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Town of Arnprior 2022 – Water Pollution Control Centre Summary Report

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Please find below a discussion of the operational undertakings of the Town of Arnprior's Water Pollution Control Centre (WPCC) for the 2022 calendar year. This report also includes a summary of all relevant sampling collected during 2022. This report is provided to meet the Town's requirements to report annually on the operation of the WPCC, as per Amended Certificate of Approval (COA) number 8537-7Y6SGZ and to provide residents of the Town of Arnprior with information on an important piece of the Town's municipal infrastructure.

1.0 Preliminary Treatment

1.1 Screen Units

There are three screening units, two automatic mechanical screen and a standby manual screen. All 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 landfill.

1.2 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.

2.0 Primary Treatment

2.1 Primary Sedimentation

There are four rectangular primary clarifiers at the WPCC: two with a surface overflow area of 142 m² and two with an overflow area of 154 m². All units are equipped with chain and flight sludge collection and manual scum removal.

Raw sludge is pumped from the primary clarifiers to Anaerobic Digesters using plunger type positive displacement pumps.

3.0 Secondary Treatment

3.1 Activated Sludge Treatment

The activated sludge treatment process includes two rectangular aeration tank and three separate rectangular secondary clarifiers, each made up of two units in parallel.

The aeration tank volumes are 1,303 m³ each, and are 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.

3.2 Phosphorous Removal

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

3.3 Chlorination System

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

3.4 De-chlorination System

The chlorinated water must be de-chlorinated before discharge into the Ottawa River. This is achieved through the addition of sodium bisulfate. The sodium bisulfate system is made up of one 1,336 L storage tank and a pair of feed pumps.

3.5 Sludge Dewatering

A Centrifuge capable of processing 7 L/s of sludge is used for dewatering anaerobically digested sludge. The sludge from this unit is loaded onto a dump truck and delivered to the Arnprior landfill.

3.6 Auxiliary Power

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

4.0 Plant Performance Summary

Certificate of Approval (COA) number 8537-7Y6SGZ, section 10-6(a) requires the Town to provide an annual summary and interpretation of all monitoring data and comparison to the effluent limits outlined in Condition 7, including an overview of the success and adequacy of the Works. All further COA reporting requirements are shown in blue italics.

4.1 Effluent Flows and Loading

Table 4-1 below indicates the effluent criteria for average monthly flows, CBOD, Total Suspended Solids, Phosphorus and their respective loadings of the WPCC. All monthly concentrations and loadings meet the effluent objectives and limits.

Table 4-1 - Summary of WPCCC 2022 Final Effluent Flows and Loading

	Daily Total (m ³ /Day)	CBOD ₅ (mg/L)	Total Suspended Solids (mg/L)	Total Phosphorus (mg/L)	CBOD ₅ Loading (kg/Day)	Total Suspended Solids Loading (kg/Day)	Total Phosphorus Loading (kg/Day)
Objective	N/A	15.0	15.0	0.75	142.5	142.5	9.5
Limit	9700	25.0	25.0	1.0	243.0	243.0	9.7
Compliance Assessment Basis	Annual Average	Monthly Average	Monthly Average	Monthly Average	Monthly Average	Monthly Average	Monthly Average
January	4005	4.8	8.5	0.40	19.0	34.0	1.6
February	4215	3.8	9.0	0.27	15.8	37.9	1.2
March	7631	3.0	5.2	0.16	22.9	39.7	1.3
April	7901	3.3	5.5	0.22	25.7	43.5	1.7
May	5397	3.0	7.2	0.24	16.2	38.9	1.3
June	4968	3.0	5.0	0.30	14.9	24.8	1.5
July	4064	3.5	7.3	0.35	14.2	29.5	1.4
August	5118	3.2	6.4	0.24	16.4	32.8	1.2
September	4855	3.3	4.8	0.22	15.8	23.1	1.1
October	4318	5.0	8.8	0.33	21.6	37.8	1.4
November	4074	3.2	4.6	0.20	13.0	18.7	0.8
December	5064	3.0	9.0	0.23	15.2	45.6	1.2
Annual Average	5134	3.5	6.8	0.26	17.6	33.9	1.3

4.2 Monitoring Data Interpretation

- 4.2.1** Five day Carbonaceous Biological Oxygen Demand (CBOD5) is sampled once per week from a composite sample. The effluent reporting criteria is 25 mg/l and the plant objective is 15 mg/l. The monthly average high was 5.0 mg/l in October. The CBOD5 objective loading rate is 142.5 kg/d, and in 2022 the plant maximum monthly average loading was 25.7 kg/d in April.
- 4.2.2** The Total Suspended Solids (TSS) in the raw and effluent wastewater is usually measured 4 times per month from a composite sample. The effluent reporting criteria is 25 mg/l and the plant objective is 15 mg/l. The maximum monthly average was 9.0 mg/l in February. The objective with respect to plant effluent loading of TSS is 142.5 kg/d. The WPCC had a maximum monthly average effluent loading of 45.6 kg/d in December.
- 4.2.3** The Total Phosphorous (TP) in the raw and effluent wastewater is sampled and tested each week from composite samples. The reporting criteria is 1.0 mg/l and the plant objective is 0.75 mg/l. The maximum monthly average of TP levels in 2022 was 0.40 mg/l in January. The Total Phosphorous objective loading rate is 9.5 kg/d and in 2022 the maximum monthly average TP loading rate was 1.7 kg/d in April.

5.0 Effluent Objectives and Effluent Quality Assurance

10-6(d) a summary of any effluent quality assurance or control measures undertaken in the reporting period.

10-6(g) a description of efforts made and results achieved in meeting Effluent Objectives of Condition 6.

5.1 Effluent Monitoring

Table 5-1 below lists the objectives, limits and results of the final effluent monitoring parameters.

Table 5-1 - 2022 Final Effluent Sampling Results

	Total Ammonia Nitrogen (mg/L)	Total Nitrogen (mg/L)	Total Residual Chlorine (mg/L)	E.Coli (CFU/100ml)	pH	Temperature (°C)	Un-Ionized Ammonia (Note #2)	Lethality Test
Objective	10.0	15.0	Non-Detect	100	6.5 - 8.5	N/A	N/A	Note #1
Limit	Note #1	N/A	0.10	200	6.0 - 9.5	N/A	N/A	Pass/ Fail
Compliance Assessment Basis	Monthly Average	Monthly Average	Min/Max	Monthly Geometric Mean Density	Min/Max	Monthly Average	Monthly Average	Single Sample
January	15.2	28.3	0.00/0.03	3	6.16/7.48	9	0.0215	Pass
February	13.6	32.9	0.01/0.03	2	6.10/6.80	10	0.0090	Pass
March	12.0	24.1	0.01/0.03	7	6.30/7.87	10	0.0382	Pass
April	8.9	19.6	0.00/0.05	10	7.26/7.68	11	0.0525	Pass
May	0.5	19.5	0.00/0.07	14	6.94/7.87	16	0.0036	Pass
June	0.4	27.7	0.00/0.03	41	6.49/7.86	19	0.0025	Pass
July	4.3	30.4	0.00/0.02	13	6.24/7.23	22	0.0158	Pass
August	0.7	20.5	0.00/0.02	10	6.22/7.12	23	0.0012	Pass
September	3.0	23.7	0.00/0.02	30	6.32/7.33	21	0.0083	Pass
October	0.4	49.3	0.00/0.04	38	6.21/7.02	19	0.0073	Pass
November	3.5	30.3	0.00/0.03	4	6.31/6.81	17	0.0044	Pass
December	4.7	28.0	0.00/0.08	2	6.20/7.00	13	0.0065	Pass
Note #1- Non- Acutely Lethal to Rainbow Trout and Daphnia Magna								
Note #2- Un-Ionized Ammonia calculated using pH and temperature at time of sampling for Total Ammonia Nitrogen								

5.1.1 Total Ammonia Nitrogen has an objective of 10.0 mg/l and the effluent limit is to be non-acutely lethal to rainbow trout and daphnia magna year round on a monthly test. The maximum monthly concentration was 15.2 mg/l in the month of January due to loss of nitrification in the colder temperatures. The monthly average for April was 8.9 mg/l with nitrification re-established with the warmer temperatures. All lethality tests throughout the year passed.

Total Nitrogen is the sum of the concentrations of nitrate, nitrite and TKN. The effluent objective for total nitrogen is 15.0 mg/l. All total nitrogen concentrations on a monthly basis were greater than the objective due to a lack of denitrification ability of the facility. Different process parameters and tank configurations were changed in an attempt to lower total nitrogen with limited success.

The objective for total nitrogen was reviewed by Stantec Consulting and their conclusions are that the 2008 Environmental Study Report (ESR) recommendations do not support the WPCC total nitrogen objectives contained in the year 2010 Certificate of Approval for the WPCC. The assimilative capacity report included in the ESR states that the Ottawa River's nitrates are not a concern. This is confirmed by the observation that neighbouring facilities that also discharge to the Ottawa River do not have a total nitrogen objective.

5.1.2 Total Residual Chlorine objective is to be non-detectable and less than 0.10 mg/l is the limit. A residual was detected in all months but at no time in the year did the value exceed the limit.

5.1.3 E.coli is measured in the unit of CFU/100ml as a monthly geometric mean density and the objective is 100 CFU/100ml. This objective was met in all months with the highest monthly geometric mean being 41 CFU/100ml in June. The limit for E.coli is 200 CFU/100ml.

5.1.4 pH is the negative log of the concentration of hydrogen. The objective for pH is 6.5 – 8.5 at all times. Exceedances noted are based on daily sampling. Soda ash is dosed in the aeration effluent channels to raise the pH and at all times the effluent pH was within the limit of 6.0 – 9.5 The WPCC effluent pH is sometimes too low because the raw sewage does not contain sufficient alkalinity to fully nitrify the incoming nitrogen

6.0 Bypass Summary

10-6(j) a summary of all By-pass, spill or abnormal discharge events.

- January 6th a by-pass at Pump Station #2 due to a failed GFI receptacle amounted to a total of 116 m³.
- On May 21st due to heavy precipitation, Pump Stations #1, #3 and the WPCC all bypassed. PS#1 amount was 0.28m³, PS#3 amount was 16m³ and the WPCC amount was 500m³.
- June 3rd due to heavy precipitation, PS#3 and the WPCC both bypassed. The total amount of bypass at PS#3 was 14m³ and at the WPCC was 54m³.
- On August 8th a bypass in the amount of 22 m³ occurred at Pump Station #3 due to heavy precipitation.
- August 26th due to heavy precipitation, a WPCC bypass occurred, the total amount being 5.5m³
- There was a bypass on October 16th in the amount of 31m³ at Pump Station #2 due to control equipment failure.
- On December 3rd due to electrical control equipment failure there was a bypass at Pump Station that amounted to 31m³

Required samples were collected for all by-passes and lab results were received. All by-passes were reported to the MECP and the local health unit.

7.0 Operating Problems

*10-6(b) a description of any operating problems encountered and corrective actions taken.
10-6(f) an evaluation of the need for modification and upgrades to the Works to improve performance and reliability and to minimize upsets and bypasses.*

An increased number of hydro power events has caused more electrical control equipment failures than in the past. Failed equipment has been refurbished by an industrial electronic repair technicians and additional units have been purchased to have available as spares. Many older Uninterrupted Power Supplies have been replaced and two spares have been purchased. Contracted technicians have serviced multiple pumps to ensure consistent operation.

8.0 Plant Maintenance

10-6(c) a summary of all maintenance carried out on major structure, equipment, apparatus, mechanism or thing forming part of the works.

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

A summary of major repairs or maintenance carried out in 2022 is as follows:

- Annual certification of laboratory instruments.
- Annual certification of backflow preventers.
- Annual certification of flow meters.
- Purchase of 2021 dump truck for hauling dewatered sludge to landfill.
- Rebuild of two primary sewage plunger pumps.
- Rebuild of polymer transfer pump.
- Both grit pumps were serviced by contractor.
- Various health and safety supplies purchased.
- Heat recirculation pump purchased and installed.
- Purchased spare packing for plunger pumps.
- Purchased spare bearings for centrifuge.
- Purchased spare shear pins for clarifier drives.
- Blower coupling refurbished and installed.
- Centrifuge drive motor refurbished.
- Purchased three UPS units and three spare batteries for PLC's.
- Purchased spare filters for turbo blowers.
- Digester supernatant breaker refurbished.
- Screen room LEL sensor replaced.

9.0 Sludge Processing

10-6(h) a tabulation of the volume of sludge generated in the reporting period, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed.

Combined primary and secondary waste activated sludge is collected from all four primary settling tanks and pumped into the anaerobic digesters. From the digesters, sludge is pumped into holding tanks, it is then conditioned and processed in the centrifuge. Sludge is dewatered to approximately 22% and loaded onto a truck and transferred to the Arnprior landfill.

A total of approximately 137,268 kg dry weight of sludge was transported to the Arnprior Waste Disposal Site. Sludge production in 2023 is expected to be higher than 2022. Table 9-1 below provides a summary of the 2022 centrifuge operation and sludge management totals.

Table 9-1 - Centrifuge Operation and Summary of Sludge Totals

Month	Sludge To Storage m³	Sludge To Centrifuge m³	% Solids Avg.	Dry Solids (kg)
January	473	517	1.30	6,721
February	599	230	2.03	4,669
March	869	682	2.21	15,072
April	919	500	2.28	11,400
May	664	514	2.46	12,644
June	606	390	2.82	10,998
July	789	548	2.60	14,248
August	815	641	2.61	16,730
September	839	390	2.81	10,959
October	950	417	2.58	10,759
November	869	557	1.91	10,639
December	1080	437	1.70	7,429
Avg	789	485	2.28	11,022
Max	1080	682	2.82	16,730
Min	473	230	1.30	4,669
Total	9471	5823		132,268

10.0 Monitoring Equipment Calibration

10-6(e) a summary of the calibration and maintenance carried out on all effluent monitoring equipment.

All flow meters were calibrated by an outside contractor and all flow meters passed calibration. The benchtop chlorine analyzer is certified annually, and samples are taken daily to test for effluent total chlorine residual.

11.0 Complaints

10-6(i) a summary of any complaints received during the reporting period and any steps taken to address complaints.

There were no complaints received during the reporting period.

12.0 Conclusion

The Arnprior WPCP met all MECP sewage effluent limits. The facility did not meet the objective for total chlorine residual being non-detectable in that the yearly average was 0.01 mg/l. The objective of 10 mg/l for the monthly average of Total Ammonia Nitrogen was exceeded in the months of January, February and March when nitrification was limited due to colder temperatures

With regards to the Total Nitrogen Objectives currently listed in the 2010 C of A, the Town, as recommended by Stantec, requested that the 2010 C of A be re-issued without a total nitrogen objective and with the seasonal total ammonia objectives recommended in the ESR. An ECA Amendment Application was prepared by Stantec and submitted by the Town on May 4th, 2022, however at this time, the MECP has not yet provided a formal decision.

For inquiries regarding this report, please contact Scott Matthews at 623-4231 Ext. 1834.

Respectfully,

Scott Matthews
Waterworks Supervisor