

Corporation of the City of Quinte West

Stonecrest Estates Wastewater Treatment Plant

2022 Annual Performance Report



A Natural Attraction



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The Corporation of the City of Quinte West

Public Works and Environmental Services

Water/Wastewater Division

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Executive Summary

The Stonecrest Estates Sewage Treatment Plant, assigned MOE Identifier number 120003762, is located at 51 Aikins Road in Bayside. The facility currently operates in accordance with ECA number 4460-AHBRVY issued on January 13, 2017. However, on July 25, 2022 the City submitted for an amendment to the existing ECA to complete Phase 2, which will increase the treatment capacity and address operational issues. The Phase 2 construction, when complete, will have a hydraulic/ membrane capacity to treat 425 m³/day.

Currently, the WWTP is a Class II Treatment Plant, and is 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;*



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- *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.*



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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	4.5	3.3	0.05	0.13	2.0	0.001	6.42	7.07	12.9
February	2.0	2.8	0.05	0.15	1.7	0.001	6.70	6.95	12.7
March	3.0	3.6	0.03	0.10	1.7	0.001	6.73	6.96	12.8
April	2.0	3.5	0.03	0.10	2.0	0.001	6.74	7.14	14.6
May	2.8	4.0	0.05	0.10	2.0	0.001	6.85	7.16	17.5
June	2.0	2.3	0.05	0.10	2.0	0.001	6.73	7.25	20.7
July	2.5	3.5	0.11	0.10	2.0	0.001	6.61	6.83	23.0
August	2.6	2.8	0.06	0.12	2.3	0.002	6.72	7.89	24.3
September	2.0	3.8	0.06	0.10	2.0	0.001	6.71	7.11	22.7
October	2.0	2.0	0.03	0.15	2.0	0.001	6.64	6.85	19.4
November	2.0	2.6	0.03	0.10	2.0	0.001	6.43	6.74	17.5
December	2.3	3.3	0.04	0.10	1.7	0.001	6.56	7.57	15.0
Annual Avg.	2.5	3.1	0.05	0.11	2.0	0.001			17.8



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Monthly Average Effluent Waste Loadings				
Month	CBOD5 (kg/d)	Total Suspended Solids (kg/d)	Total Phosphorus (kg/d)	Total Ammonia Nitrogen (kg/d)
	<i>Limit: 4.25 kg/d</i>	<i>Limit: 4.25 kg/d</i>	<i>Limit: 0.09 kg/d</i>	<i>Limit: 1.28 kg/d</i>
January	0.5	0.3	0.005	0.01
February	0.2	0.2	0.004	0.01
March	0.3	0.4	0.003	0.01
April	0.3	0.5	0.004	0.01
May	0.4	0.5	0.006	0.01
June	0.2	0.3	0.006	0.01
July	0.3	0.4	0.012	0.01
August	0.3	0.3	0.006	0.01
September	0.2	0.4	0.006	0.01
October	0.2	0.2	0.003	0.02
November	0.2	0.3	0.004	0.01
December	0.3	0.4	0.004	0.01



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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	359.5	481.8	9.4	86.6
February	326.0	323.0	8.0	74.1
March	265.8	342.0	8.7	69.3
April	284.0	319.8	7.5	68.3
May	365.4	431.2	9.2	92.0
June	376.3	364.8	8.0	91.2
July	372.8	349.0	9.6	79.9
August	423.0	326.6	8.1	70.9
September	405.3	330.8	7.7	75.8
October	340.8	363.8	8.3	83.3
November	347.0	308.4	8.2	76.7
December	632.8	513.5	16.2	120.0



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Facility Flow Monitoring			
Month	Average Daily Flow (cu.m./day)	Month Max Daily Flow (cu.m./day)	Total Monthly Flow (cu.m./month)
	<i>Rated Capacity: 213 cu.m./day</i>	<i>Peak Rated Capacity: 436 cu.m./day</i>	
January	100	117	3110
February	90	103	2523
March	108	153	3342
April	130	139	3890
May	131	145	4054
June	119	142	3569
July	108	126	3342
August	103	133	3201
September	112	130	3375
October	112	151	3460
November	113	131	3387
December	119	152	3687
	Annual Avg Daily Flow = 112 cu.m./day	Maximum Daily Flow = 153 cu.m./day	Total Annual Flow = 40,941 cu.m.



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

No Bypasses, Spills, or Abnormal Discharge Events to report for the monitoring period.

Summary of Operating Problems throughout Monitoring Period

The Stonecrest Estates WWTP performed well throughout the reporting period. However, ongoing issues with membrane fouling continue to limit this facility's hydraulic capability. As flows increase the 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. When the construction of Phase 2 is complete, it is anticipated there will be further improvement on this front. Additional screening, upgraded membranes and increased operational flexibility are projected to address these issues.

The following figure depicts Average Daily Flow and monthly Maximum Daily Flows against the facility Rated Capacity. Notably, 2022 saw an increase in annual plant flow and a subsequent increase in Average Daily Flow (ADF) of 6%. The 3-year ADF increased by 15%, with the 5-year average increasing by 8%.



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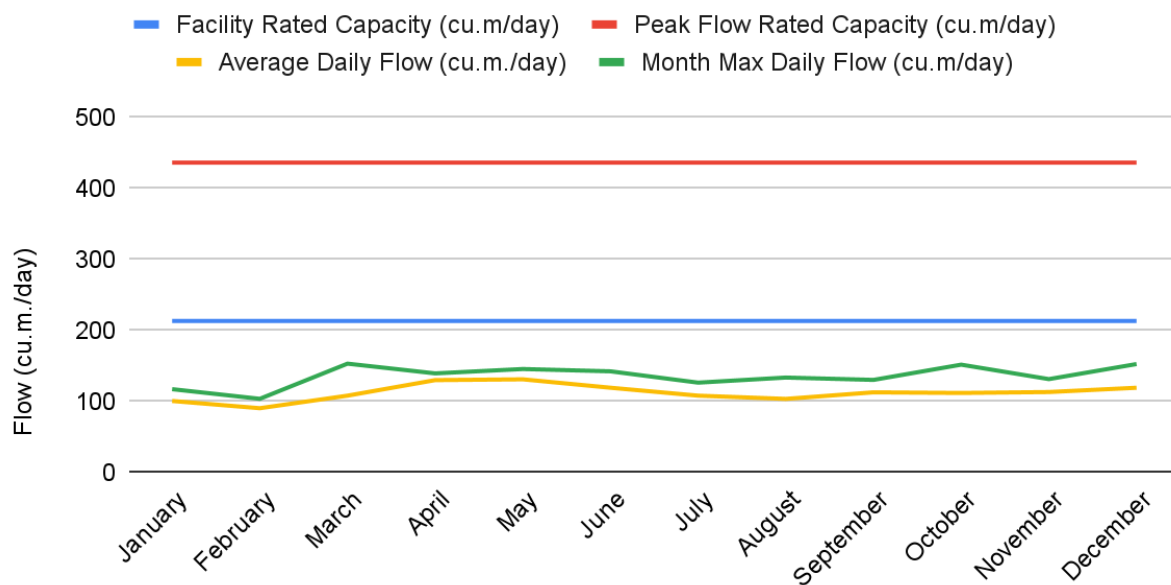
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2022 Facility Flow Evaluation

Plant Flow vs. Facility Rated Capacity



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 Annual Average Concentration of CBOD5 was 2.5 mg/L.



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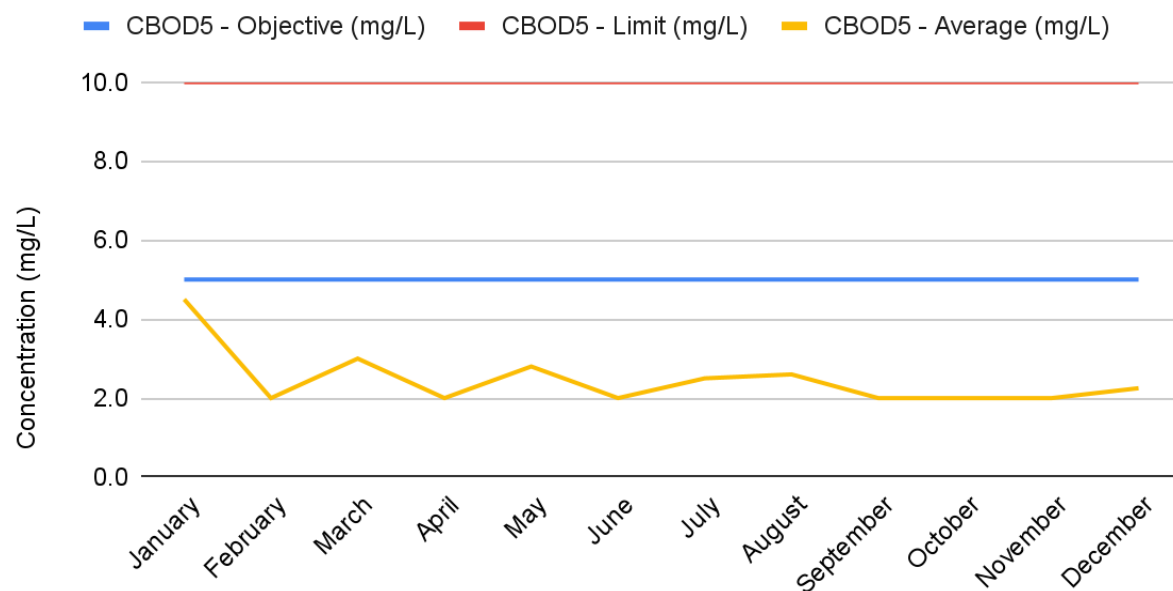
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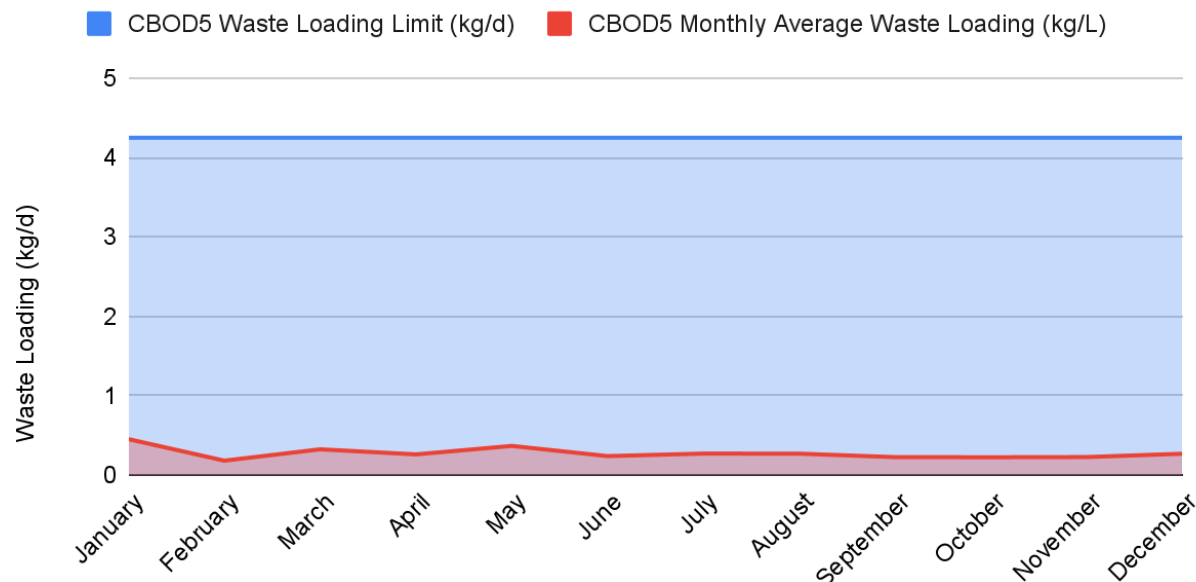
2022 Carbonaceous Biochemical Oxygen Demand

CBOD5 Concentration vs. Limit & Objective



2022 CBOD5 Waste Loading

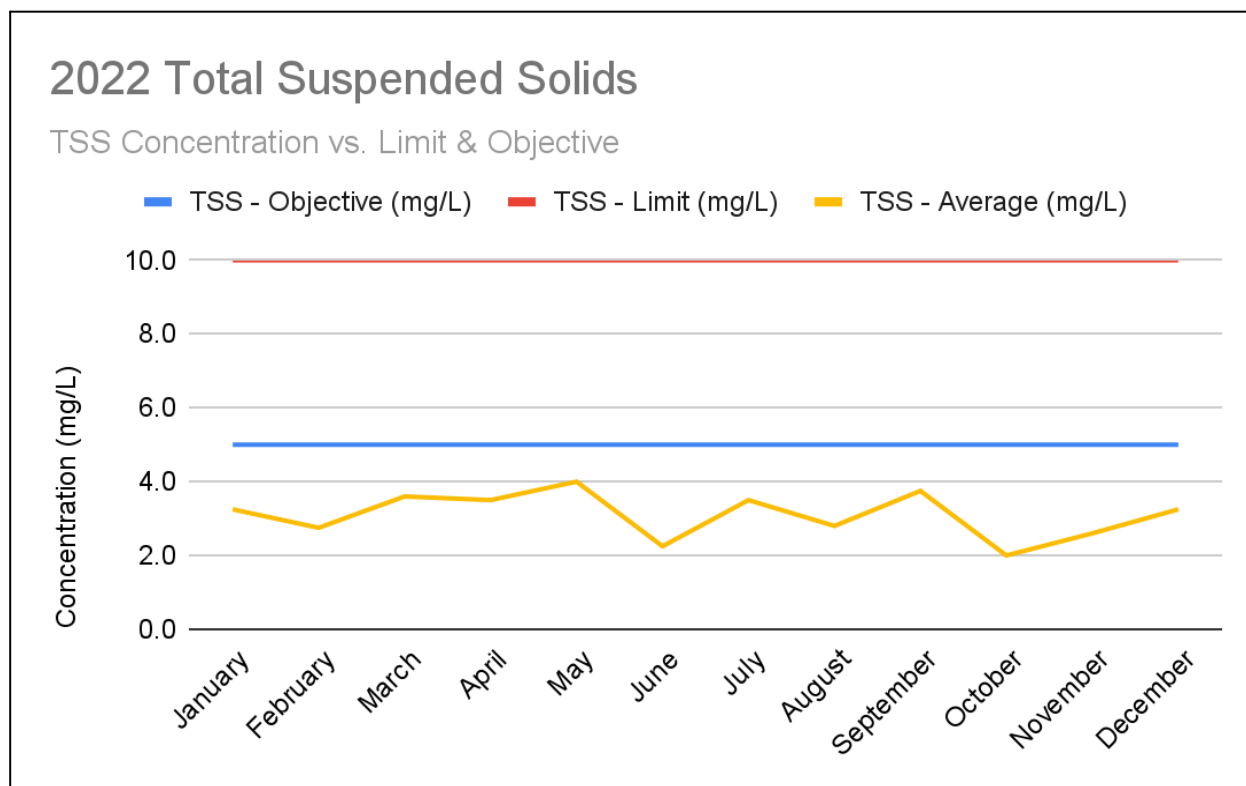
CBOD5 Monthly Average Loading relative to Effluent Limit





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 2.5 mg/L TSS. It is apparent in the following figures the facility was successful in maintaining a stable effluent quality over the reporting period.





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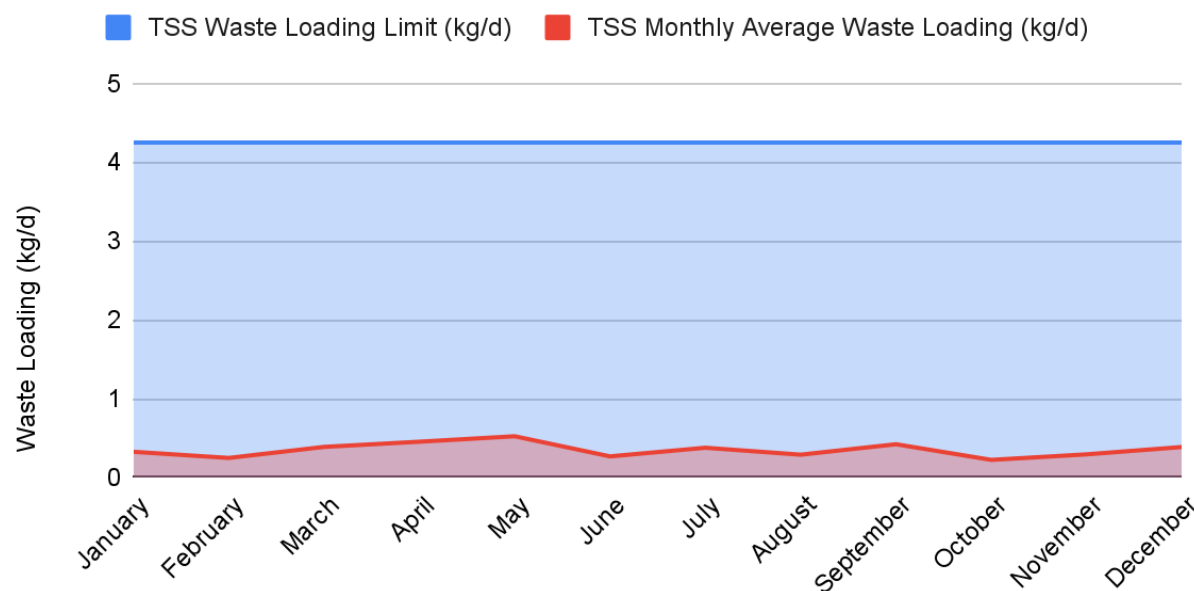
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2022 Total Suspended Solids Waste Loading

TSS Monthly Average Waste Loading relative to Effluent Loading Limit



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 0.05 mg/L TP. It is apparent in the following figures the facility was successful in maintaining a fairly stable effluent quality over the reporting period. The increase noticed in July can be attributed to an increase in seasonal temperature, combined with a decrease in alkalinity caused a subsequent decrease in phosphorus removal by aluminum sulfate. Operational adjustments were made to correct this.



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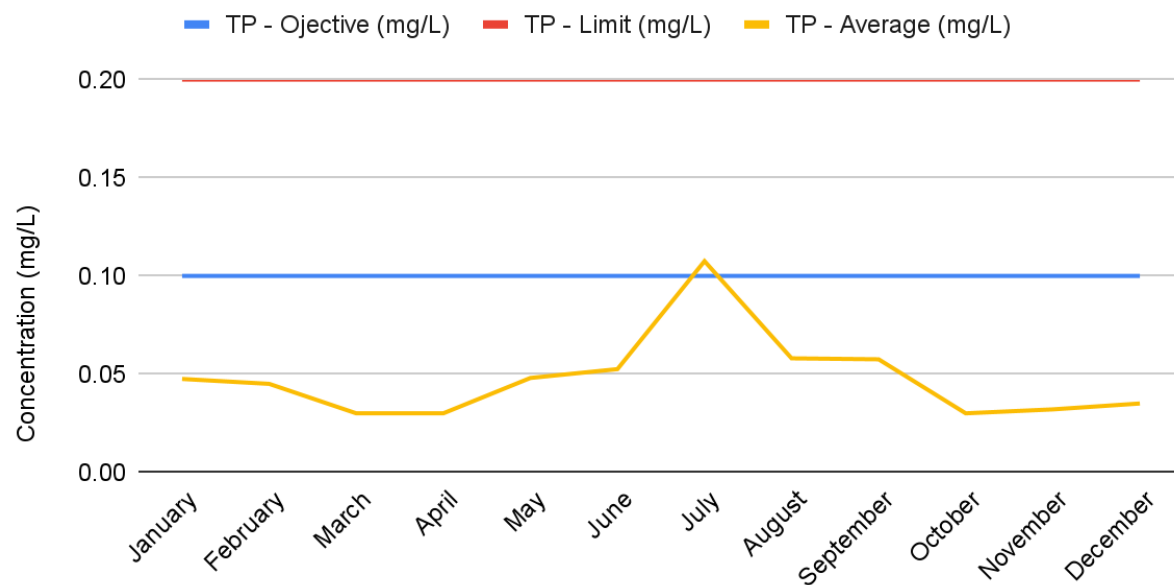
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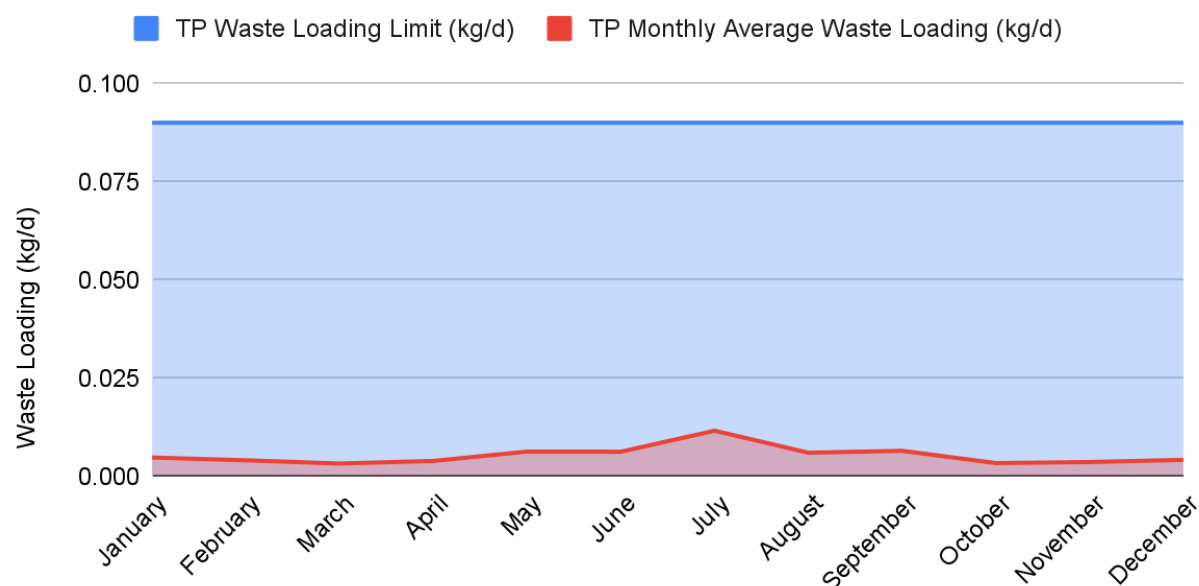
2022 Total Phosphorus

TP Concentration vs. Limit & Objective



2022 Total Phosphorus Waste Loading

TP Monthly Average Waste Loading relative to Effluent Limit





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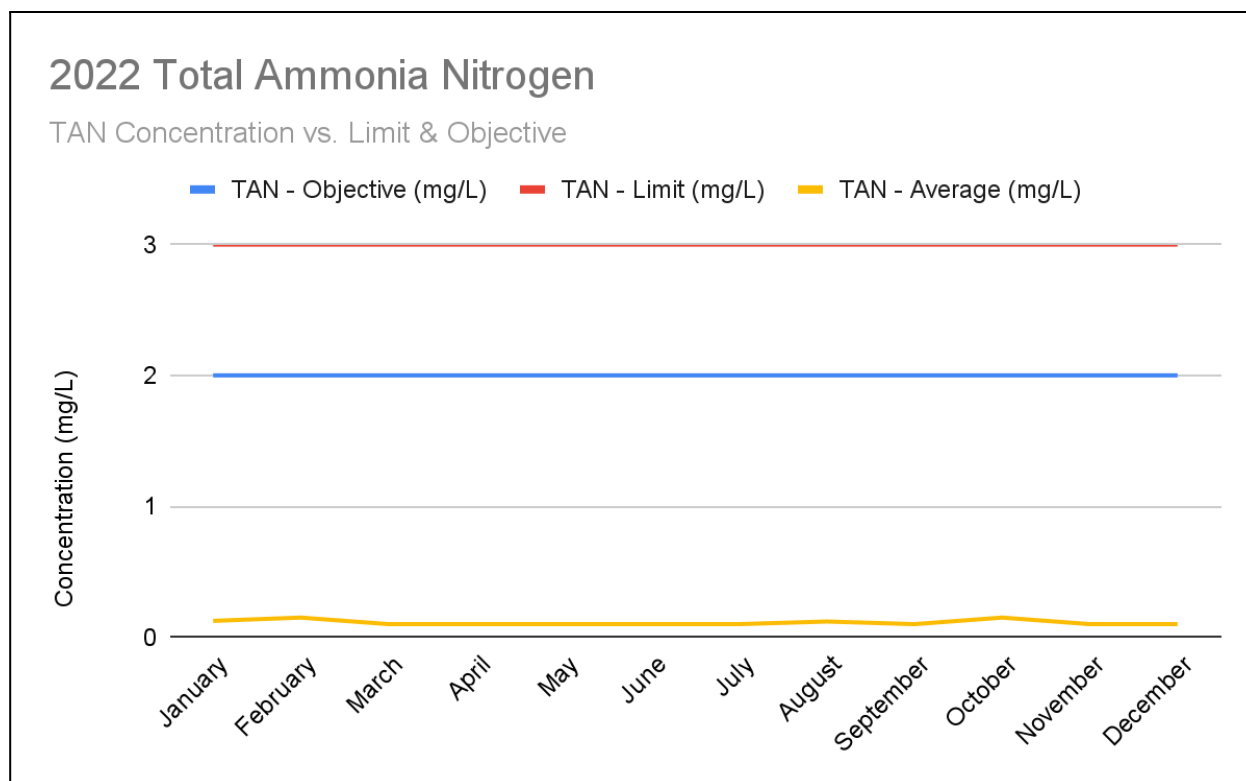
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Total Ammonia Nitrogen (TAN) - Ammonia (NH_3) / Ammonium (NH_4^+)

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.





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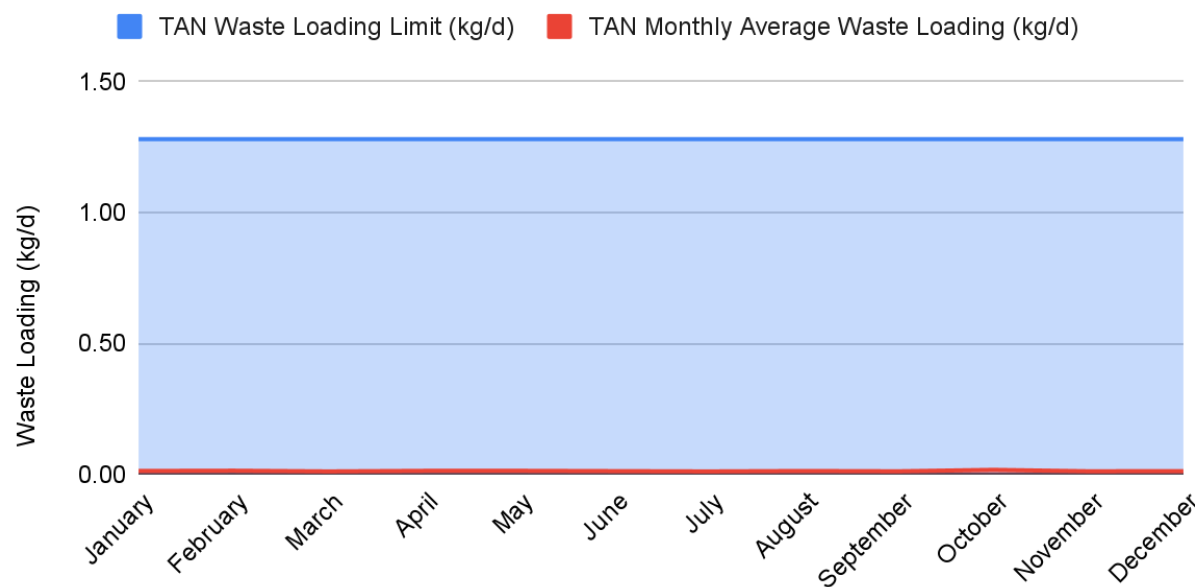
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2022 Total Ammonia Nitrogen Waste Loading

TAN Monthly Average Waste Loading relative to Effluent Limit



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.



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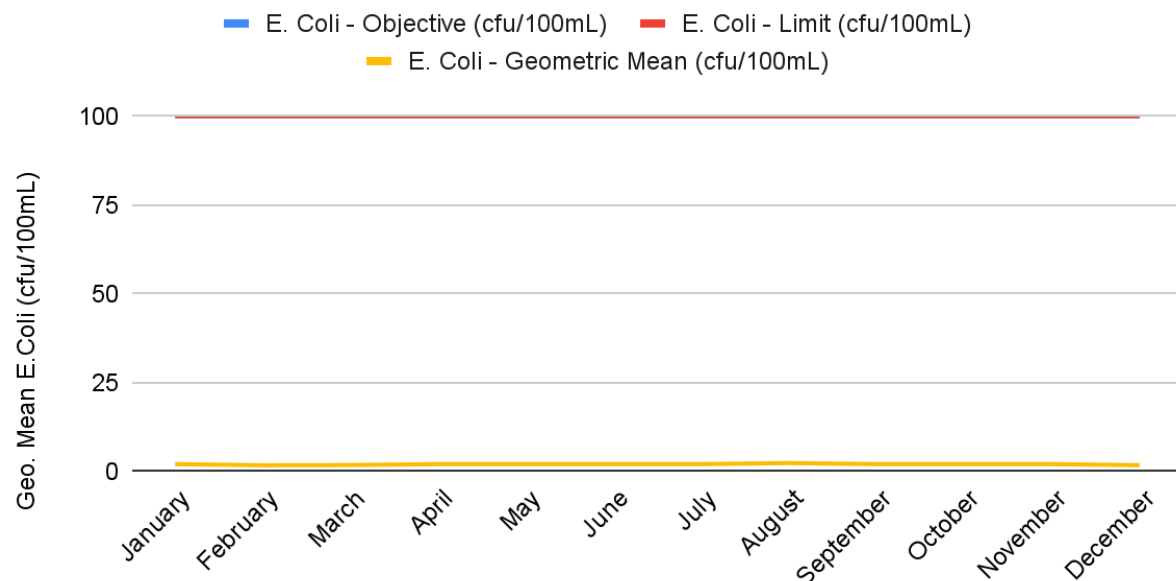
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2022 Geometric Mean Density of E. Coli

GMD E. Coli vs. Limit & Objective



Final Effluent pH

227 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 quality assurance/ quality control (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.



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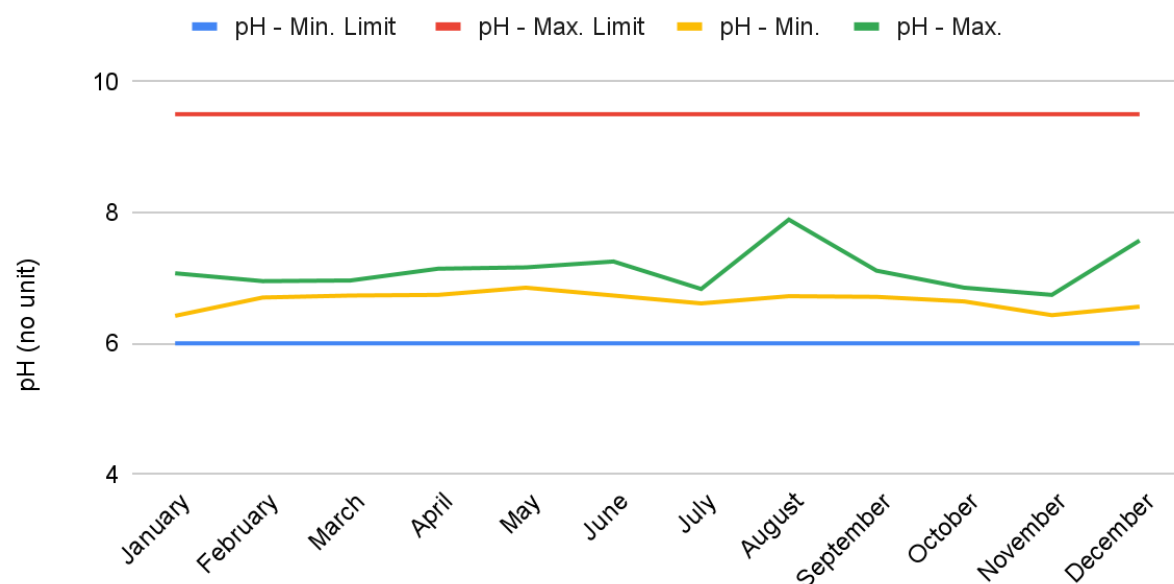
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2022 Final Effluent pH

pH vs. Limit & Objective



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. 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
- Routine chemical Clean-in-Place back flushes were performed as needed as well as periodic chemical baths
- 16 membrane cassettes were replaced
- Odour control scrubber was repaired and carbon media replaced



Biosolids Management Summary

The onsite 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. This volume was approximately 666 cu.m during 2022. It is anticipated with the completion of Phase 2, that this amount will decrease in 2023. 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.



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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 April 2023

Instrument Type

Magnetic Flow Meter

Meter Information

Date of Test: 2022-08-16
Location: Stonecrest WWTP
Meter Under Test: Effluent Flow
Client Tag: QW00005368/FIT701
Manufacturer: Endress Hauser
Model: Promag 10
Serial Number: -
Totalizer As Found: 164206M3
Totalizer As Left: 164208M3
Allowable Error%: 15%
Programming Parameters:
DN Size: 80.000
Cal Factor: 1.2332
Zero: 0
Calibration Due: Aug-23

Method of verification

EnH Field Check Verification/Calibration

Units:

LPM

Zero:

0.00

Span:

200.00

Totalizer:

M3 **Flow Test**

Sim Setting	Sim Flow LPS	Meter Display	Current Output	Disp Error%	mA Error %
0.000	0.000	0.000	4.000	0.000	0.000
50.000	50.000	49.792	7.928	0.104	0.900
100.000	100.000	101.930	11.971	0.965	0.242
150.000	150.000	150.790	15.972	0.395	0.175
200.000	200.000	199.830	20.010	0.085	0.050
Average Error%				0.31	0.27
Result:				PASS	PASS

Totalizer Test

Sim Flow Rate	1000.000	LPM
Start Totalizer	164207.000	M3
End Totalizer	164208.000	M3
Volume Simulated	1.000	M3
Time(Seconds)	57.140	
Calculated Totalizer(MUT)	0.952	
Error%	5.005	
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.



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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.