Frankford Wastewater Treatment Plant

2021 Annual Performance Report



A Natural Attraction



ublic Works and Environmental Services
Water/Wastewater Division

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2021 Annual Performance Report Frankford WWTP

Executive Summary

The Frankford Wastewater Treatment Plant (FWWTP), assigned MOE Identifier number 110000267, is located at 174 North Trent Street. The facility operates in accordance with Environmental Compliance Approval number 5056-AE9QVC, issued on January 10, 2017.

The WWTP is a Class II Treatment Plant, and has a rated capacity of 2,800 cu.m/day. The facility is described as an extended aeration activated sludge treatment plant with tertiary treatment. The process comprises two circular treatment facilities with integrated extended aeration tanks, aerobic sludge digestion, aerobic sludge storage tanks, and interior circular secondary clarifiers. Secondary effluent enters the tertiary filter building through a filter inflow distribution channel before receiving tertiary treatment through two dual media gravity effluent filters. Final effluent is disinfected using UV irradiation before final discharge to the Trent River via outfall downstream of Dam 4. The facility services a population of approximately 4,000 people within the Frankford service area. Three (3) Sewage Pumping Stations; two located on the West side of the Trent River, and one located on the East side of the Trent River.

In accordance with the ECA, an annual report shall be prepared by March 31 of the year following the end of the period being reported upon. This annual report contains the following information as per Reporting Condition of the ECA:

- 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;



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- 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 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.



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Summary and Interpretation of Monitoring Data

Final Effluent parameter monitoring - with Limits									
Month	[CBOD5] (mg/L)	[TSS] (mg/L)	[TP] (mg/L)	[TAN] (mg/L)	GMD E.Coli (cfu/100mL)	Acute Lethality RBT (% Mortality)	Acute Lethality DM (% Mortality)	pH - MIN	pH - MAX
	Limit: 25.0mg/L; Objective: 15.0mg/L	Limit: 25.0mg/L; Objective: 15.0mg/L	Limit: 0.25mg/L; Objective: 0.20mg/L	See TAN section for Limits	Limit: 200 cfu/100mL; Object.: 150 cfu/100mL	Non-lethal	Non-lethal	Limit: 6.0	Limit: 9.5
January	2.0	2.0	0.03	0.1	2.0	10	0	7.08	7.45
February	2.0	2.0	0.03	0.5	2.0	ND	ND	6.83	7.49
March	2.0	2.0	0.03	0.1	2.0	ND	ND	6.93	7.27
April	2.3	2.5	0.03	0.1	2.0	0	0	6.63	7.40
May	2.0	2.3	0.03	0.1	2.0	ND	ND	6.99	7.35
June	2.0	2.2	0.03	0.1	2.0	ND	ND	6.93	7.44
July	2.0	2.0	0.03	0.1	2.0	0	0	6.86	7.24
August	2.0	2.0	0.03	0.1	4.9	ND	ND	6.78	7.40
September	2.4	2.0	0.03	0.1	2.0	ND	ND	6.97	7.49
October	2.0	3.3	0.03	0.1	2.0	0	0	7.10	7.45
November	2.0	2.5	0.03	0.1	2.8	ND	ND	6.68	7.31
December	2.0	2.2	0.03	0.1	2.0	ND	ND	6.70	7.05



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Final Effluent parameter monitoring - without Limits

	Unionized Ammonia (mg/L)	Hydrogen Sulphide (mg/L)	Dissolved Oxygen (mg/L)	Temperature (deg.C)	
January	0.001	0.02	7.96	9.3	
February	0.002	0.02	8.07	7.7	
March	0.001	0.02	8.80	9.0	
April	0.001	0.02	7.44	11.7	
May	0.001	0.02	7.59	14.4	
June	0.001	0.02	6.68	18.8	
July	0.001	0.02	6.48	20.2	
August	0.001	0.02	6.97	21.3	
September	0.001	0.02	7.47	20.0	
October	0.001	0.02	7.76	18.2	
November	0.001	0.02	8.17	13.4	
December	0.001	0.02	9.24	10.3	



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Monthly Average Effluent Waste Loadings

monthly Average Emacht waste Loudings					
Month	CBOD5 (kg/d)	Total Suspended Solids (kg/d)	Total Phosphorus (kg/d)	Total Ammonia Nitrogen (kg/d)	
	Limit: 70.0 kg/d	Limit: 70.0 kg/d	Limit: 0.70 kg/d	See TAN section for Limits	
January	6.9	6.9	0.1	0.3	
February	4.8	4.8	0.1	1.3	
March	7.0	7.0	0.1	0.3	
April	7.3	8.1	0.1	0.3	
May	5.4	6.1	0.1	0.3	
June	4.2	4.6	0.1	0.2	
July	3.7	3.7	0.1	0.2	
August	3.7	3.7	0.1	0.2	
September	4.2	3.5	0.1	0.2	
October	3.7	5.9	0.1	0.2	
November	3.7	4.6	0.1	0.2	
December	5.0	5.5	0.1	0.2	



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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	115.3	143.8	1.2	12.6
February	120.8	251.0	2.8	15.4
March	123.4	195.4	2.9	12.0
April	138.5	156.5	2.2	13.8
May	88.5	173.8	1.8	13.5
June	103.2	213.0	2.1	17.4
July	103.5	156.8	2.0	13.8
August	89.8	259.3	1.9	13.3
September	110.6	184.6	1.7	13.3
October	87.8	145.3	1.2	14.3
November	74.5	145.0	1.6	12.2
December	73.4	143.2	1.3	10.8



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	Facility Influent F	low Monitoring		Facility Effluent Flow Monitoring			
Month	Average Daily Influent Flow (cu.m/day)	Month Max Daily Influent Flow (cu.m/day)	Total Influent Flow (cu.m/month)	Average Daily Effluent Flow (cu.m./day)	Month Max Daily Effluent Flow (cu.m./day)	Total Effluent Flow (cu.m./month)	
	Rated Capacity: 2800 cu.m./day	Peak Rated Capacity: 9000 cu.m./day					
January	2,140	2,541	66,350	2,243	2,685	69,539	
February	1,805	2,101	50,542	1,909	2,224	53,466	
March	2,300	3,514	71,313	2,395	3,478	74,259	
April	2,203	2,719	66,101	2,313	2,812	69,391	
May	1,987	2,377	61,584	2,106	2,556	65,287	
June	1,651	1,778	49,542	1,772	1,962	53,161	
July	1,841	2,088	57,057	1,982	2,274	61,430	
August	1,753	1,960	54,348	1,873	2,119	58,075	
September	2,242	6,187	67,249	2,422	6,502	72,659	
October	2,318	3,795	71,844	2,467	3,912	76,483	
November	2,317	3,561	69,519	2,416	3,432	72,495	
December	2,578	3,160	79,924	2,755	3,349	85,409	
	Annual Avg Daily Influent Flow = 2,097 cu.m./day	Max Daily Influent Flow = 6,187 cu.m./day	Total Annual Influent Flow = 765,373 cu.m.	Annual Avg Daily Effluent Flow = 2,224 cu.m./day	Max Daily Effluent Flow = 6,502 cu.m./day	Total Annual Effluent Flow = 811,654 cu.m.	



Public Works and Environmental Services Water/Wastewater Division



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2021 Annual Performance Report Frankford WWTP

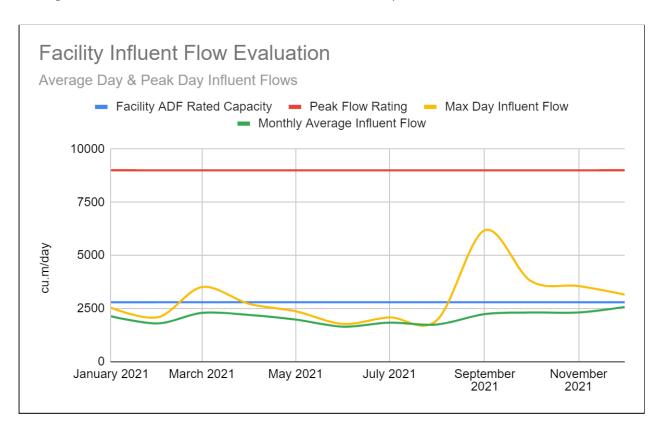
Summary of Bypass, Spill, or Abnormal Discharge Event(s)

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

Summary of Operating Problems throughout Monitoring Period

During the reporting period there are no noteworthy operating problems. The plant performed very well throughout the year. The city continues to seek out and repair I&I into the sanitary system to help better manage flows to the facility.

The following figure depicts Average Daily Flow and month Maximum Daily Flows against the facility Rated Capacity. Seasonal flow increases can be seen and reflect the I&I challenges that face this system. Heavy rain events in September caused the highest Max Daily flow to reach 6,187 m³/day. 2021 saw a reduction in Average Daily Flow of 9% from the 3-year average and 10% from the 5-year average. As well as a notable reduction in total annual plant flow.





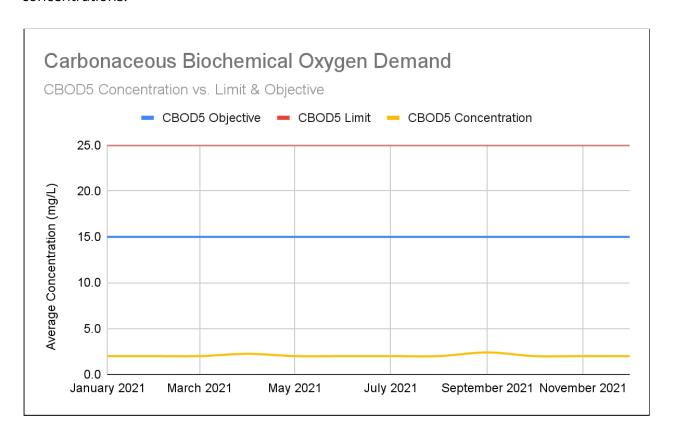
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Analysis of Final Effluent Monitoring Dataset

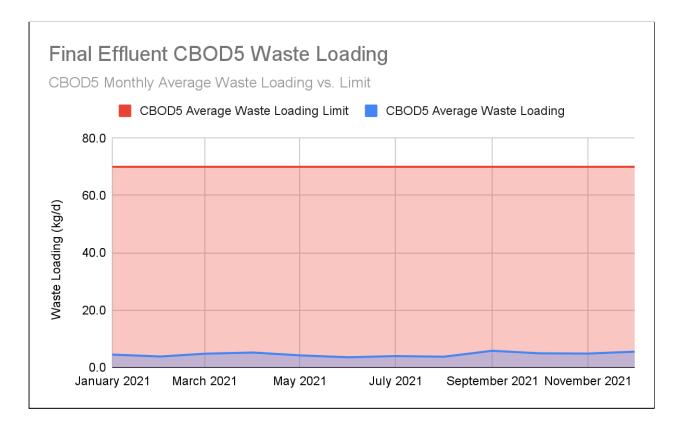
Carbonaceous Biochemical Oxygen Demand (CBOD5) / Biochemical Oxygen Demand (BOD5)

The facility performed adequately to reduce BOD concentrations through the treatment process throughout the entire Reporting Period. Final Effluent Waste Loadings also remained below the allowable limits throughout the Reporting Period largely due to the low monthly average concentrations.





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Total Suspended Solids (TSS)

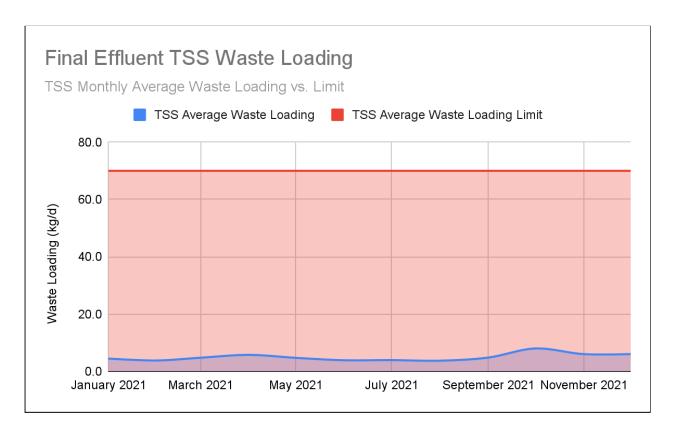
Generally, the facility operated well throughout the Reporting Period to maintain compliance with the Effluent Limits and Objectives established in the ECA.





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Total Phosphorus (TP)

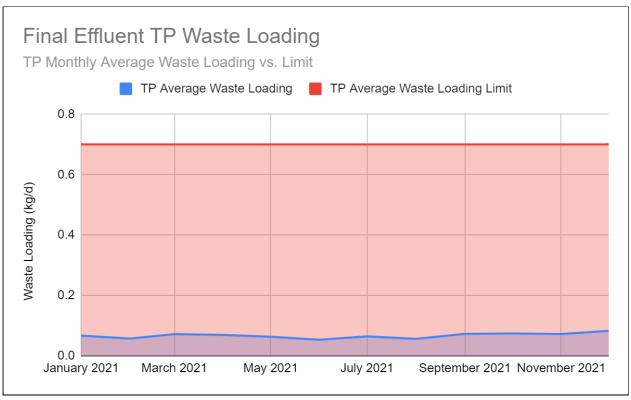
Facility performance was generally stable throughout the Reporting Period in meeting Total Phosphorus Monthly Average Concentrations Objectives and Limits and Effluent Waste Loading Limits.

QuinteWest,

The Corporation of the City of Quinte West

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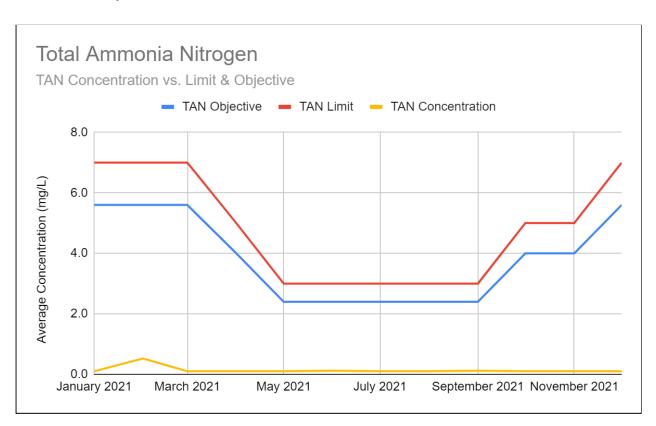


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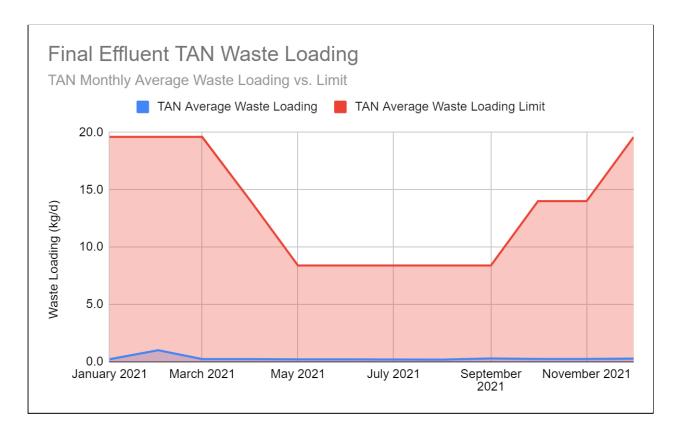
Total Ammonia Nitrogen (TAN) - Ammonia (NH₃) / Ammonium (NH₄⁺)

The measure of both Ammonia and Ammonium is called the Total Ammonia Nitrogen (TAN) content. The neutral, unionized form of ammonia (NH_3) is highly toxic to fish and other aquatic life; Condition 9(5) of the ECA requires the Owner to monitor for this. The yearly average unionized ammonia concentration in the Final Effluent was 0.001 mg/L with the highest calculated monthly average concentration being 0.002 mg/L in February. The facility operated well throughout the entire year to operate such that the Monthly Average TAN Concentrations and Waste Loadings remained well below the Effluent Objectives and Limits.





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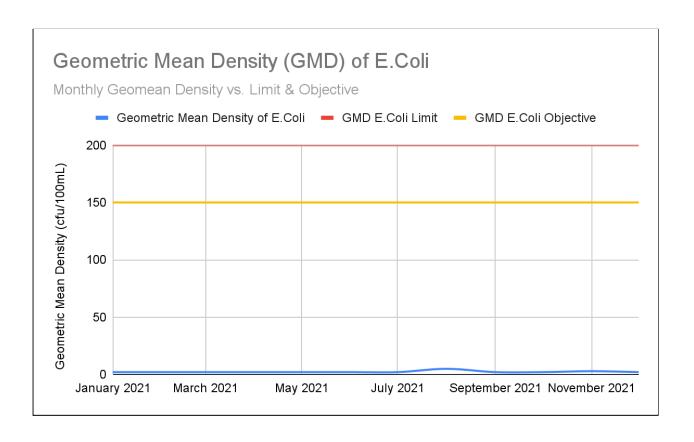


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Geometric Mean Density of E. Coli

The Figure below demonstrates the facility's effectiveness in continuously disinfecting its Final Effluent discharge. The UV Disinfection process consists of two banks (one standby) of UV irradiation lamps, each bank having a Peak Rated Capacity of 9000 cu.m/day. Regular weekly sampling results generally measured at or below the MDL of 2 cfu/100mL. With regular preventative maintenance, the system continues to perform well.



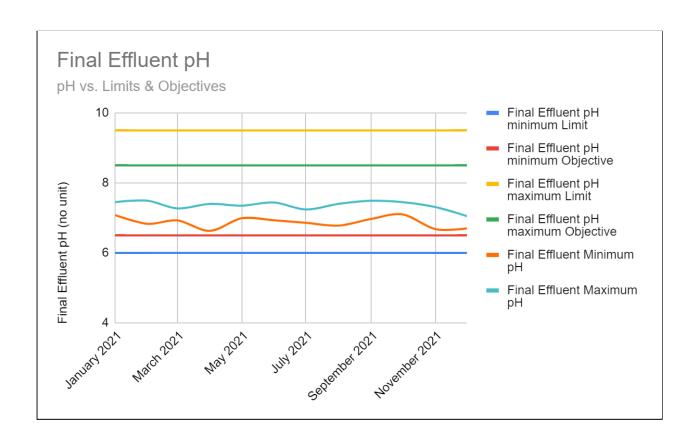


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Final Effluent pH

As shown in the following chart, the Final Effluent pH remained within allowable limits established in the ECA. The ECA requires the Owner to collect a grab sample of the Final Effluent on a weekly basis and test for pH. The Operators collected some 246 samples of Final Effluent throughout the reporting period, and analyze the pH using in-house equipment.





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Acute Lethality to Rainbow Trout and Daphnia Magna

The City contracts all Acute Lethality testing to *Aquatox Testing and Consulting Inc.* In January, the results from the sample collected yielded 0% mortality in Daphnia Magna at 100% Effluent Concentration and 10% mortality in Rainbow Trout at 100% Effluent Concentration. The remaining samples collected in April, July and October yielded 0% mortality In Daphnia Magna and Rainbow Trout. In accordance with the Wastewater Systems Effluent Regulations, effluent is deemed acutely lethal if there is greater than 50% mortality in Rainbow Trout at full strength effluent.

As Rainbow Trout are susceptible to ammonia, a review of the weekly sample results was conducted, and all sample results measured at or below the MDL each week during each month as outlined in the table below. Further, there were no other indicators in weekly sample results to suggest the Effluent quality was diminished.

Final Effluent Ammonia Results					
Date	TAN concentration (mg/L)	Calculated Unionized Ammonia Concentration (mg/L)			
January 12, 2021	0.1	0.001			
April 14, 2021	0.1	0.001			
July 14, 2021	0.1	0.001			
October 13, 2021	0.1	0.001			



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Effluent monitoring requirements without Limits

The City is responsible for sampling other parameters that do not have an established Effluent Limit. Those are listed below along with a short interpretation of associated facility performance, and sample results are summarized in the Table to section <u>Summary and Interpretation of Monitoring Data</u>.

- **Hydrogen Sulphide:** Final Effluent sample results consistently measured below the lab MDL for the entire reporting period. In the next ECA amendment, the City will apply to have this monitoring requirement removed due to its redundancy.
- **Dissolved Oxygen**: While the City actively monitors and controls D.O. in the aeration basin to enhance the oxidation process, staff only collect Final Effluent samples for D.O. analysis weekly and analyse this parameter using in-house equipment. A total of 55 samples were collected throughout the Reporting Period and analysed for D.O. The minimum Final Effluent DO was measured at 6.24 mg/L on July 5. The maximum D.O. was measured at 9.45 mg/L on December 20.
- **Temperature**: 246 samples of Final Effluent were collected throughout the Reporting Period and the Temperature was taken using in-house equipment. The measured minimum reading was 5.6 deg.C on February 12, and the measured maximum was 22.5 deg.C on August 26.

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:

- Two new pumps in Riverside Pumping Station
- Top end and injectors rebuilt on Trent Street Generator
- Full UV bulb replacement
- Frankford WTP/WWTP Generator fuel system upgrades



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Biosolids Management Summary

Date Hauled	Volume Hauled	Biosolids Destination			
January 13, 15, 21	396	Trenton WWTP dewatering and storage			
February 18, 19, 23, 24	588	Trenton WWTP dewatering and storage			
March 29 - 30	528	Trenton WWTP dewatering and storage			
May 19, 21	1040	Trenton WWTP dewatering and storage,			
July 26	160	Land Application - NASM Plan #24244, NASM Plan #23401			
August 18 - 19	1160	Land Application - NASM Plan #23499, NASM Plan #23513			
November 9 - 10	1160	Land Application - NASM Plan #24243			
Total Volume of Sludge generated in 2021 = 5032 cu.m					
Estimated Sludge generated in 2022 - 6000 cu.m.					

Summary of Effluent Quality Assurance and Control Measures

The City collects samples from Raw Sewage stream, Aeration Tanks, Secondary Clarifiers and Final Effluent on a routine basis throughout the week. The City satisfies its regulatory compliance requirements by submitting a set of samples to an accredited laboratory, SGS Canada Inc. on a weekly basis, normally on Wednesday's. These sample results are manually entered into a spreadsheet and evaluated for compliance with the ECA. In addition to these samples, Operators perform in-house analysis for Total Suspended Solids, pH, temperature, alkalinity, dissolved reactive phosphorus, and Final Effluent Dissolved Oxygen. Sample results are entered into a spreadsheet for facility evaluation



Public Works and Environmental Services Water/Wastewater Division

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and process optimization. On an annual basis, the spectrophotometer is calibrated by a third party. Operators calibrate other instrumentation, such as the bench top pH meter, regularly.

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.



Public Works and Environmental Services Water/Wastewater Division

2021 Annual Performance Report Frankford WWTP

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:

Instrument Type Open Channel

Fluke 289 S/N 96220182 NIST Cal Due Mar 2022

Method of verification Head Simulation

LPS Units: 0.00 Zero: Span: 140.20 M3 Flow Test

Totalizer:

Meter Information

Date of Test: 2021-08-10 Frankford WWTP Meter Under Test Final Effluent Client Tag: QW00001959 Manufacturer: Simens Model: OCMIII Serial Number: PBD/X8060040XV Totalizer As Found: 9230955M3 Totalizer As Left: 9230980M3 Acceptable Error: 15% Programming Parameters:

Max Flow 140.199LPS Max Head .415M Primary Device Parshall 9"

Calibration Due: Aug-22

Head Applied	Sim Flow	Meter Display	Current Output	Disp Error%	mA Error %
0.000	0.000	0.000	3.982	0.000	0.450
0.100	15.801	14.450	5.631	0.964	2.968
0.200	45.630	44.700	9.091	0.663	1.265
0.300	84.854	81.870	13.339	2.128	2.520
0.400	131.774	127.100	18.506	3.334	2.797
			Average Error%	1.42	2.00
			Result:	PASS	PASS

Totalizer Test

Sim Flow Rate	131.774	LPS
Start Totalizer	9230966.000	M3
End Totalizer	9230975.000	M3
Volume Simulated	9.000	M3
Time(Seconds)	71.050	
Calculated Totalizer(MUT)	9.363	
Error%	-3.872	
Result:	PASS	

Comments:

Unit passes verification. 1021mm measured empty distance

Tower Electronics Canada Inc. 2687 Hwy 40 KOK 3MO Wooler On Canada

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

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



Public Works and Environmental Services Water/Wastewater Division

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Notice of Modifications

There were no 'Notice of Modifications' forms submitted to the Ministry during this Reporting Period.

Summary of complaints received throughout the reporting period

There were no complaints received by City staff regarding the Frankford WWTP throughout the reporting period.