



## **2009 Annual Report**

### **Frankford Wastewater Treatment Plant**



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**PUBLIC WORKS &  
ENVIRONMENTAL SERVICES**

**2009 Annual Report  
Frankford Wastewater Treatment  
Plant  
Summary Overview**

## **1. 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 m<sup>3</sup>/d, with a peak daily flow capacity of 9,000 m<sup>3</sup>. 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.



2. Summary of all monitoring data:

Effluent Quality – Effluent Monitoring Program Results with Compliance Limits											
MONTH	2009 Monthly BOD Concentration (mg/L) Objective: 15.0 mg/L Limit: 25.0 mg/L	12-Month Cumulative Average BOD Concentration (mg/L) Objective: 15.0 mg/L Limit: 25.0 mg/L	2009 Monthly Total Suspended Solids Concentration (mg/L) Objective: 15.0 mg/L Limit: 25.0 mg/L	12-Month Cumulative Average TSS Concentration (mg/L) Objective: 15.0 mg/L Limit: 25.0 mg/L	2009 Monthly Total Phosphorus Concentration (mg/L) Objective: 0.3 mg/L Limit: 0.5 mg/L	12-Month Cumulative Average TP Concentration (mg/L) Objective: 0.3 mg/L Limit 0.5 mg/L	Ammonia + Ammonium Nitrogen Concentration (mg/L)	E. Coli (cfu/100 mL) Objective: 150 cfu/100 mL Limit: 200 cfu/100 mL	pH		Temp
	MIN	MAX	Limit	Limit	Objective:	Limit	Limit	Limit	Limit	Limit	
January	2	2	2	3	0.12	0.14	0.65	2	7.67	8.22	8
February	2	2	2	3	0.09	0.13	0.10	2	7.68	7.95	7
March	2	2	9	3	0.03	0.13	0.10	2	7.68	7.74	7
April	2	2	2	3	0.07	0.12	0.15	2	7.69	8.00	10
May	2	2	2	3	0.06	0.11	0.13	2	7.69	8.20	13
June	2	2	2	3	0.09	0.11	0.10	2	7.86	8.30	16
July	2	2	2	3	0.15	0.11	0.20	2	7.67	7.95	19
August	2	2	2	3	0.10	0.10	0.88	2	7.77	8.16	19
September	2	2	2	3	0.17	0.10	0.28	2	7.60	8.15	17
October	2	2	2	3	0.10	0.10	0.93	2	7.62	8.09	13
November	2	2	2	3	0.13	0.10	0.30	2	7.61	7.90	10
December	2	2	2	3	0.09	0.10	0.12	2	7.74	8.03	7



Effluent Quality – Compliance Parameter Monthly Average & Cumulative Average Waste Loadings						
Month	2009 Monthly BOD Average Waste Loading (kg/d) Objective: 34.5 kg/d Limit: 57.5 kg/d	12-Month Cumulative Average BOD Waste Loading (kg/d) Objective: 34.5 kg/d Limit: 57.5 kg/d	2009 Monthly Total Suspended Solids Average Waste Loading (kg/d) Objective: 34.5 kg/d Limit: 57.5 kg/d	12-Month Cumulative Average TSS Waste Loading (kg/d) Objective: 34.5 kg/d Limit: 57.5 kg/d	2009 Monthly Total Phosphorus Waste Loading (kg/d) Objective: 0.7 kg/d Limit: 1.1 kg/d	12-Month Cumulative Average TP Waste Loading (kg/d) Objective: 0.7 kg/d Limit: 1.1 kg/d
January	4.4	6.0	4.4	6.3	0.3	0.33
February	5.7	5.9	5.0	6.4	0.2	0.32
March	5.3	5.8	24.0	7.6	0.1	0.31
April	7.0	5.1	7.0	7.0	0.2	0.27
May	4.6	5.0	4.6	6.9	0.1	0.26
June	3.7	4.8	3.7	6.0	0.2	0.24
July	3.1	4.4	3.1	5.6	0.2	0.24
August	2.9	4.3	2.9	5.4	0.1	0.21
September	3.0	4.2	3.0	5.3	0.3	0.20
October	3.4	4.1	3.4	5.3	0.2	0.20
November	3.5	4.1	3.5	5.2	0.2	0.20
December	5.1	4.0	5.1	5.1	0.2	0.20

Influent Quality – 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	52	96	1.86	16
February	82	92	2.09	18.4
March	59	77	1.29	10.8
April	67	86	1.07	9.7
May	86	207	4.54	21.1
June	65	82	1.87	13.3
July	92	129	2.43	19.6
August	87	128	2.57	19.5
September	91	152	2.32	16.3
October	81	174	2.04	17.5
November	95	99	2.21	19.1
December	45	65	1.41	13.1



**PUBLIC WORKS & ENVIRONMENTAL SERVICES**

**2009 Annual Report  
Frankford Wastewater Treatment Plant**

<b>Influent &amp; Effluent Quantity – 2009 Monthly Flow Summary with Compliance Parameter Influent Flow Summary</b>							
	<b>Raw Water Flows</b>						
	<i>Approved 12-Month Cumulative Average Daily Flow: 2,300 m<sup>3</sup>/d Approved Peak Daily Flow: 9,000 m<sup>3</sup>/d</i>	<i>12-Month Cumulative Average Daily Influent Flow *</i> (m <sup>3</sup> /d)	<i>Influent Monthly Peak Flow</i> (m <sup>3</sup> /d)	<i>Influent Monthly Total Flow</i> (m <sup>3</sup> /month)	<i>Effluent Average Daily Flow</i> (m <sup>3</sup> /d)	<i>Effluent Monthly Peak Flow</i> (m <sup>3</sup> /d)	<i>Effluent Monthly Total Flow</i> (m <sup>3</sup> /month)
January	2,358	2,412	3,141	73,099	2,190	3,130	67,893
February	2,606	2,419	4,966	72,963	2,492	5,114	69,773
March	2,799	2,393	4,423	86,772	2,665	4,167	82,621
April	3,710	2,313	7,555	111,311	3,512	7,188	105,371
May	2,219	2,266	2,856	68,779	2,310	2,807	71,624
June	1,614	2,243	2,183	48,426	1,868	2,362	56,046
July	1,071	2,178	1,583	33,191	1,563	2,023	48,467
August	848	2,109	1,789	26,291	1,470	1,903	45,559
September	1,014	2,057	1,441	30,406	1,493	1,776	44,800
October	1,481	2,044	2,062	45,912	1,685	2,147	52,232
November	1,641	2,018	2,068	49,218	1,753	2,167	52,575
December	2,397	1,980	4,275	71,912	2,545	4,011	76,336

\* C of A # 3-0843-94-956 Condition 1.2 states that 'the Owner shall ensure that the flow of sewage **into the sewage treatment plant** does not exceed the average daily flow of 2,300 m<sup>3</sup>/d for any period of time greater than twelve (12) consecutive calendar months'. The Cumulative Average Daily Influent flow is an average of the average daily flow for 12 consecutive calendar months. Therefore for the months of January, February, March, and April the Frankford WWTP was operating above the 2,300 m<sup>3</sup>/d influent flow limit as set out in the C of A.



**3. Comprehensive interpretation of all monitoring data and analytical data collected relative to the works and a comparison to the effluent quality and quantity criteria described in Condition 1:**

**Biological Oxygen Demand (BOD)**

The Frankford WWTP had an average BOD removal efficiency of 97.2%. Referring to Figures 1 (a.-c.) it is evident the plant is very capable of removing high BOD levels in the influent even during high flow situations. The C of A states that ‘*non-compliance with respect to BOD Concentrations and Waste Loadings occurs when the annual average concentration during any twelve (12) consecutive calendar months exceeds the corresponding Effluent Limit*’. The plant did not exceed either the concentration or the average waste loading limit according to C of A requirements, and did not exceed the C of A limit during any month in 2009 either. In fact, the cumulative annual average is quite close to the monthly averages for both Concentrations and Waste Loadings as depicted in Figures (b and c).

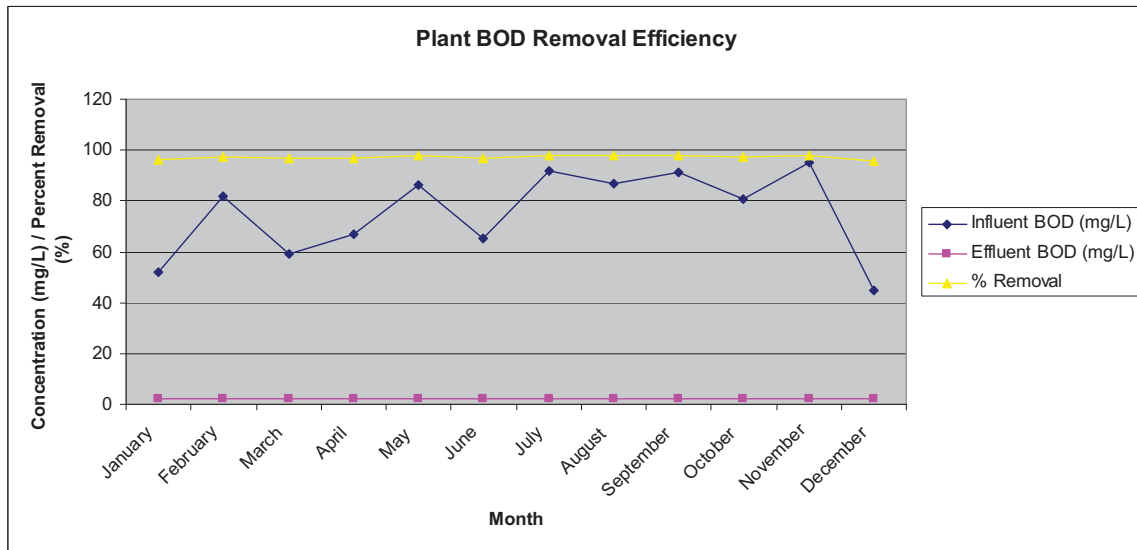


Figure 1a. Plant BOD Removal Efficiency

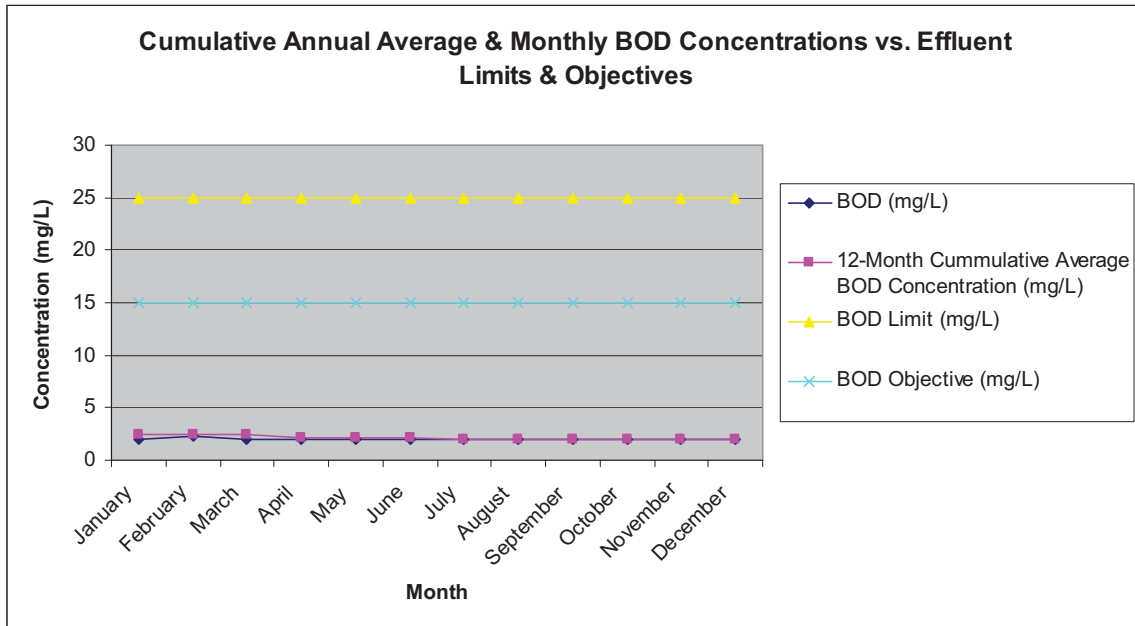


Figure 1b. 12-Month Cumulative Average & Monthly BOD Concentrations vs. Effluent Limit & Objective

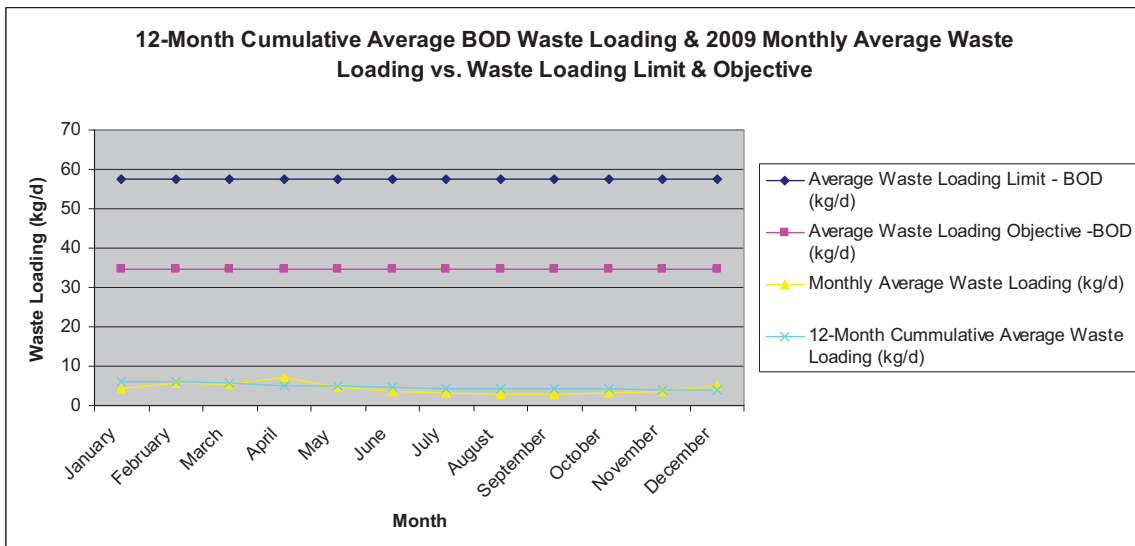


Figure 1c. 12-Month Cumulative Average BOD Waste Loading & 2009 Monthly Average Waste Loading vs. C of A Waste Loading Limit & Objective



**Total Suspended Solids (TSS)**

The Frankford WWTP had an average TSS removal efficiency of 97.3% throughout the reporting period. According to Figures 2 (a.-c.), it is evident the plant was able to remove the occasionally high Total Suspended Solids coming into the plant. The C of A states that *'non-compliance with respect to TSS Concentrations and Waste Loadings occurs when the annual average concentration during any twelve (12) consecutive calendar months exceeds the corresponding Effluent Limit'*. The plant did not exceed either the Concentration Limit of 25.0 mg/L or the Average Waste Loading limit of 57.5 kg/d according to C of A requirements, and did not exceed the C of A limits or objectives during any month in 2009 either. In fact, the cumulative annual average is quite close to the monthly averages for both Concentrations and Waste Loadings as depicted in Figures (b and c).

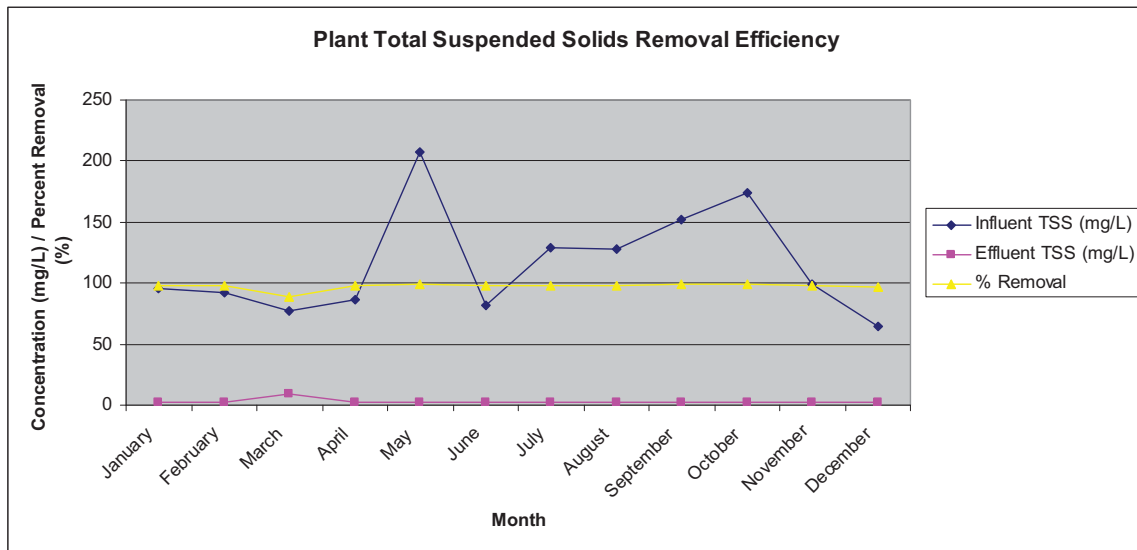


Figure 2a. Plant Total Suspended Solids Removal Efficiency

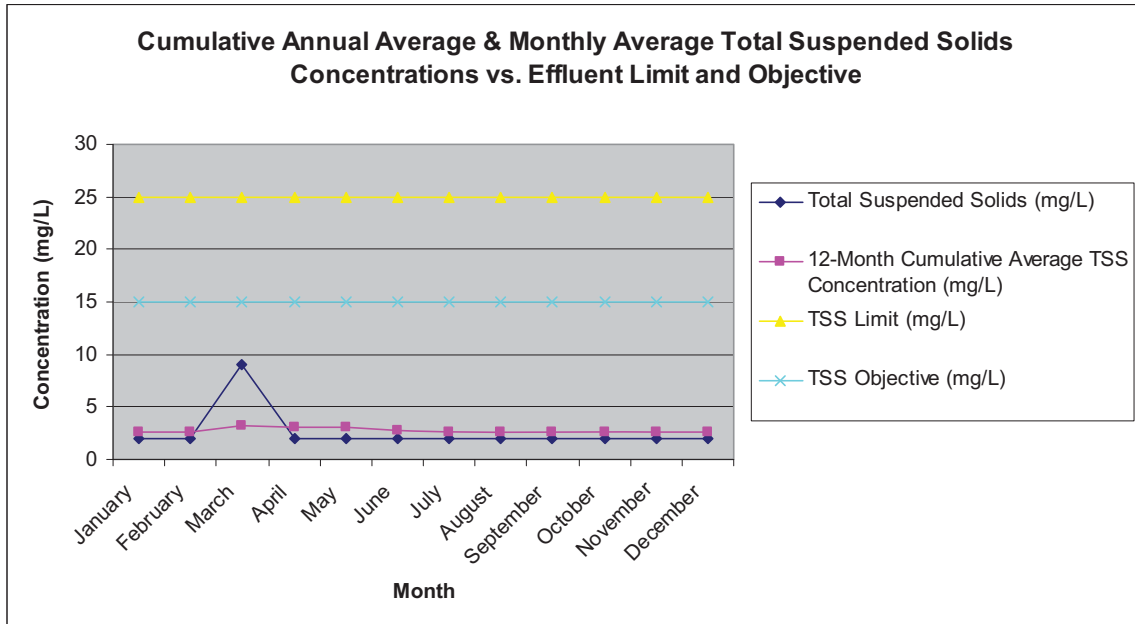


Figure 2b. 12-Month Cumulative Average & Monthly Average Total Suspended Solids Concentrations vs. Effluent Limit & Objective

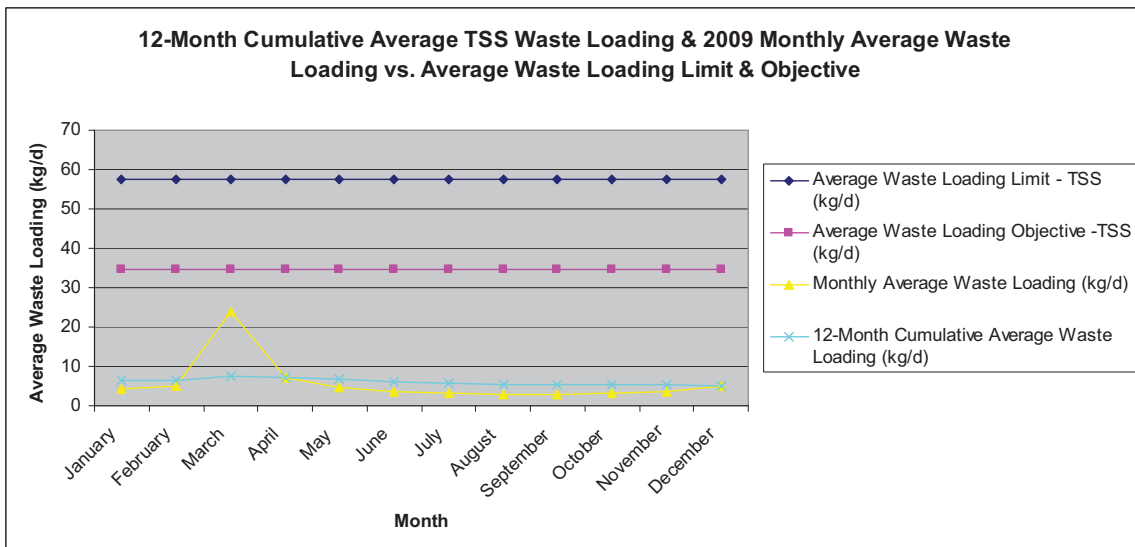


Figure 2c. 12-Month Cumulative Average TSS Waste Loading & 2009 Monthly Average Waste Loadings vs. Effluent Waste Loading Limit & Objective



**Total Phosphorus (TP)**

The Frankford WWTP had an average TP Removal Efficiency of 95.0% throughout the reporting period. According to Figure 3a, it is evident the plant was able to remove the occasionally high Total Phosphorus concentrations coming in to the plant. The C of A states that ‘*non-compliance with respect to TP Concentrations occurs when the Monthly Average Concentration exceeds the Limit of 0.5 mg/L. Average Waste Loading non-compliance occurs when the annual average concentration during any twelve (12) consecutive calendar months exceeds 1.1 kg/d.*’ According to Figures 3 (b and c), it is evident the plant was able to remain within compliance limits and consistently met the Effluent Objective throughout 2009.

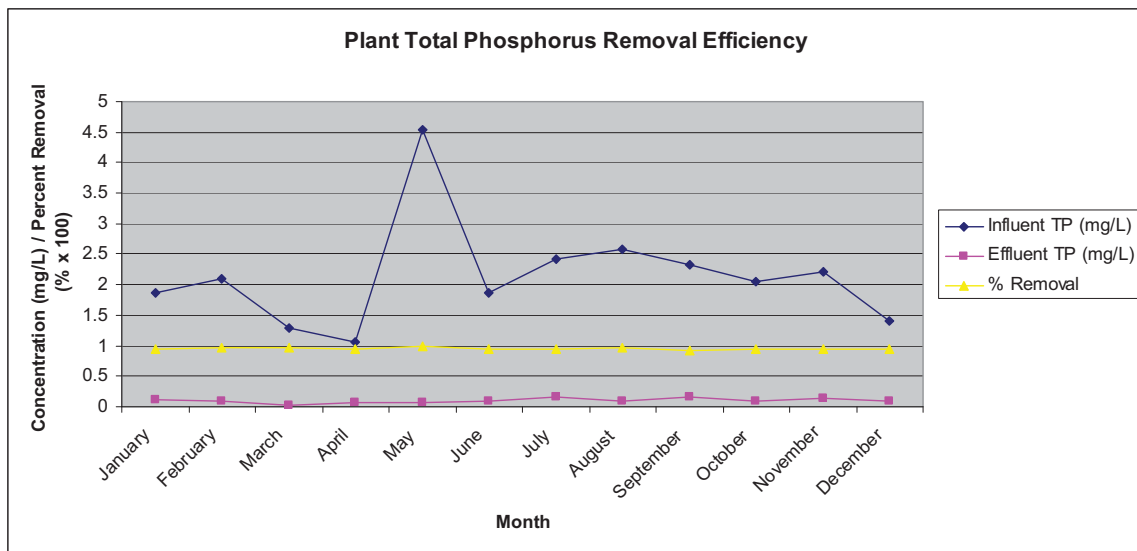


Figure 3a. Plant Total Phosphorus Removal Efficiency (Percent Removal x 100)

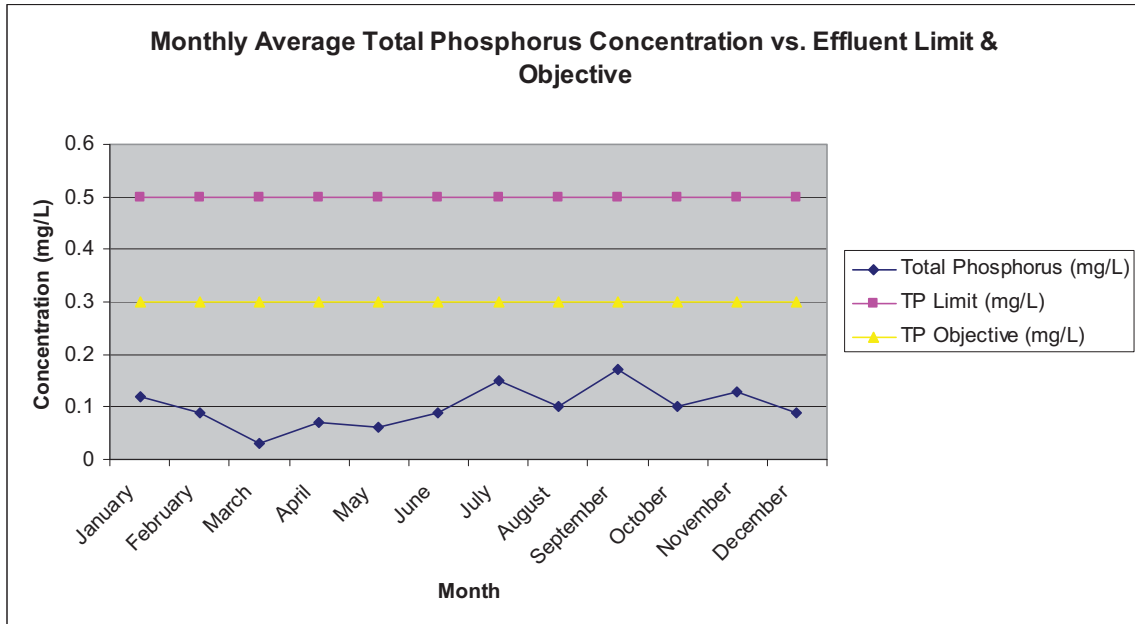


Figure 3b. Monthly Average Total Phosphorus Concentration vs. Effluent Limit & Objective

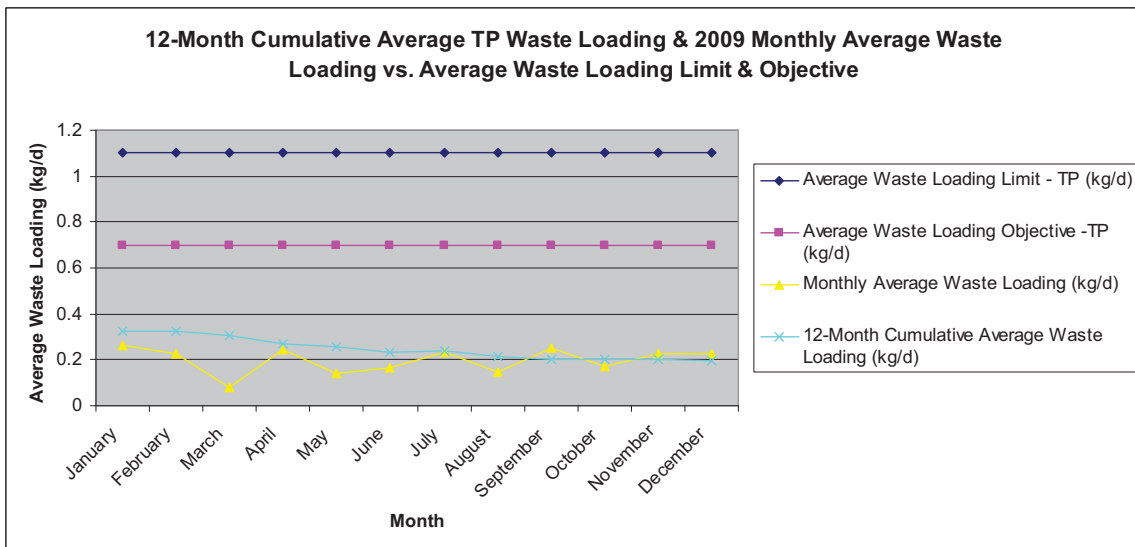


Figure 3c. 12-Month Cumulative Average TP Waste Loading & 2009 Monthly Average Waste Loading vs. Average Waste Loading Limit & Objective

**Nitrogen Removal**

There are no Limits or Objectives stipulated in the C of A for Nitrogen Concentrations or Waste Loadings. However, with an average Plant Nitrogen Removal Efficiency of 98.0% it can be said Nitrogen levels in the Effluent should be satisfactory. Throughout 2009 the Average Concentration of Nitrogen discharged to the Trent River was 0.33 mg/L. The average Influent Nitrogen Concentration was 16.2 mg/L. The difference in these values suggests the plant is quite capable of processing the high incoming nitrogen concentrations easily.

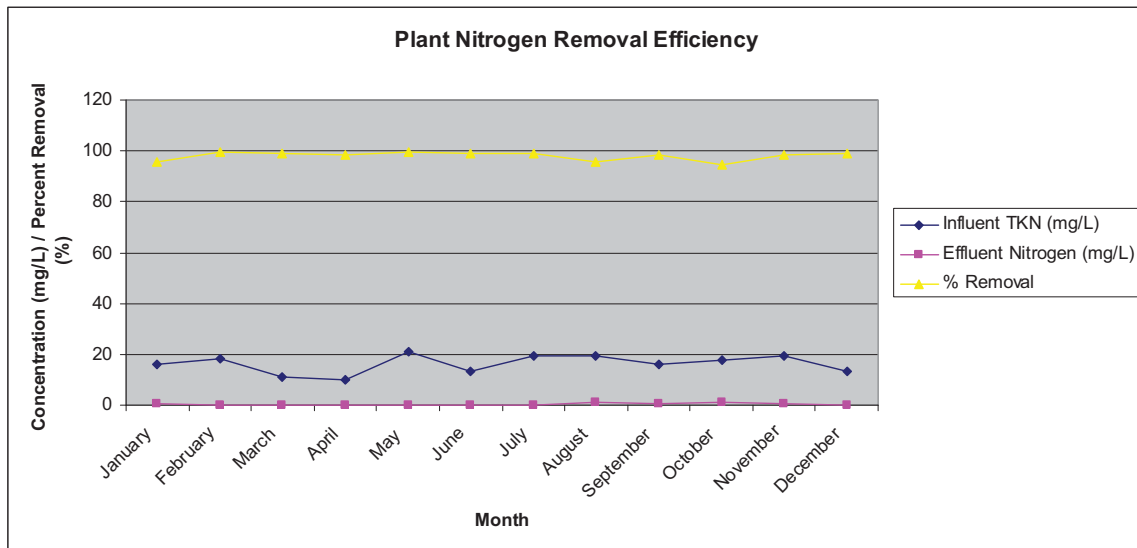


Figure 4a. Plant Nitrogen Removal Efficiency



**pH**

The Frankford WWTP C of A stipulates the ‘pH of the effluent shall remain with 6.0 and 9.5 at all times’. Figure 5 clearly shows the pH remained within compliance limits throughout the reporting period.

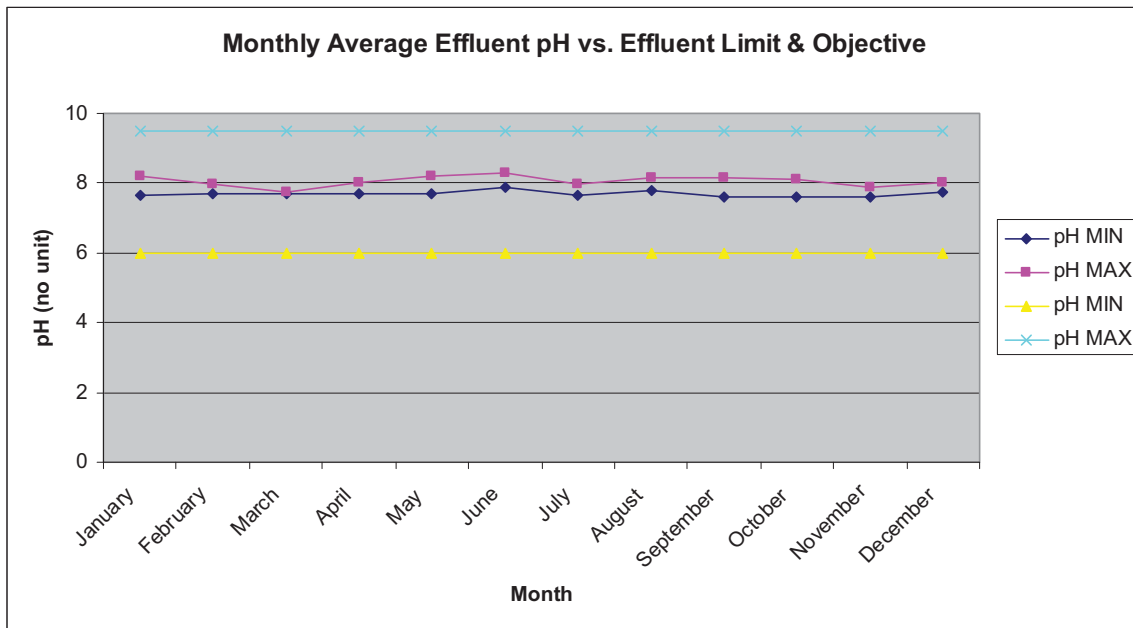


Figure 5: Monthly Average Effluent pH vs. Effluent Limit & Objective

**E. Coli**

The Frankford WWTP C of A stipulates the ‘Monthly Geometric Mean Density of *E. Coli* shall not exceed 200 cfu/100 mL’. The plant also has an objective to remain below 150 cfu/100 mL monthly. The plant was able to operate such that the effluent was continuously disinfected with an average monthly *E. Coli* concentration of 2 cfu/100 mL. This shows the UV irradiation disinfection process works very well at the Frankford WWTP. Please refer to the Effluent Quality Table for details on results obtained throughout the reporting period.



**Influent & Effluent Flows in 2009**

The Frankford WWTP C of A stipulates that ‘the Owner shall ensure that the flow of sewage into the sewage treatment plant does not exceed the average daily flow of 2,300 m<sup>3</sup>/d for any period of time greater than twelve (12) consecutive calendar months’. For the months of January, February, March, and April, the 12-month cumulative average daily flow (the average of the monthly average daily flow over the last 12 months) exceeded the C of A limit. This is due in most part to the high flows during 2008. In January, February, March, April, and December of 2009, each month’s average daily flow was above the design capacity of 2,300 m<sup>3</sup> as well. The City is working with a consultant to look at re-rating the facility to a higher capacity based on the historical treatment performance.

**The last five (5) years of historical annual average daily plant flows are depicted in Figure 6 c. The last 3-year average annual daily flow of 2,132 m<sup>3</sup>/d shows the plant is operating at 93% of its approved capacity, while the last 5-year average annual daily flow of 2,053 m<sup>3</sup>/d shows the plant was operating at 89% of the plants approved capacity.**

Please see the Influent & Effluent Quantity table for further details on monthly flows throughout the year.

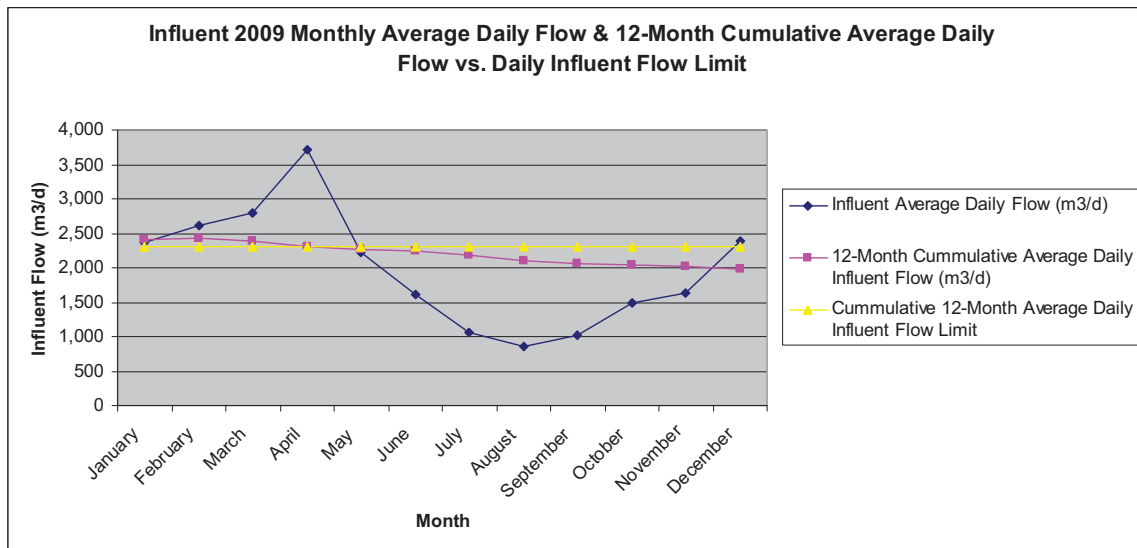


Figure 6a. 2009 Monthly Average Influent Daily Flow & 12-Month Cumulative Average Daily Flow vs. C of A Influent Flow Limit

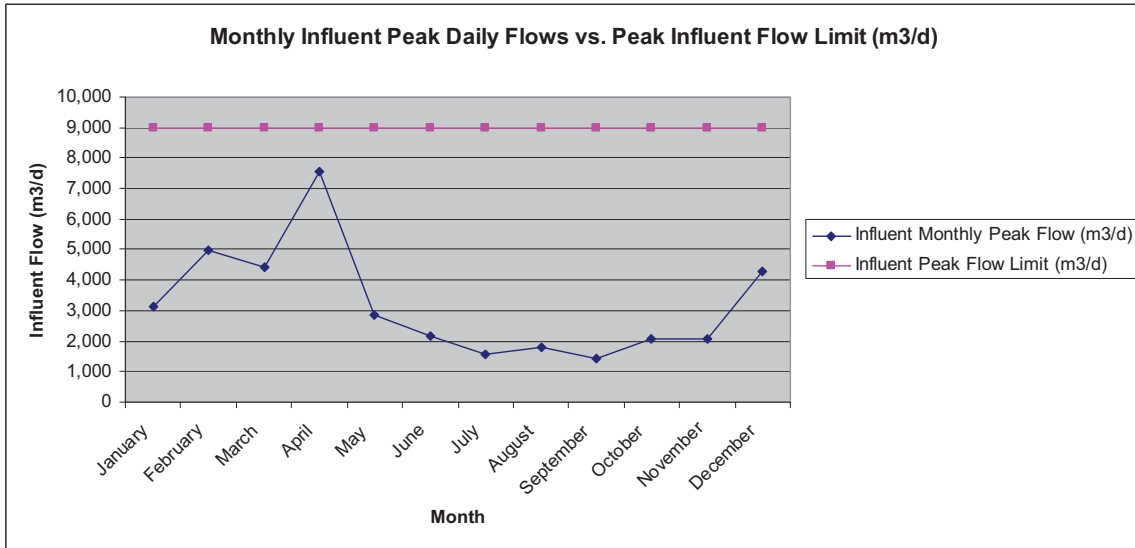


Figure 6b. 2009 Monthly Influent Peak Flows vs. Peak Influent Flow Limit

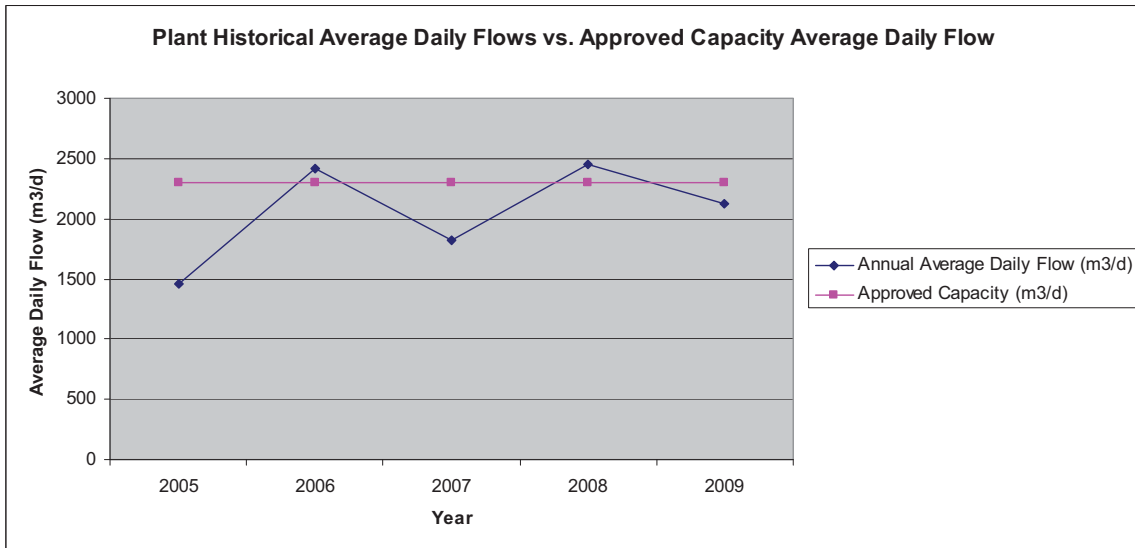







Figure 6c. Plant Historical Average Daily Flows vs. Approved Capacity Average Daily Flow

**4. Summary of any effluent quality assurance or control measures undertaken in the reporting period:**

Influent and Effluent analyses for BOD, Total Suspended Solids, Total Phosphorus, Total Ammonia Nitrogen, E. Coli, and pH are performed by an accredited laboratory, SGS Lakefield Research Ltd, and the results obtained are used for compliance purposes. In-house analyses are also 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.

**5. Summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming a part of the Works:**

-  Clarifier Gear Box replacement
-  Alum pump replacement
-  Alarm upgrades
-  A computerized maintenance management system will be implemented in 2010
-  Routine preventative maintenance performed throughout the year

**6. Description of any operating problems encountered and corrective actions taken during the reporting period:**

In September 2009, a report was made to the Ministry of Environment in respect of the Peak Flow Rate limit of 9,000 m<sup>3</sup>/d exceedance. In hindsight, this report should not have been made as there are two separate values reported for the Trent Street Pumping Station on the SCADA reports (where the plant influent flow meter is located), and the value reported was not entirely accurate. There is a 'total flow' volume reported in the monthly reports along with a 'Peak Flow' volume reporting column. This peak flow volume is an instantaneous capture of the Maximum Litre/sec. volume being pumped by the Low Lift pumping station, and not a daily Maximum Flow Rate. The Actual Maximum daily flow or Daily Peak Flow was never exceeded throughout the inspection period. Therefore, there were no operating problems throughout the reporting period to note.

**7. 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 OWRA:**

Not Applicable

**8. 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 with an outline of the proposed sludge handling methods and disposal areas to be utilized over the next reporting period:**

- ✚ February 9, 2009 a total of 462 m<sup>3</sup> was hauled to Trenton WWTP for dewatering by Entec Waste Management and this was sent to the Frankford Landfill Site
- ✚ In May of 2009 a total of 1,314 m<sup>3</sup> was dewatered on-site by Entec Waste Management and sent to the Frankford Landfill site
- ✚ October 1, 2009 a total of 1,085 m<sup>3</sup> of liquid biosolids was land applied by Widespread Agri Systems on the Hamilton Farm
- ✚ November 12, 2009 a total of 320 m<sup>3</sup> of liquid biosolids was land applied by Widespread Agri Systems on the Hamilton Farm

Therefore a total of 3,181 m<sup>3</sup> of biosolids were removed from the Frankford WWTP during 2009.

The City anticipates that approx. 3,500 m<sup>3</sup> of biosolids will be generated in 2010.

Land application will be the preferred method of disposal in the future.

**9. Overview of the success and adequacy of the sewage treatment plant:**

The Frankford WWTP has demonstrated that it is capable and does produce excellent quality Effluent on a continual basis. The plant successfully removed biosolids throughout the year and was able to land apply most of the material making this a significant cost savings for the City of Quinte West. The City is currently in the process of having XCG Consultants Ltd do a capacity assessment of the Frankford WWTP to explore the option of re-rating the Frankford WWTP to a larger capacity.