



Town of Midland WASTEWATER SERVICES ANNUAL REPORT 2019



Town of Midland Water & Wastewater Services

Definitions

The following defines terms that appear throughout this report and that will often be used for the duration of the report:

“BOD” – Biochemical Oxygen Demand

“Biosolids” - is a primarily organic solid product by wastewater treatment processes that can be beneficially recycled.

“CFU” - Colony-Forming Unit.

“Dissolved Oxygen” (DO) - the oxygen freely available in wastewater.

“ECA” - Environmental Certificate Approval.

“Final Effluent” - sewage discharge via the sewage treatment plant outfall after undergoing the full train of unit process.

“Geometric Mean Density” is the ninth root of the product of multiplication of the results of a number of the samples over the period specified.

“I&I” (Inflow and Infiltration) means dilution of sewage decreases the efficiency of treatment, and may cause sewage volumes to exceed design capacity.

“Limited Operational Flexibility” (LOF) means any modifications that the Owner is permitted to make to the works under this Approval.

“m³” - cubic meters.

“NASM” - Non-Agricultural Source Material.

“Overflow” means any discharge to the environment from the sewage Treatment Plant at a location other than the plant outfall (i.e.:storm equalization tank). This type of by-pass receives partial treatment before it is discharged to the environment.

“Owner” - The Corporation of the Town of Midland and its successors and assignees.

“Phosphorus” - a nonmetal of the nitrogen group.

“Plant By-Pass” - diversion of sewage around one or more unit processes within the Sewage Treatment Plant with the diverted sewage flows being returned to the sewage Treatment Plant treatment train upstream of the final effluent sampling location and discharging to the environment through the sewage treatment plant outfall.

“PLC” - Programmable Logic Controller.

“SCADA” - Supervisory Control and Data Acquisition.

“Supernatant” - the relatively clear water layer between the sludge on the bottom and the scum on the surface of an anaerobic digester, septic tank or secondary clarifier.

“Total Ammonia” - the sum of both NH_3 and NH_4^+ .

“Water Supervisor” - the Water Supervisor for the Barrie Office of the Ministry.

A number of other technical terms have been used in this report but occur less frequently. Where necessary and to the reader’s benefit, definitions for these terms are provided as they occur.

Executive Summary

The purpose of the Town of Midland Wastewater Services Annual Report is to be a clear and concise assessment of the system's performance. Within the 2019 Reporting Year, there was **no failure to meet effluent limits and objectives**. However, **two (2) overflow events were reported**. For more information about the overflows, refer to the *Overflows* section on Page 21 of this report.

Additionally, this report is to provide information to all applicable stakeholders and to satisfy the regulatory requirements of the Amended Environmental Compliance Approval 5708-A72SPG as issued July 20, 2016.

The Owner shall prepare and submit a performance report to the Water Supervisor on an annual basis, within ninety (90) days following the end of the period being reported upon. The first such report shall cover the first annual period following the commencement of operation of the works and subsequent reports shall be submitted to cover successive annual periods following thereafter. The reports shall contain, but shall not be limited to, the following information;

- a summary and interpretation of all monitoring data and a comparison to the effluent limits outlined in Condition 7, including an overview of the success and adequacy of the Works;
- a description of any operating problems encountered, and corrective actions taken;
- a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works;
- a summary of any effluent quality assurance or control measures undertaken in the reporting period;
- a summary of the calibration and maintenance carried out on all effluent monitoring equipment;
- a description of efforts made, and results achieved in meeting the Effluent Objectives of Condition 6.
- a tabulation of the volume of sludge generated in the reporting period, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed;
- a summary of any complaints received during the reporting period and any steps taken to address the complaints;
- a summary of all By-pass, spill or abnormal discharge events;

- a copy of all Notice of Modifications submitted to the Water Supervisor as a result of Schedule B, Section 1, with a status report on the implementation of each modification;
- a report summarizing all modifications completed as a result of Schedule B, Section 3; and;
- any other information the Water Supervisor requires from time to time.

The Town of Midland Wastewater System is in a fit state of repair and follows best industry practices during the repair and maintenance of the system. Infrastructure review occurs regularly between Infrastructure and Wastewater Services to optimize priority projects and minimize common costs.

Copies of the Amended Environmental Compliance Approval 5708-A72SPG as issued July 20th, 2016 are available upon request.

Introduction

The Town of Midland has prepared this Performance Report for the operations conducted during the 2019 calendar year.

This Performance Report has been prepared to meet the following commitments:

- To provide the Town of Midland, as “the Owner” of the sewage works, a summary of the operation and maintenance of the wastewater treatment plant that took place during the reporting period of January 1st 2019 to December 31st 2019 and
- To comply with Condition 11 of ECA #5708-A72SPG

This Performance Report, provided to the the Town of Midland Mayor and Council, conveys information related to the performance of operations and maintenance, which aids in decision making related to system upgrades and expansion needs.

Ministry of the Environment, Conservation and Parks

The Midland Wastewater Treatment Plant is a conventional activated sludge plant owned and operated by the Town of Midland. The wastewater treatment plant was originally constructed in 1965 as a primary treatment plant. In 1980 the plant was expanded and upgraded to a secondary treatment facility. The treated effluent is discharged via a gravity outfall into Midland Bay (located on Georgian Bay). Environmental Compliance Approval (ECA) Number 5708-A72SPG was issued on July 20th, 2016 and governs the operation of the facility. The ECA identifies an average day design capacity of 15,665 m³/day and a Peak Flow Rate of 37,000 m³/day.

The treatment plant and collection system are operated under the following Certificates of Classification:

Class III Wastewater Treatment Certificate #89

Class II Wastewater Collection Certificate #2074

For the reporting period covered in this report, The Corporation of the Town of Midland was defined as the Operating Authority of the Wastewater Treatment Plant and the associated collection system.

Midland Wastewater Treatment Plant 2019 Effluent Flows (m ³)												
DATE	January	February	March	April	May	June	July	August	September	October	November	December
Total	247208.98	238549.95	281410.24	354638.63	287935.77	229107.73	218835.03	237792.92	204295.61	229133.80	232148.25	223537.03
Avg.	7974.48	8519.64	9077.75	11821.29	9288.25	7636.92	7059.19	7670.74	6809.85	7391.41	7738.28	7451.23
Max.	9911.95	17398.18	18264.28	20062.69	13504.70	8914.81	8431.07	8757.62	7751.71	10041.79	10086.47	10490.04
Min.	7080.05	6788.68	4804.26	9361.20	4110.67	6309.00	6213.22	5966.07	5889.68	6362.67	6649.94	6096.61
Average Daily Flow	8203.25											
Max Daily Flow	20062.69											
YEARLY TOTAL	2984593.94											

Figure 1: Midland Wastewater Treatment Plant 2019 Effluent Flow

Flows

The 2019 average daily flow was 8203.25 m³ or 52% of plant rated capacity. The plant discharged a total of 2,984,593.94 m³ for the reporting period of January 1st to December 31st 2019. The 2019 maximum daily flow occurred April 19th when the flow recorded was 20,062.69 m³. During the days of April 18th and 19th the Midland area experienced 24.6 and 13.2 mm of rainfall respectively.

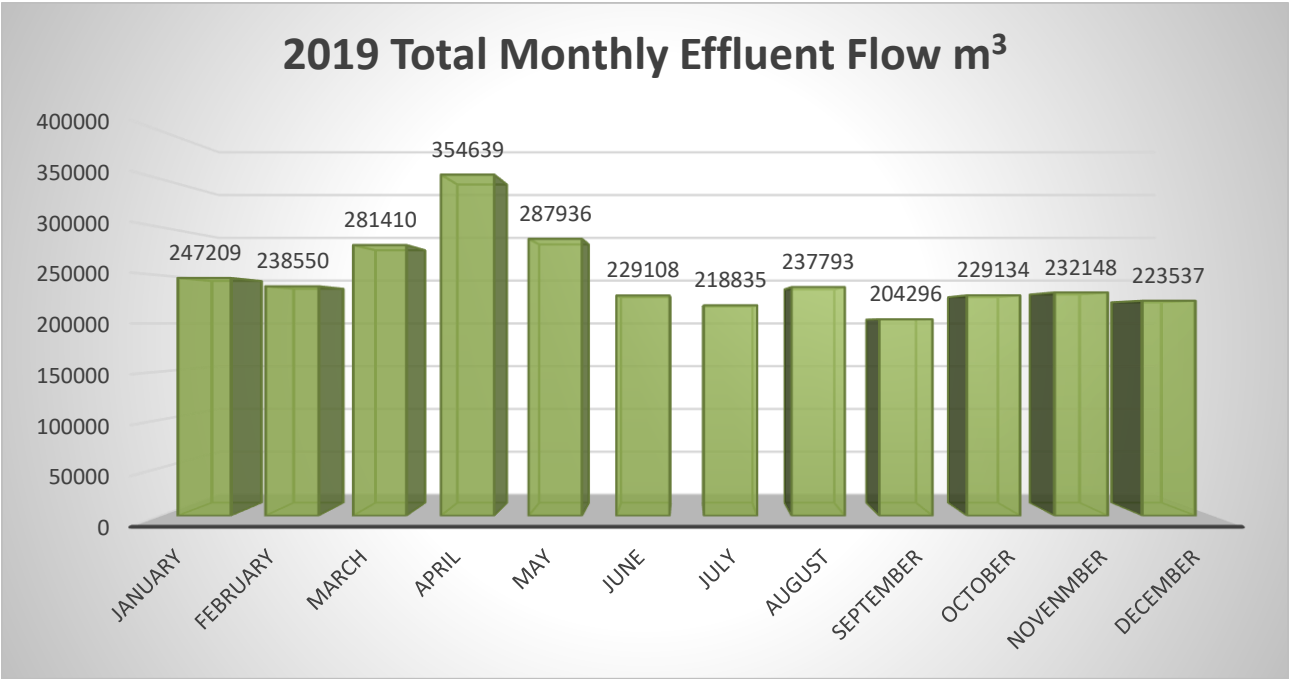


Figure 2: Monthly Effluent Flow in m³ for 2019.

Effluent Flow

The Total Monthly Discharge Flows are consistent throughout the year with exception to March, April and May due to seasonal thaws and infiltration. This is also evident by the max day flow reading recorded. An Inflow and Infiltration Study (I&I) is being conducted in efforts to reduce the unnecessary treatment of rainwater and runoff during thaw seasons and storm events. Strategies identified in the I&I study should increase the longevity of the Wastewater Collection System/Treatment Plant and provide technical data to make decisions on possible treatment upgrades or process expansions.

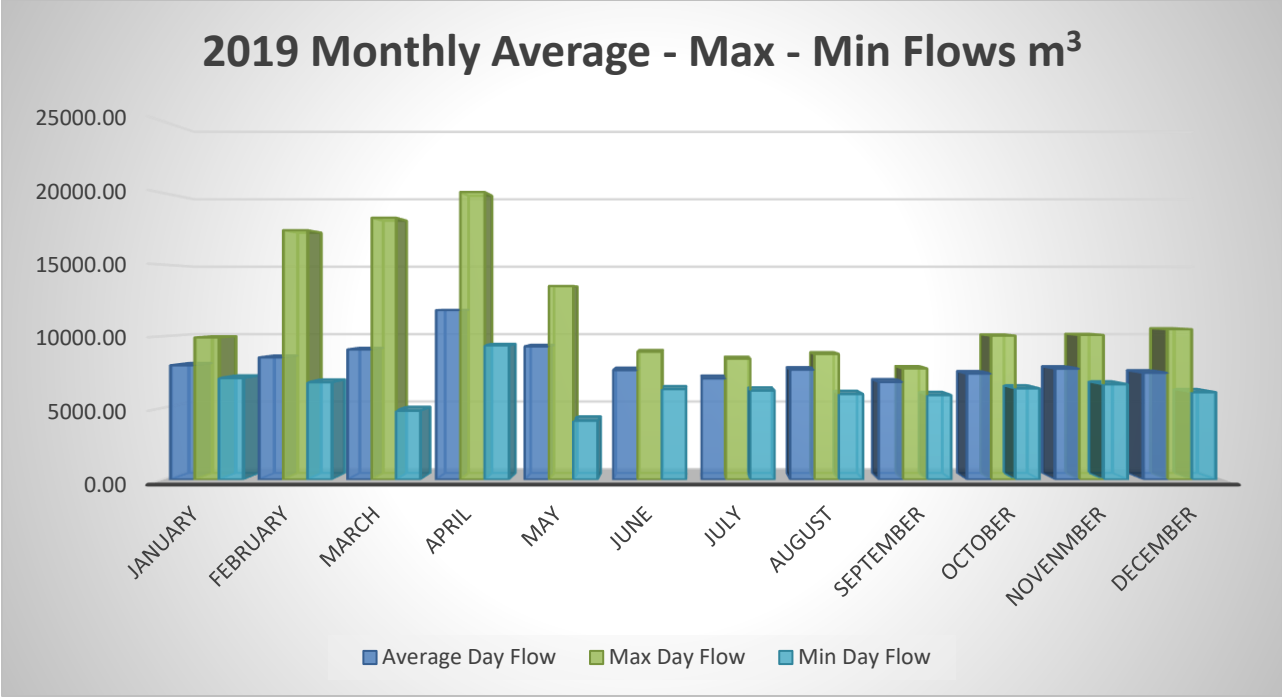


Figure 3: Monthly Average, Max and Min Day Flows in m³ for 2019.

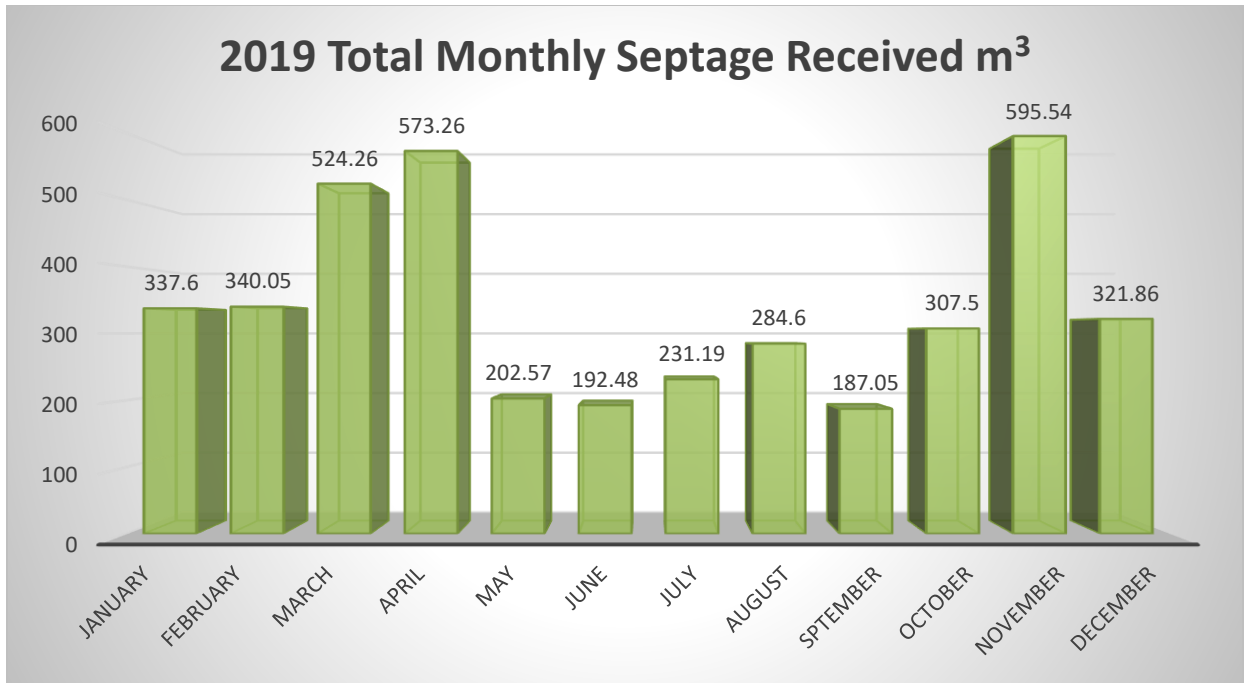


Figure 4: Total Monthly Septage Received m³ for 2019

Septage Receiving

Within reporting period of January 1st to December 31st, 2019 the Wastewater Treatment Plant receives additional sewage in the forms of septic and holding tanks, portable toilets, grease traps, marine waste and recreational vehicle holding tanks. The septage received is stored in holding tanks and pumped to the primary clarifier at a time as not to upset the treatment process.

Midland Wastewater Treatment Plant 2019 Effluent Loading

EFFLUENT LOADING 2019													
Month	Effluent Flows	CBOD ₅ Annual Average Concentration		Total Suspended Solids Annual Average Concentration		Total Phosphorus Annual and Monthly Average Concentration (1,716 Kg/Yr)-146 Kg/Month		Total Ammonia Nitrogen Monthly Average Concentration			Total Chlorine Monthly Average Concentration		E.Coli
		Monthly Average 10 mg/L	Loading 4856 Kg/month	Monthly Average 10 mg/L	Loading 4856 Kg/month	Monthly Avg.	Loading	Monthly Average 10mg/L	Monthly Average 15mg/L	Loading Kg/month	Usage Kg/month	Effluent Residual 0.02 mg/l	
ECA Limits	m ³					0.4 Monthly-0.3 Yearly mg/l							Geometric Mean 200 col/100ml
January	247208.98	3.00	741.63	4.20	1038.28	0.10	24.72		1.21	299.12	363.46	0.002	2
February	238549.95	3.00	715.65	4.25	1013.84	0.07	16.70		2.72	648.86	334.27	0.007	5
March	281410.24	3.00	844.23	3.50	984.94	0.07	19.70		1.12	315.18	455.51	0.003	3
April	354638.63	3.00	1063.92	4.25	1507.21	0.12	42.56		0.99	351.09	461.07	0.002	11
May	287935.77	3.00	863.81	5.00	1439.68	0.11	31.67		0.51	146.85	506.89	0.001	14
June	229107.73	3.00	687.32	3.25	744.60	0.10	22.91	0.89		203.91	460.44	0.004	4
July	218835.03	3.00	656.51	4.80	1050.41	0.13	28.45	0.67		146.62	493.32	0.003	30
August	237792.92	3.00	713.38	5.00	1188.96	0.10	23.78	1.63		387.60	473.79	0.002	4
September	204295.61	3.00	612.89	3.25	663.96	0.11	22.47		1.28	261.50	465.35	0.007	5
October	229133.80	3.00	687.40	5.80	1328.98	0.08	18.33		0.17	38.95	478.10	0.004	16
November	232148.25	3.00	696.44	4.25	986.63	0.10	23.21		0.27	62.68	520.43	0.004	4
December	223537.03	3.00	670.61	7.60	1698.88	0.09	20.12		0.38	84.94	501.91	0.004	5
Total	2984593.94							1.06	0.96		5514.54		
Monthly Average	248716.16	3.00	746.15	4.60	1137.20	0.098	24.55		0.99	2944.80	459.55	0.004	8.6
Annual Daily Average	8203.25										15.10		
Annual Average		3.00	8953.78	4.68	13967.90	0.098	292.49		0.99	2954.75		0.004	7.0

Figure 5: Total Monthly Effluent Loading for 2019

Summary and Interpretation of Monitoring Data

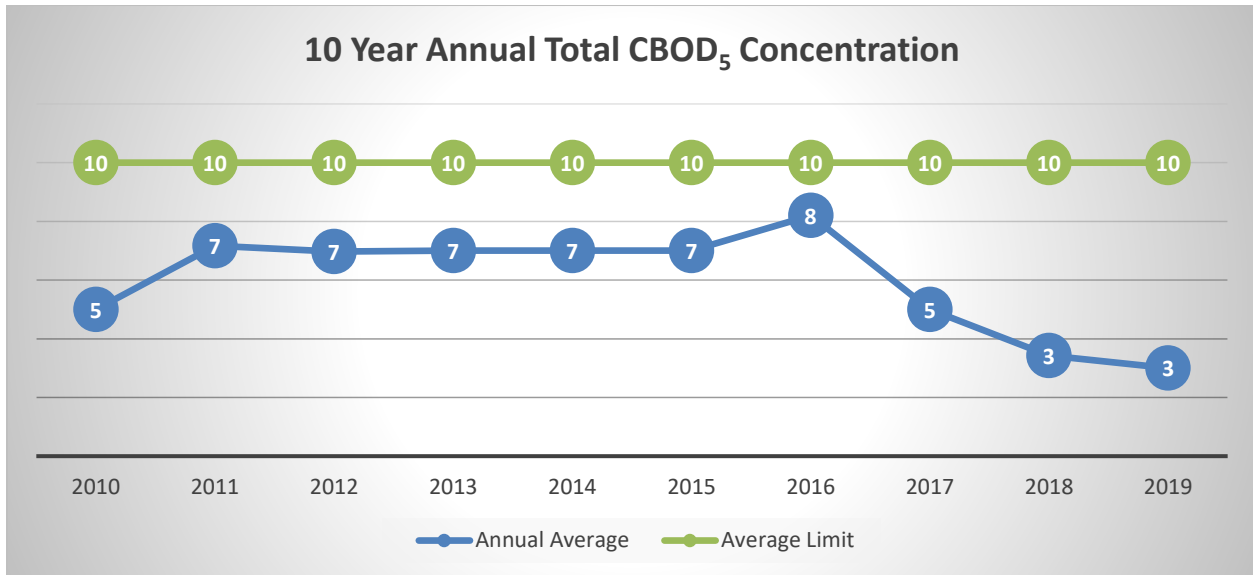


Figure 6: 10 Year Annual Total CBOD₅.

Total CBOD₅

From the ECA the Monthly Average Concentration limit for Carbonaceous Biochemical Oxygen Demand (CBOD₅) to the environment is 10 mg/l. During the Reporting Period of January 1st to December 31 2019 Midland's Monthly Average CBOD₅ was 3.0 mg/l and the annual average was also 3.0 mg/l. CBOD₅ is a 5 day test that represents the quantity of oxygen which is consumed in the course of aerobic processes of decomposition of organic materials, caused by microorganisms. The BOD therefore provides information on the impact the organic portion of the effluent will have on the oxygen level of the receiving stream, and on aquatic life of the bay.

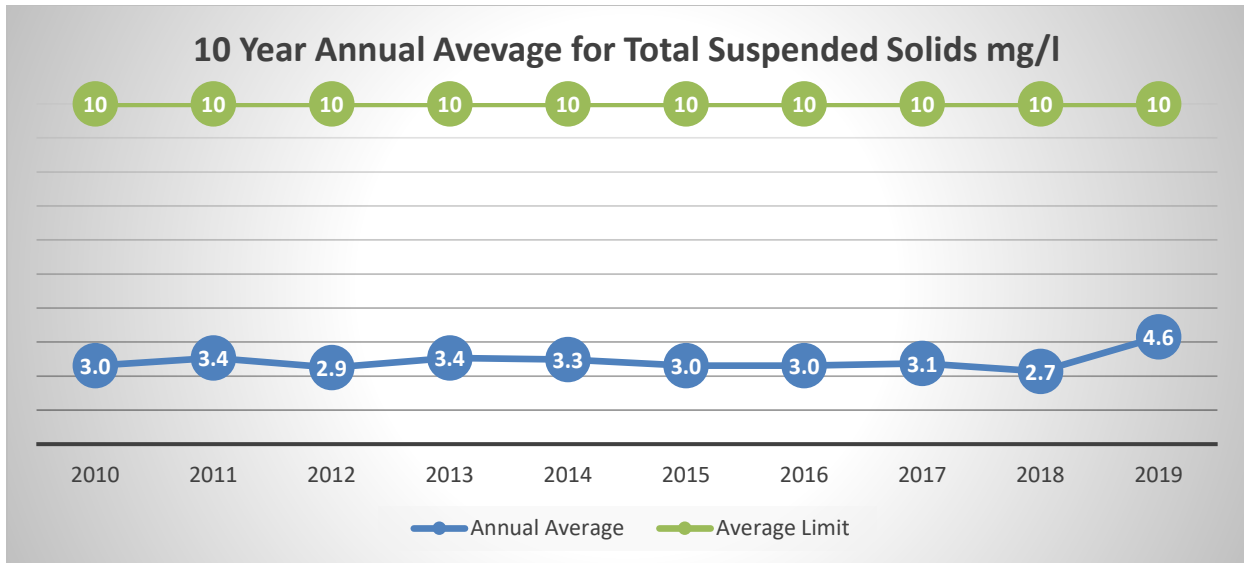


Figure 7: 10 Year Annual Average for Total Suspended Solids.

Total Suspended Solids

As defined in the ECA, the maximum Monthly Average Concentration for Total Suspended Solids (TSS) released to the environment is 10 mg/l. During the Reporting Period of January 1st and December 31st, 2019 Midland’s Monthly Average was 4.60 mg/l and 4.68 mg/l annually. TSS can include a wide variety of material, such as silt, decaying plant and animal matter, and industrial wastes. High concentrations of suspended solids can lower water quality by absorbing light. Waters then become warmer and lessen the ability of the water to hold oxygen necessary for aquatic life.

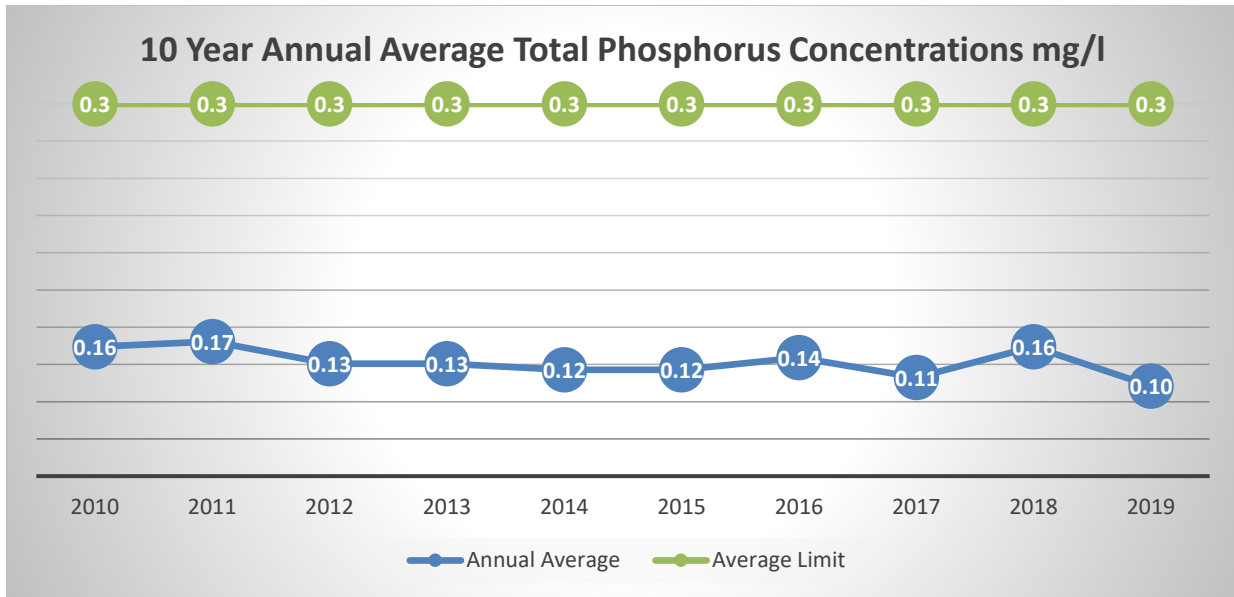


Figure 8: 10 Year Annual Average Total Phosphorus Concentrations

Total Phosphorus

Total Phosphorus is the sum of reactive, condensed and organic phosphorous. It is an essential element for plant life, but when there is too much of it in water, it can speed up eutrophication (a reduction in dissolved oxygen in water bodies caused by an increase of mineral and organic nutrients) of rivers and lakes.

The highest average monthly total phosphorus concentration of 0.13 mg/L took place during the month of July. This concentration results in a total monthly loading for July of 28.45 kg.

The annual average concentration of 0.10 mg/L was well below the annual yearly objective of 0.3 mg/L and also below the 0.4 mg/L monthly limit dictated by the ECA. The total annual phosphorus loading of 292.49 kg/year is well below the ECA limit of 1,716 kg/year. The monthly objective for phosphorus of 146 kg/month was also achieved with a monthly loading average of 24.55 kg/ month.

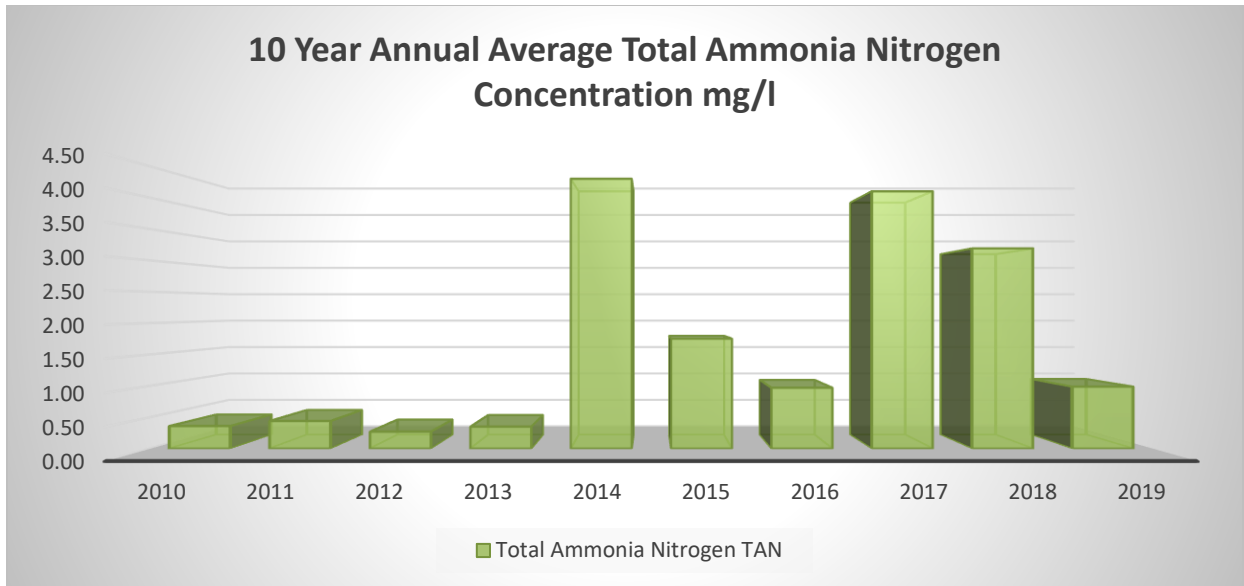


Figure 9: 10 Year Annual Average Total Ammonia Nitrogen Concentration

Total Ammonia Nitrogen

Total Ammonia is the sum of the free ammonia-nitrogen plus the amount of nitrogen from ammonia that has combined with chlorine. Ammonia pollution is a matter of increasing concern for regulatory authorities because of the serious threat it poses to the balance of sensitive habitats and to flora and fauna. Controlling ammonia discharges from wastewater treatment can make a significant contribution to reducing its environmental impact.

The average concentration of Total Ammonia Nitrogen (T.A.N.) between June 1st, 2019 to August 31st, 2019 (Summer) was 1.06 mg/L, the ECA limit is 10 mg/L.

The average concentration of Total Ammonia Nitrogen (T.A.N.) between January 1st, 2019 to May 31st, 2019 and September 1st, 2019 and December 31st 2019 (Winter) was 0.96 mg/L, the ECA limit is 15 mg/L.

The loading objective 5.0 mg/l identified in the ECA was also achieved for the reporting period of January 1st to December 31st, 2019.

Midland Wastewater Treatment Center 2019 Chlorine Usage and Effluent Residuals Kg's														
	January	February	March	April	May	June	July	August	September	October	November	December	Total	Monthly Average
Monthly Chlorine Usage	363.46	334.27	455.51	461.07	506.89	460.44	493.32	473.79	465.35	478.10	520.43	501.91	5514.54	
Monthly Average Daily Chlorine Use	11.72	11.94	14.69	15.37	16.90	15.35	15.91	15.28	15.51	15.42	17.35	16.19		15.14
Monthly Average Effluent Residual	0.002	0.007	0.003	0.002	0.001	0.004	0.003	0.002	0.007	0.004	0.004	0.004		0.004

Figure 10: Monthly and daily chlorine usage in Kg's.

Chlorine Usage

The monthly usage of Chlorine was consistent throughout 2019 with a total usage of 5514.54 kg. The average daily usage also remained consistent and remained between 11.7 kg/day and 17.3 kg/day for the reporting period January 1st and December 31st 2019. The Total Chlorine Residual of 0.004 mg/l in the Effluent was well below the 0.02 mg/l Objective and Limits set out in the ECA.

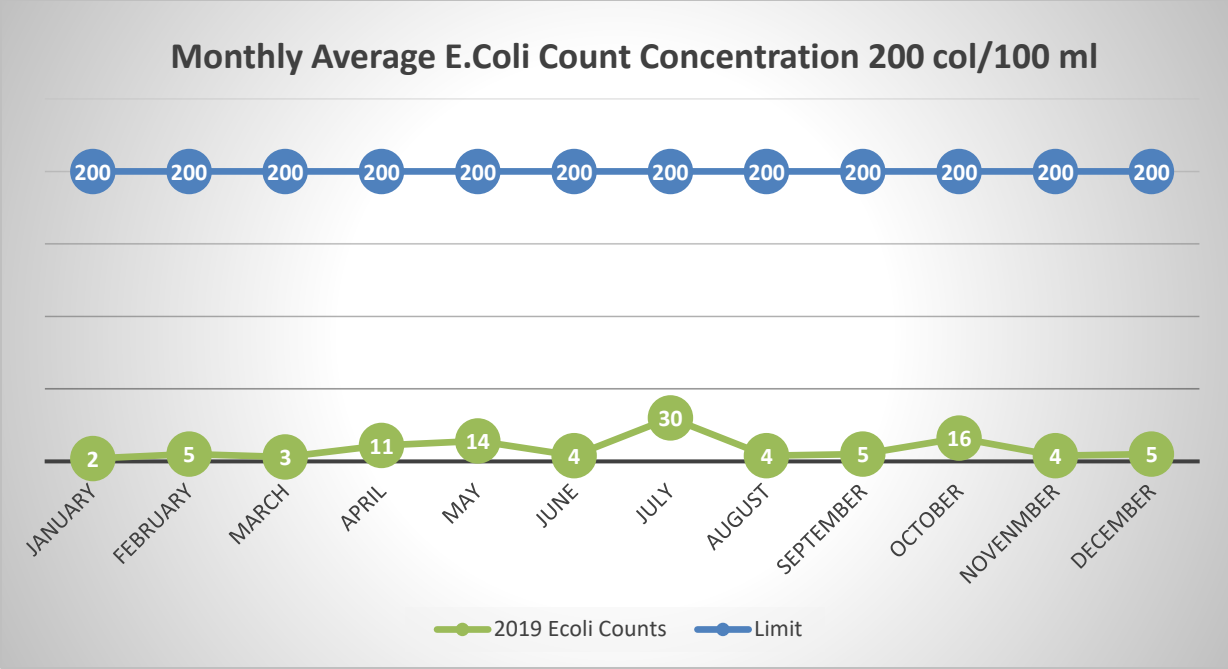


Figure 11: Monthly Average E.Coli Count Concentration 200 col/100 ml

E.Coli

Escherichia coli (*E. coli*) are a group of bacteria commonly found in the intestines of warm-blooded animals, including people. *E. coli* in fresh water can indicate the presence of pathogens (disease-causing organisms) from animal or human feces. The pathogens can cause illness for anyone who ingests them.

From the ECA the E.Coli, on a Monthly Geometric Mean, must be less than 200 Colony-Forming units/100 ml (CFU's) released to the environment. Midland's Monthly Average E.coli count was 8.6 organisms per 100 ml of effluent discharged from the works.

Operational Improvements

Regular Supernatant:

Operators have been diligently optimizing the process of transferring supernatant from the secondary sludge digestion process. The supernatant liquid level is determined using a set of valves and piping. The piping is connected to a main discharge pipe which discharges to the primary clarifiers. The process of transferring supernatant ensures the biosolids are the highest percentage solids possible, reducing the hauling and associated costs.

Egg Shaped Digester Mixing Schedule Change:

Recent Egg-Shaped Digester PLC Upgrades have allowed Operators to better control the digester mixing system. The digester mixing system is a support system. The fundamental requirements are: 1. Maintain a homogenous digesting mass. 2. Assure even distribution of raw sludge as a food source. 3. Guarantee that solids retention Time (SRT) and a hydraulic retention Time (HRT) are maintained. 4. Maintain consistent non-varying digester temperature. The work has significantly reduce the amount of pumping hours, subsequently reducing maintenance and electrical consumption, while maintaining quality digested bio-solids.

NASM/Biosolids

In 2019 10570 m³ of digested Biosolids were hauled from the Town of Midland Wastewater Treatment Plant under contract L04-49844 by Region of Huronia Environmental Services (ROHES). This is a 14% decrease from 2018. Efforts by staff to increase supernatant procedures has reduced the amount of Biosolids hauled by ROHES and stored at lagoons located in New Lowell during the winter months and apply to land in the summer months. Biosolids production volumes are expected to be near or slightly less in the 2020 calendar year.

2019 Biosolids Generated and Hauled

2019	January	February	March	April	May	June	July	August	September	October	November	December	Total
Loads	26	24	21	25	28	19	19	13	14	19	23	21	252
Volume m³	1092	1008	882	1050	1176	788	798	542	588	798	966	882	10570

Table 1: 2019 Biosolids Generated and Hauled

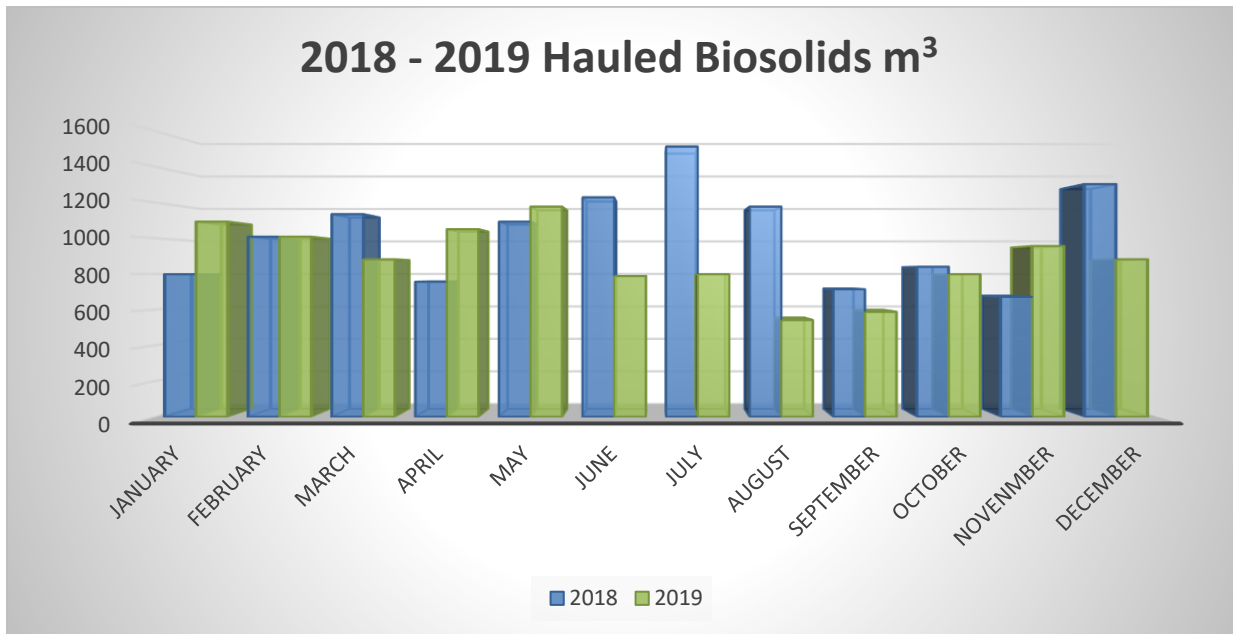


Figure 12: 2018-2019 Hauled Biosolids

Summary of Effluent Quality Assurance and Control Measures

The Midland WWTP Operators collect samples from Raw Sewage, Primary Clarifier Effluent, Aeration Tanks, Secondary Clarifier Effluent, Primary and Secondary Digesters and Final Effluent on a regular basis throughout the work week and month. Staff use standardized and accepted laboratory techniques when samples are tested for various parameters in-house for process control and effluent quality assurance. A spreadsheet is used to track in-house lab results to perform several calculations used to monitor and measure the effectiveness of the plant performance. In addition to the in-house analysis, samples are collected weekly and sent to a certified laboratory, Caduceon Environmental Laboratories. These sample results are used to determine compliance with the ECA and Ministry Regulation.

Overflows

In 2019 there were two overflow events that occurred during the reporting period of January 1st to December 31st. Event 1, February 4th there was an overflow occurrence of 482 m³ from the storm detention tank. Contributing factors were significant rainfall and snow melt. Event 2, on July 27th there was a secondary overflow of 65 m³ from Chamber A. Contributing factors include significant rain fall combined with high flows. This is also known as a Sanitary Sewer Overflow (SSO). All overflows and by-passes are reported to the Ministry of Environment, Conservation and Parks (MECP) as well to the Town of Midland's social platforms.

2019 OVERFLOW REPORT

Date	Location	Type	Volume m ³	Duration (Hrs)	Rainfall (mm)
February 4th 2019	Storm Tank	Primary	482 m ³	2.3 Hrs	15.0 mm
July 27th 2019	Chamber A	Secondary	65 m ³	0.20 Hrs	18.3 mm

Infiltration and Inflow Study and Wastewater Master Plan

The Town of Midland is currently conducting an infiltration and inflow study in order to determine magnitude of the I&I problem and, if so, the areas within the Town that would see the most return on investment for repairs. At strategic points within the sanitary system flow monitors were installed along with a rain gauge at the wastewater treatment plant. Over the 12-month flow monitoring program the data collected we were able to calculate a Dry Weather Flow and a Wet Weather Flow along with a Peaking Factor and Estimated Peak I&I. The objective of the Wastewater Master Plan is to assess the current treatment capacity of the Midland Wastewater Treatment Plant and identify potential servicing alternatives for the Wastewater Treatment Plant and Collection System.

Calibration

All analyzers and flow meters are calibrated as per the manufacturers recommendations, a minimum of once a year. Calibration was completed in June 2019 by a third party instrumentation and controls technician. Calibration Certificates are submitted and retained electronically for each unit and devices. Below is a list of locations of units and devices and description.

	Date	Location	Description	Serial #
1	June 17/19	Midland WWTP	WAS Flow Meter	A98 14063
2	June 17/19	Midland WWTP	RAS Flow Meter	302418
3	June 17/19	Midland WWTP	Final Effluent Flow Meter	PBD/L3050094
4	June 17/19	Midland WWTP	Raw Sewage Tank Level	PDB/K0020132
5	June 18/19	Midland WWTP	Bypass Flow Meter	PBD/A7210157
6	June 18/19	Midland WWTP	Calcium Thiosulfate Level North	PBD/A6281118
7	June 18/19	Midland WWTP	Calcium Thiosulfate Level South	PBD/A680892
8	June 27/19	Midland WWTP	Dechlor Chemical Flow Meter	N1B4070001
9	June 18/19	Midland WWTP	Storm Tank Overflow Meter	N/A
10	June 19/19	Midland WWTP	Storm Tank Level	N/A
11	June 19/19	Midland WWTP	Influent Flow Meter	N/A
12	June 19/19	Midland WWTP	Primary Raw Sludge Flow Meter	A964188
13	June 19/19	Midland WWTP	Alum Pump #1 Flow Meter	N1K2145086
14	June 19/19	Midland WWTP	Alum Pump #2 Flow Meter	N1K2145145
15	June 19/19	Midland WWTP	Bio-Solids Haulage Flow	N1K502510
16	June 20/19	Midland WWTP	Septage Tank Level	N/A
17	June 20/19	Aberdeen SPS #3	Well Level	N/A
18	June 20/19	Pillsbury SPS #4	Well Level	PBD/V7120381
19	June 20/19	Pillsbury SPS #4	Station Flow	3K620000240145
20	June 20/19	Russ Howard SPS #5	Well Level	N/A
21	June 20/19	Vindin SPS #6	Well Level	PBD/W2190022
22	June 20/19	Vindin SPS #6	Outflow Meter	1320A359
23	June 24/19	Bay Port SPS #7	Station Flow Meter	282948
24	June 24/19	Bay Port SPS #7	Well Level	PBD/X5290260
25	June 24/19	Chamber A	Bypass Flow Meter	PBD/A7210157
26	June 24/19	Bay SPS #1	Well Level	N/A
27	June 18/19	Midland WWTP	Secondary Flow to Clarifier Meter	N/A

Summary of Maintenance Performed Throughout the Reporting Period

In addition to regular maintenance management programs and maintenance to all effluent monitoring equipment, works were upgraded or replaced in accordance with the Capital Plan as follows:

Treatment Facility

- Replaced the Roof at Russ Howard Pump Station # 5
- SCADA Upgrade
- Online Process Instrumentation
 - Dissolved Oxygen Probe
 - Mixed Liquor Suspended Solids Probe
 - Raw Suspended Solids Probe
 - pH Suspended Solids Probe
 - Final Effluent Suspended Solids Probe
 - Final Effluent pH Probe
 - Secondary Clarifier Level Indicator
 - Flow Meters
- Egg Shaped Digester PLC Upgrade
- Aeration Variable Frequency Drive Upgrade
- Storm Tank Tipping Bucket Actuator
- Storm Tank Gate Actuator
- Primary Clarifier #2 Rebuild
- Egg Shaped Digester Clean - Out
- Secondary Digester #1 Clean – Out
- Secondary Digester #2 Clean – Out

Collection System

- Pole Camera Purchase
- Sanitary Sewer Relining

Summary of Complaints received throughout the Reporting Period

There was one complaint received by the Town of Midland municipal staff throughout the Reporting Period for the Town of Midland Wastewater Treatment Plant for odour. Details of the date and time of the occurrence was not available, and it was believed to be caused by the disposal of Septic Waste. Staff are currently exploring odour control technologies for the Septage Receiving Process.

Limited Operational Flexibility-Notice of Modifications Form

There were no Limited Operation Flexibility or Notice of Modification forms submitted throughout the Reporting Period. All upgrades/modifications have been completed in accordance with the Terms and Conditions of the ECA.

Closing Remarks

Throughout the Reporting Period the Midland WWTP operated to the best of its ability while subject to extensive construction activity, and seasonal influences. With continued construction and typical average daily flows, operations staff expect the WWTP to operate as designed over the next Reporting Period.