

TOWN OF ARNPRIOR WATER POLLUTION CONTROL CENTRE

ANNUAL SUMMARY REPORT

2010

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PRELIMINARY TREATMENT

Screen Units

There are two screening units; the automatic mechanical screen and the standby manual screen. Both screens have openings of 13 mm between bars and are enclosed with an odour enclosure where the air is discharged to the exterior atmosphere through a carbon filter. The screenings are then transferred onto a conveyer that empties into a container for disposal at the Arnprior Waste Disposal Site.

Grit Removal

Grit removal is achieved by a pair of rectangular aerated spiral roll 90 m³ tanks. Each tank has a grit screw conveyer which pushes settled grit into the grit hoppers. Grit is then pumped into a grit dewatering classifier unit where dense grit particles are separated from light organic solids.

PRIMARY TREATMENT

Primary Sedimentation

There are three rectangular primary clarifiers at the Water Pollution Control Centre (WPCC): two with a surface overflow area of 142 m² and one with an overflow area of 154 m². All units are equipped with a chain and flight sludge collection and manual scum removal. Raw sludge is pumped from the primary clarifiers into the sludge holding tanks using plunger type positive displacement pumps.

SECONDARY TREATMENT

Activated Sludge Treatment

The activated sludge treatment process includes one rectangular aeration tank and two separate rectangular secondary clarifiers, each made up of two parallel units. The aeration tank has a volume of 1,303 m³, and is equipped with four inlet gates and one outlet slide plate for isolation. The secondary clarifiers have a surface area of 310 m² each. They are equipped with longitudinal and cross chain and flight collector mechanisms, which collect the activated sludge into a sump where it is returned to the aeration tank.

Phosphorous Removal

The phosphorous control system consists of two 12,100 L indoor ferric chloride chemical storage tanks and two chemical feed pumps, complete with calibration cylinders. The ferric chloride is added to the aeration tank or preliminary discharge, depending on operational requirements.

Chlorination System

Disinfection of the plant discharge is accomplished through the addition of Sodium Hypochlorite (NaOCl). The NaOCl is stored in the 12,100 L tanks, and a bank of three variable speed metering pumps is used to deliver the chlorine to the chlorine contact chamber.

De-chlorination System

The chlorinated water must be de-chlorinated prior to discharge into the Madawaska River. This is achieved through the addition of sodium bisulfate (Na^2SO^4). The sodium bisulfate system is made up of one 1,336 L storage tank and two feed pumps.

Sludge Dewatering

There are two sludge dewatering systems at the WPCCC. The primary unit is a Polymer system and Centrifuge capable of processing 7 L of sludge per second. The sludge from this unit is loaded onto a dump truck and delivered to the Arnprior Waste Disposal Site. The backup system consists of a belt filter press unit, a flocculation tank, sludge screw conveyer, and an automatic polymer delivery system. The dewatered sludge from this system is also delivered to the Arnprior Waste Disposal Site.

Auxiliary Power

The WPCCC is equipped with a 400 Kw diesel generator and automatic transfer switch. This generator will automatically start when a power outage occurs and is able to supply power to run the entire plant.

Plant Performance Summary (4.3- a)

The WPCCC has a non-compliance parameter limit of an annual average concentration of 25 mg/l of Biological Oxygen Demand (BOD_5), 25 mg/l of suspended solids and a monthly average of 1 mg/l of total phosphorus. There is also a Monthly Geometric Mean Density (Geo-Mean) limit of 200 organisms per 100 ml of E.Coli in the treatment plant effluent. All effluent results for 2010 were within these parameters:

COMPLIANCE DATA 2010							
MONTH	SUSPENDED SOLIDS		PHOSPHOROUS		B.O.D		E.COLI Geo-Mean
	Influent. mg/L	Effluent. mg/L	Influent. mg/L	Effluent. mg/L	Influent. mg/L	Effluent. mg/L	
JAN.	113.00	7.09	2.82	0.15	102.00	10.25	2.0
FEB.	116.38	6.42	2.80	0.25	126.50	11.75	2.0
MAR.	80.83	5.69	1.99	0.15	72.40	14.80	3.2
APR.	112.17	6.11	2.93	0.12	112.00	16.25	2.5

MAY	110.88	7.00	3.19	0.12	102.75	4.50	4.5
JUN.	129.25	4.31	3.63	0.11	110.40	8.00	2.0
JUL.	149.75	6.57	2.74	0.13	115.00	12.25	2.0
AUG.	312.00	8.25	3.10	0.13	127.00	8.00	4.5
SEPT.	124.83	6.30	2.77	0.08	100.00	8.40	22.0
OCT.	128.11	5.22	2.48	0.12	97.00	9.80	4.0
NOV.	122.25	9.57	2.30	0.23	107.00	12.00	13.5
DEC.	96.00	6.60	3.68	0.13	233.80	8.40	20.4
AVG	132.95	6.59	2.87	0.14	117.15	10.37	6.9
MAX	312.00	9.57	3.68	0.25	233.80	16.25	22.0
MIN	80.83	4.31	1.99	0.08	72.40	4.50	2.0

Monitoring Data Interpretation (4.3 b & c)

The Total Suspended Solids (TSS) in the raw and effluent wastewater is measured 3 times per week from a composite sample. The effluent reporting criteria is 25 mg/l and the plant target is 15 mg/l. The average monthly effluent TSS in 2010 was 6.59 mg/l and the monthly maximum average level was 9.57 mg/l in November. The TSS removal efficiency at the WPCC was 95% in 2010. Non-compliance with respect to plant effluent loading of Suspended Solids is 197.5 kg/d. The WPCC had an average daily effluent loading of 44.9 kg/d in 2010.

The Total Phosphorous (TP) in the raw and effluent wastewater is sampled and analyzed three times per week from composite samples. The reporting criteria are 1.0 mg/l and the plant target is 0.5 mg/l. The average monthly TP levels in 2010 was 0.14 mg/l with a monthly high average of 0.25 mg/l in February. The Total Phosphorous non-compliance loading rate is 7.9 kg/d and in 2010 the average daily TP loading rate was 0.94 kg/d.

Five day Biological Oxygen Demand (BOD₅) is sampled once per week from a composite sample. The effluent reporting criteria is 25 mg/l and the plant target is 15 mg/l. The average monthly BOD₅ in 2010 was 10.37 mg/l with a monthly average high of 22.0 mg/l in September. The BOD₅ removal efficiency at the WPCC was 91 %. The BOD₅ non-compliance loading rate is 197.5 kg/d and in 2010 the plant averaged an effluent loading rate of 0.94 kg/d.

Total Kjeldahl Nitrogen (TKN) is the sum of organic nitrogen, ammonia (NH₃), and ammonium (NH₄⁺) in the chemical analysis of soil, water, or wastewater (e.g. sewage treatment plant effluent). To calculate Total Nitrogen (TN), the concentrations of nitrate-N and nitrite-N are determined and added to TKN. There are no effluent limit criteria for TKN. The average monthly TKN levels in 2010 was 11.2 mg/l with a monthly average high of 18.6 mg/l in February.

Chloride is common in human diet and passes through unchanged through the digestive system. It can also be increased by industrial processes. There are no effluent limit criteria for chloride; the average monthly chloride level was 139.2 mg/l with a monthly high of 266.2 mg/l in March.

Conductivity is a measure of the ability of water to carry an electric current. If the wastewater has too many molecules of organic compounds it cannot conduct a current as well.

There are no effluent limit criteria for conductivity. The average monthly conductivity in 2010 was 861.9 $\mu\text{mho/cm}$ with a monthly high of 1,344 $\mu\text{mho/cm}$ in March.

Ammonia is present naturally in wastewater. There is no effluent limit for 2010 although there will be an effluent target of 10 mg/l in 2011. The average monthly Ammonia concentration was 9.82 mg/l, with the monthly high at 16.2 mg/l in February.

Nitrate is found in small amounts in wastewater, but can be formed during the nitrifying process at biological treatment plants. There are no effluent criteria for Nitrate, and the average monthly nitrate concentration in 2010 was 1.3 mg/l, with a monthly high of 2.2 mg/l in March.

Nitrite is formed during the reduction of ammonia and nitrate; there are no effluent criteria for nitrite. The average monthly nitrite concentration in 2010 was 0.58 mg/l and the monthly high was 1.88 mg/l in November.

Phosphate is normally found in wastewater and if discharged to receiving water can stimulate the growth of plants life in nuisance quantities. The effluent limit for phosphate is included in the total phosphorus limit of 1.0 mg/l. The average monthly phosphate concentration in 2010 was 0.06 mg/l, with a monthly high of 0.3 mg/l in March.

Alkalinity is the acid neutralizing capacity of water. There are no effluent criteria for alkalinity. The average monthly alkalinity concentration in 2010 was 164 mg/l, with the monthly high at 211 mg/l in April.

Plant Flow Summary (4.3 b & c)

The WPCC has a permit under the Certificate of Approval (C of A) to discharge an effluent of 7,900 m^3/d averaged over the year, and a peak hourly flow of 2,000 m^3 . The average daily flow in 2010 was 6,283 m^3 per day, or 79% of the C of A permitted flow. As indicated in the table below, the average daily flow exceeded 7,900 m^3/d in March and April, due to high rainfall. A summary of the 2010 plant flow is as follows:

ARNPRIOR WPCC FLOW M^3									
Month	Maximum Daily Flow for Month m^3	Total Monthly Influent Flow m^3	Minimum Daily Flow for Month m^3	Total Monthly Effluent Flow m^3	Secondary Bypass m^3	Number of Secondary Bypass Events	Plant Bypass m^3	Number of Plant Bypass Events	Average Daily Flow m^3
Jan	9,753	157,612	4,010	157,983	242	1	0	0	5,096
Feb	6,193	121,371	3,672	132,140	0	0	0	0	4,557
March	14,716	253,132	4,986	248,189	0	0	0	0	8,006
April	10,376	205,723	5,751	212,112	415	2	0	0	7,070
May	7,742	203,389	5,025	203,389	0	0	0	0	6,561
June	11,189	210,341	4,902	195,607	80	4	0	0	6,520
July	15,589	307,300	6,589	250,523	1,078	3	0	0	8,081
Aug	10,255	195,446	5,057	283,603	3,162	6	0	0	9,148
Sept	9,938	192,458	5,173	219,572	98	2	0	0	7,319
Oct	8,306	195,770	5,030	179,978	0	0	0	0	5,806
Nov	14,877	252,223	4,556	199,748	173	1	0	0	6,443
Dec	13,134	200,432	3,673	196,319	275	2	0	0	6,333

Avg	11,006	207,933	4,869	206,597	460		0		6,745
Max	15,589	307,300	6,589	283,603	3,162		0		9,148
Min	6,193	121,371	3,672	132,140	0		0		4,557
Total	9,753	2,495,197	4,010	2,479,163	5,523	21	0	0	N/A

Plant Maintenance (4.3 d)

Plant maintenance is scheduled and tracked using a computerized maintenance system. A weekly maintenance schedule is printed out and the maintenance personnel initial for maintenance done. If any major repairs are required on any equipment, the operator fills out a work order detailing work required and parts needed.

A summary of major repairs or maintenance carried out in 2010 is as follows:

- An extensive plant expansion has been taking place during 2010, including an additional automated pretreatment screen, primary clarifier, aeration tank, secondary clarifier, anaerobic digesters, and other pumps and mechanical equipment.

Operational Problems (4.3 e)

There are many day to day adjustments and/or repairs that the operators must carry out in addition to the major maintenance listed below.

Some operational problems that occurred in 2010 are as follows:

- 1- Due to occasional high levels of rain in 2010, and the infiltration of storm water in the sanitary sewer system, the secondary treatment system of the plant was occasionally hydraulically overloaded resulting in secondary treatment bypassing. These sudden high flow events also make process control difficult.

Proposed Alteration (4.3 f)

1. There is an ongoing major upgrade to the WPCC that is taking place this year; the project will include new digesters, a primary settling tank, an aerator, and a secondary clarifier.

Sludge Processing (4.3 g/h)

Combined primary and secondary waste activated sludge is collected from all three primary settling tanks and pumped into the sludge holding tank. From the sludge holding tank it is conditioned and processed on the centrifuge or belt filter press. Sludge is dewatered to approximately 25% and loaded onto a truck and transferred to the Arnprior Waste Disposal Site. There were 314 loads of sludge to the Arnprior Waste Disposal Site in 2010, with a total of approximately 262,521 kg dry weight of sludge. Sludge production in 2011 is expected to be slightly higher than 2010.

A summary of the sludge processed is as follows:

SUMMARY OF SLUDGE MANAGEMENT

CENTRIFUGE OPERATION

Month	Sludge To Storage m ³	Sludge To Filter m ³	Dewatering Hours	% Solids Avg.	Dry Solids (kg)	Avg. % Cake Solids Content	Sludge Hauled Loads
Jan	1,617	1,407	100	2.42	34,049	24.17	29
Feb	1,241	1,203	84	1.94	23,320	25.00	19
Mar	1,269	1,331	43	1.83	24,291	24.87	25
Apr	1,080	1,197	92	2.00	23,940	30.00	42
May	343	891	83	1.20	10,692	33.00	26
Jun	1,221	1,227	102	3.88	47,608	28.50	30
Jul	677	900	83	1.80	16,200	25.00	26
Aug	1,351	900	83	1.80	16,200	25.00	25
Sep	1,113	900	83	1.80	16,200	25.00	26
Oct	1,144	900	83	1.80	16,200	25.00	26
Nov	863	900	83	1.80	16,200	25.00	26
Dec	797	979	80	1.80	17,622	25.00	14
Avg	1,060	1,061	83	2.01	21,877	26.29	26
Max	1,617	1,407	102	3.88	47,608	33.00	42
Min	343	891	43	1.20	10,692	24.17	14
Total	12,716	12,735	997		262,521	315.54	314

Wastewater Profile

In addition to the above compliance sampling and analysis, the table below outlines the monthly average results of various characteristics of the raw and treated wastewater. These samples are taken with composite samplers and sent to a certified laboratory:

ARNPRIOR WATER POLLUTION CONTROL CENTRE												
Month	Total Phosphorous mg/l		Ammonia mg/l		TKN mg/l		BOD mg/l		Nitrate mg/l		Nitrite mg/l	
	Raw	Effluent	Raw	Effluent	Raw	Effluent	Raw	Effluent	Raw	Effluent	Raw	Effluent
Jan	2.82	0.15	15.29	13.84	25.58	16.00	102.00	10.25	0.35	1.30	0.40	0.33
Feb	2.80	0.25	15.08	16.33	25.53	18.58	126.50	11.75	0.38	0.70	0.35	0.43
Mar	1.99	0.15	10.21	6.97	16.86	9.09	72.40	14.80	0.94	2.16	0.38	0.60
Apr	2.93	0.12	14.40	9.67	19.40	8.80	112.00	16.25	0.35	1.43	0.10	0.50
May	3.19	0.12	18.15	10.19	30.68	11.93	102.75	4.50	0.10	1.03	0.10	0.38
Jun	3.63	0.11	18.18	8.64	29.78	10.13	110.40	8.00	0.10	1.24	0.10	0.34
Jul	2.74	0.13	15.00	6.65	20.15	6.19	115.00	12.25	0.10	1.53	0.10	0.48
Aug	3.10	0.13	15.55	5.94	26.58	7.27	127.00	8.00	0.10	1.53	0.20	0.25
Sep	2.77	0.08	15.22	8.72	25.60	10.15	100.00	8.40	0.14	1.46	0.12	0.36
Oct	2.48	0.12	13.92	10.57	23.94	12.18	97.00	9.80	0.10	1.06	0.18	0.80
Nov	2.30	0.23	13.20	7.82	22.63	9.52	107.00	12.00	0.10	0.98	0.10	1.88
Dec	3.68	0.13	14.20	12.50	26.70	14.42	233.80	8.40	0.43	0.76	0.10	0.68
Average	2.87	0.14	14.87	9.82	24.45	11.19	117.15	10.37	0.27	1.26	0.19	0.58
Max	3.68	0.25	18.18	16.33	30.68	18.58	233.80	16.25	0.94	2.16	0.40	1.88
Min	1.99	0.08	10.21	5.94	16.86	6.19	72.40	4.50	0.10	0.70	0.10	0.25

ARNPRIOR WATER POLLUTION CONTROL CENTRE								
Month	Chloride		Phosphate		Alkalinity		Conductivity	
	Raw	Effluent	Raw	Effluent	Raw	Effluent	Raw	Effluent
Jan.	149.25	172.50	0.85	0.02	187.50	170.00	971.00	1,017.25
Feb.	216.50	171.25	0.96	0.09	189.75	186.25	1,181.00	1,036.50
Mar.	257.60	266.20	0.76	0.30	235.20	204.20	1,376.00	1,344.00
April	166.75	185.75	1.13	0.03	227.50	211.50	1,033.00	1,084.00
May	119.05	109.75	1.41	0.04	207.50	169.25	667.25	790.50
June	95.50	75.84	1.25	0.04	183.40	133.40	806.80	689.80
July	90.43	66.08	0.74	0.05	176.25	119.25	664.50	504.50
Aug.	116.75	78.10	0.47	0.02	176.00	118.00	761.50	535.50
Sept.	92.50	88.78	0.64	0.01	167.60	130.00	833.60	669.40
Oct.	121.00	128.68	0.63	0.03	192.20	173.00	819.80	807.00
Nov.	150.00	132.08	0.87	0.06	159.25	159.75	2,490.75	789.00
Dec.	165.20	195.67	0.29	0.03	200.67	198.33	1,013.00	1,075.33
Average	145.04	139.22	0.83	0.06	191.90	164.41	1,051.52	861.90
Max.	257.60	266.20	1.41	0.30	235.20	211.50	2,490.75	1,344.00
Min.	90.43	66.08	0.29	0.01	159.25	118.00	664.50	504.50

Calibration (4.3 i)

All flow metres were calibrated on site by a service contract, given to Endress + Hauser Canada Ltd., the manufacturer of the metres. A company representative applied a number of performance checks to the meters and all meters were within +- 1% accurate.

Conclusion

This report is available at the Arnprior Town Hall, 105 Elgin Street West, at the 2nd floor public works space. This report will also be presented to Members of Council for adoption.

For any further information on this report please call Michael Trumble at 613-623-4231 ext. 246.

Respectfully,

Michael Trumble
Waterworks Supervisor