.50	67.60
February	225	1320	1500	1050	20.9	110	39.39	95.40
March	645	9500	9490	5550	123	322	61.33	79.50
April	1280	2360	2380	1820	48.4	185	58.47	47.70
May	4000	10300	9070	12800	69.4	356	258.58	63.60
June	8940	70800	61000	62000	402	1210	345.89	111.30
July	3450	4040	6050	18000	35.9	221	253.77	127.20
August	1920	4850	5740	6300	30.4	287	281.90	141.30
September	3740	4880	7440	13200	35	312	180.48	79.50
October	3420	11900	15000	7550	69.9	252	217.00	15.90
November	2950	17400	17100	66000	55	555	96.24	31.80
December	660	1970	3080	3320	30.7	258	146.48	63.60

Table 21 Bypasses and Overflows

There were no bypass or overflow events reported in 2022.

BYPASS AND/OR OVERFLOW EVENT REPORT												
Location	Date	Event Start Time	Event End Time	Event Duration (hours)	Total Volume (m3)	Sampled	Flow Mes/Mod/Est	Level of Treatment Received	Disinfection status	Reason(s)	Comments	Reference Number

Flow	Level of Treatment Received	Disinfection	Reason
Mod = Modelled	Sewage, Raw	No	1 = Precipitation
Meas = Measured	Sewage, Primary Treatment received	Yes, Chlorinated	2 = Spring Thaw / Snow Melt
Est = Estimated	Sewage, Secondary treatment received	Yes, UV	3 = Infiltration
	Sewage, Tertiary	Yes, Ozone	4 = Mechanical/Equipment Failure
	Sewage, Final Effluent		5 = Pipe Failure (break/leak/plugged)
			6 = Process Upsets
			7 = Power Failure
			8 = Planned Maintenance
			9 = Exceed Design Capacity
			10 = Other

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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Beth Van Erp, C.Tech.
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