2009 Annual Report

Trenton Wastewater Treatment Plant

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1. Executive Summary

The Trenton Wastewater Treatment Plant, MOE Identifier Number: 110000775, is located at 25 Couch Crescent in Trenton, ON. The plant operates under Certificates of Approval (C of A) numbers 3-0732-93-006, No. 8-4116-92-006, and No. 1-0210-69-753236. The facility is owned and operated by the Corporation of the City of Quinte West. The Trenton WWTP is rated as a Class 3 facility. It is described as a conventional activated sludge treatment plant with tertiary filtration treatment. Anaerobic digestion is used at this facility, and disinfection is through UV irradiation treatment. The receiving water body is the Bay of Quinte. The plant has a design capacity of 15,900 m^3/day, and a design peak flow capacity of 51,100 m^3/day. The Trenton Wastewater Treatment plant services a population of approximately 17,000 people along with various industries in the area.

As per C of A number 3-0732-93-006, Condition 17 (a-c), an annual report shall be prepared within 90 days following the end of the calendar year detailing the following:

i. Executive summary (the annual report as a whole satisfies this requirement);

ii. tabulation and comprehensive interpretation of all monitoring data and analytical results collected in accordance with Conditions Nos. 13, 14 and 15 of the C of A during the reporting period, and a comparison to the effluent quality and quantity criteria described in Conditions Nos. 10, 11, 12 and 13;

iii. summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the works;

iv. description of all operating problems encountered and corrective actions taken during the reporting period;

v. tabulation of the volume of sludge generated in the reporting period and an outline of anticipated volumes to be generated over the next reporting period, and an outline of the sludge handling methods and disposal areas to be utilized over the next reporting period;

vi. evaluation of the calibration and maintenance procedures conducted on all monitoring equipment;

vii. an evaluation for the need for modifications to the works to improve performance and reliability and to minimize upsets and bypasses.

This condition, or annual reporting requirement is imposed 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 Utilisation Guidelines and consistent with requirements of Part V of the Environmental Protection Act.

2. Tabulation and comprehensive interpretation of all monitoring data and analytical results:

Effluent Quality - Compliance Criteria for Effluent Concentrations and Loadings							
MONTH	**BOD** *Objective: Concentration 15.0 mg/L Loading: 238.5 kg/d*		**Suspended Solids** *Objective: Concentration 15.0 mg/L Loading: 238.5 kg/d*		**Total Phosphorous** *Objective: Concentration 0.5 mg/L Loading: 8.0 kg/d*		**E. Coli** *Effluent Objective: 200 cfu/100 mL*
	Monthly Concentration (mg/L) *Limit:25.0 mg/L*	**Monthly Loading (kg/d)** *Limit: 397.5 kg/d*	**Monthly Concentration (mg/L)** *Limit:25.0 mg/L*	**Monthly Loading (kg/d)** *Limit: 397.5 kg/d*	**Monthly Concentration (mg/L)** *Limit: 1.0 mg/L*	**Monthly Loading (kg/d)** *Limit: 15.9 kg/d*	**Monthly Geometric Mean density** (cfu/100 mL)
January	21	269.7	26	333.9	0.68	8.7	315
February	10	157.5	6	94.5	0.07	1.1	229
March	18	284.2	11	173.7	0.14	2.2	2,972
April	12	219.4	14	256.0	0.18	3.3	66
May	11	154.8	5	70.4	0.34	4.8	907
June	16	186.9	3	35.0	0.18	2.1	74
July	6	70.7	5	58.9	0.25	2.9	2
August	5	55.7	4	44.6	0.28	3.1	4
September	3	34.3	4	45.8	0.28	3.2	66
October	6	83.4	3	41.7	0.08	1.1	12
November	8	114.2	10	142.7	0.13	1.9	60
December	7	116.7	6	100.0	0.06	1.0	320

Effluent Quality – Non-Compliance Criteria Cumulative Average Concentrations & Loadings						
Month	**BOD** *Objective:* *Concentration 15.0 mg/L* *Loading: 238.5 kg/d*		**Suspended Solids** *Objective:* *Concentration 15.0 mg/L* *Loading: 238.5 kg/d*		**Total Phosphorous** *Objective:* *Concentration 0.5 mg/L* *Loading: 8.0 kg/d*	
	12-month Cumulative Average Concentration (mg/L)	**12-month Cumulative Average Loading** (kg/d)	**12-month Cumulative Average Concentration** (mg/L)	**12-month Cumulative Average Loading** (kg/d)	**12-month Cumulative Average Concentration** (mg/L)	**12-month Cumulative Average Loading** (kg/d)
January	17.4	240.00	13.1	245.35	0.33	4.46
February	16.6	231.69	12.2	231.79	0.30	4.10
March	17.5	243.71	12.2	234.60	0.29	3.84
April	17.2	228.24	12.5	222.18	0.28	3.48
May	15.9	212.42	12.4	199.32	0.29	3.66
June	16.0	212.60	11.7	186.85	0.28	3.53
July	15.4	207.19	11.4	180.46	0.27	3.41
August	14.0	190.37	10.4	162.70	0.26	3.29
September	13.1	182.26	8.9	155.55	0.25	3.24
October	11.9	172.93	7.7	142.74	0.23	3.09
November	12.1	177.75	8.2	149.95	0.23	3.16
December	10.3	145.60	8.1	116.40	0.20	2.96

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Effluent Quality - Weekly Monitoring Program Analytical Results

Month	Dissolved Reactive Phosphorus (mg/L)	Total Kheldahl Nitrogen (mg/L)	Ammonia + Ammonium (mg/L)	Nitrite + Nitrate (mg/L)	Alkalinity (mg/L)	Chlorides (mg/L)	Conductivity (microS/cm)	Total Coliforms (cfu/100 mL)	Faecal Streptococcus (cfu/100 mL)	pH MIN	pH MAX	Temp. (deg. C)
January	0.03	13	12	4.7	230	188	1,075	11,208	1,575	6.6	8.0	8
February	0.03	8	8	2.8	198	215	1,050	2,132	313	6.6	7.7	9
March	0.03	13	12	2.8	198	192	1,085	5,526	4,251	6.9	8.6	9
April	0.03	7	6.3	2.5	221	185	1,043	1,136	51	7.1	8.0	10
May	0.12	13	12.1	2.3	230	156	983	3,149	294	7.0	7.7	14
June	0.11	9.7	8.6	4	209	142	953	1,913	46	7.0	8.1	18
July	0.06	4	3.4	7.3	144	130	831	12	2	6.9	8.0	21
August	0.16	3.2	2.2	9.87	134	123	819	16	2	7.0	8.1	22
September	0.15	1.4	0.9	8.7	126	112	769	711	86	7.0	8.0	22
October	0.03	2.2	1.5	8.8	154	120	802	124	20	7.1	8.1	18
November	0.04	2	1.4	4.9	183	113	792	419	93	7.1	7.9	15
December	0.03	3.4	2.6	4.1	207	126	878	72	16	7.0	7.9	10

Influent Quality - Weekly Monitoring Program Analytical Results

(mg/L unless otherwise stated)

Month	BOD_5	Total Suspended Solids	Total Phosphorus	Dissolved Reactive Phosphorus	Total Kjeldahl Nitrogen	Ammonia + Ammonium Nitrogen	Nitrite + Nitrate	Alkalinity	Chlorides	Conductivity (microS/cm)	pH MIN	pH MAX
January	345	526	10.7	0.92	54	18.1	0.06	251	190	1,070	7.1	8.1
February	230	385	3.5	0.9	18.9	10.3	0.1	237	203	1,014	6.9	7.7
March	238	299	2.8	1.1	11	7.1	0.06	223	206	1,015	7.2	7.8
April	245	236	3.34	0.92	13.6	6.7	0.06	254	183	1,027	7.2	7.6
May	201	229	3.3	1.4	13.3	9.5	0.06	263	166	997	7.2	7.4
June	217	276	3.8	1.59	23.6	12.6	0.06	266	142	987	7.0	7.5
July	185	267	3.2	1.2	14.5	11.3	0.06	201	143	622	7.1	7.8
August	205	280	4.3	1.8	19.7	13.4	0.06	238	123	877	7.2	7.5
September	179	268	3.6	1.6	18.6	16.4	0.06	248	114	969	7.0	7.9
October	173	256	3	0.8	13.4	10	0.06	248	125	848	7.1	7.7
November	201	230	2.5	0.78	12.5	8.1	0.06	243	118	833	7.1	7.5

Effluent Quantity – Flow Data							
Month	**Raw Water Flows** *Approved Capacity of 15,900 m^3/d Approved Peak flow of 51,100 m^3/d*			**Final Effluent Flows** *Approved Capacity of 15,900 m^3/d Approved Peak flow of 51,100 m^3/d*			
	Total Flow (m^3/month)	Average Flow (m^3/d)	Peak Flow (m^3/d)	Total Flow (m^3/month)	Annual Cumulative Average (m^3/d)	Monthly Average (m^3/d)	Peak Flow (m^3/d)
January	315,573	10,180	16,967	398,153	13,645	12,844	16,365
February *	388,502	13,875	43,704	440,924	13,828	15,747	23,188
March	424,382	13,690	28,978	489,386	13,649	15,787	20,558
April	561,183	18,706	50,112	548,537	13,064	18,285	25,322
May **	297,076	9,583	20,622	436,382	13,132	14,077	20,647
June **	193,623	6,454	8,063	350,402	13,099	11,680	13,871
July ***	285,985	9,225	9,504	365,203	13,158	11,781	14,738
August	284,642	9,182	9,504	345,382	13,132	11,141	13,551
September	338,611	11,287	25,554	343,249	13,303	11,442	16,931
October	507,824	16,381	21,759	431,068	13,639	13,905	16,742
November	559,754	18,658	28,216	428,130	14,013	14,271	16,809
December	573,940	18,514	26,798	516,843	13,969	16,672	20,141

* In February there were three days where the influent flow meter was out of service due to SCADA issues.
** Influent flow meter calibration issues as of May 12th, readings not reliable for month of May, and June.
*** Influent flow signals are only used for process control purposes while Final Effluent flows used for all reporting requirements.

2. Comprehensive interpretation of all monitoring data and analytical results collected in accordance with Conditions 13, 14, and 15 of the C of A, and a comparison to the effluent quality and quantity criteria described in Condition # 10, 11, 12, and 13:

2009 Summary of Bypasses and Spills		
Date	**Description**	**Samples Collected during bypass**
January 27, 2009	**Tertiary filter bypass** of secondary UV treated sewage to Bay of Quinte due to secondary blankets not settling from the capacity of sludge within the plant. Operator reports samples are not being taken. Operator reports that they have contracted out to have a sludge belt press and a sludge thickener to come and remove the sludge from the plant. Bypass complete January 30, 2009, volume of 24, 900 m^3 to Bay, for a duration of 72 hours.	**BOD** = 20.5 mg/L **Total Suspended Solids** = 44 mg/L **Total Phosphorous** = 0.67 mg/L **E. Coli** = 828 cfu/100 mL
March 20, 2009	**Methane Gas leak** in Digester #2. Complete rebuild of gas train system taking place into 2010. Leak still active as of December 31, 2009. Repairs scheduled to be complete April 2010	Not applicable
July 19, 2009	**Spill** – Sanitary sewer forcemain rupture on Douglas Rd. Raw sewage entering storm sewer was cleaned out as best as possible and chlorinated. Storm Sewer discharges to Trent River. Forcemain repair lasted approx. 5 hours with an estimated spill volume of 144 m^3.	**BOD** = 89 mg/L **Total suspended solids** = 16 mg/L **Total Phosphorous** = 4.78 mg/L **E. Coli** = 18, 500 cfu/100 mL
September 23 – September 28 & October 5, 2009 – November 5, 2009	**Partial Tertiary filter bypass** – Clarifier #2 drive shaft gears broke. Therefore to perform necessary maintenance and allow staff to enter the clarifier safely a partial tertiary filter bypass commenced to reduce the hydraulic head on the clarifier effluent channel. Due to a heavy rainfall however on October 5, clarifier repairs had to be stopped and the clarifier filled to allow for the excess influent flow into the plant. Repairs were resumed on October 5, 2009 and lasted until November 5, 2009 as damages to the clarifier were much more extensive than originally planned. An estimated total of 288,462 m^3 was bypassed for a total duration of 38 days.	**BOD** = 6.4 mg/L **Total Suspended Solids** = 4.6 mg/L **Total Phosphorous** = 0.13 mg/L **E. Coli** = 61 cfu/100 mL
September 29 – September 30, 2009	**Partial Tertiary filter bypass** – Due to a period of heavy rainfall, the plant experienced higher than normal influent flows for a period of approx. 48 hrs. The filters were not able to process the inflow quick enough, therefore the level of the filter increased, overflowing the bypass weir of the filter. This caused a blending of the final filtered effluent, and the partially treated effluent going to the Bay of Quinte. Samples were collected during the bypass. The estimated volume bypassed is 5,080 m^3.	**BOD** = 7 mg/L **Total Suspended Solids** = 12 mg/L **Total Phosphorous** = 0.32 mg/L **E. Coli** = 320 cfu/100 mL
December 3, 2009	**Tertiary filter bypass** – December 3, 2009 – January 27, 2010. Due to higher than normal influent flows during a rain event on December 3, 2009, tertiary filters were not able to process inflow quick enough resulting in effluent water overflowing weirs of filters. This caused a blending of final filtered effluent water and partially treated effluent water. As a result of this poor filter performance, both filters were taken offline with MOE approval on December 9, 2009 for yearly preventative maintenance and cleaning. The estimated volume bypassed is 686, 287 m^3 for a duration of 44 days.	Effluent samples collected to Month End: **BOD** = 7.6 mg/L **Total Suspended Solids** = 5.2 mg/L **Total Phosphorous** = 0.06 mg/L **E. Coli** = 1900 cfu/100 mL

Biological Oxygen Demand (BOD)

The Trenton WWTP accepts waste discharge from various industries in the City resulting in higher than typical raw BOD concentrations. Referring to the following figures 1a.-d., it is clearly evident the plant is able to process these high BOD levels, with an average reduction rate of 95.5%, without exceeding compliance limits.

Under the C of A non-compliance with regulatory requirements for BOD occurs when '*the annual average concentration and waste loading of BOD exceeds effluent limits during any twelve (12) consecutive calendar months'*. The plant was able to remain within compliance, however experienced difficulty with the annual cumulative effluent objective concentration of 15 mg/L between January and July of 2009. The annual cumulative average BOD waste loadings have also remained within compliance limits throughout the reporting period, however did not meet the effluent objective of 238.5 kg/d for January and March.

In January, March, and June of 2009 the plant was not able to meet the effluent objective concentration of 15 mg/L for the month. In January and March of 2009 the plant was not able to meet the effluent objective waste loading of 238.5 kg/d for the particular month in which analytical results were collected. Should the plant have exceeded the BOD compliance limits, this still would not have been a reportable occurrence as the C of A only requires the City to make reports based on the 12-month cumulative average.

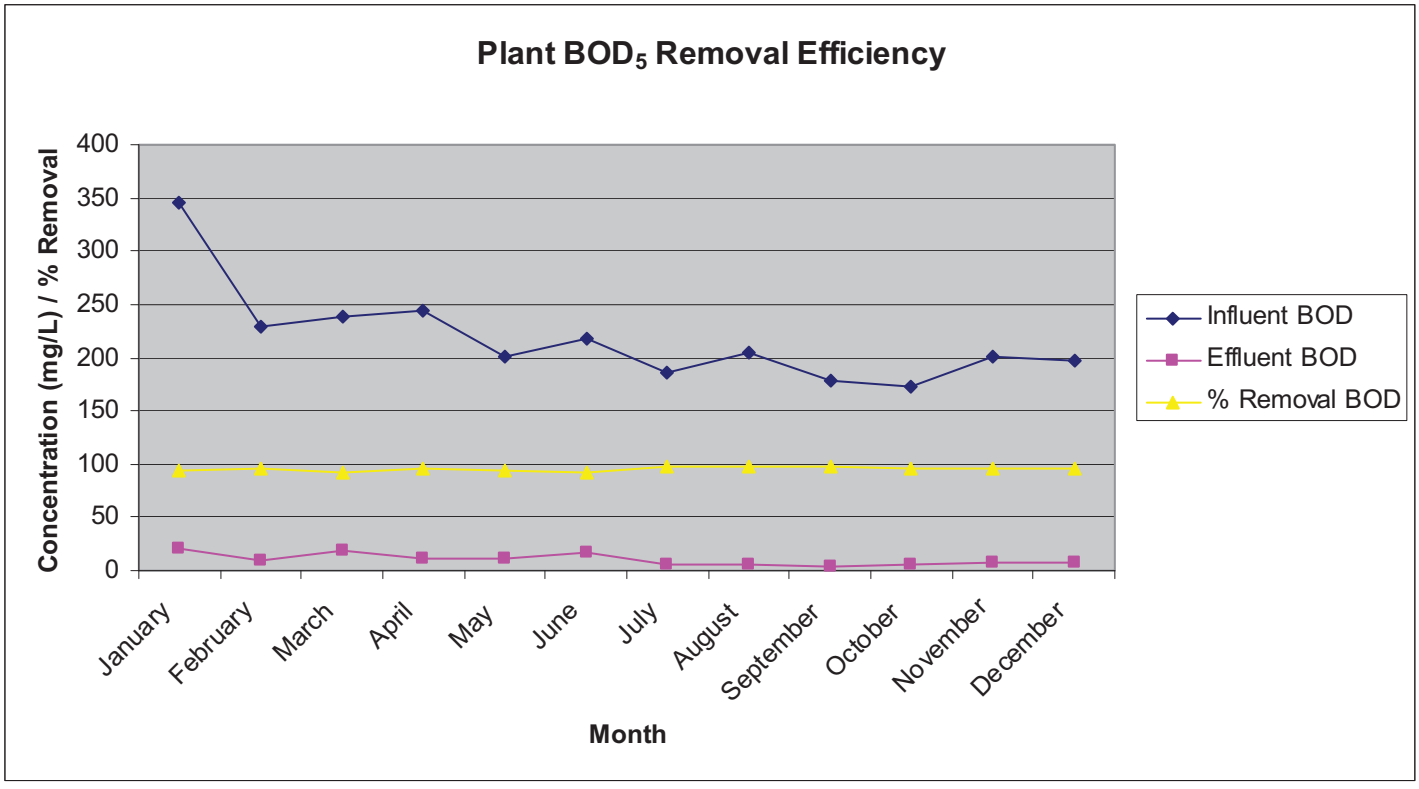

Figure 1a. BOD Removal Efficiency

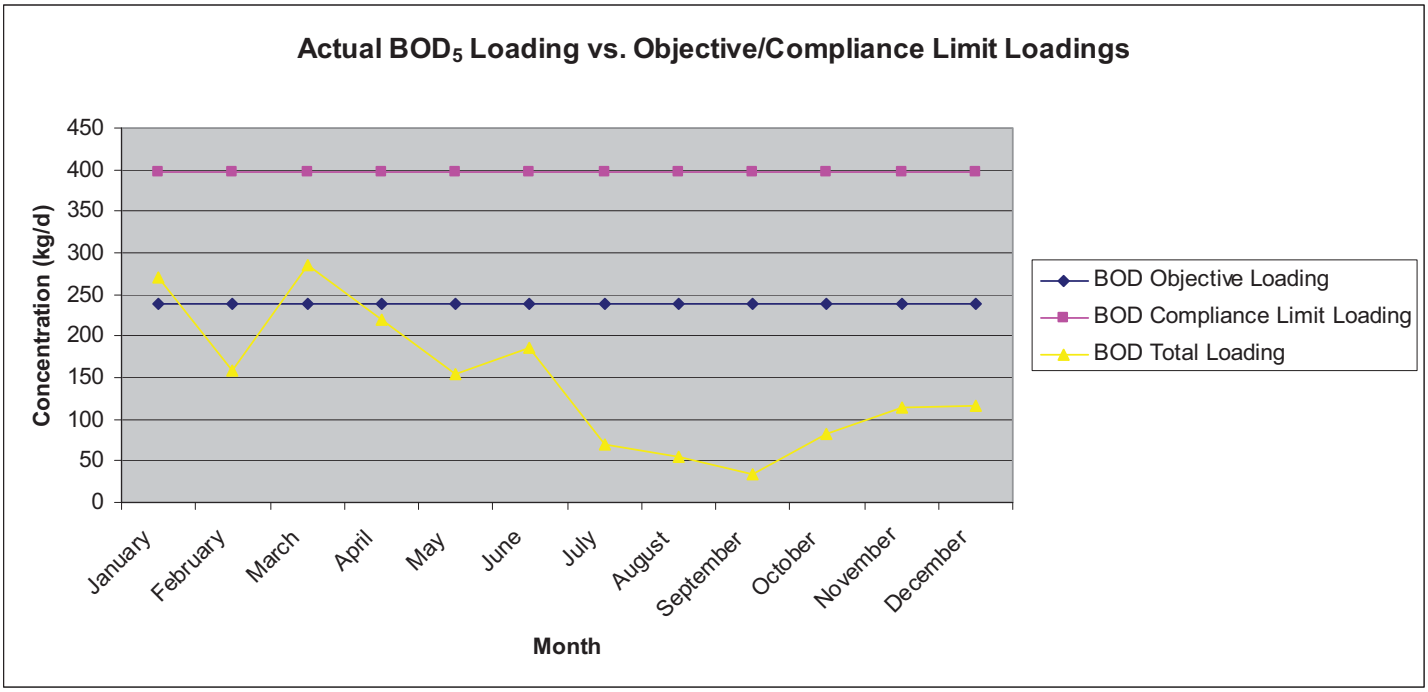

Figure 1b. 2009 BOD Loadings vs. Objectives & Compliance Limits

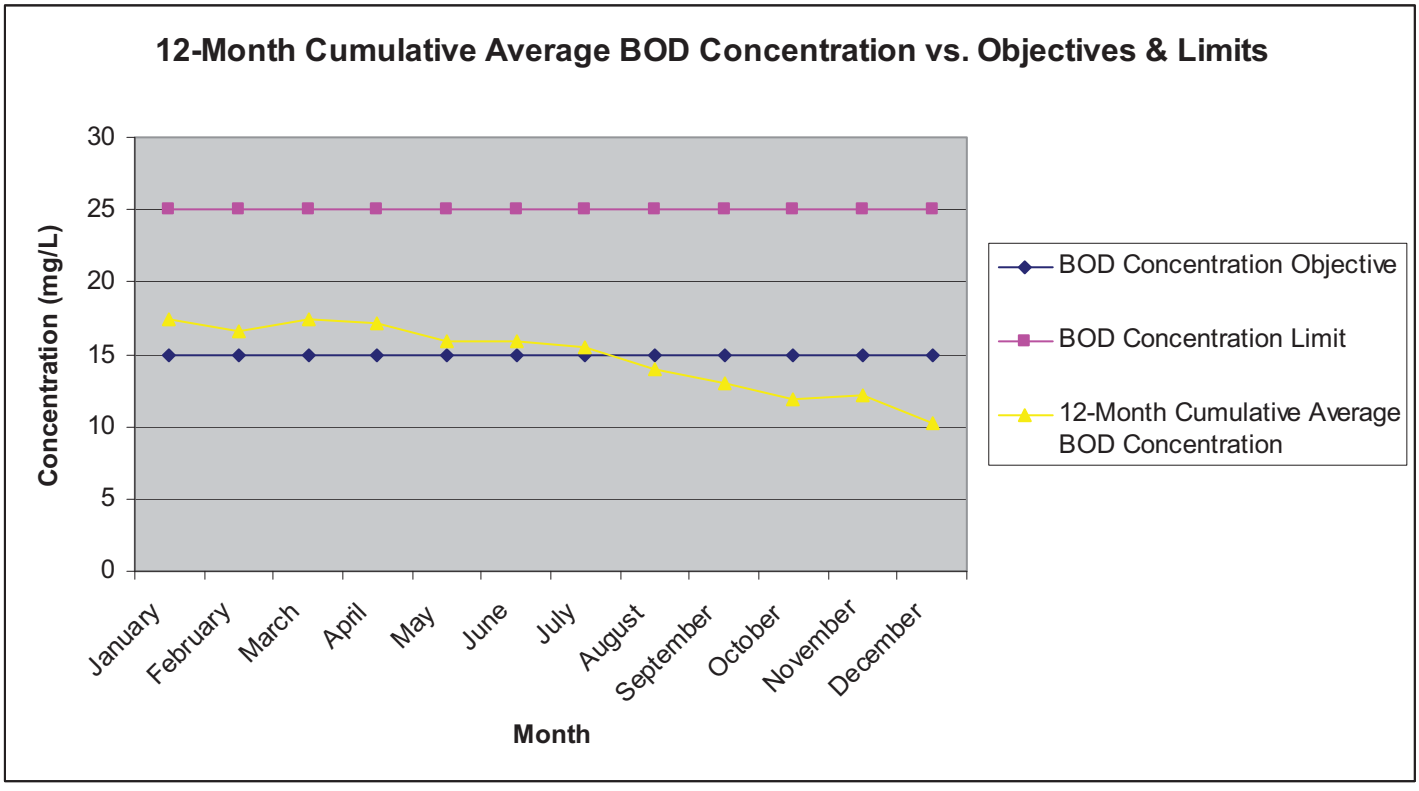

Figure 1c. BOD Annual Cumulative Average Concentration vs. Concentration Objectives & Limits

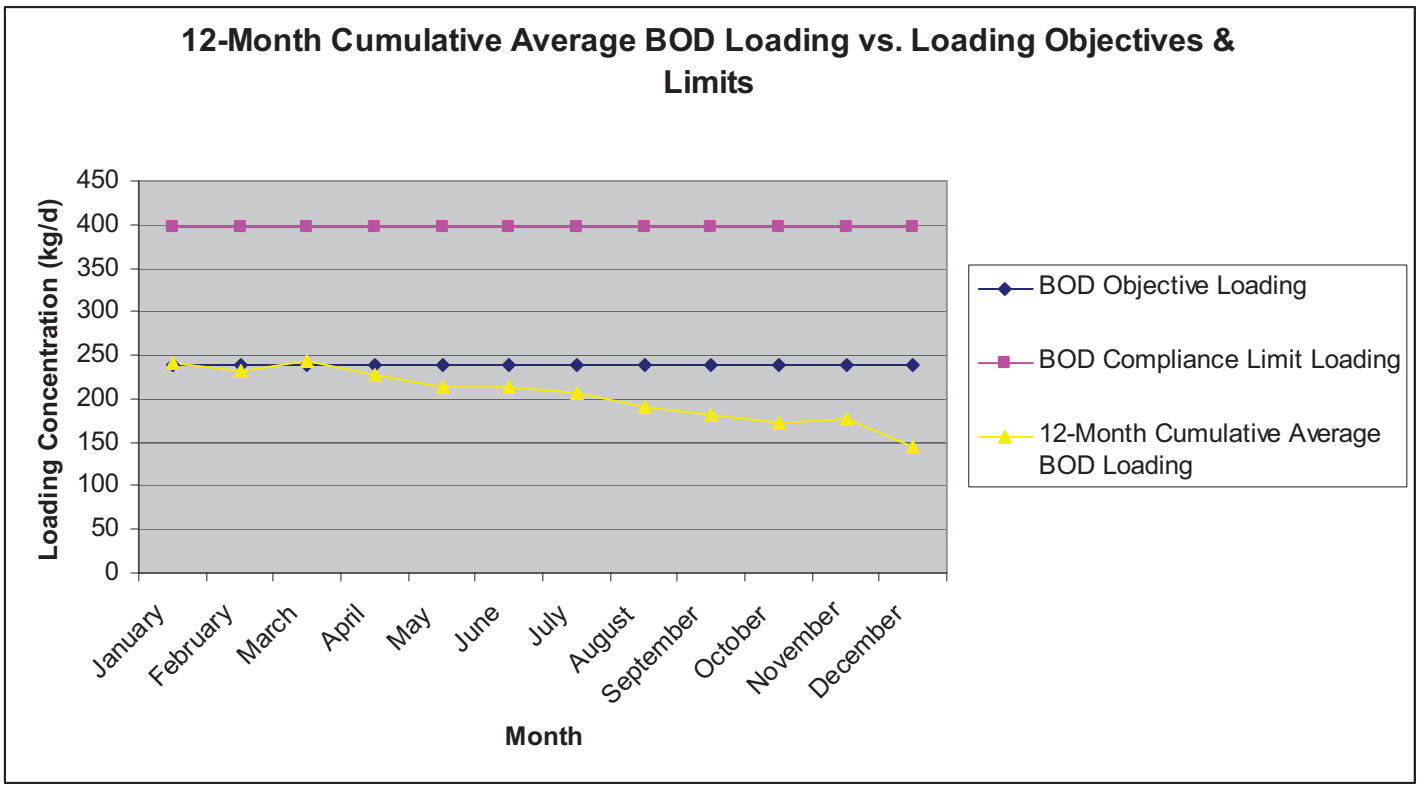

Figure 1d. BOD Annual Cumulative Average Loadings vs. Loading Objectives & Limits

Total Suspended Solids (TSS)

The Trenton WWTP collected Final Effluent and Influent Suspended Solids samples weekly throughout the reporting period as per C of A requirements with additional sampling being completed periodically throughout the year during bypass events. Please refer to the following Figures 2a.-d. for details on plant performance. Figure 2a shows the plant had an average total suspended solids removal efficiency of 97.4%.
For the month of January, the suspended solids limit of 25 mg/L was exceeded with an average suspended solids result of 26 mg/L. This is due to the bypass at the plant between January 27 and January 30. The loading objective was exceeded in January and April of 2009 as well due to the higher than normal suspended solids results and high flows. However, none of these instances are reportable as the C of A requires MOE notification only if the annual average concentration of suspended solids exceeds the limit of 25.0 mg/L, and this has not occurred throughout the reporting period. In fact, the cumulative average concentration of suspended solids was such that the plant remained below the suspended solids concentration objective of 15.0 mg/L throughout the year. The 12-month cumulative average loading objective was exceeded in January however this was due to the relatively high suspended solids concentrations during 2008. It should be noted that the plant performance is clearly improving based on the 12-month cumulative average concentration results.

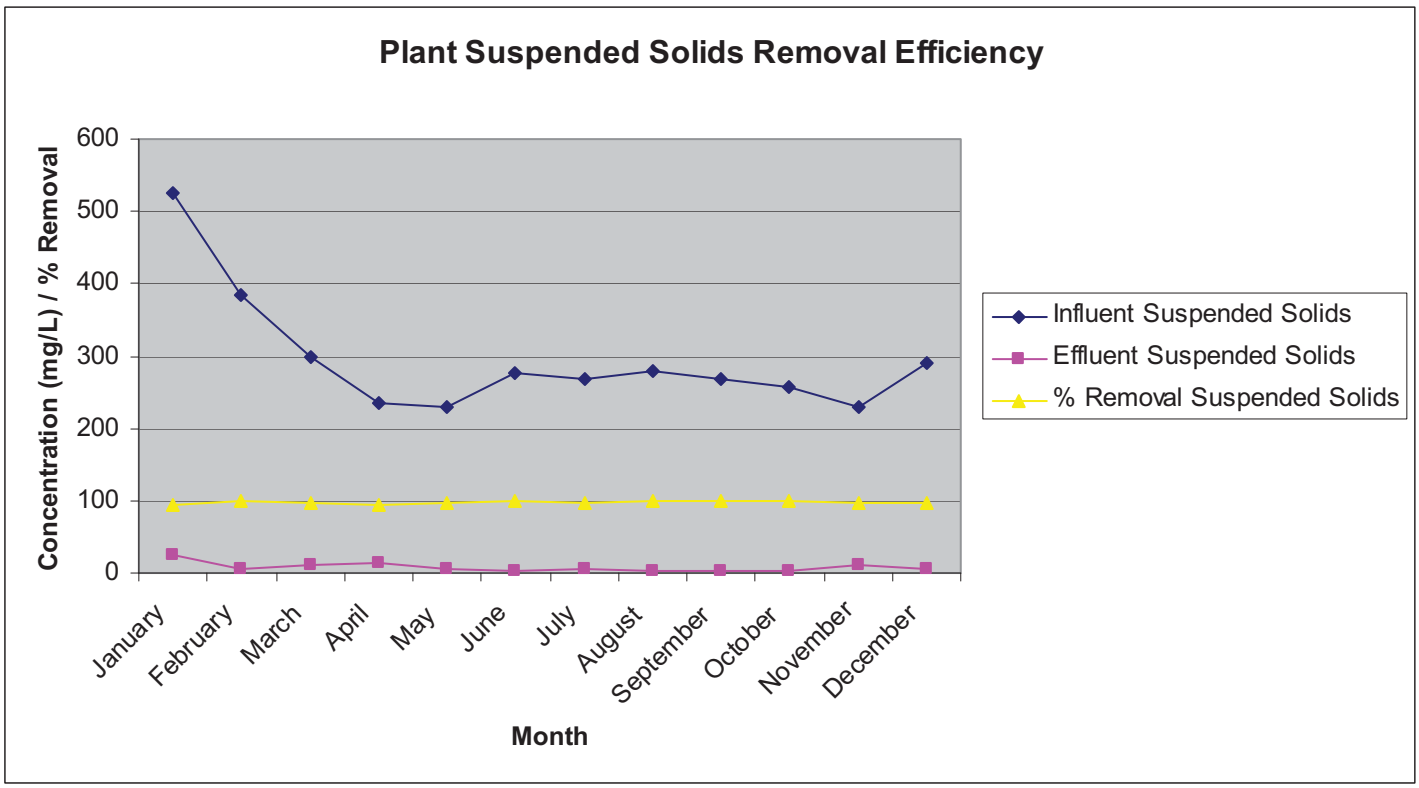

Figure 2a. 2009 Suspended Solids Removal Efficiency

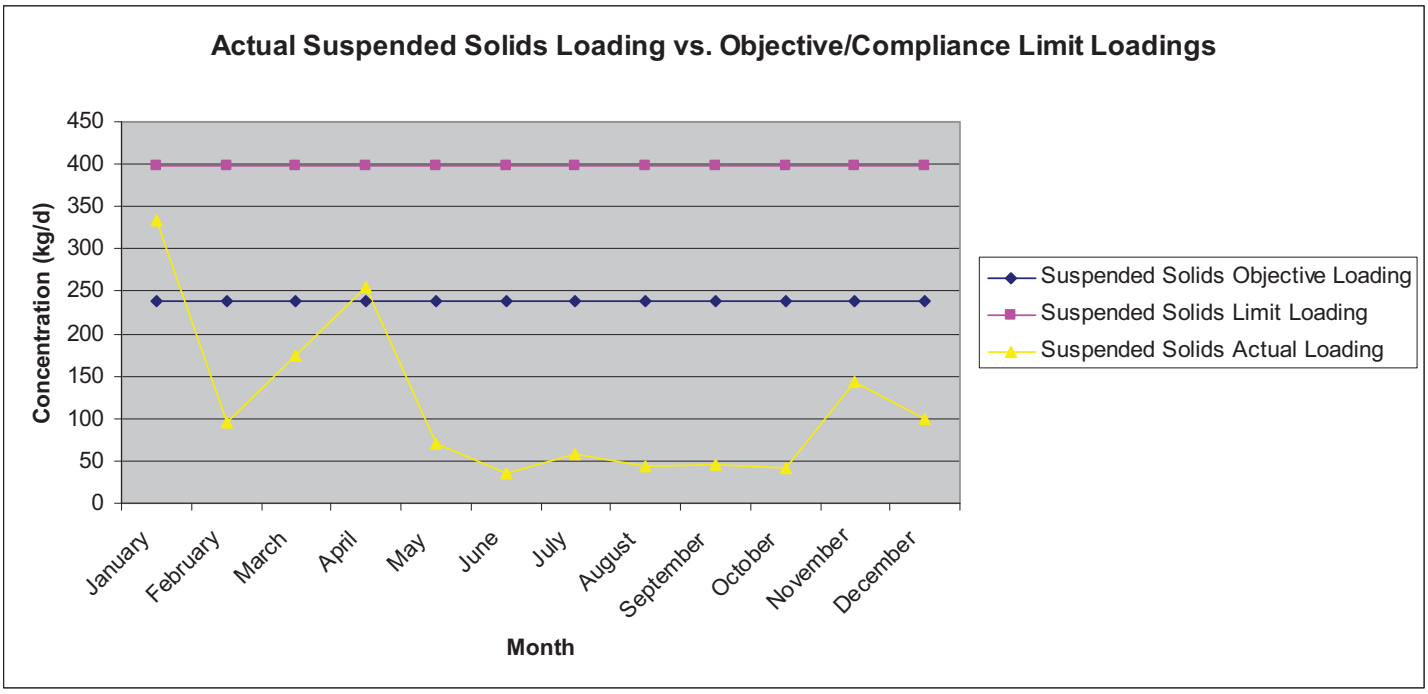

Figure 2b. 2009 Suspended Solids Loadings vs. Objective/Compliance Limit Loadings

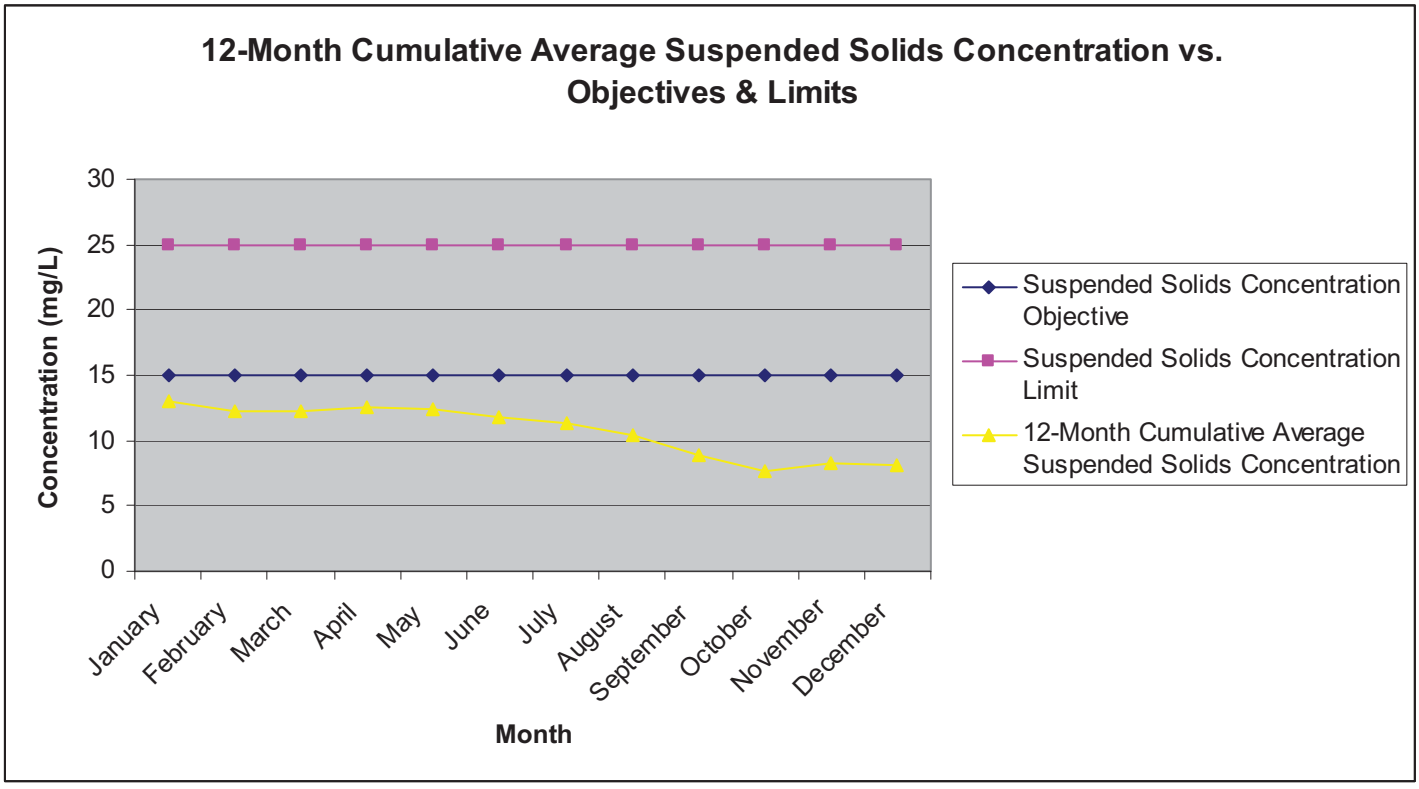

Figure 2c. 12-month Cumulative Average Suspended Solids Concentrations vs. Objectives & Limits

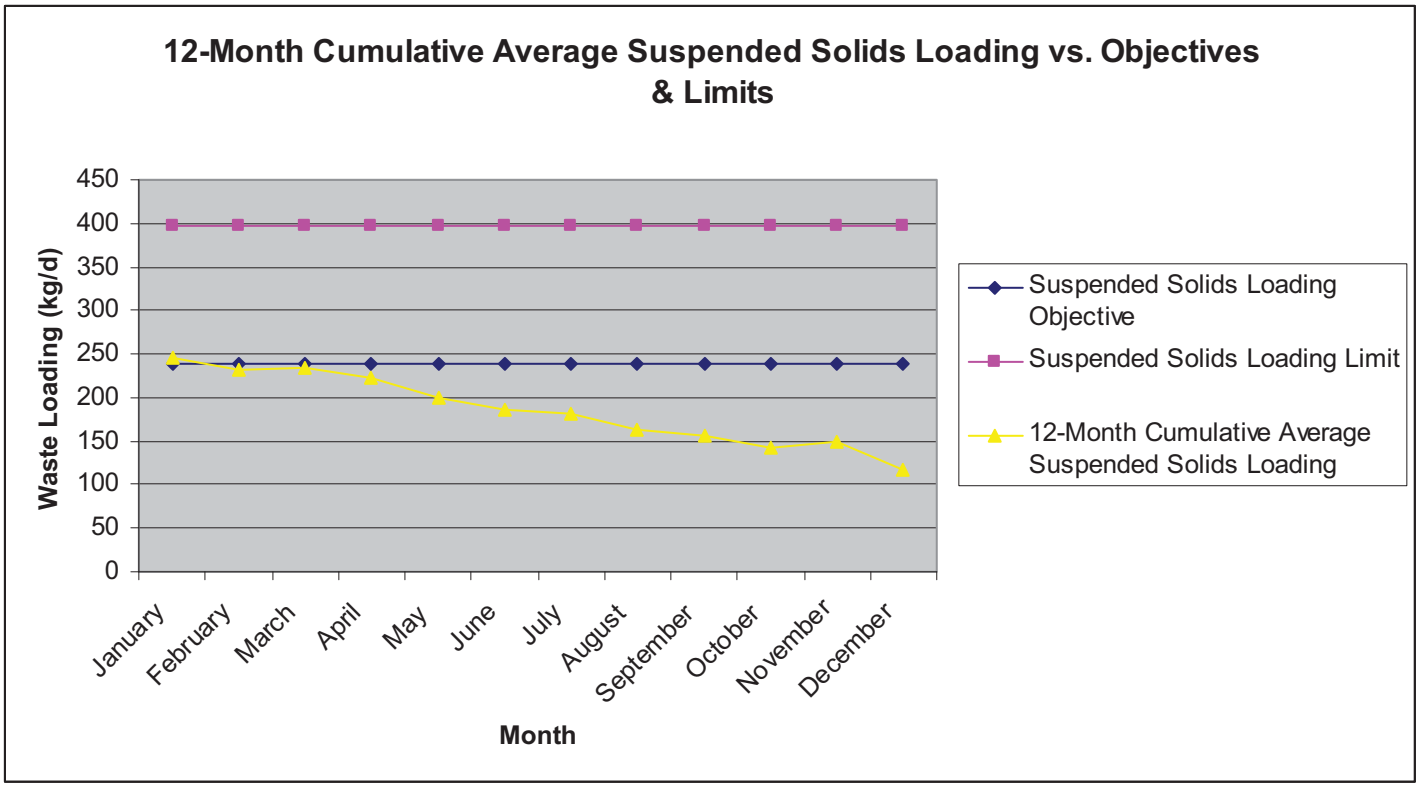

Figure 2d. 12-month Cumulative Average Suspended Solids Loadings vs. Objectives & Limits

Total Phosphorous (TP)

The Trenton WWTP collects Total Phosphorus samples on a weekly basis with additional sampling being completed periodically throughout the year during bypass events. Apart from the other regulatory parameters BOD, and Suspended Solids, the Trenton WWTP has a legal obligation to notify the MOE of 'monthly average concentration' exceedances throughout the reporting period in addition to 12-month cumulative average concentration and loading exceedances. Please refer to the following figures 3a.-e. for details on plant performance. Figure 3a. shows the plant had an average Total Phosphorus removal of 94.5%.
For the month of January in 2009, the plant did not meet the Total Phosphorus Concentration Objective of 0.5 mg/L, or the Total Phosphorus Loading Objective of 8.0 kg/d. This is due to the bypass which occurred between January 27th and January 30th. Other than the poor plant performance during January 2009, all other regulatory compliance limits and objectives were met.

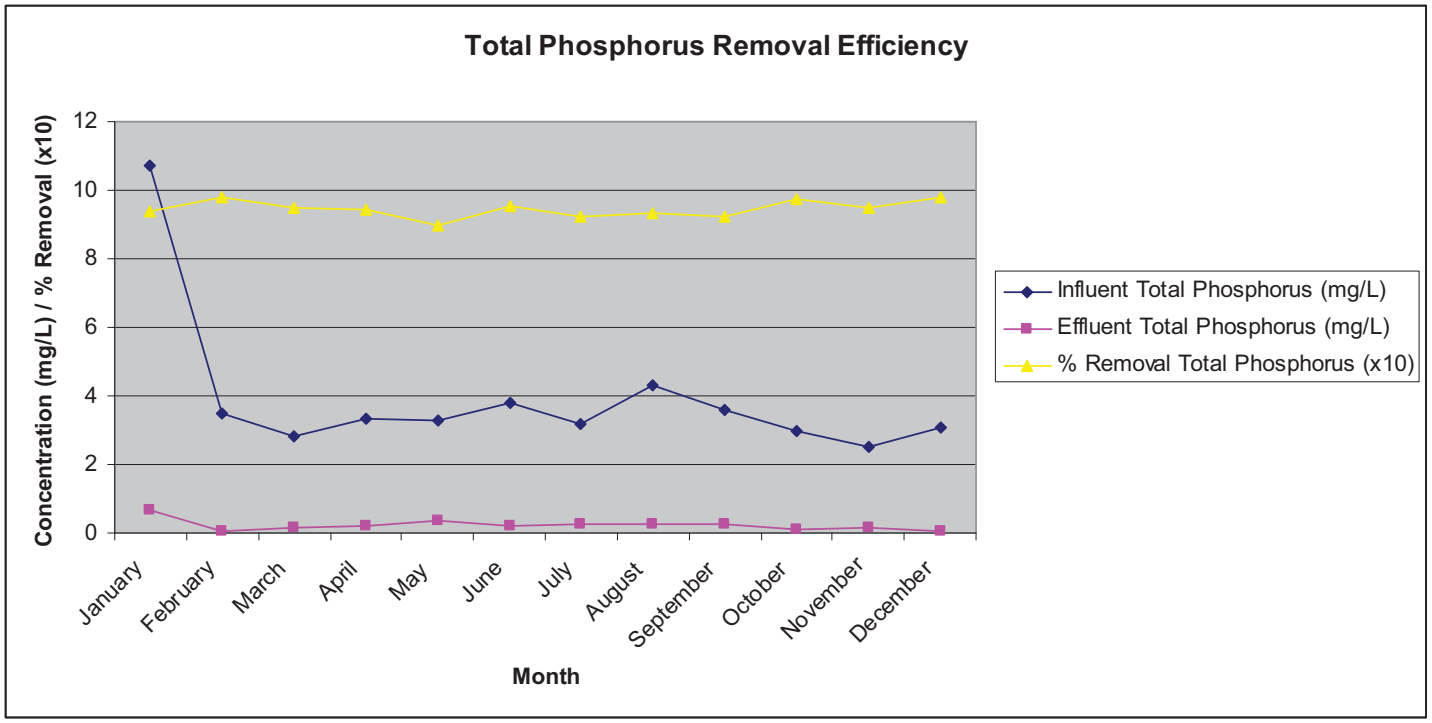

Figure 3a. Total Phosphorus Removal Efficiency

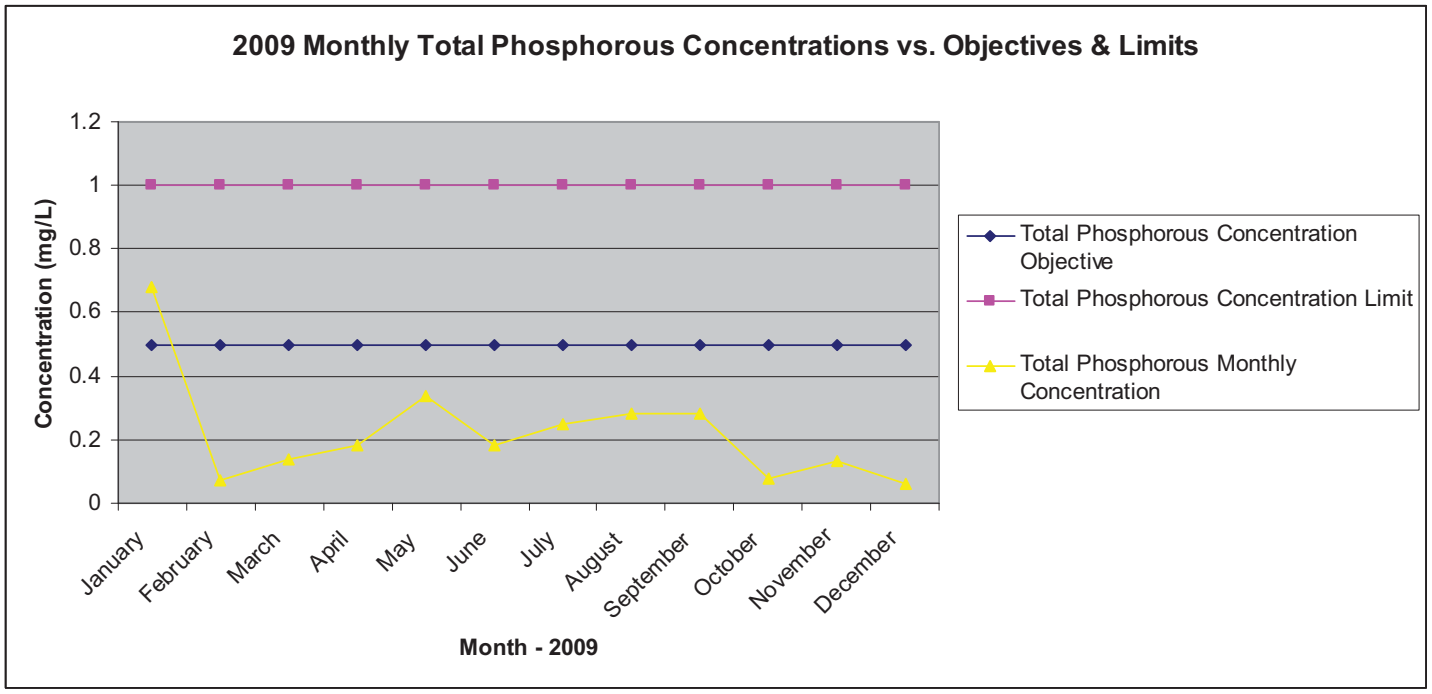

Figure 3b. 2009 Monthly Total Phosphorus Concentrations vs. Objectives & Limits

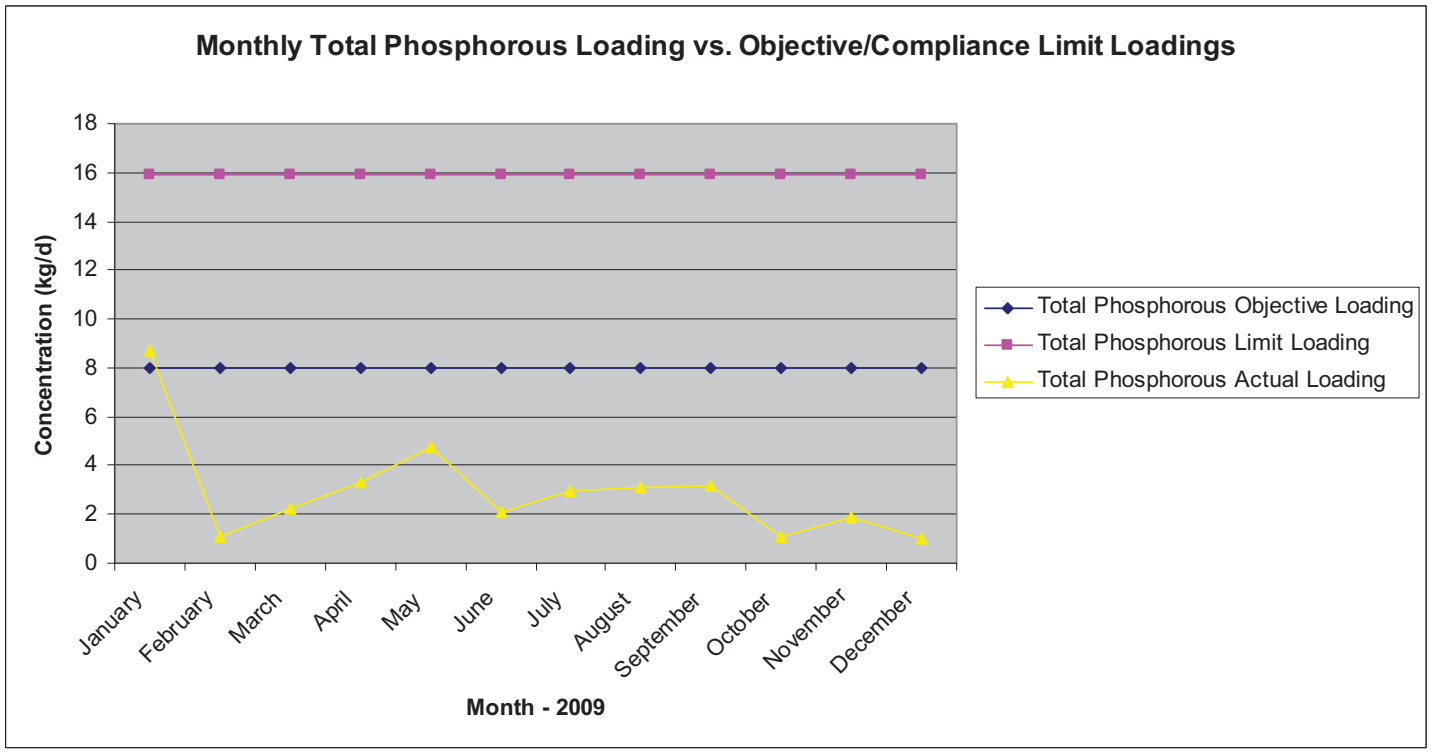

Figure 3c. 2009 Monthly Total Phosphorus Loadings vs. Objectives & Limits

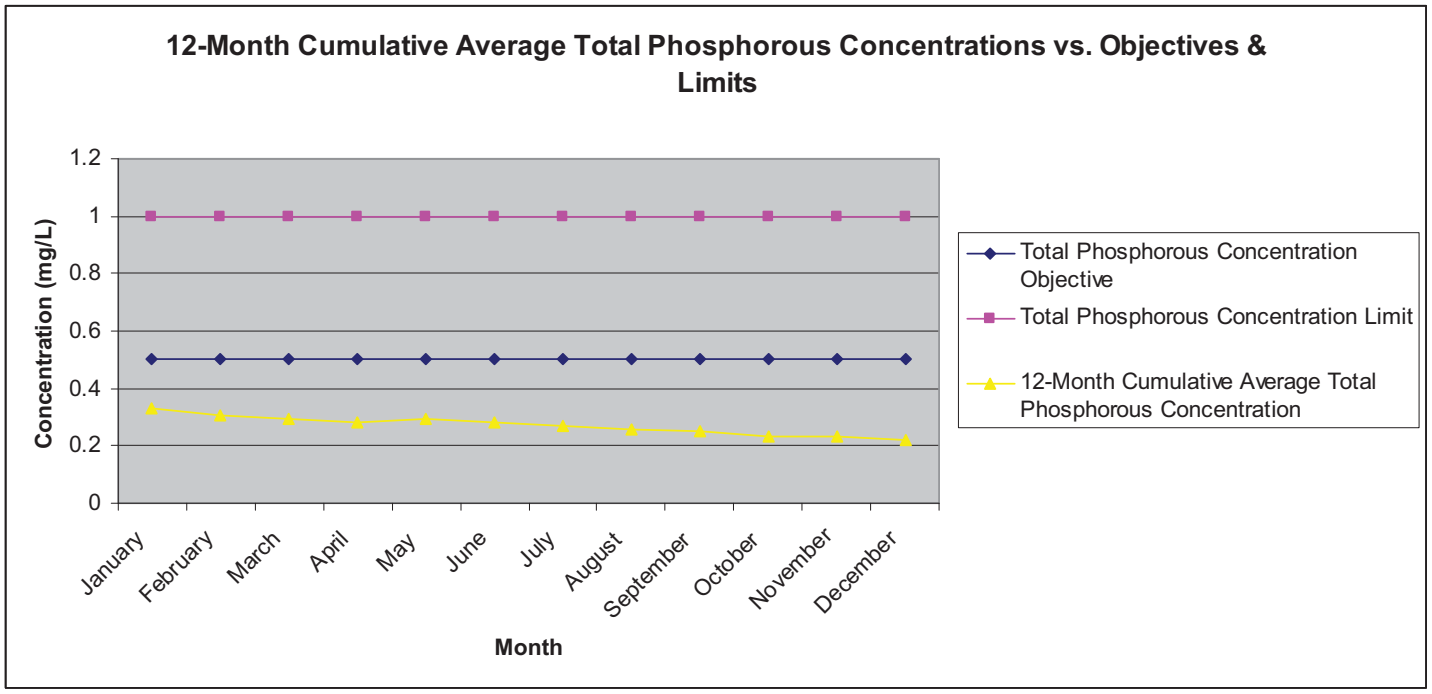

Figure 3d. 12-month Cumulative Average Total Phosphorus Concentrations vs. Objectives & Limits

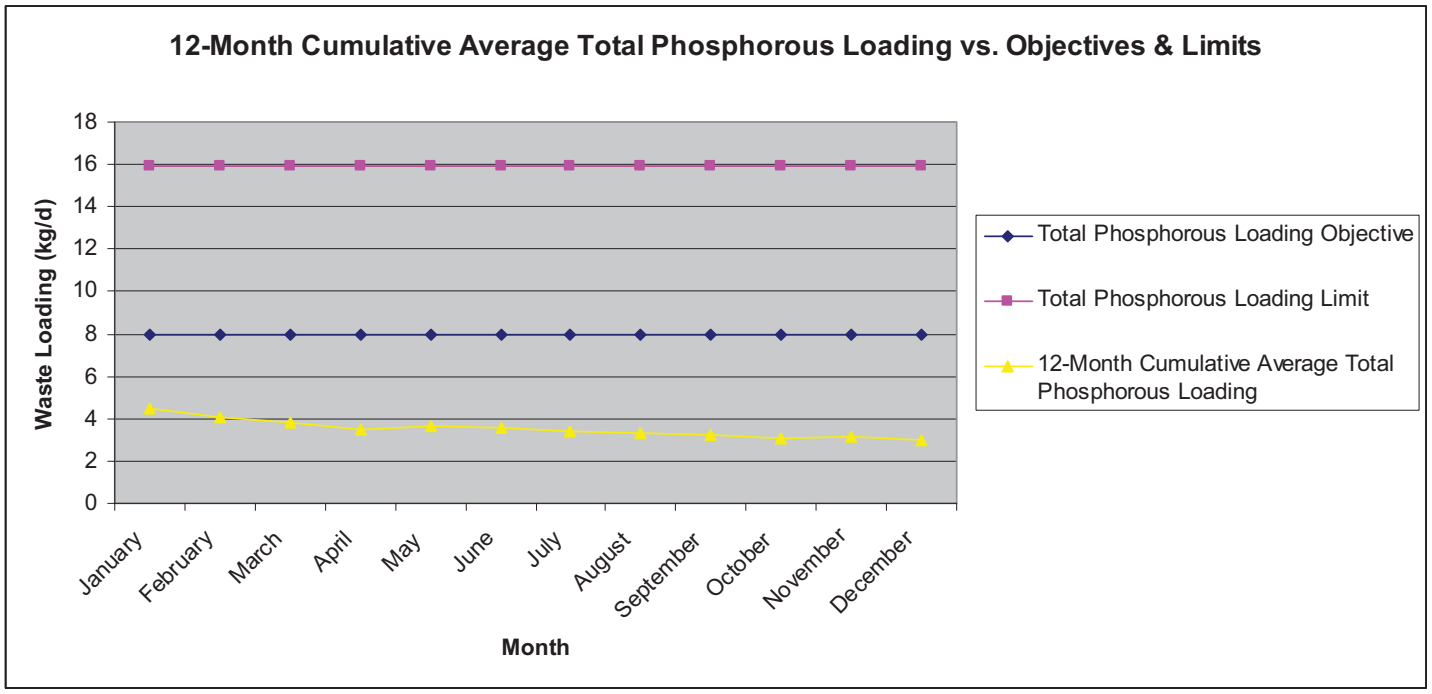

Figure 3e. 12-month Cumulative Average Total Phosphorus Loadings vs. Objectives & Limits

Geometric Mean Density of E. Coli

Throughout the inspection period, the plant did not meet the Geometric Mean density of E. Coli objective for the months of January, February, March, May, and December. This is due to the poor tertiary filter performance throughout the inspection period, and the high monthly flows. There are no reporting requirement for E. Coli exceedances, this is a C of A objective.

Trenton WWTP Flows

During the reporting period, the influent flow meter had to be calibrated several times due to the limited accuracy of the meter. For the purposes of this annual report, Final Effluent flows are being used to calculate compliance with flow limits and loadings.

The last 5 years of historical annual average daily plant flows are depicted in Figure 4c. The last 3-year average annual daily flow of 13, 416 m^3/d shows the plant is operating at 84% of it's approved capacity, while the last 5-year average annual daily flow of 14, 517 m^3/d shows the plant is operating at 91% of it's approved capacity.

Please refer to the *Effluent Quantity* Flow data chart for additional details on flows throughout the reporting period.

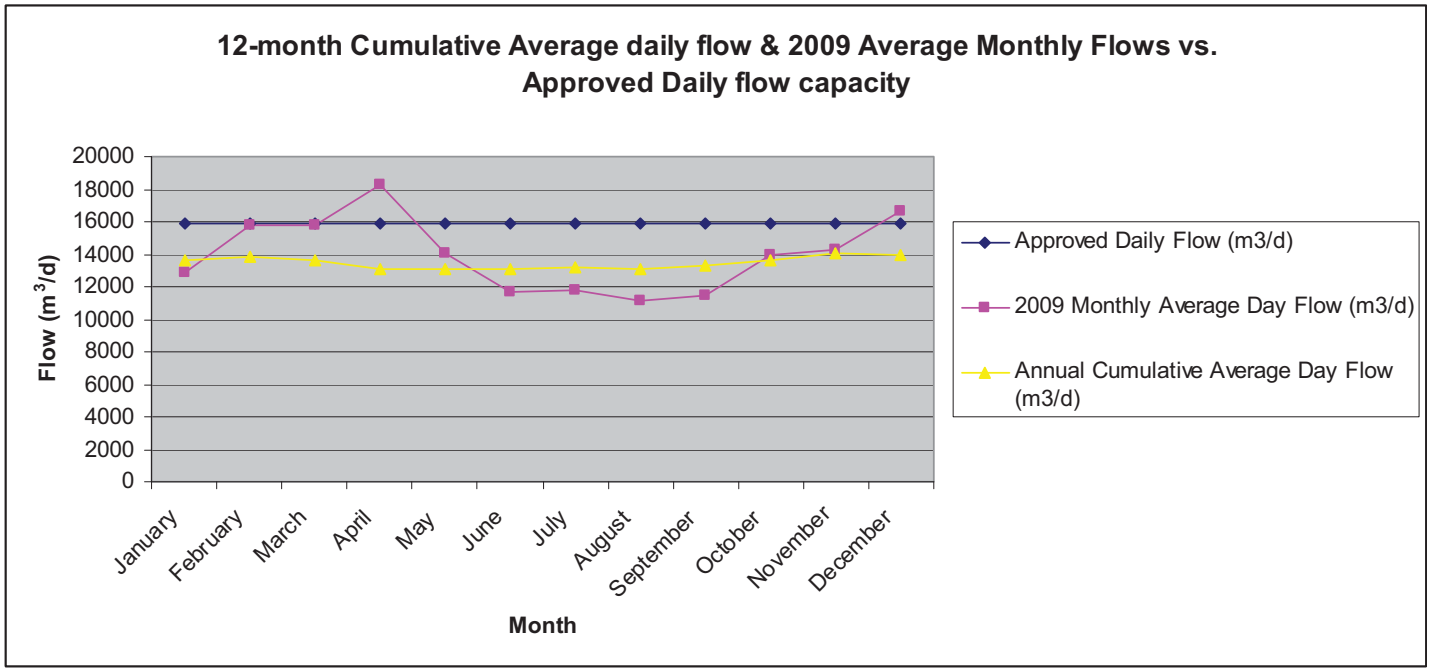

Figure 4a. Regulatory compliance cumulative average daily flow & 2009 Average monthly flow vs. C of A Approved Daily Flow.

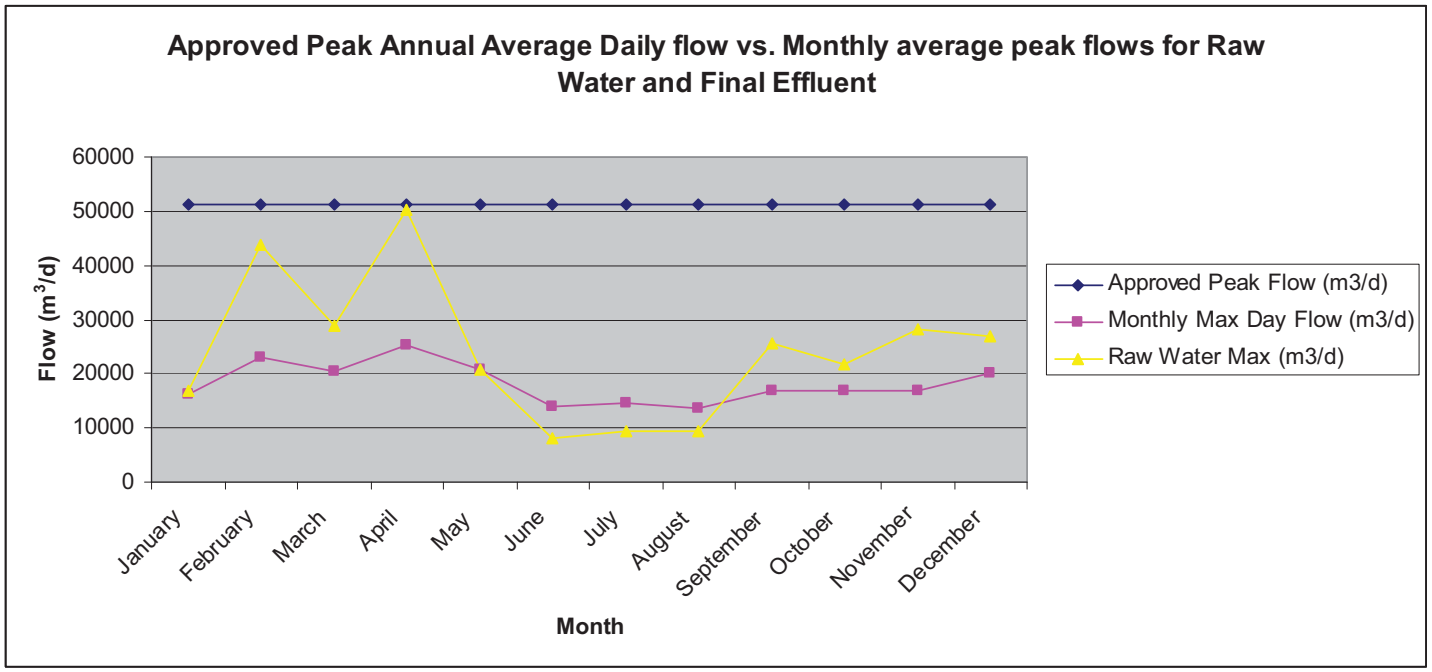

Figure 4b. Regulatory compliance Peak Annual average daily flow vs. Monthly Average Peak Flows for Raw Water and Final Effluent flows.

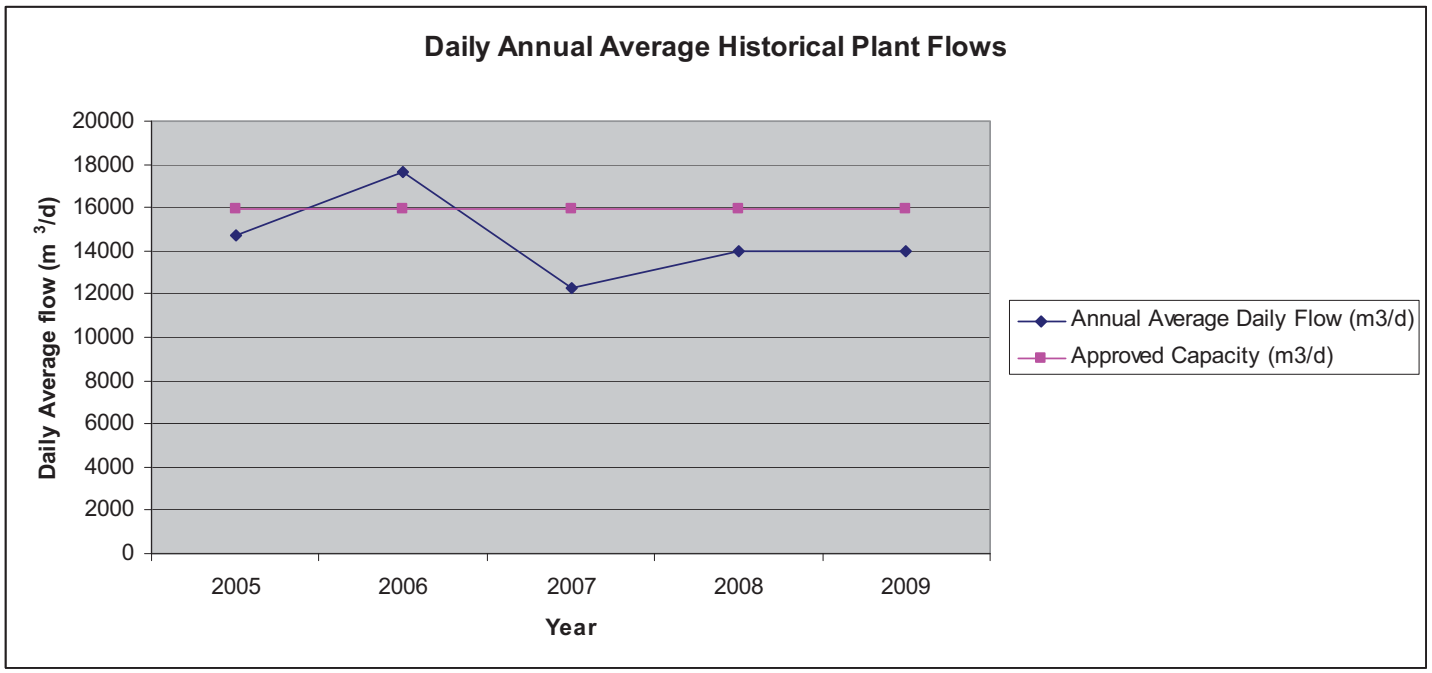

Figure 4c. Historical Plant Flows *(Influent 2005-2008 & Effluent – 2009)*

3. Summary of all maintenance carried out during the reporting period:

- On-site sludge belt press repaired
- A replacement sludge pump was installed for feeding the belt press
- Digester gas train system replacement as per TSSA orders
- Filter backwash system maintenance repairs were completed
- Filter cleaning and media replacement was completed
- Alarm Upgrades
- A failure occurred in Clarifier #2 chain and flight system resulting in the need for significant repairs. The units was repaired and returned to service.
- Both Digesters were fully cleaned and internal piping was repaired
- A computerized maintenance management system will be implemented in 2010

4. Description of all operating problems and corrective actions taken during the reporting period:

- Solids build-up in plant as a result of the lack of storage. Entec Waste Management contracted to remove solids throughout the year
- Clarifier #2 failure in September caused partial tertiary filter bypass.
- Digester #2 methane gas leak due to gas train system disrepair.
- Tertiary filter bypass for much of the months of January, and September through December due to either poor filter performance, lack of backwashing capabilities, or from maintenance being performed on Clarifier #2.

5. Tabulation of volume of sludge generated during the year, anticipated sludge volume generated during 2010, and outline of sludge handling methods and disposal areas to be utilized in 2010:

2009 Biosolids Removal Program		
Month	**Biosolids Volume (m^3)**	**Disposal Site**
February	5,361	Frankford Landfill
March	1,874	Frankford Landfill
April	3,070	Frankford Landfill
May	2,190	Frankford Landfill
June	3,147	Frankford Landfill
July	6,293	Frankford Landfill
August	3,561	Frankford Landfill
September	3,186	Frankford Landfill
October	4,042	Frankford Landfill
November	2,697	1,395 m^3 to Frankford Landfill Site 154 m^3 to Mount Ridge Landfill
December	3,776	1,452 m^3 to Frankford Landfill Site 414 m^3 to Mount Ridge Landfill

Total Volume of Biosolids Removed from TWWTP in 2009 39,197 m^3

Eugene Craig Lagoon Biosolids details:

Month	Volume (m3)	Disposal Site
June	859	Land Applied: Certified Field
October	422.5	Land Applied: Certified Field
November	2,208	Land Applied: Certified Field

*This lagoon has been decommissioned effective November 2009.

The City anticipates the continuation of on-site dewatering will be utilized at the Trenton WWTP during 2010 until long-term, on-site Biosolids storage can be arranged.

6. Evaluation for the need for modifications to the works to improve performance and to minimize upsets and bypasses:

The City is working with a consultant in 2010 to review all system processes to determine any capacity or treatment performance issues.