



A Natural Attraction

2010 Annual Wastewater Report

Frankford Wastewater Treatment Plant



Public Works & Environmental
 Services
 7 Creswell Drive
 Trenton, Ontario K8V 5R6
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Water Wastewater Services
 2010 Annual Wastewater
 Reports
 Frankford WWTP
 MOE Identifier # 110000267

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Summary Overview

The Frankford WWTP, MOE Identifier Number: 110000267, is located at 174 Trent Street North. The plant operates under Certificate of Approval (C of A) number 3-0843-94-956. The Frankford WWTP is rated as a Class 3 facility. It is described as a conventional activated sludge treatment plant with tertiary treatment. Aerobic digestion is used, a set of two tertiary sand filters provide additional solids removal, and UV irradiation treatment is used for effluent disinfection before it is discharged to the Trent River. The plant has a rated capacity of 2300 m³/d, with a peak daily flow capacity of 9,000 m³. The Frankford Wastewater Treatment plant services a population of approximately 2,600 people.

As per C of A number 3-0843-94-956, Condition 4.4 (a-i), an annual report shall be prepared within 90 days following the end of the calendar year detailing the following:

- a. A summary of all monitoring data including an overview of the success and adequacy of the sewage treatment program;
- b. A comprehensive interpretation of all monitoring data and analytical data collected relative to the works during the reporting period and a comparison to the effluent quality and quantity criteria described in Condition 1;
- c. A summary of any effluent quality assurance or control measures undertaken in the reporting period;
- d. A summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming a part of the works;
- e. A description of any operating problems encountered and corrective actions taken during the reporting period;
- f. A summary of any proposed alteration, extension or replacement in the process or operation of the works to be completed over the next reporting period which may require approval under the Ontario Water Resources Act;
- g. A tabulation of the volume of sludge generated in the reporting period and an outline of anticipated volumes to be generated in the next reporting period;
- h. An outline of the proposed sludge handling methods and disposal areas to be utilized over the next reporting period;
- i. A summary of the calibration and maintenance procedures conducted on all monitoring equipment.

This Condition, or annual reporting requirement is included to ensure that all pertinent information is available for the evaluation of the performance of the sewage works, and that disposal of sludge generated at the sewage works is in accordance with the Provincial Sludge Utilization Guidelines and consistent with requirements of Part V of the Environmental Protection Act.



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Summary of all monitoring data and a comparison to the effluent quality and quantity criteria described in Condition 1 of C of A:

Table 1 – Effluent Monitoring Program Results with Compliance Limits

MONTH	2010 Monthly BOD Concentration (mg/L) <i>Objective: 15.0 mg/L</i> <i>Limit: 25.0 mg/L</i>	12-Month Cumulative Average BOD Concentration (mg/L) <i>Objective: 15.0 mg/L</i> Limit: 25.0 mg/L	2010 Monthly Total Suspended Solids Concentration (mg/L) <i>Objective: 15.0 mg/L</i> <i>Limit: 25.0 mg/L</i>	12-Month Cumulative Average TSS Concentration (mg/L) <i>Objective: 15.0 mg/L</i> Limit: 25.0 mg/L	2010 Monthly Total Phosphorus Concentration (mg/L) <i>Objective: 0.3 mg/L</i> Limit: 0.5 mg/L	12-Month Cumulative Average TP Concentration (mg/L) <i>Objective: 0.3 mg/L</i> <i>Limit 0.5 mg/L</i>	Ammonia + Ammonium Nitrogen Concentration (mg/L)	Geometric Mean Density E. Coli (cfu/100 mL) <i>Objective: 150 cfu/100 mL</i> <i>Limit: 200 cfu/100 mL</i>	pH		Temp
									MIN	MAX	
									<i>Limit 6.0</i>	<i>Limit 9.5</i>	
January	3.2	2.1	5.4	2.9	0.08	0.10	0.26	2	6.78	7.48	4.5
February	3	2.2	2	2.9	0.04	0.09	0.1	2	7.10	7.36	4.3
March	2.4	2.2	2.2	2.3	0.03	0.09	0.1	2	6.97	7.34	5.6
April	3.3	2.3	2.3	2.3	0.04	0.09	0.1	2	7.00	7.23	7.7
May	2	2.3	2	2.3	0.04	0.09	0.18	2	6.89	7.52	10.9
June	2	2.3	2	2.3	0.04	0.08	0.2	2	6.97	7.63	15.4
July	2	2.3	2	2.3	0.04	0.07	0.1	2	6.41	7.62	19.5
August	2	2.3	2	2.3	0.04	0.07	0.1	2	6.49	7.28	19.8
September	2	2.3	2	2.3	0.04	0.06	0.1	2	6.43	7.64	19.1
October	2	2.3	2	2.3	0.03	0.05	0.1	2	7.01	7.56	15.3
November	2	2.3	2	2.3	0.03	0.04	0.1	2	6.29	7.67	15.8
December	4.3	2.5	2.7	2.4	0.16	0.05	0.1	2.9	6.47	7.39	8.5
Year Avg.	2.52		2.38		0.05		0.13	2.08	7.11		12.2

Table 1 - Effluent Monitoring Program with Compliance Limits and Objectives



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Table 2 – Monthly Average and 12-Month Cumulative Average Effluent Waste Loadings						
Month	2010 Monthly BOD Average Waste Loading (kg/d)	12-Month Cumulative Average BOD Waste Loading (kg/d)	2010 Monthly Total Suspended Solids Average Waste Loading (kg/d)	12-Month Cumulative Average TSS Waste Loading (kg/d)	2010 Monthly Total Phosphorus Waste Loading (kg/d)	12-Month Cumulative Average TP Waste Loading (kg/d)
	<i>Objective: 34.5 kg/d Limit: 57.5 kg/d</i>	<i>Objective: 34.5 kg/d Limit: 57.5 kg/d</i>	<i>Objective: 34.5 kg/d Limit: 57.5 kg/d</i>	<i>Objective: 34.5 kg/d Limit: 57.5 kg/d</i>	<i>Objective: 0.7 kg/d Limit: 1.1 kg/d</i>	<i>Objective: 0.7 kg/d Limit: 1.1 kg/d</i>
January	7.7	4.2	12.9	5.7	0.2	0.2
February	5.2	4.2	3.5	5.6	0.1	0.2
March	5.7	4.3	5.2	4.4	0.1	0.2
April	6.0	4.1	4.1	4.1	0.1	0.2
May	3.2	4.0	3.2	4.0	0.1	0.2
June	3.2	3.9	3.2	3.9	0.1	0.1
July	3.2	4.0	3.2	4.0	0.1	0.1
August	3.1	4.0	3.1	4.0	0.1	0.1
September	2.8	3.9	2.8	3.9	0.1	0.1
October	3.5	3.9	3.5	3.9	0.1	0.1
November	4.0	4.0	4.0	4.0	0.1	0.1
December	11.2	4.4	6.9	4.2	0.4	0.1
Yearly Average	4.89		4.64		0.10	

Table 2 - Monthly Average and 12-Month Cumulative Average Effluent Waste Loadings



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Table 3 – Monthly Average Influent Monitoring Program Results

Month	BOD (mg/L)	Total Suspended Solids (mg/L)	Total Phosphorus (mg/L)	Total Kjeldahl Nitrogen (mg/L)
January	49.0	83.3	2.07	14.7
February	71.8	105.0	2.01	17.8
March	62.8	73.2	1.87	15.8
April	51.3	80.3	1.85	17.9
May	79.0	80.3	2.22	19.6
June	90.6	181.4	2.45	20.4
July	62.8	81.3	2.01	20.3
August	89.6	182.0	2.10	16.0
September	92.8	165.0	1.74	13.9
October	70.8	93.0	1.36	13.9
November	98.6	128.4	1.90	11.0
December	49.0	75.0	1.32	12.4
Yearly Average	72.3	110.7	1.9	16.1

Table 3 - Monthly Average Influent Monitoring Program Results



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Table 4 – 2010 Monthly Influent & Effluent Flow Summary

Month	Raw Water Flows <i>Approved 12-Month Cumulative Average Daily Flow: 2,300 m³/d Approved Peak Daily Flow: 9,000 m³/d</i>				Effluent Average Daily Flow (m ³ /d)	Effluent Monthly Peak Flow (m ³ /d)	Effluent Monthly Total Flow (m ³ /month)
	Influent Average Daily Flow (m ³ /d)	12-Month Cumulative Average Daily Flow (m ³ /d)	Influent Monthly Peak Flow (m ³ /d)	Influent Monthly Total Flow (m ³ /month)			
January	2,529	1,983	8,053	78,404	2,392	7,430	74,140
February	1,918	1,910	2,401	53,718	1,735	2,263	48,589
March	2,583	1,873	4,073	80,077	2,359	3,451	73,129
April	2,007	1,717	2,461	60,220	1,835	2,210	55,057
May	1,547	1,667	1,819	47,952	1,622	1,823	50,280
June	1,296	1,666	1,859	38,869	1,601	2,173	48,043
July*	1,187	1,712	1,493	36,791	1,619	1,949	50,180
August*	899	1,771	1,394	27,878	1,555	1,996	48,215
September*	664	1,803	1,183	19,930	1,400	1,820	42,002
October*	1,379	1,824	1,781	42,754	1,728	2,129	53,576
November	2,310	1,854	3,527	69,289	2,007	3,134	60,201
December	2,826	1,869	7,351	87,615	2,575	6,269	79,825
Total Effluent Flow for 2010 = 683,237 m³							
2010 Average Daily Influent Flow = 1,872 m³							
3-Year Average Daily Influent Flow = 2,099 m³/d							
5-Year Average Daily Influent Flow = 2,096 m³/d							

Table 4 - 2010 Monthly Influent & Effluent Flow Summary

* Influent average daily flow figures inaccurate due to problems with flow meter. Effluent average daily flows used for compliance purposes (using 2010 average daily effluent flows to determine the 12-Month cumulative average daily flow for the reporting period in conjunction with 2009 Influent average daily flows).

A new flow meter has been purchased to replace the existing flow meter at Trent St. pump station.



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Summary of Bypasses or Spills throughout the reporting period:

Table 5 – Summary of Bypasses or Spills throughout the reporting period								
Bypass Details			Bypass Sample Results					
Bypass Date	Bypass Duration	Volume Bypassed (m³)	pH	BOD (mg/L)	TSS (mg/L)	TP (mg/L)	NH3 + NH4 (mg/L)	E. Coli (cfu/100 mL)
January 25-27 <i>Sample: Jan 26</i> <i>Sample: Jan 27</i>	49.5 hrs	4, 946	7.68 7.84	6 2	19 2	0.28 0.03	0.9 0.1	2 2
December 1-2 <i>Sample: Dec 1</i> <i>Sample: Dec 2</i>	45 hrs	7, 861	6.72 6.63	16 2	5 3	0.8 0.06	0.1 0.1	20 2

Table 5 - Summary of Bypasses or Spills throughout the reporting period



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Interpretation of all monitoring data and a comparison to the effluent limits and objectives:

Biological Oxygen Demand (BOD₅)

The Frankford WWTP operated with an average 96.1% BOD Removal throughout the reporting period. Non-compliance with respect to BOD in the Effluent is deemed to have occurred when the annual average concentration during any twelve consecutive calendar months exceeds 25.0 mg/L. Figure 1 illustrates the monthly average, and the 12-month cumulative average of BOD concentrations in the Effluent vs. the C of A Limit and Objective concentrations. It clearly shows the plant operated well below allowable limits. The monthly average and 12-month cumulative average BOD Waste Loadings in the Effluent also remained well below the allowable limit of 57.5 kg/d and the objective waste loading of 34.5 kg/d as shown in Figure 2. Figure 3 details the monthly average Influent and Effluent BOD concentrations in relation to the BOD Removal efficiency over the reporting period. As shown, the removal efficiency was quite stable throughout the year, even during months in which the plant experienced high volumes and bypassing situations.

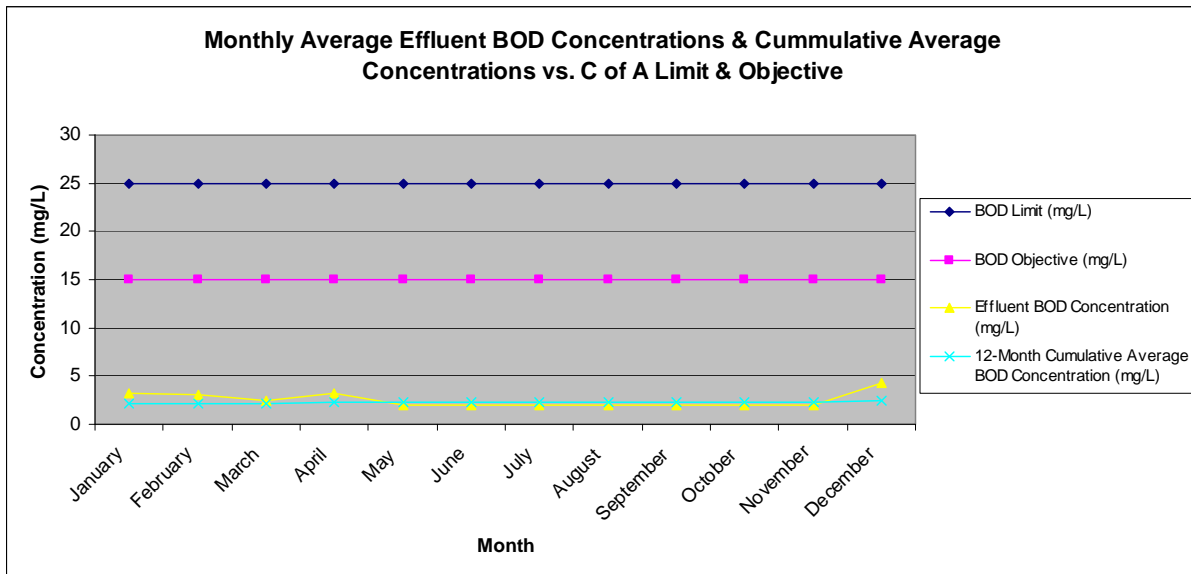


Figure 1 - Monthly & 12-Month Cumulative Average Effluent BOD Concentrations vs. C of A Limit & Objective



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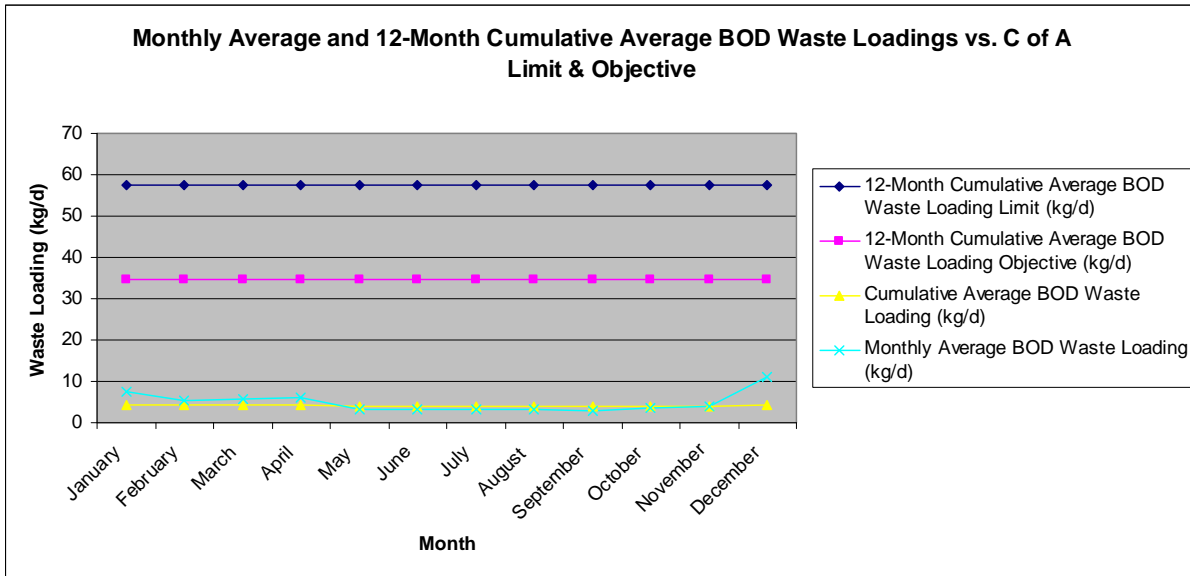


Figure 2 - Monthly & 12-Month Cumulative Average BOD Waste Loadings vs. C of A Limit & Objective

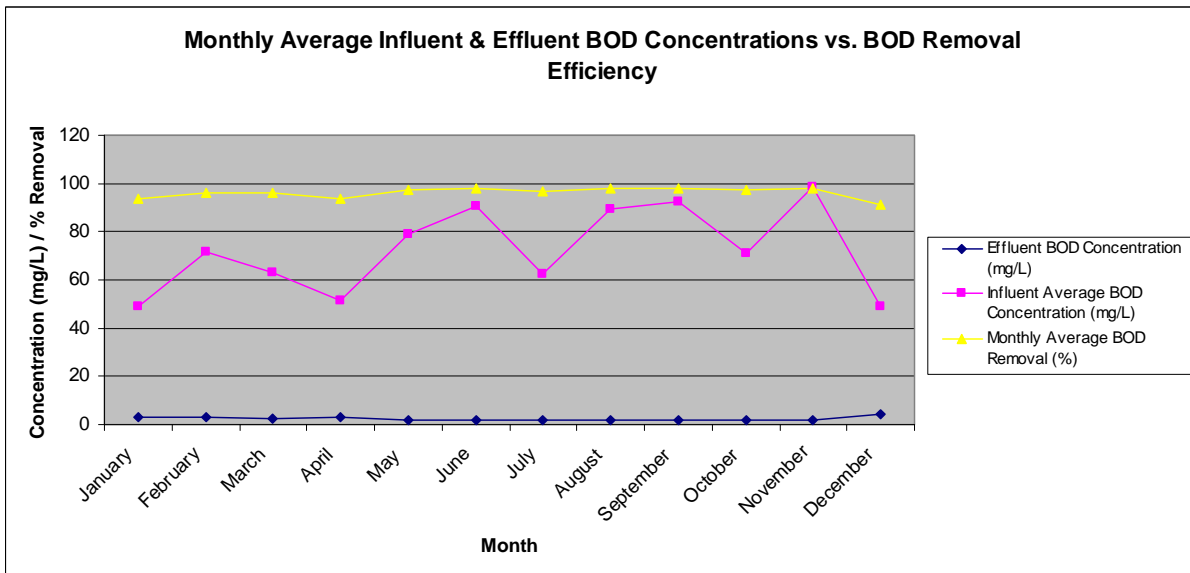


Figure 3 - Monthly Average Influent & Effluent BOD Concentrations vs. BOD Removal Efficiency



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Total Suspended Solids (TSS)

The Frankford WWTP operated with an average 97.5% TSS Removal Efficiency throughout the reporting period. Figure 4 depicts the 2010 monthly average and the 12-month cumulative average TSS concentrations in the Effluent in comparison to the C of A Limit and Objective concentrations. TSS Concentration in the Effluent is considered to be non-compliant when the 12-month cumulative average concentration exceeds 25.0 mg/L. The plant was able to run well below the allowable limit and objective throughout the reporting period. In Figure 5 the monthly average and 12-Month cumulative average TSS Waste Loadings are plotted against the Effluent Limit and Objective for Effluent TSS Waste Loading, and is shown to be operating within compliance. Figure 6 plots the Influent and Effluent monthly average TSS concentrations in relation to the Removal Efficiency within the plant. Again, even during months of high flows or bypassing the removal efficiency of suspended solids is consistent.

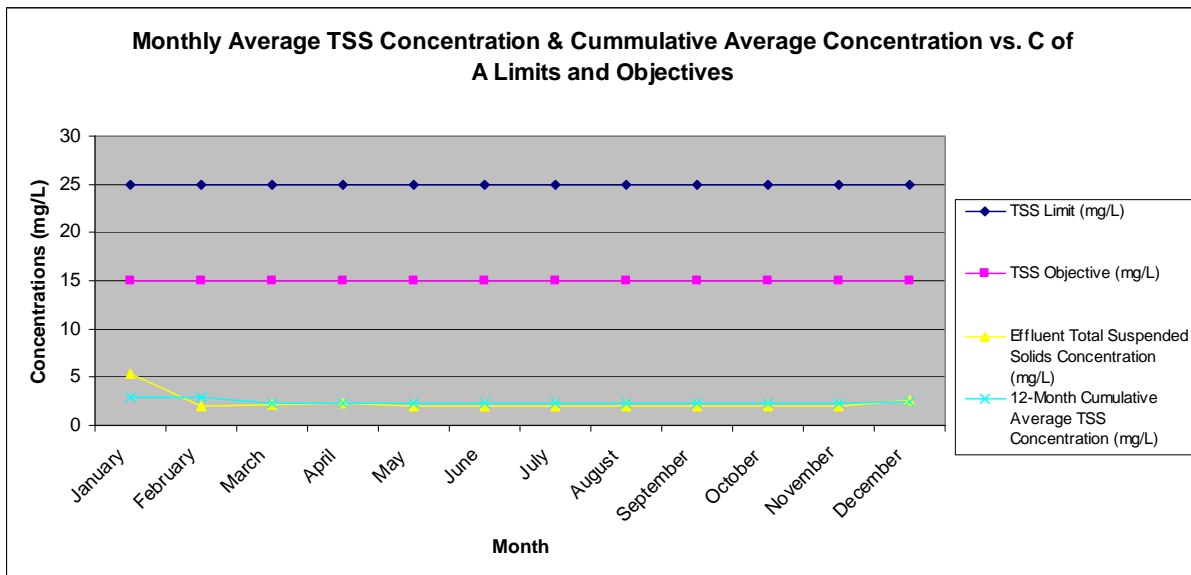


Figure 4 - Monthly & 12-Month Cumulative Average TSS Concentrations vs. C of A Limit and Objective



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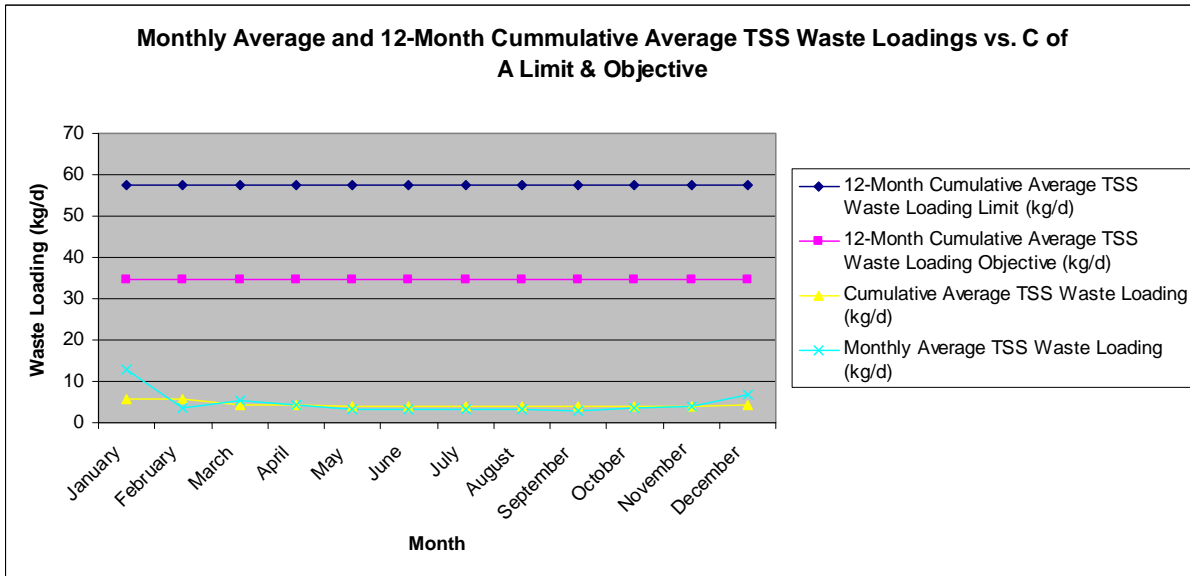


Figure 5 - Monthly Average & 12-Month Cumulative Average TSS Waste Loadings vs. C of A Limit & Objective

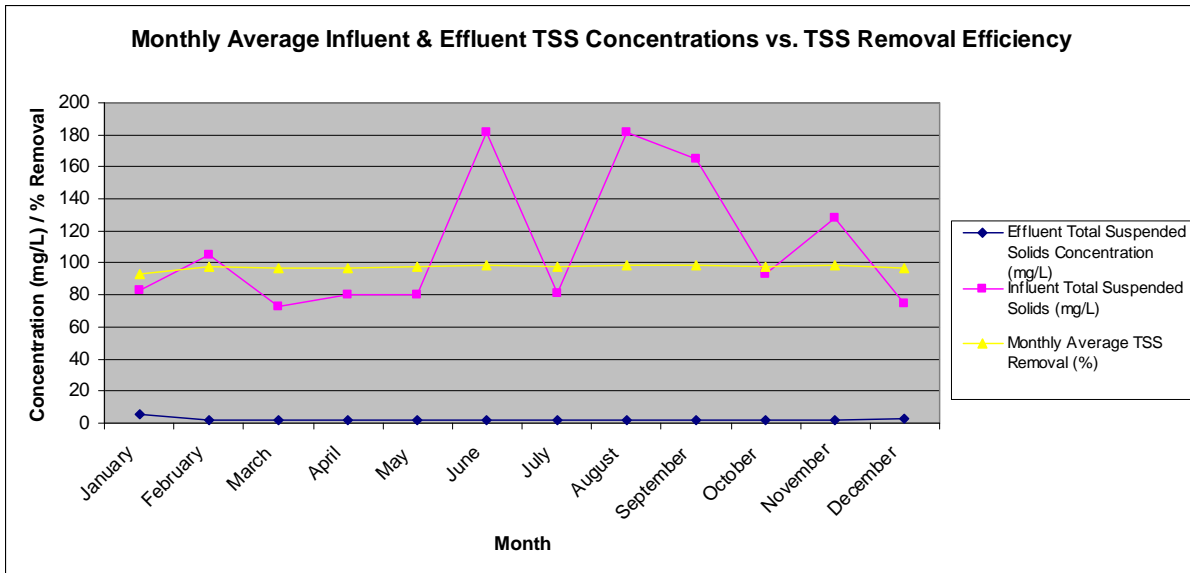


Figure 6 - Monthly Average Influent & Effluent TSS Concentrations vs. TSS Removal Efficiency



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Total Phosphorus (TP)

Throughout the reporting period, the FWWTP operated with an average 97.1% Phosphorus removal efficiency. The FWWTP C of A deems Total Phosphorus concentrations to be non-compliant when the monthly average concentration exceeds 0.5 mg/L. Figure 7 plots the monthly average TP concentrations in relation to the C of A Limit and Objective, clearly illustrating the TP concentrations remained within compliance limits and objectives throughout the reporting period. Figure 8 plots the 12-month cumulative average and monthly average TP Waste Loadings in the Effluent against the C of A Limit and Objective. The 12-month cumulative average TP Waste Loading is used for compliance purposes in accordance with the C of A. Throughout the reporting period, the 12-month cumulative average remained below the C of A Limit of 1.1 kg/d and objective of 0.7 kg/d. However, it should be noted that in the early months of 2010, the cumulative average TP concentration was higher than months later in the year. This is due to higher than normal flows experienced in the beginning of 2009 which has a direct relationship on waste loading calculations. Figure 9 plots the monthly average influent and effluent TP concentrations in relation to the Phosphorus Removal Efficiency of the plant. It is evident that the plant operates efficiently removing Influent Phosphorus concentrations, even when concentrations are quite high in the Influent.

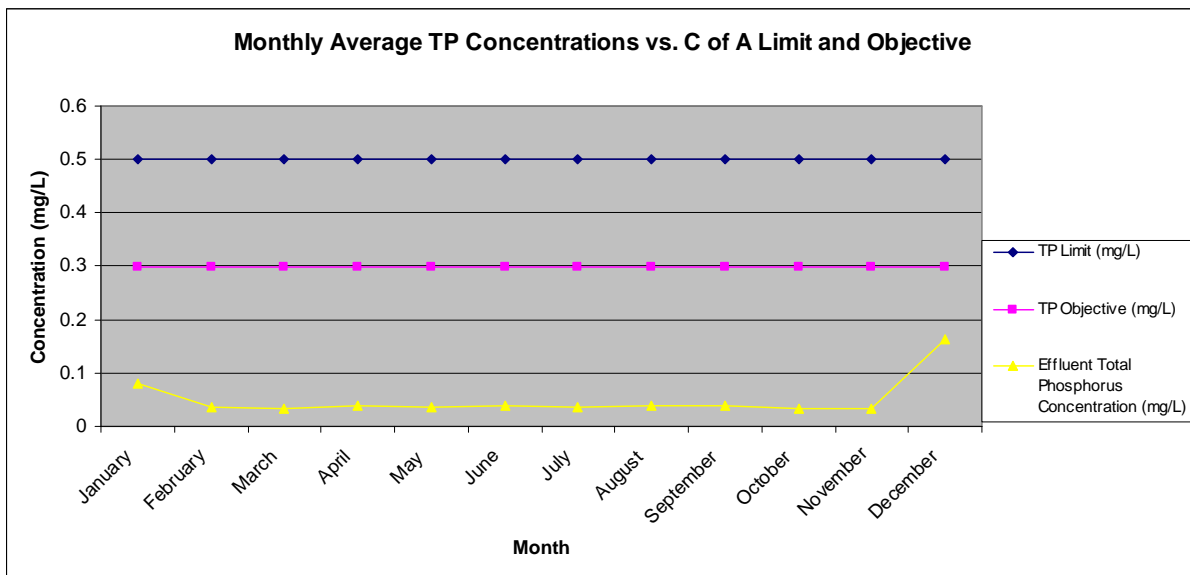


Figure 7 - Monthly Average TP Concentrations vs. C of A Limit and Objective



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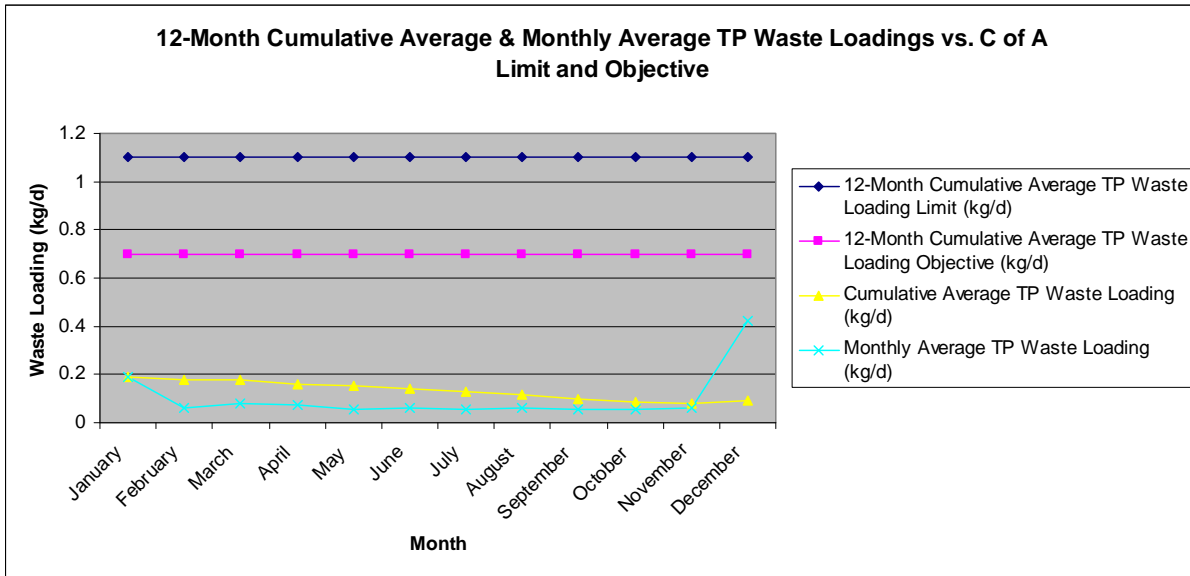


Figure 8 - Monthly Average & 12-Month Cumulative Average TP Waste Loadings vs. C of A Limit & Objective

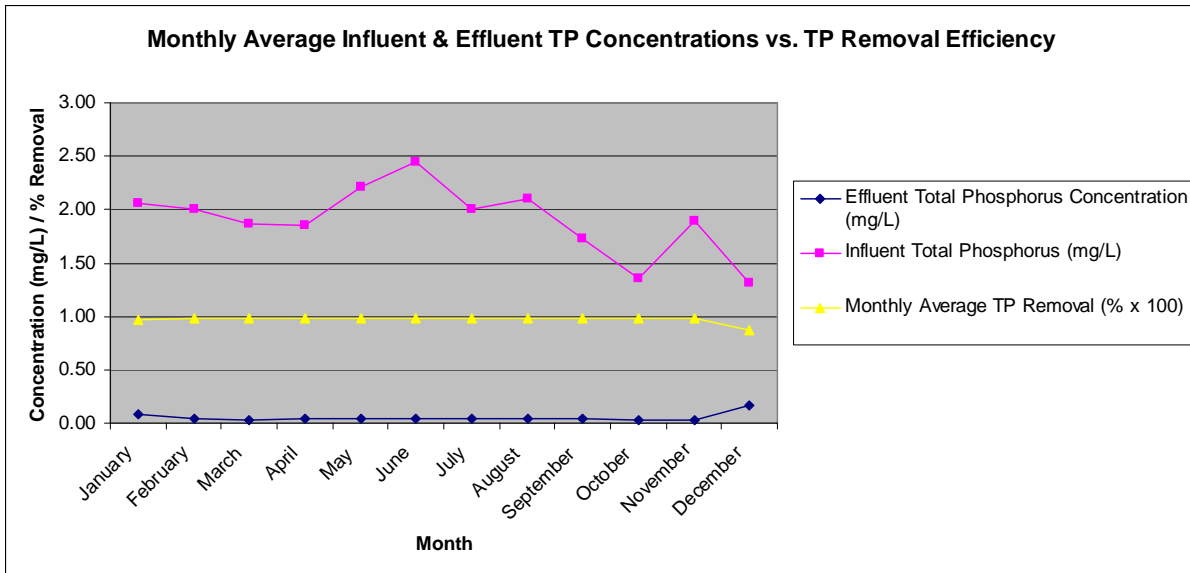


Figure 9 - Monthly Average Influent & Effluent TP Concentrations vs. TP Removal Efficiency



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pH

Throughout the reporting period, the FWWTP operated within the C of A Limits for monthly minimum pH values, and monthly maximum pH values. pH monitoring has been established to minimize the environmental impact, protect water quality, fish and other aquatic life in the receiving water body.

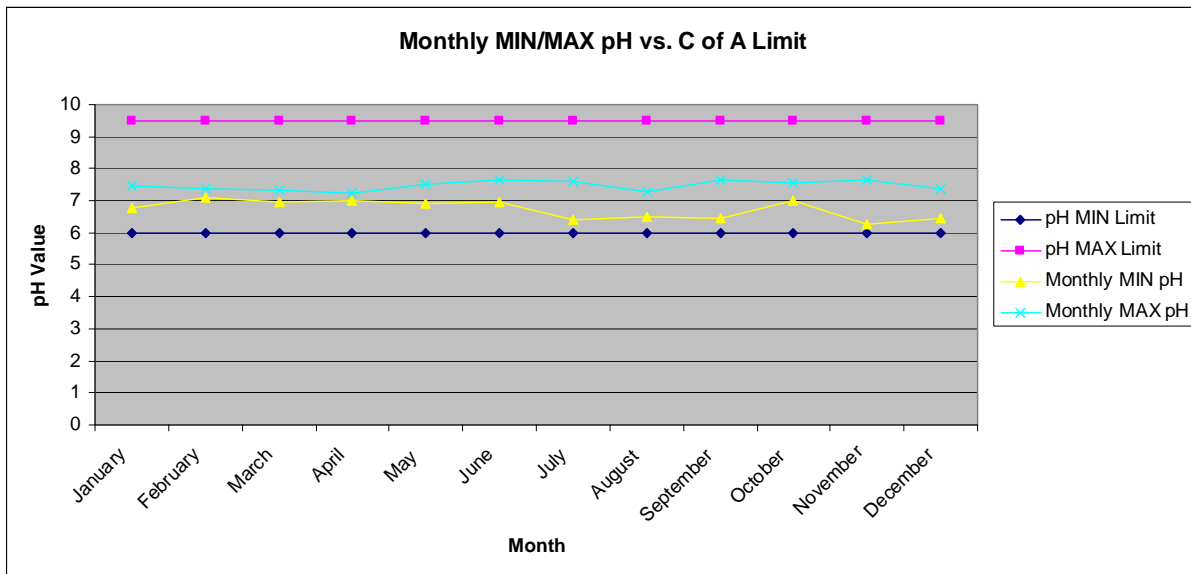


Figure 10 - Monthly Minimum & Maximum Effluent pH vs. C of A Limit



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E. Coli

Throughout the reporting period, the monthly Geometric Mean Density of E. Coli consistently remained below allowable limits and objectives. This is due to the fact that there were never any disruptions in continuous UV Disinfection of the Effluent.

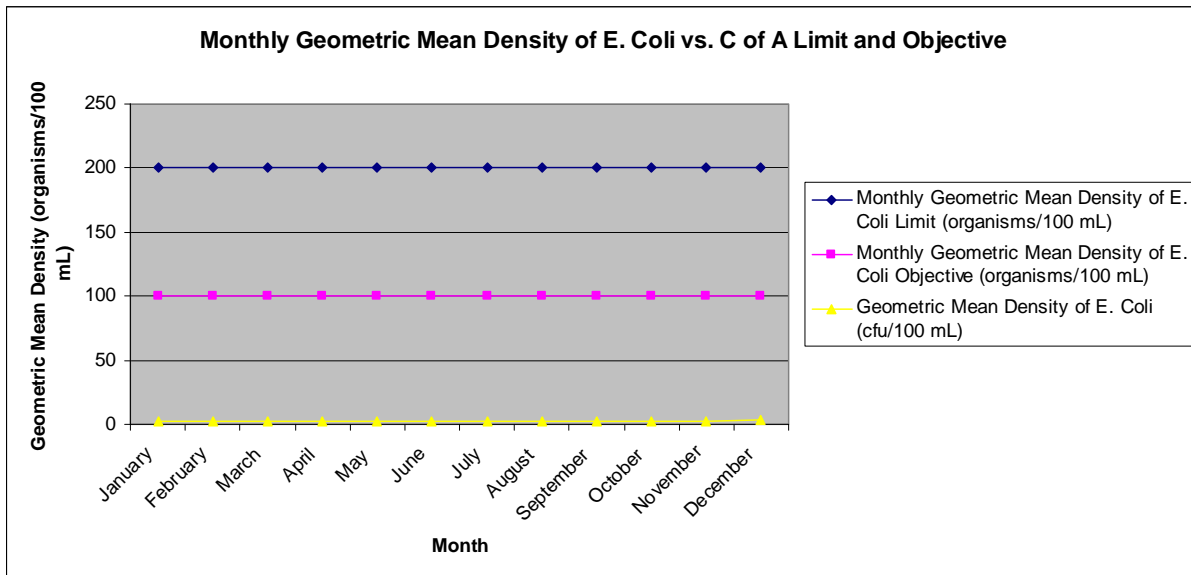


Figure 11 - Monthly Geometric Mean Density of E. Coli vs. C of A Limit and Objective



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Flow Monitoring

The FWWTP is required to monitor both Influent and Effluent flows on a continuous basis. With respect to compliance, the C of A deems the flow of sewage into the sewage treatment plant non-compliant should the average daily flow exceed 2,300 m³/d for any period of time greater than twelve consecutive calendar months. Additionally, the Owner shall ensure the flow of sewage into the sewage treatment plant does not exceed the peak flow rate of 9,000 m³/d at any time. Throughout the reporting period, there were no events of non-compliance with respect to flows as depicted in Figures 12, and 13. As seen in Figure 12, the 12-month cumulative average influent flows in the early months of the year, (January, February and March) had higher influent flow values than the following months of the year. This is due to high flows experienced in 2009.

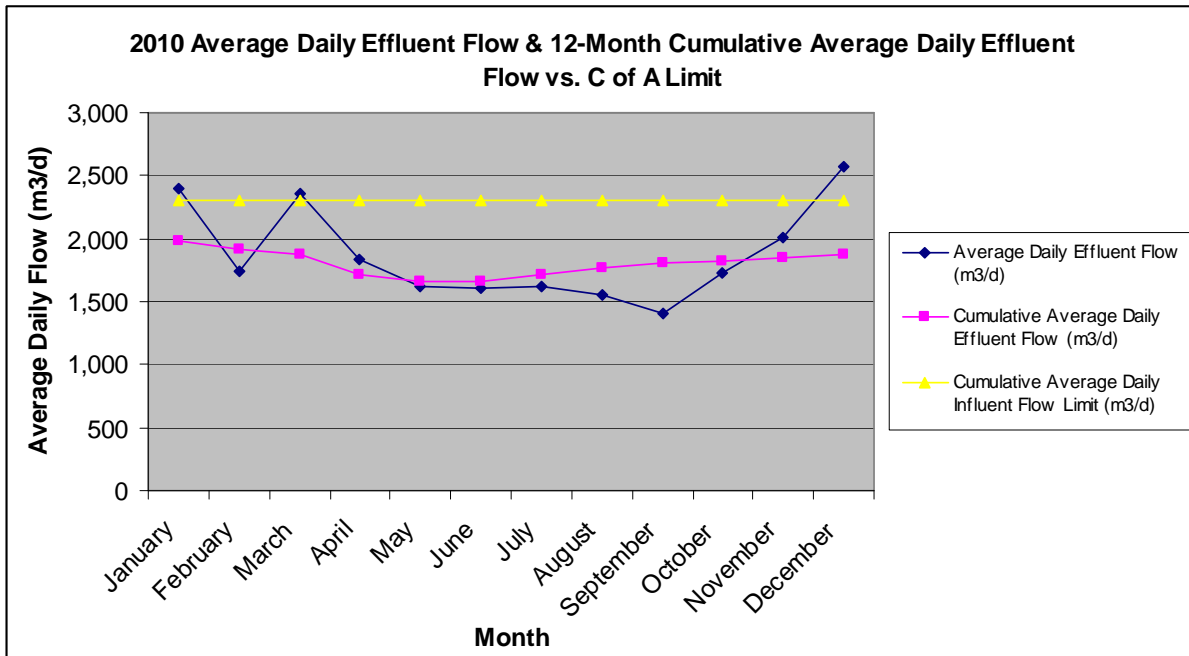


Figure 12 - Monthly Average & 12-Month Cumulative Average Daily Effluent flows vs. C of A Limit



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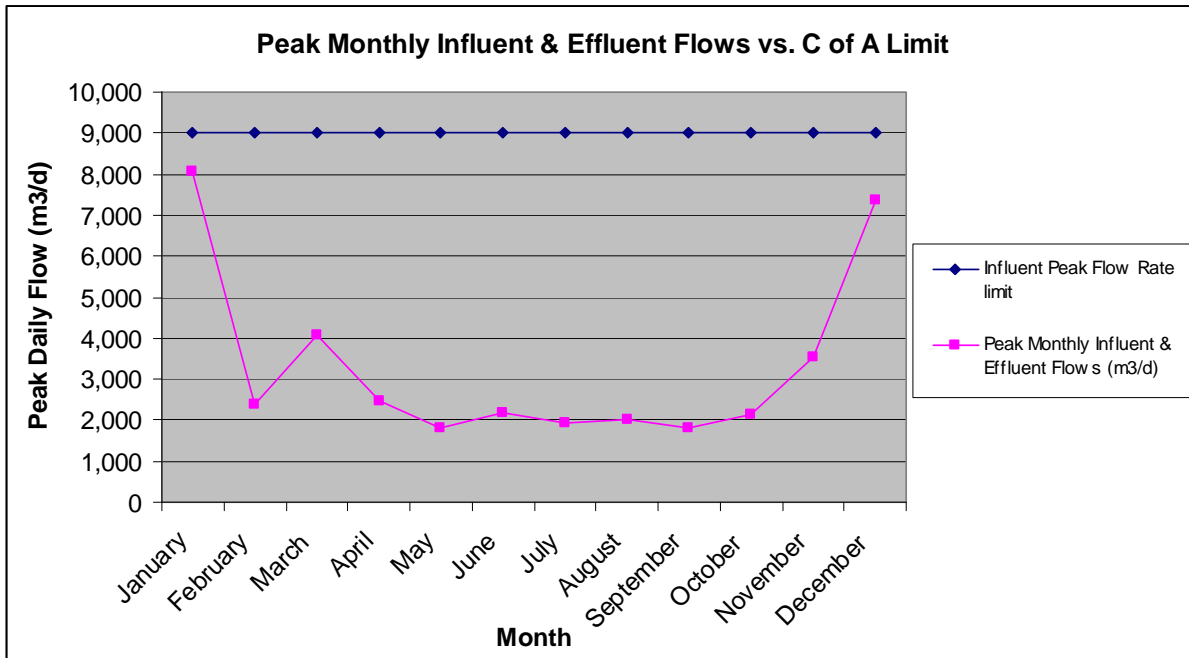


Figure 13 - Monthly Maximum Daily Influent/Effluent Flows vs. C of A Influent Flow Limit

* For the months of June, July, August, September, and October, graph is plotting maximum effluent flows.

Additional Non-Regulated C of A Monitoring Requirements:

The FWWTP operated in accordance with Condition 3.2 of the C of A throughout the reporting period. This condition states that the 'Owner shall endeavor to operate the sewage treatment plant such that the effluent will not contain any oil or other substance in amounts sufficient to create a visible sheen or film on the surface of the receiving waters...'

The FWWTP operated in accordance with Condition 3.3 of the C of A. This condition revolves around flow in the Ontario Hydro dam tailrace (where the plant outfall is located). Should flow be stopped or curtailed for more than three consecutive days in the receiving water, portable piping and pumping equipment should be installed at plant outfall to discharge directly into the main stream. This scenario never occurred throughout the reporting period.



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Nitrogen Sampling

Under Condition 2.1 (c) of the C of A there is a Nitrogen sampling requirement for both the Raw Influent and Final Effluent. Figure 14 plots the monthly average Influent and Effluent Nitrogen concentrations in relation to the Nitrogen Removal Efficiency of the plant. The plant operated with an average 99.2% Nitrogen Removal Efficiency throughout the reporting period. Should Nitrogen concentrations ever become a compliance parameter, the City is confident it would meet and exceed limits and objectives.

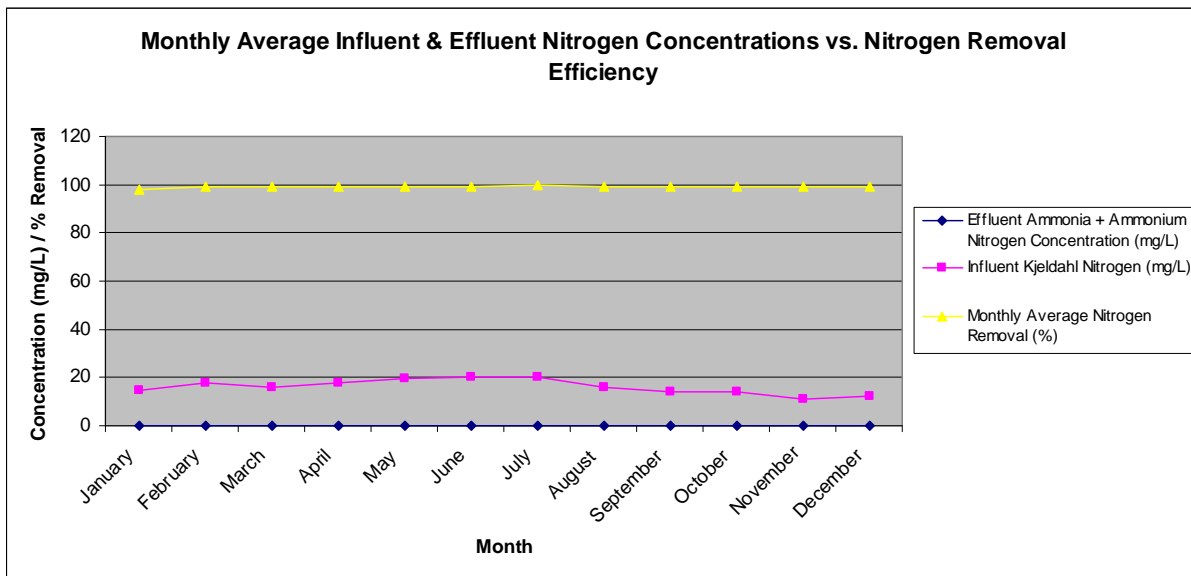


Figure 14 - Monthly Average Influent & Effluent Nitrogen Concentrations vs. Nitrogen removal efficiency

Summary of Effluent Quality Assurance or Control Measures undertaken during the reporting period:

Influent and Effluent analyses for BOD, Total Suspended Solids, Total Phosphorus, Nitrogen, and E. Coli are performed by an accredited laboratory, SGS Canada Inc, and the results obtained are used for compliance purposes. *With the exception of pH and Temperature*, in-house analyses are completed by trained operators, however these results are not used to determine compliance as there are no quality assurance/control measures in place. These results are used for process management purposes only.



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Summary of all maintenance carried out throughout the reporting period:

- ✚ Emergency Generator was serviced and tested
- ✚ Electrical MCC panels were inspected and cleaned
- ✚ A new computerized maintenance management system was set up for scheduled inspections and preventative maintenance Work Orders
- ✚ Electrical control wiring for Oxford and Riverside Drive Pump Stations was upgraded.

Description of operating problems encountered and corrective actions taken during the reporting period:

There were no operating problems experienced throughout the reporting period.

Summary of any proposed alterations, extensions, or replacement in the process or operation of the works to be completed over the next reporting period:

The City plans to start an Environmental Assessment in 2011 to explore the option of future expansion.



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Tabulation of the volume of sludge generated during the reporting period with anticipated volumes to be generated in 2011:

Month	Volume	Disposal Method	Land C of A #
January	175	Hauled to Trenton WWTP for dewatering, cake to Landfill	A021601
February	559	Hauled to Trenton WWTP for dewatering, cake to Landfill	A021601
August	448	Land Applied – Surface Spread	S-3125-51
August	368	Land Applied – Surface Spread	S-3625-76A
August	432	Land Applied – Surface Spread	S-3625-75
November	1, 122	Land Applied – Incorporated	S-3626-137
<i>Total Volume of Sludge generated throughout 2010</i>			<i>3, 104 m³</i>
<i>Estimated Volume of Sludge generation for 2011</i>			<i>4, 000 m³</i>

Outline of the proposed sludge handling methods and disposal areas to be utilized over the next reporting period:

The City intends to continue land application of it's Biosolids over the next reporting period on one of several certified land sites. Should sludge removal be necessary in the Winter months, the City will employ a certified dewatering company to remove Biosolids, dewater, and transport to Landfill.



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Summary of the calibration and maintenance procedures conducted on all monitoring equipment:

Trent Street Pumping Station Fisher & Porter Flow Meter

	Average % Error	Pass/Fail
Display	-1.08	Pass
mA Output	0.07	Pass
Totalizer	-1.25	Pass
Final Effluent Parshall Flume meter		
Display	-0.99	Pass
mA output	-0.65	Pass
Totalizer	1.24	Pass

Overview of the success and adequacy of the Works:

Throughout the reporting period, the Frankford WWTP consistently operated in accordance with the Certificate of Approval. In the future, operators will seek to continually improve plant operation through the use of the new Maintenance Management System.