Corporation of the City of Quinte West

Stonecrest Estates Wastewater Treatment Plant

2021 Annual Performance Report

A Natural Attraction

Executive Summary

The Stonecrest Estates Sewage Treatment Plant, assigned MOE Identifier number 120003762, is located at 51 Aikins Road in Bayside. The facility operates in accordance with ECA number 4460-AHBRVY issued on January 13, 2017.

The WWTP is a Class II Treatment Plant, and is currently rated to treat 213 cu.m/day. The facility is described as a Membrane Treatment facility. The process is described as having one (1) Equalization (EQ) Tank receiving wastewater from the Stonecrest Estates subdivision, and the Bayside Secondary School. Raw sewage from the EQ tank is pumped through a fine-screen, before it is discharged into one (1) Anoxic Tank equipped with two (2) submersible pumps and one (1) mixer. Mixed Liquor from the Anoxic tank is continuously pumped into one (1) Aeration tank equipped with fine bubble aeration. Before Mixed Liquor is gravity-fed into the Membrane holding tank, it is dosed with Aluminum Sulphate for Phosphorus control, and Sodium Hydroxide for pH control. A set of two (2) Permeate extraction pumps operate in a Duty/Standby configuration and place a vacuum on the membrane modules operating in parallel. This pulls clear liquid through the membranes, while leaving sludge and organisms behind in the treatment process. Final Effluent receives a UV irradiation disinfection, before final discharge into the Bay of Quinte.

In accordance with ECA number 4460-AHBRVY an annual report shall be prepared within 90 days following the end of the calendar year being reported upon. This annual report details the following information:

- *A summary and interpretation of all monitoring data and a comparison to the effluent limits outlined in Condition 8, 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;*
- *A tabulation of the volume of sludge generated in the reporting period and an outlined of the 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 information the Water Supervisor requires from time to time.*

Summary and Interpretation of Monitoring Data

Final Effluent parameter monitoring									
Month	**[CBOD5]** *(mg/L)*	**[TSS]** *(mg/L)*	**[TP]** *(mg/L)*	**[TAN]** *(mg/L)*	**GMD E.Coli** *(cfu/100mL)*	**Unionized Ammonia** *(mg/L)*	**pH - MIN**	**pH - MAX**	**Temp. - MAX** *(deg.C)*
	Limit: 10.0mg/L; Objective: 5.0mg/L	*Limit: 10.0mg/L; Objective: 5.0mg/L*	*Limit: 0.20mg/L; Objective: 0.10mg/L*	*Limit: 3.0mg/L; Objective: 2.0mg/L*	*Limit: 100 cfu/100mL; Object.: 100 cfu/100mL*	**No Limit**	*Limit: 6.0*	*Limit: 9.5*	**No Limit**
January	2.5	2.3	0.04	0.10	2	0.001	6.61	6.94	14.7
February	2.0	2.0	0.07	0.15	2	0.001	6.69	7.06	13.9
March	2.0	2.0	0.10	0.14	2	0.001	6.71	7.05	15.2
April	2.0	2.0	0.06	0.10	2	0.001	6.63	7.00	16.6
May	2.0	5.0	0.11	0.10	2	0.001	6.62	7.01	21.2
June[1]	5.4	**15.4**	**0.36**	0.10	2	0.001	6.72	7.08	23.7
July	2.0	4.8	0.10	0.15	2	0.001	6.62	7.22	24.4
August	2.0	7.5	0.06	0.30	4.2	0.002	6.68	6.98	25.5
September	2.0	4.2	0.04	0.16	2	0.001	6.52	7.48	24.5
October	2.0	3.5	0.04	0.13	2	0.001	6.63	7.74	22.5
November	2.0	2.3	0.05	0.10	2	0.001	6.56	6.90	19.3
December	2.2	4.6	0.04	0.10	2	0.001	6.59	7.01	15.7
Annual Avg.	2.5	5.2	0.10	0.13	NR[2]	0.001	NR	NR	NR

[1] TSS and TP exceeded Effluent Limits due to Bypass Event on June 23, 2021. Monthly averages would have measured below the allowable Effluent Limit with 5.0 mg/L and 0.14 mg/L respectively for TSS and TP.
[2] NR means Not Regulated. This parameter does not have an associated Annual Average compliance Limit.

Monthly Average Effluent Waste Loadings				
Month	**CBOD5** *(kg/d)*	**Total Suspended Solids** *(kg/d)*	**Total Phosphorus** *(kg/d)*	**Total Ammonia Nitrogen** *(kg/d)*
	Limit: 4.25 kg/d	*Limit: 4.25 kg/d*	*Limit: 0.09 kg/d*	*Limit: 1.28 kg/d*
January	0.3	0.3	0.005	0.01
February	0.2	0.2	0.007	0.02
March	0.2	0.2	0.011	0.01
April	0.2	0.2	0.007	0.01
May	0.2	0.5	0.011	0.01
June	0.5	1.4	0.033	0.01
July	0.2	0.5	0.010	0.01
August	0.2	0.7	0.005	0.03
September	0.2	0.5	0.005	0.02
October	0.2	0.4	0.004	0.01
November	0.2	0.3	0.005	0.01
December	0.3	0.5	0.004	0.01

Raw Sewage Monthly Average Concentrations				
	Monthly Average BOD5 Concentration *(mg/L)*	**Monthly Average Total Suspended Solids Concentration** *(mg/L)*	**Monthly Average Total Phosphorus Concentration** *(mg/L)*	**Monthly Average Total Kjeldahl Nitrogen Concentration** *(mg/L)*
January	347.8	345.3	7.7	70.1
February	351.8	302.0	8.2	77.7
March	257.2	315.6	6.5	60.3
April	293.3	223.3	5.2	52.5
May	263.5	320.8	6.9	60.0
June	554.8	429.6	11.4	101.0
July	340.5	426.3	7.6	59.4
August	362.0	346.8	10.8	103.9
September	257.8	269.6	6.6	69.1
October	280.5	293.3	9.0	94.6
November	231.8	306.0	7.0	75.1
December	277.4	302.0	8.0	81.1

Facility Flow Monitoring

Month	**Average Daily Flow** *(cu.m./day)*	**Month Max Daily Flow** *(cu.m./day)*	**Total Monthly Flow** *(cu.m./month)*
	Rated Capacity: 213 cu.m./day	*Peak Rated Capacity: 436 cu.m./day*	
January	116	142	3596
February	107	135	3005
March	105	128	3251
April	108	124	3254
May	103	124	3189
June	92	109	2747
July	95	109	2951
August	92	113	2858
September	114	143	3408
October	106	128	3295
November	118	129	3554
December	116	133	3585
	Annual Avg Daily Flow = 106 cu.m./day	**Maximum Daily Flow = 142 cu.m./day**	**Total Annual Flow = 38,693 cu.m.**

Summary of Bypass, Spill, or Abnormal Discharge Event(s)

Month	Date	Duration	Event Type	Volume (cu.m)
June	June 23	Approx. 2.5 hrs	Unplanned Bypass Event - Secondary Treatment - Membrane Breach	3.69

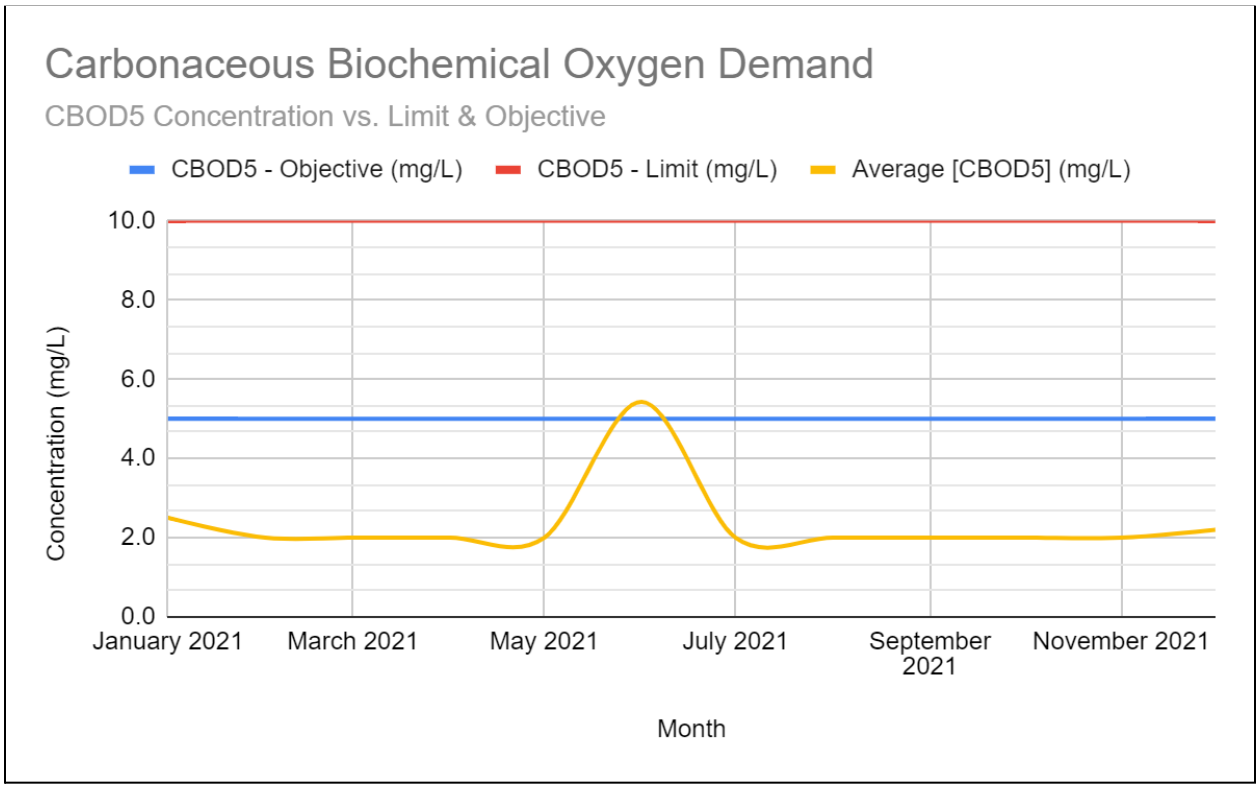
Summary of Operating Problems throughout Monitoring Period

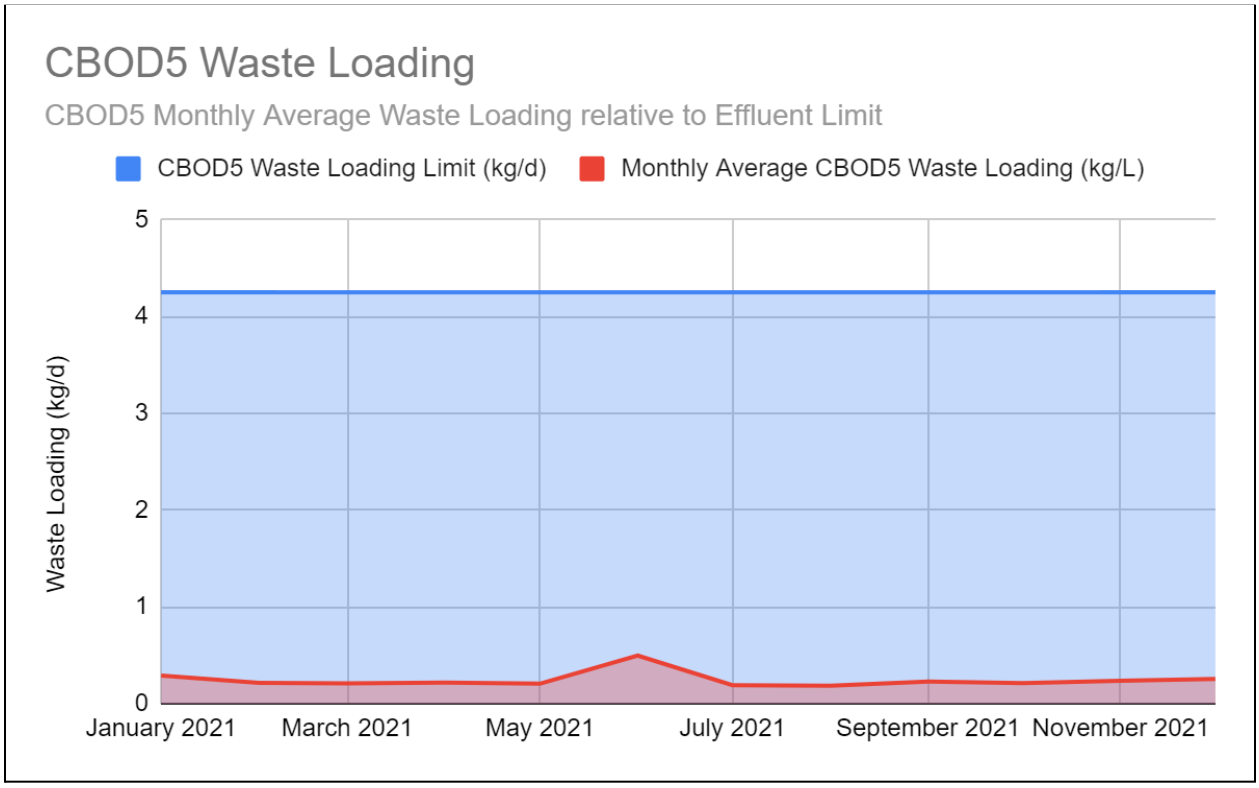
The Stonecrest Estates MBR performed very well throughout the reporting period. However ongoing issues with membrane fouling continue to limit this facility's hydraulic capability. As flows increase this fouling issues are compounded. It is theorized that fibrous material is getting through the screens and matting the bottom of the membrane skid, which can be seen when the skid is cleaned. As this fibrous mat builds up it inhibits the air scour from sloughing off material from the membranes. This causes membrane performance to decrease requiring more frequent back washes, chemical baths, and physical cleaning of the membranes.

Analysis of Final Effluent Monitoring Dataset

Carbonaceous Biochemical Oxygen Demand (CBOD5) / Biochemical Oxygen Demand (BOD5)

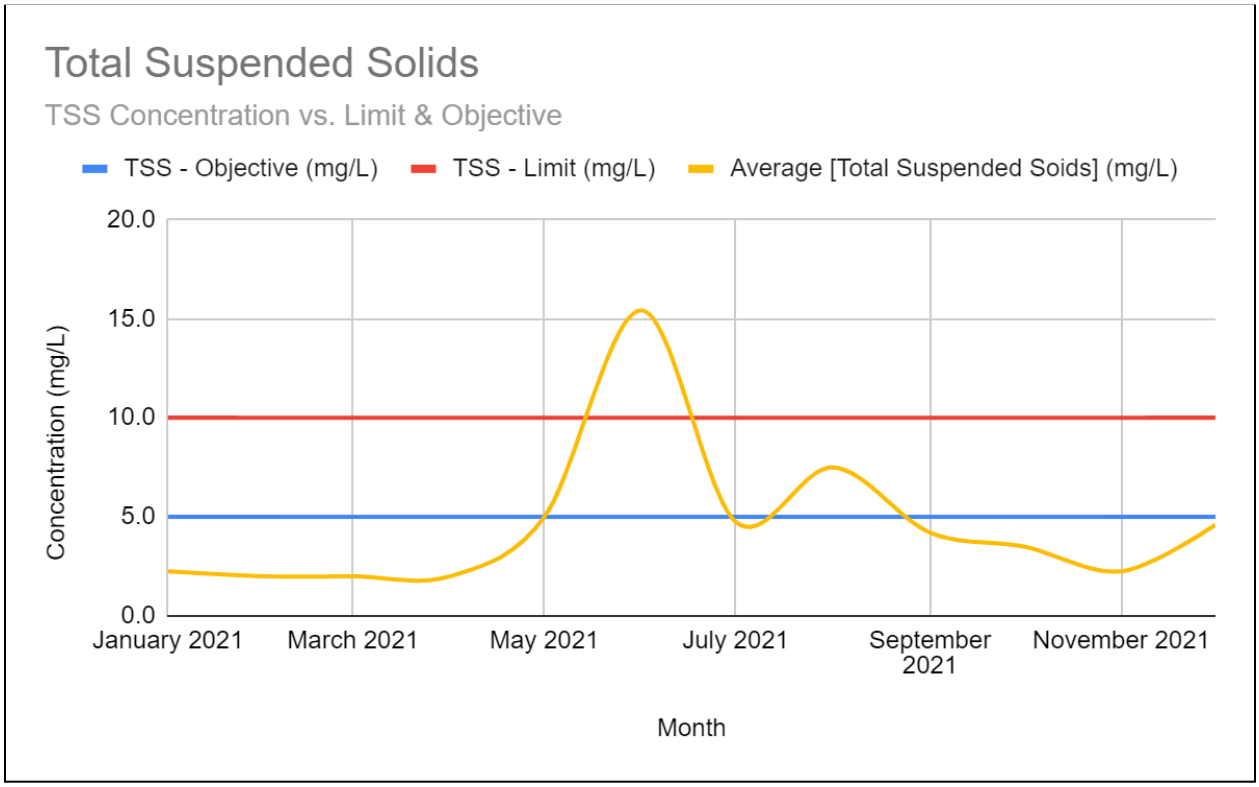
The following two Figures depict facility CBOD performance throughout the reporting period. It is apparent the facility operated efficiently to maintain monthly average Effluent concentrations and waste loadings below the Effluent Objectives and Limits. The increase in Effluent concentrations for the month of June can be attributed to a Bypass Event that occurred on June 23, 2021. The Annual Average Concentration of CBOD5 was 2.5 mg/L.

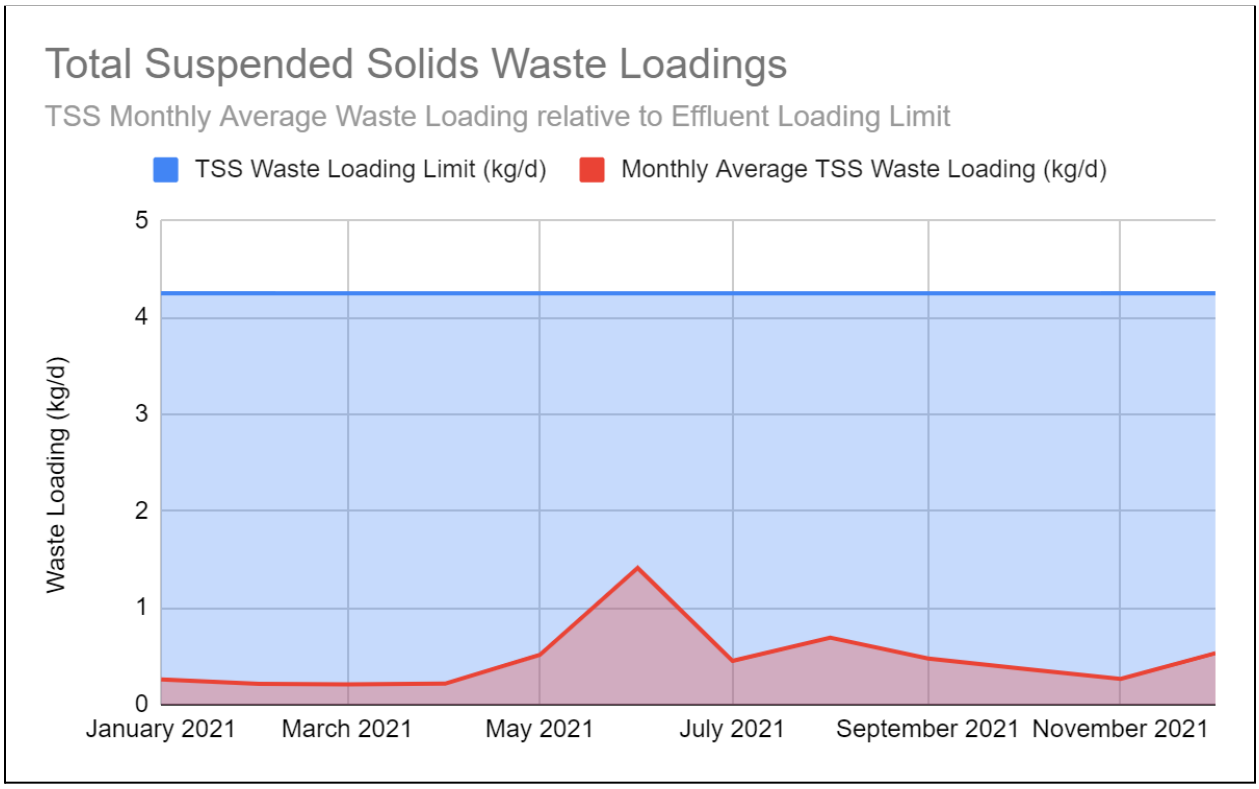

Carbonaceous Biochemical Oxygen Demand
CBOD5 Concentration vs. Limit & Objective
CBOD5 - Objective (mg/L)
CBOD5 - Limit (mg/L)
Average [CBOD5] (mg/L)
10.0
8.0
6.0
4.0
2.0
0.0
Concentration (mg/L)
January 2021
March 2021
May 2021
July 2021
September 2021
November 2021
Month


CBOD5 Waste Loading
CBOD5 Monthly Average Waste Loading relative to Effluent Limit
CBOD5 Waste Loading Limit (kg/d)
Monthly Average CBOD5 Waste Loading (kg/L)
5
4
3
2
1
0
Waste Loading (kg/d)
January 2021
March 2021
May 2021
July 2021
September 2021
November 2021

Total Suspended Solids (TSS)

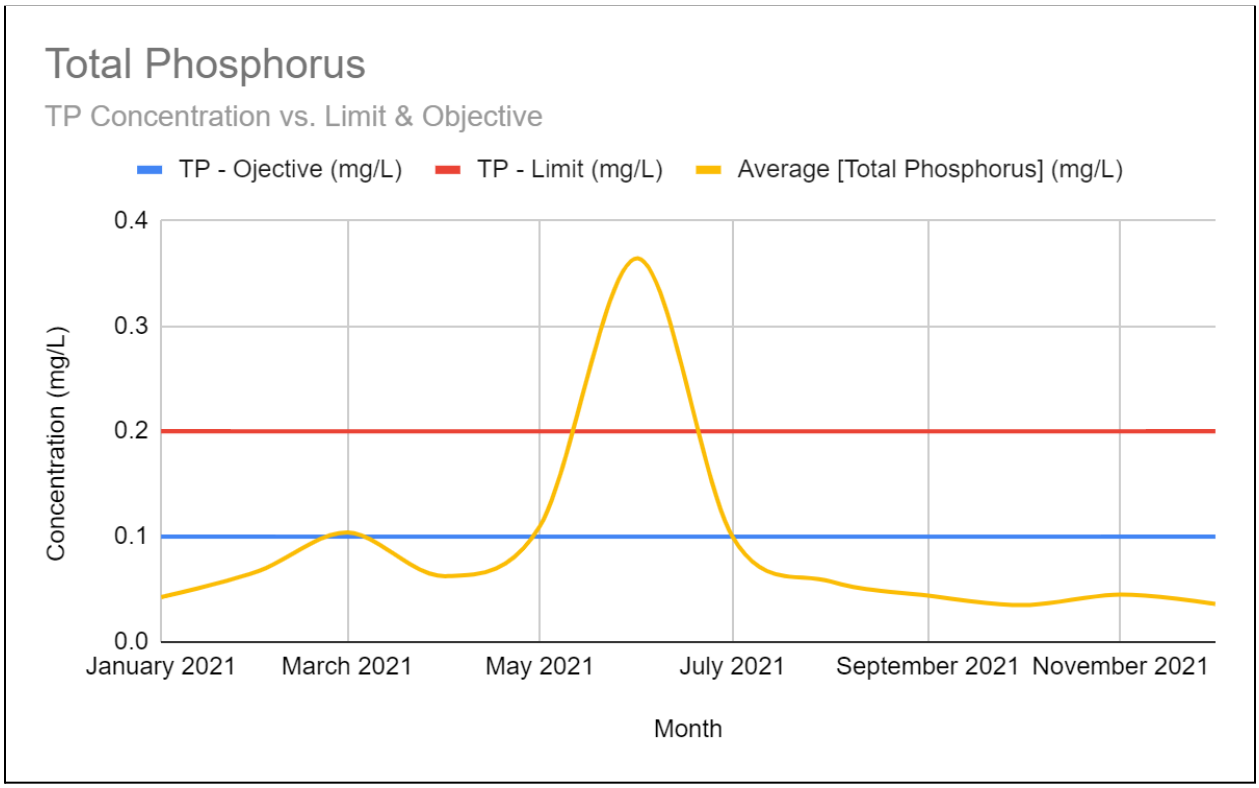
The facility performed quite well over the reporting period in maintaining compliance with the Effluent Limits and Objective for TSS with an Annual Average Concentration of 5.2 mg/L TSS. The increase in Effluent concentration for the month of June can be attributed to a Bypass Event that occurred on June 23, 2021, resulting from a breach in process piping. The monthly average concentration for TSS would have measured below the allowable Effluent Limit with 5.0 mg/L. It is apparent in the following figures the facility was successful in maintaining a stable effluent quality over the reporting period.

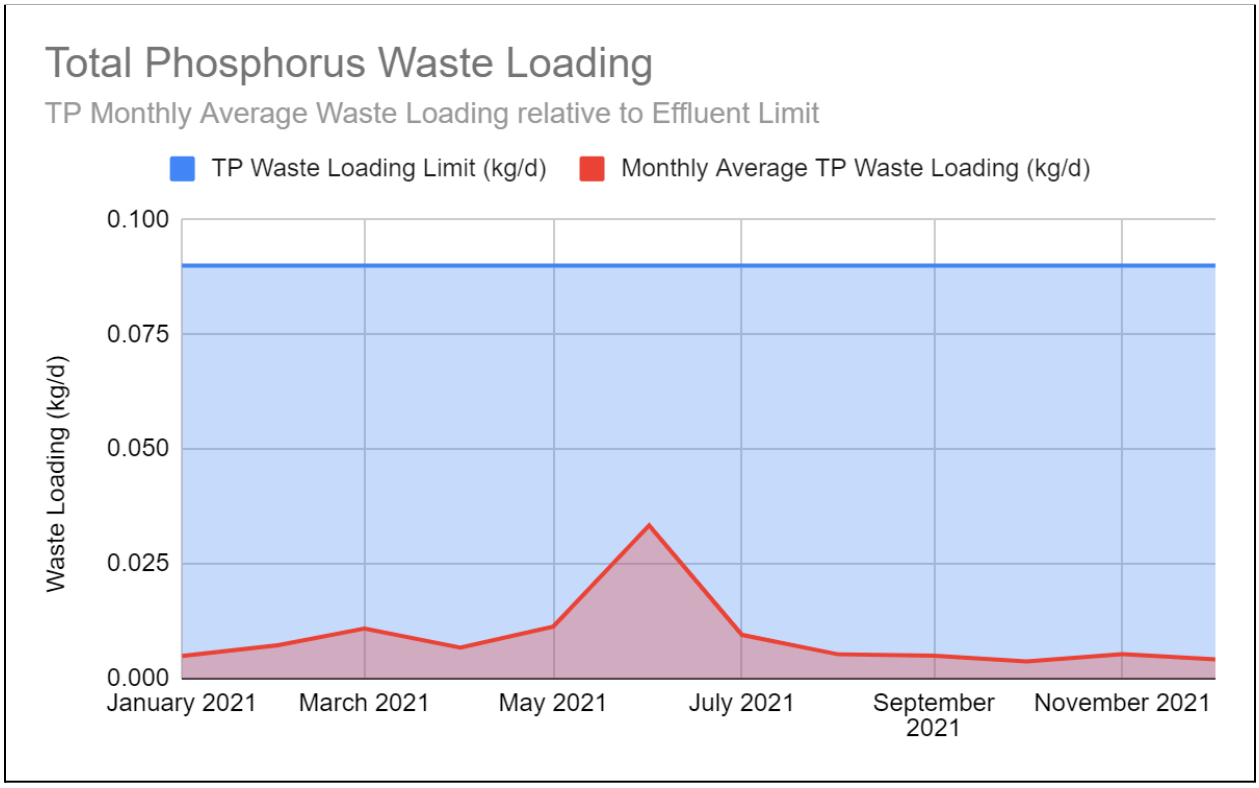




Total Phosphorus (TP)

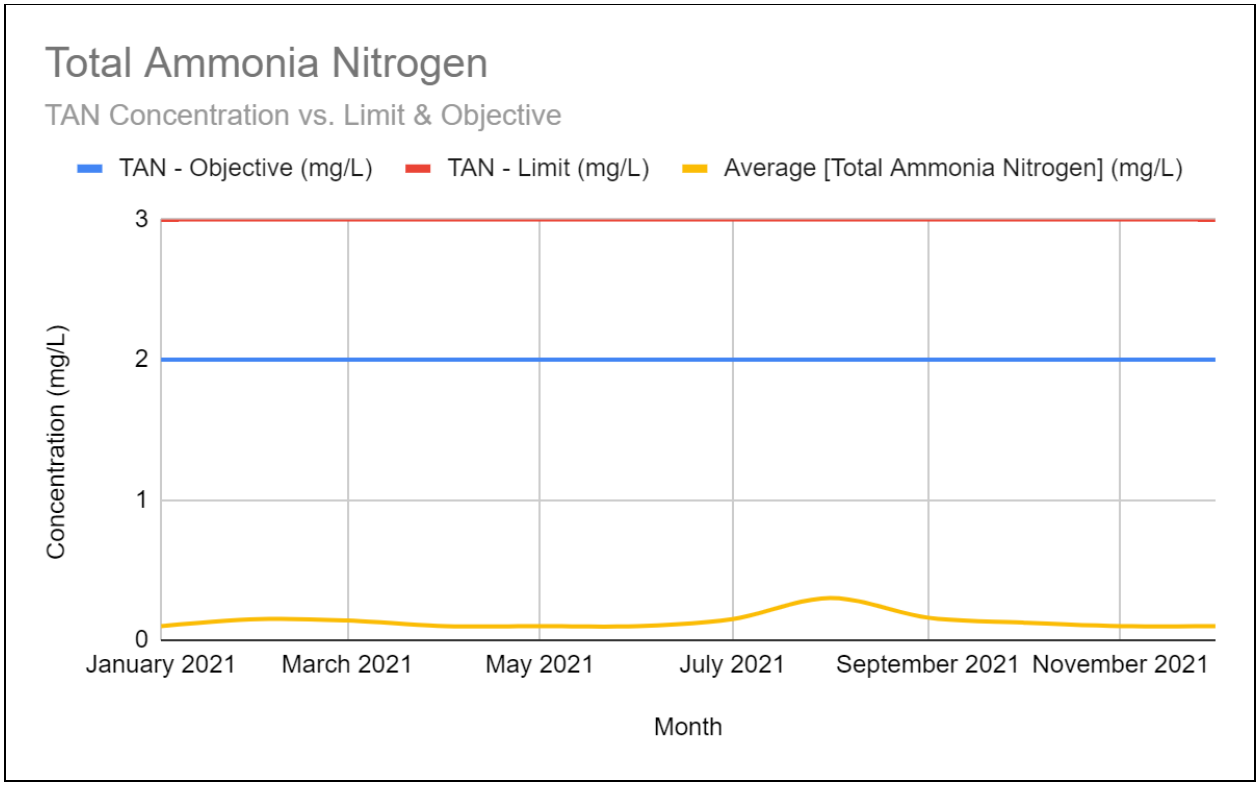
The facility performed quite well over the reporting period in maintaining compliance with the Effluent Limits and Objective for TP with an Annual Average Concentration of 0.1 mg/L TP. The increase in Effluent concentration for the month of June can be attributed to a Bypass Event that occurred on June 23, 2021, resulting from a breach in process piping. The monthly average concentration for TP would have measured below the allowable Effluent Limit with 0.14 mg/L. It is apparent in the following figures the facility was successful in maintaining a stable effluent quality over the reporting period.

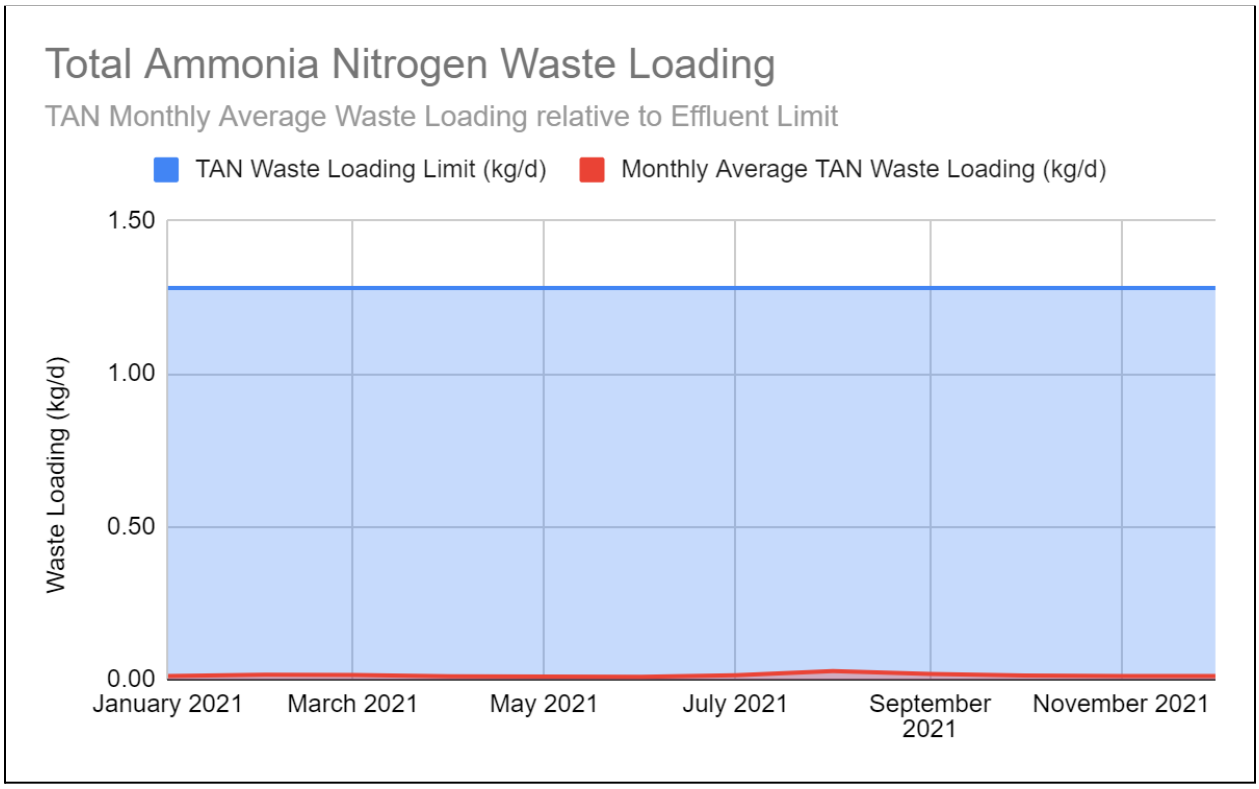

Total Phosphorus
TP Concentration vs. Limit & Objective
TP - Ojective (mg/L)
TP - Limit (mg/L)
Average [Total Phosphorus] (mg/L)
Concentration (mg/L)
0.4
0.3
0.2
0.1
0.0
January 2021
March 2021
May 2021
July 2021
September 2021
November 2021
Month


Total Phosphorus Waste Loading
TP Monthly Average Waste Loading relative to Effluent Limit
TP Waste Loading Limit (kg/d)
Monthly Average TP Waste Loading (kg/d)
Waste Loading (kg/d)
0.100
0.075
0.050
0.025
0.000
January 2021
March 2021
May 2021
July 2021
September 2021
November 2021

Total Ammonia Nitrogen (TAN) - Ammonia (NH_3) / Ammonium (NH_4^+)

The measure of both Ammonia and Ammonium is called the Total Ammonia Nitrogen (TAN) content. Since the facility was designed to facilitate Nitrification, a Monthly Average TAN Effluent Limit and Objective have been established in the ECA. It is apparent in the figure below that the Nitrification process was well established and maintained throughout the Reporting Period. The annual average concentration of unionized ammonia was 0.001 mg/L, supporting the conclusion of the facility's effective performance.

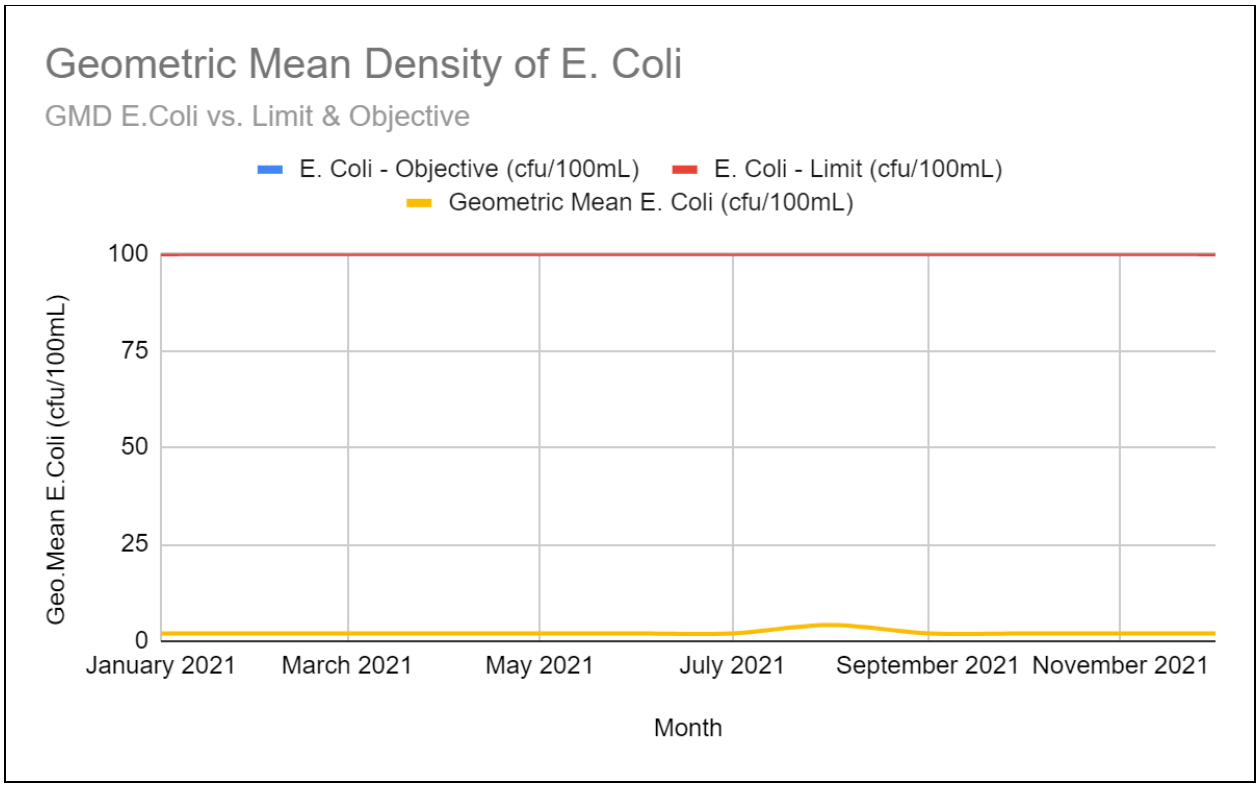



Total Ammonia Nitrogen Waste Loading
TAN Monthly Average Waste Loading relative to Effluent Limit
TAN Waste Loading Limit (kg/d)
Monthly Average TAN Waste Loading (kg/d)
Waste Loading (kg/d)
1.50
1.00
0.50
0.00
January 2021
March 2021
May 2021
July 2021
September 2021
November 2021

Geometric Mean Density of E. Coli

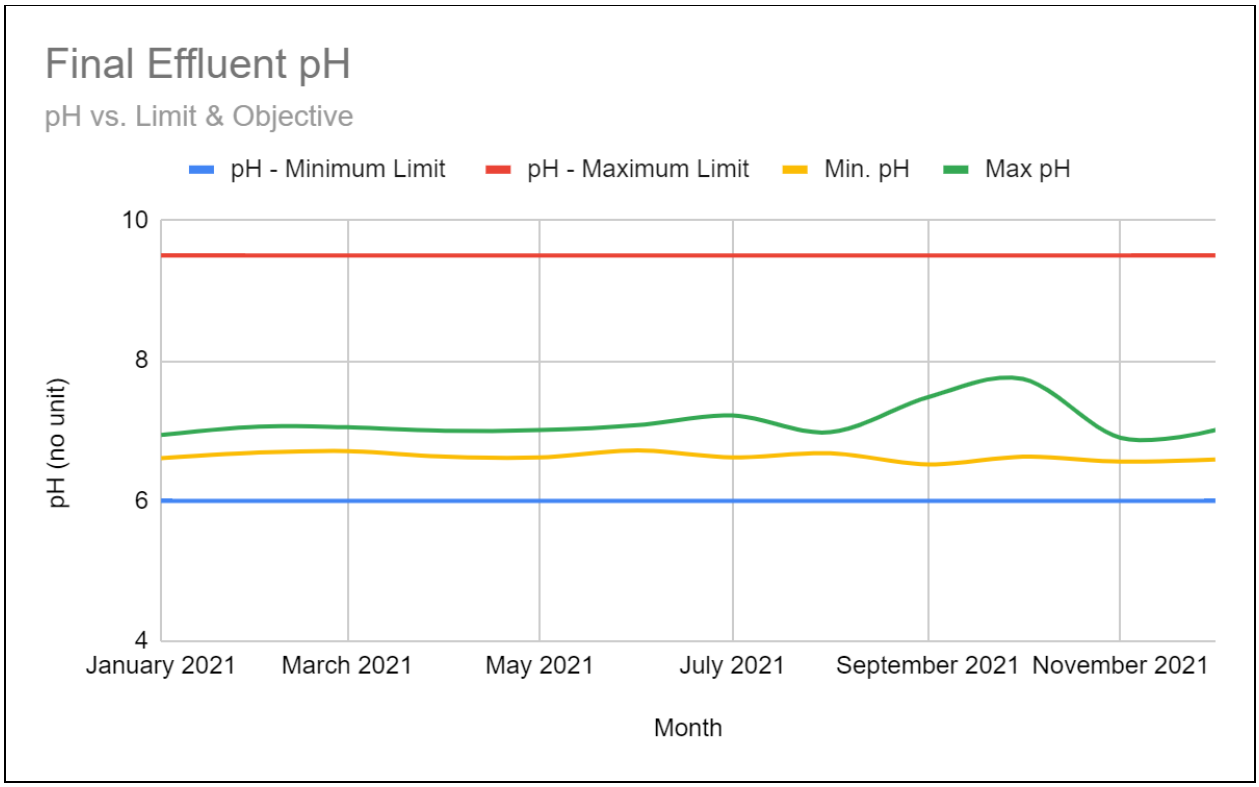
Membrane treatment technology is proven effective in pathogenic organism removal, specifically E. Coli, as the pore-size of the membrane plates are smaller than an E. Coli cell. This means that E. Coli can not readily pass through a membrane.

The figure below provides a clear representation that Final Effluent E.Coli concentrations are measured well below the allowable Limit throughout the Reporting Period.



Final Effluent pH

221 Final Effluent samples were collected and tested for pH throughout the Reporting Period. It is important to note that pH measurements used to determine compliance with the ECA have no QA/QC measures in place, other than routine calibration procedures of the pH probe. The figure below provides evidence the pH was maintained within compliance Limits throughout the monitoring period.



Summary of Maintenance performed throughout Reporting Period

The City continues to support an active Preventative Maintenance (PM) program to ensure the facility is maintained in a fit state of repair. A new digital operations and asset management platform was implemented in 2021 providing a more accessible and easier to use workflow for management and staff. Outside of Preventative Maintenance, the following Reactive Maintenance activities were completed by staff, or outside contractors as identified:

- Membrane cassettes were removed from service and mechanically cleaned in the Spring and the Fall. Chemical bath completed.
- The SCADA interface and PLC program were updated to a more standard layout and control to other Facilities in Quinte west to provide better functionality and comfortability of staff

Biosolids Management Summary

The onsite biosolids storage tank has a storage capacity of approximately 57 cu.m. This tank was emptied periodically throughout the Reporting Period and disposed of in the Trenton Wastewater Collection System for further treatment at the Trenton Wastewater Treatment Plant. All material is hauled by a certified waste hauler on an as-needed basis.

Summary of Effluent Quality Assurance and Control Measures

The Stonecrest Estates STP Operator collects samples from Raw Sewage, Anoxic Tank, Aeration Tank, Membrane Tank, and Final Effluent on a regular basis throughout the week. The 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 and plant performance data. In addition to the in-house analysis, samples are collected weekly and sent to a certified laboratory – SGS Environmental Services. These sample results are used to determine compliance with the ECA, as the City does not have approved QA/QC measures in place for their in-house testing to qualify accuracy of results.

Final Effluent Monitoring Equipment Calibration and Maintenance

Works Orders are generated on an annual basis to calibrate the facility Flow Meter. This calibration is completed by a third party contractor. The following figure is a copy of the Calibration Certificate.

Tower Electronics Canada Inc.
Instrument Calibration Certificate

Customer:
The City of Quinte West
7 Creswell Drive
PO Box 490
Trenton, ON K8V 5R6

Calibration by:
Dan Matchett

Standards:
Endress and Hauser Field Check S/N:0000551303 Cal Due Mar 2022

Instrument Type
Magnetic Flow Meter

Method of verification
EnH Field Check Verification/Calibration

Units: LPM
Zero: 0.00
Span: 200.00
Totalizer: M3

Meter Information

Date of Test:	2021-08-25
Location:	Stonecrest WWTP
Meter Under Test	Effluent Flow
Client Tag:	QW00005368/FIT701
Manufacturer:	Endress Hauser
Model:	Promag 10
Serial Number:	-
Totalizer As Found:	124349M3
Totalizer As Left:	124352M3
Allowable Error%:	15%
Programming Parameters:	
DN Size:	80.000
Cal Factor:	1.2332
Zero:	0
Calibration Due:	Aug-22

Flow Test

Sim Setting	Sim Flow LPS	Meter Display	Current Output	Disp Error%	mA Error %
0.000	0.000	0.000	3.998	0.000	0.050
50.000	50.000	49.718	7.995	0.141	0.062
100.000	100.000	101.790	12.057	0.895	0.475
150.000	150.000	150.040	15.981	0.020	0.119
200.000	200.000	199.960	19.919	0.020	0.405
			Average Error%	0.22	0.22
			Result:	PASS	PASS

Totalizer Test

Sim Flow Rate	200.000	LPM
Start Totalizer	124351.000	M3
End Totalizer	124352.000	M3
Volume Simulated	1.000	M3
Time(Seconds)	296.850	
Calculated Totalizer(MUT)	0.990	
Error%	1.061	
Result:	PASS	

Comments:
Unit passes verification.

Tower Electronics Canada Inc.
2687 Hwy 40
K0K 3M0
Wooler On
Canada

Email: Dan@Tecanada.ca
Website: www.tecanada.ca

Calibrations Service Sales
Temporary and Permanent Meter Installations
Instrumentation For Flow Level Pressure.

Notice of Modifications

There were no Notices required for modification of the facility in accordance with the conditions under Limited Operational Flexibility.

Summary of complaints received throughout the reporting period

There were no complaints received by City staff with respect to the Stonecrest Estates WWTP throughout the reporting period.