

2022

2022 Annual Cardinal WPCP Summary Report to Council



**Prepared by: Eric Wemerman
For: CAO and Council
1/13/2023**

Introduction

Under Environmental Compliance Approval (ECA) # 3-0341-94-957 issued by the Ministry of Environment, Conservation and Parks (MECP), Edwardsburgh/Cardinal is required to report annually on values/parameters listed in the ECA for the Cardinal Water Control Pollution Plant (WPCP). The annual report covers the period of January 1st to December 31st, 2022 and is submitted to council and MECP by the March 31st deadline. The report is also made available for public viewing on the Township site.

The facility is normally staffed with a licensed operator Monday thru Friday, with walkthrough inspections performed twice daily and by the rotational on-call operator on weekends and holidays. The wastewater treatment process is operated via a Supervisory Control and Data Acquisition (SCADA) system, monitored by a 3rd party security company which notifies the on-call operator to respond to alarms or customer complaints. Routine in-house and external laboratory sampling is performed to monitor the effectiveness of the treatment process and to ensure system is operating as designed.

Executive Summary

In 2022 the average daily flow into the Cardinal WPCP was 967 m³/day or 40 % of the rated capacity for the system. The maximum daily flow recorded was 3707 m³/day. The highest flows occur during periods of heavy rain and snow melt. Ongoing efforts including Cured-In-Place Pipe Work (CIPP) and complete rehabilitation of sanitary mains have decreased peak flow rates as shown in this report. No exceedances of monthly effluent criteria or annual loading rates occurred in 2022. A total of 667 m³ of biosolids were removed in 2022, a decrease of 3% from 2021.

Two notices were made to the Spills Action Centre, Leeds & Grenville Health Unit, South Dundas and MECP regarding a sanitary force main break and a partially treated effluent bypass due to a UV System failure at the WPCP. Operational issues, complaints, and corrective actions for 2022 have been summarized in this report. The report summarizes monthly flow, influent/effluent chemical results, and percent removal efficiencies. Long term comparison of final effluent results versus objectives and compliance limits demonstrate the Cardinal WPCP is operating within the prescribed ECA.

Common Acronyms

WPCP: Water Pollution Control Plant

MECP: Ministry of Environment, Conservation, Parks

CIPP: Cured in Place Pipework

SCADA: Supervisory Control and Data Acquisition

SBR: Sequential Batch Reactor

ATAD: Auto-Thermophilic Aerobic Digester

WAS: Waste Activated Sludge

IECBL: Industrial Electrical Contractors Brockville

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Process Summary

The Cardinal Waste Water Collection system includes four sanitary lift stations, four forcemains and pipework ranging in size from 200 mm to 450 mm comprised of clay, PVC and CIPP lined main. Influent enters the Cardinal Water Control Pollution Plant via gravity where it is diverted to two continuous flow bar screens. The bar screens remove larger debris and transfer it into a Rotopac compactor. The compactor compresses and dewateres the solids prior to disposal. The influent then passes through a circular vortex grit chamber. Higher density grit, (typically sand), settles and is pumped to a grit dewatering screw. A bin containing grit and compacted debris is removed by a 3rd party company.

Aluminum sulfate is injected, (for phosphorus control), into the influent stream prior to alternately entering one of two Sequential Batch Reactors (SBR's). The SBR's normally operate in five stages. Idle (not filling), static fill (filling but not aerating), aerated fill (aerated and filling), React (Aeration but not filling), settle (60 minutes) and decant (draining SBR effluent). During high flow conditions, the SBRs may transition to a simultaneous stage (fill-settle and fill decant).

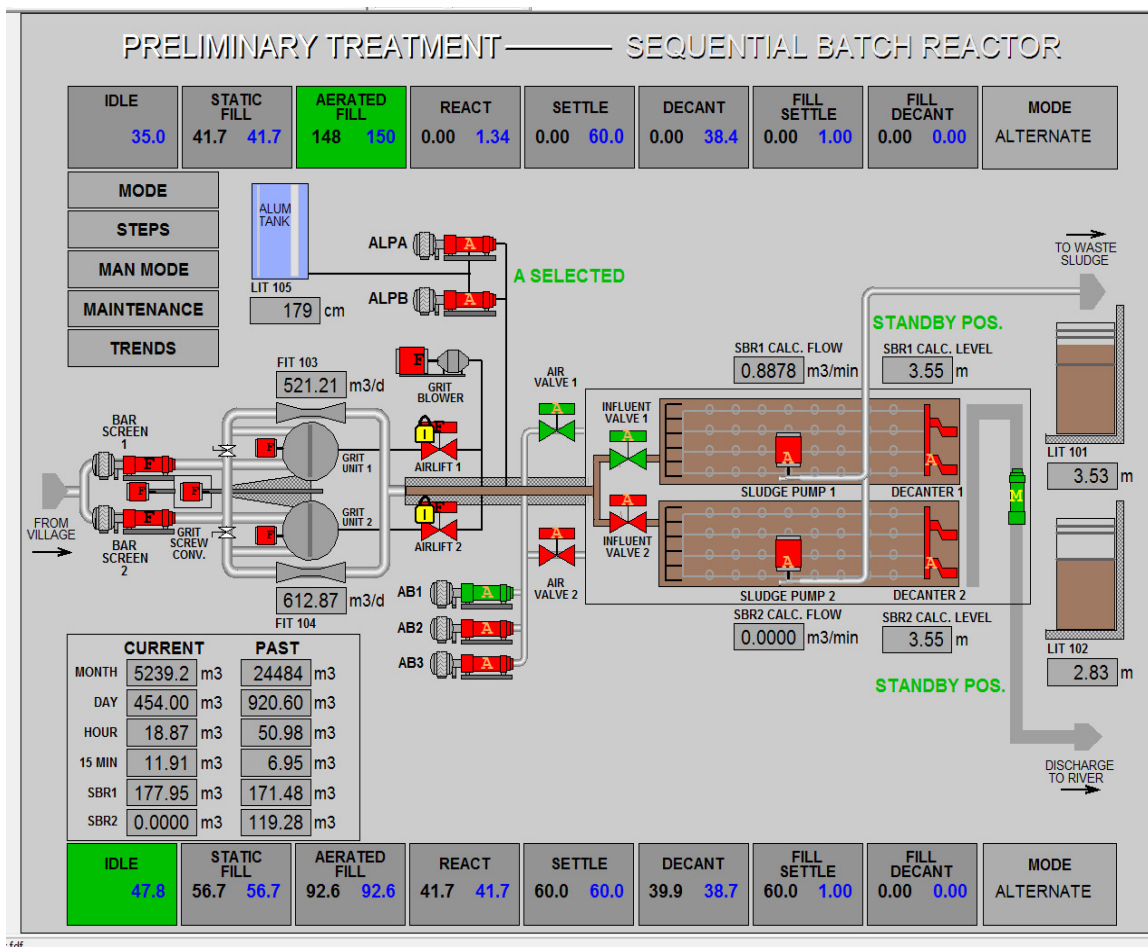
Under normal operations, influent is directed to only one of the two SBR basins at a time. The aeration or aerobic stage, followed by an anerobic stage, provides a suitable environment for microorganisms to reduce Biochemical Oxygen Demand (BOD), Nitrates and Ammonia below ECA limits and objectives. The settle period allows for the separation of solids and supernatant liquid to ensure effluent total suspended solids is below an annual average of 25 mg/L. Effluent then passes through a Trojan UV 3000B system for disinfection and sterilization of pathogenic micro-organisms.

Waste activated sludge is removed daily from the sequential batch reactors by a process called wasting and transferred into an un-thickened holding tank. A gravity belt thickener is utilized 2 to 3 times per week to thicken the sludge. The thickened sludge is processed into a holding tank. The sludge is then batch treated, (2 to 3 times per week), through the auto-thermophilic aerobic digesters, (ATADs), and pumped into the land application holding tanks. Semi-annually, the digested sludge is hauled away by GFL Environmental

Inc. and applied to a licensed land application site under the authority of Certificate of Approval # 5948-7JRMAJ (issued January 9, 2021) and Approval of Amended NASM, (non-agricultural source material), Plan – 23296 as per regulation 267/03.

Process Schematic

Schematic drawing showing the process of the Cardinal Water Control Pollution Plant.



System Approvals

System	Environmental Compliance Approval	Renewal Date
Cardinal Water Pollution Control Plant	3-0341-94-957	N/A
Township of Edwardsburgh/Cardinal Sewage Collection System	155-W601	June 15, 2026

Staffing and Licensing

The table below lists the licensed operational staff at the end of the 2022 calendar year.

<u>Name</u>	<u>Position</u>	<u>License #</u>	<u>Type</u>	<u>Class</u>
Eric Wemerman	Chief Operator	64873	WWT	II
		80295	WWC	II
Aaron Campbell	Assistant Chief Operator	81927	WWT	II
		96033	WWC	II
Stephen Campbell	Operator	18529	WWT	II
		76515	WWC	II
Mark Simzer	Operator	93002	WWT	II
		104866	WWC	II
Tyler Selleck	Operator	113844	WWT	I
Gord Shaw	Director of Operations	58944	WWT	III
		78208	WWC	II
Wayne Lefebvre	Public Works Operator	17953	WWC	I

Tabulation of Monitoring Data

Effluent quality obtained leaving the facility met or was better than the effluent objectives set forth in Condition 6 of the Certificate of Approval. A summary of annual concentrations and loadings versus objectives and compliance can be found in the appendices of this report. Effluent and totalized flow trending from 1997 to 2022 versus compliance and objective limits can be found on pages 12 to 14.

There were no occurrences of non-compliance with respect to Condition 7, 8,9 or 10 of the Certificate of Approval as demonstrated in Appendix A, B and C of this report.

Preventative Maintenance Program

Routine and scheduled maintenance was performed based on maintenance and lubrication schedules developed by design consultants and reviewed and modified by operations staff as needed. Routine maintenance is completed in house by Environmental Staff.

Preventative Maintenance Program

<u>Service Provider</u>	<u>System Component</u>	<u>Frequency</u>
Capital Controls	Greyline Level Controllers, Flow meters, Gas Detection Systems, ATAD temperature sensors.	Annual
Trojan UV	Trojan UV 3000 B System	Annual
GAL Power	Generators	Semi-annual
Schneider Electric	SCADA System	Semi-annual
Black & McDonald	Boiler System	Quarterly
DCIS	Confined space equipment	Annual
Claude Bourck Plumbing	Backflow Preventors	Annual
Dundee Marine	Outfall pipework inspections	Bi-annual
Electrical Safety Authority	Electrical inspections	Annual
Clean Water Works	Pressure cleaning and vacuuming sanitary pumping stations and sewer mains	Annual
Environmental Services	Routine maintenance & lubrication schedule	Weekly

2022 Capital Projects

<u>Project</u>	<u>Cost</u>	<u>Completion Date</u>
Helen Street CIPP Project	\$72,457.52	August 5 th , 2022
SAM Grit Dewatering Screw Unit replacement	\$44,260.51	September 20, 2022
County Road 2 Water and Sanitary Replacement Pre-Engineering Study.	\$64,471.59	December 15, 2022

Cardinal WPCP Operational Problems

The following operational problems occurred at the Cardinal WPCP in 2022.

<u>System Component</u>	<u>Operational Problem</u>	<u>Corrective Action</u>
Sludge Thickening System	Seepex pump faulting (Emergency shut down)	IECBL serviced and repaired the variable frequency drive.
WAS Pump # 1	Waste Activated Sludge Pump # 1 not running.	Tested and replaced fuses in panel.
Biofilter Effluent Pump	Motor not running.	Hewitts replaced motor and serviced Biofilter pump panel.
Air Handling Unit	Motor running loud and hot.	Hewitts replaced motor and belts.
Phone Line	Static phone line	Bell Canada repaired phone line.

<u>System Component</u>	<u>Operational Problem</u>	<u>Corrective Action</u>
Exterior Building lighting	Not operating at night.	IECBL replaced light fixture unit and sensor.
UV System	Loss of power and alarm communication.	Replaced fuses and repaired alarm wiring.
Generator	Battery life reached.	Replaced batteries.
UV System	Trojan UV 3000B (Bank # 8)	Replaced four ballasts.
Air Handling Unit	Over-heating	Morrisburg Plumbing replaced temperature sensor.
Boiler System	Circulating pump leaking	Morrisburg Plumbing replaced seal in pump.
Bio-Filter System	Loud motor/Belt	Cleaned motor housing and replaced belt.

Cardinal Sanitary Collection System Operational Problems and Complaints

The following operational problems and complaints occurred in 2022.

<u>System Component</u>	<u>Frequency in 2022</u>	<u>Corrective Action</u>
Sanitary Lateral blockages	9	Inspected upstream & downstream sanitary manholes. Plumber augers to remove blockage and CCTV inspects laterals. Homeowner corrects issues identified on private property. Laterals on public property are replaced based on CCTV inspection.
Sewer lateral replacement	3	Replaced defective sewer lateral.
Sewer Odor (general)	1	Checked sewer manholes, perimeter of WPCP. Sanitary system not the cause of the odor.
Sewer Odor (Residential)	1	Checked sewer manhole by property. Owner to contact plumber to inspect lateral on private property.
Adelaide Station (Heating System)	1	Morrisburg Plumbing replaced control board in heating system.
Force main break Walter St.	1	Set up temporary bypass. Reported to Spills Action Centre, Leeds & Grenville Health Unit, South Dundas and MECP. Repaired force main.
Henry St Pumping Station loss of power	1	Switched to secondary power. Rideau St Lawrence repaired transformer.

<u>System Component</u>	<u>Frequency in 2022</u>	<u>Corrective Action</u>
Sewer main blockage	1	Clean Water Works high pressured cleaned sewer main between Dundas/Waddell to Dundas/West Streets. No sewer lateral back ups or property damage reported.
Generator	1	GAL Power investigated generator fault at Adelaide Station. No cause determined.
Henry Street Pumping Station	1	Replaced faulty pressure transducer and sonar/pressure boards in Greyline Level Controller.
Highway 2 Pumping Station	1	Relocate electrical service and replace disconnect panel. Partially completed. Work to be completed in 2023.

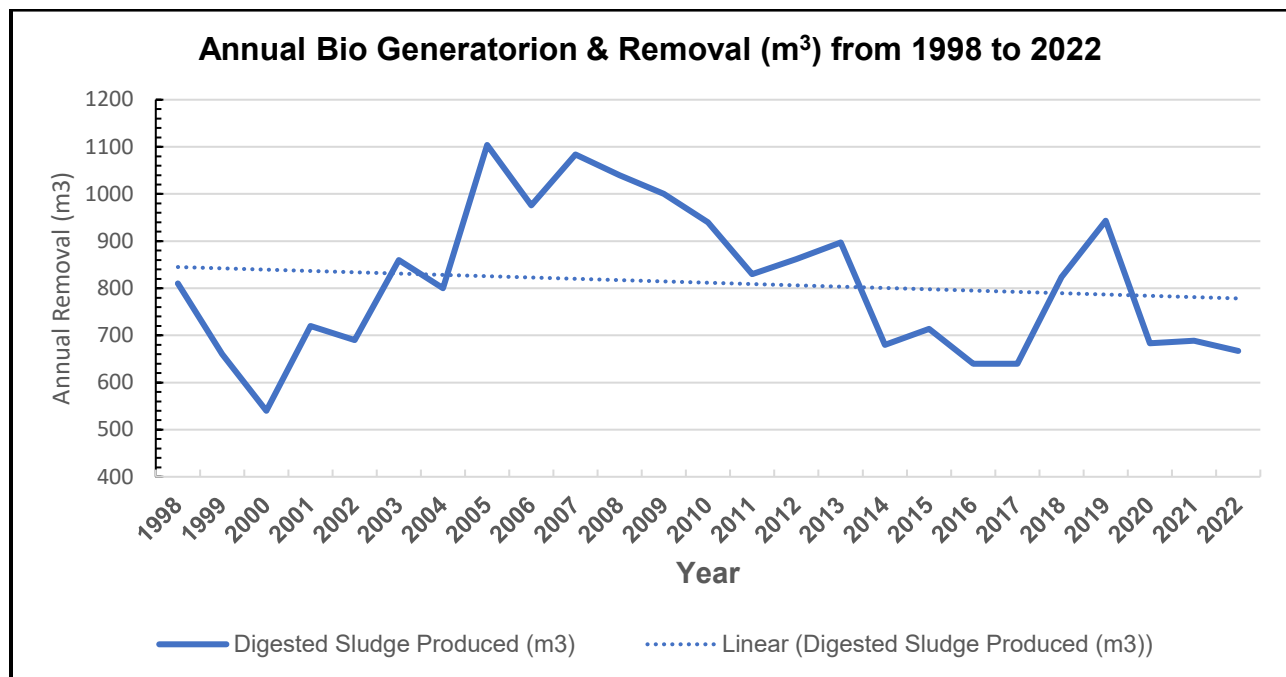
2022 Bypass & Spill Summary

The following bypass/spill events occurred during the reporting year.

<u>System</u>	<u>Date</u>	<u>SAC Reference #</u>	<u>Volume (m3)</u>	<u>Corrective Action</u>
Force Main Break (Walter Street)	June 7, 2022	1-1U1WWG	9.6	Set up temporary bypass. Reported to Spills Action Centre, Leeds & Grenville Health Unit, South Dundas and MECP. Repaired force main.
Cardinal WPCP	August 13, 2022	1-237JEK	80	Placed secondary UV System online. Reported to the Spills Action Centre, Leeds & Grenville Health Unit, South Dundas and MECP. Replaced fuses in the Trojan UV System. Collected chemical and microbiological samples. Investigated and repaired alarm relay communication issue.

Bio-Solids Generation and Removal

The total amount of bio-solids treated at the WPCP and removed by GFL Environmental Inc in 2022 was 667 m³ compared to 689 m³ in 2021. The graph below summarizes total annual bio-solids generation from 1998 to 2022.



Calibration and Maintenance Procedures

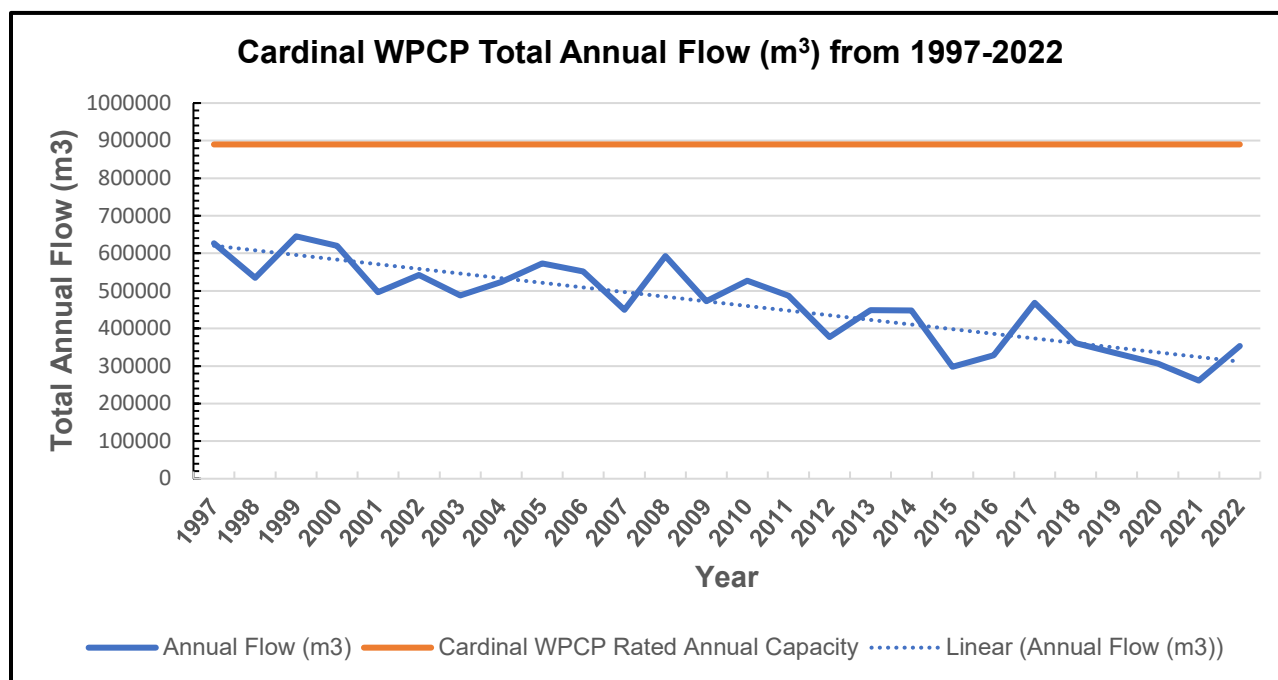
The calibration and maintenance intervals utilized at this facility seem sufficient to maintain equipment and instrumentation in good working order. Capital Controls is sub contracted to perform annual and emergency calibrations on equipment within the treatment and collection system.

Evaluation of Performance and Reliability

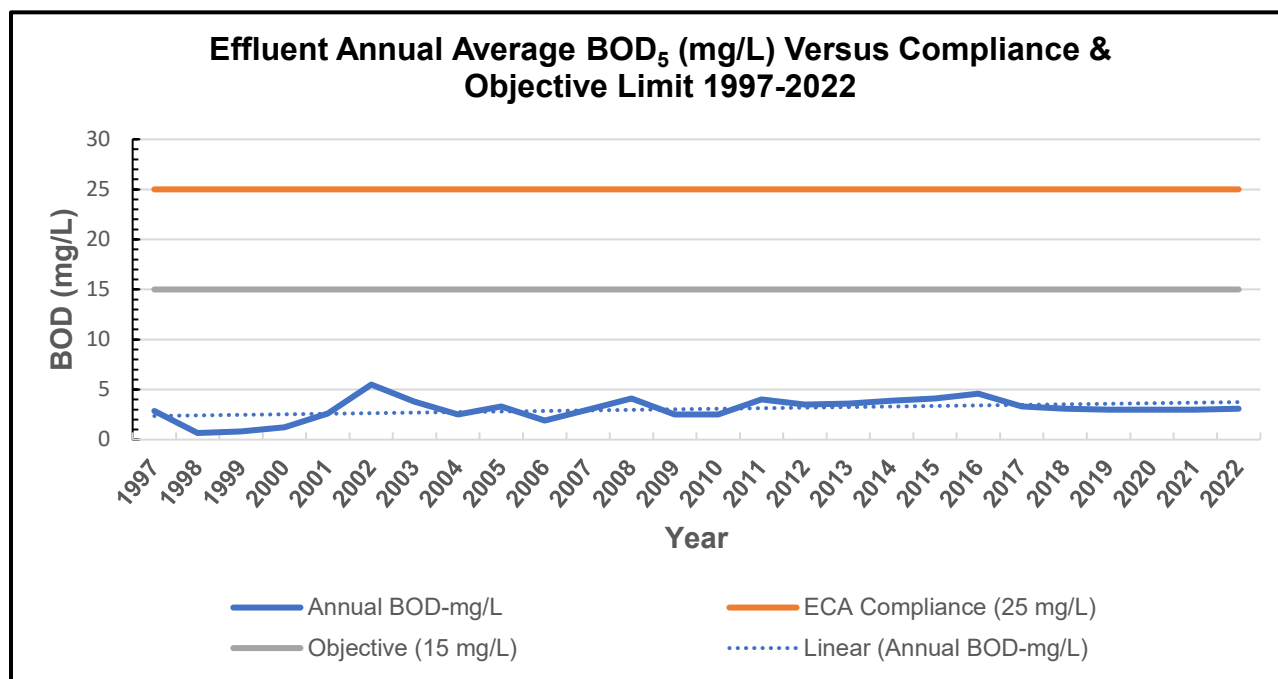
The facility is being operated and maintained to produce high-quality effluent that is demonstrated by the overall results achieved in 2022. Extraneous flows are being addressed through Cured in Place Pipe work and complete replacement of sanitary sewers and manholes. The graphs on page 12-14 shows the total influent flow has steadily decreased since 1997 and effluent quality analysis for Biochemical Oxygen Demand, Total Suspended Solids and Total Phosphorus remain well below compliance

limits established in the ECA. Appendices A to D summarizes monthly flow, influent/effluent results, and sludge processing data for 2022.

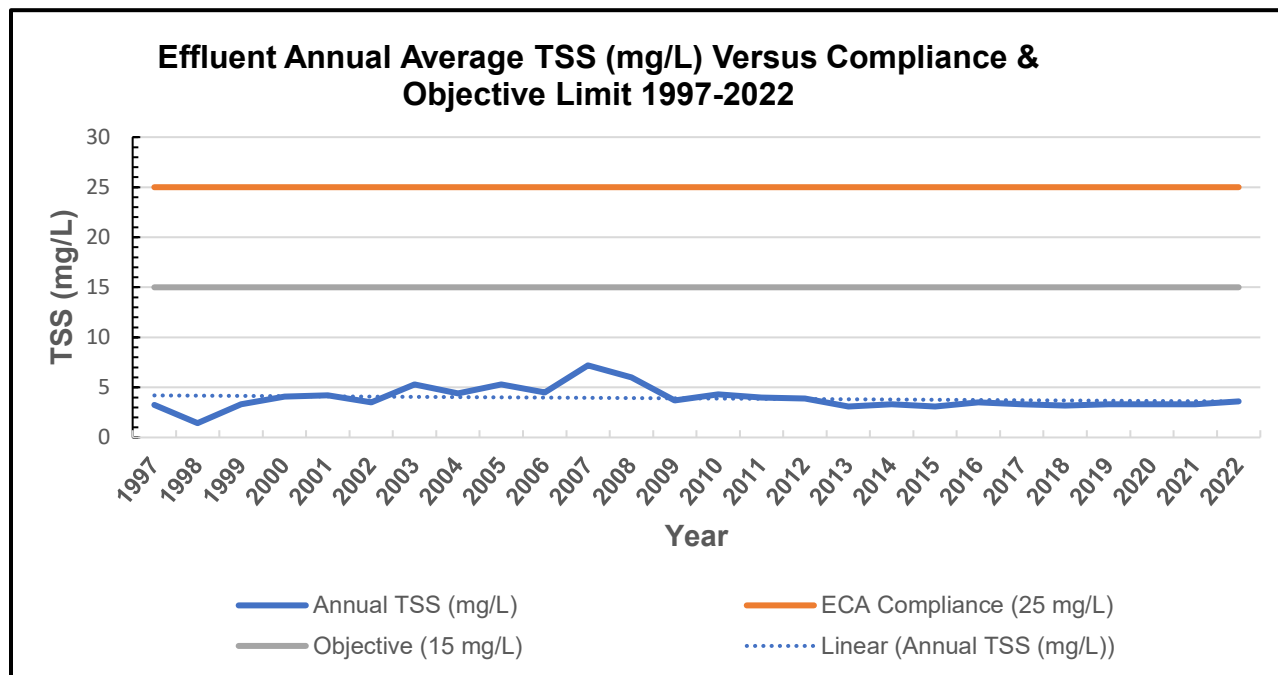
Cardinal WPCP Total Annual Flow



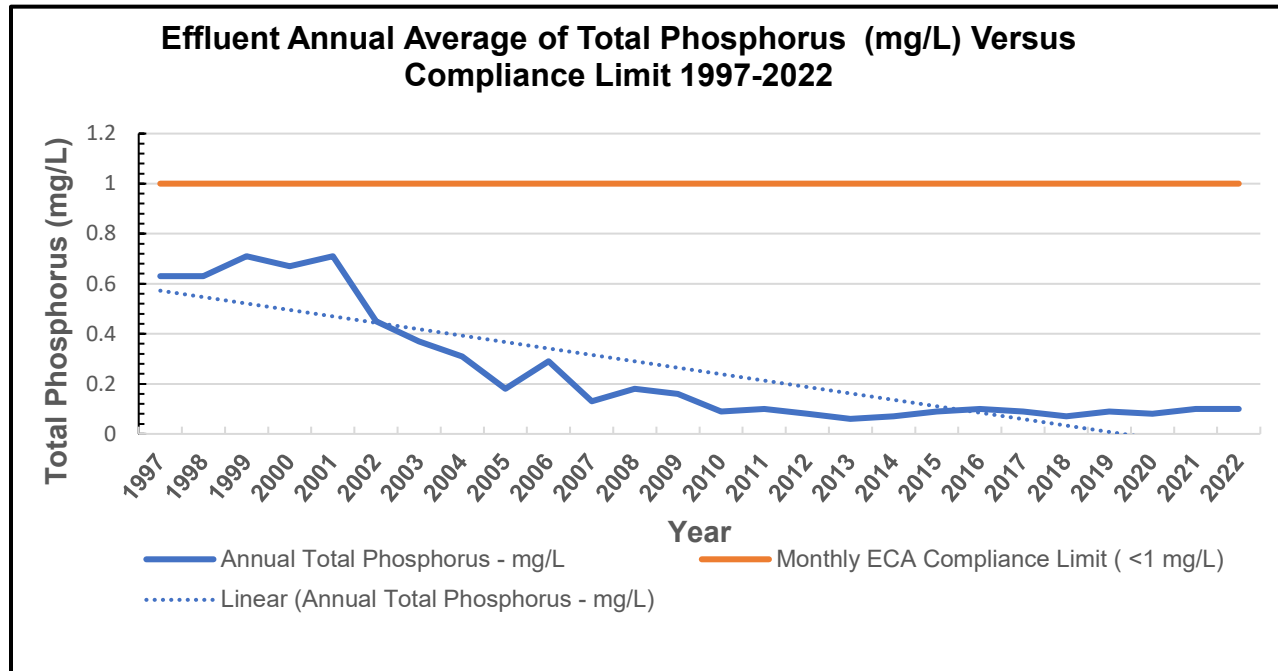
Effluent Biochemical Oxygen Demand (BOD) Performance Summary



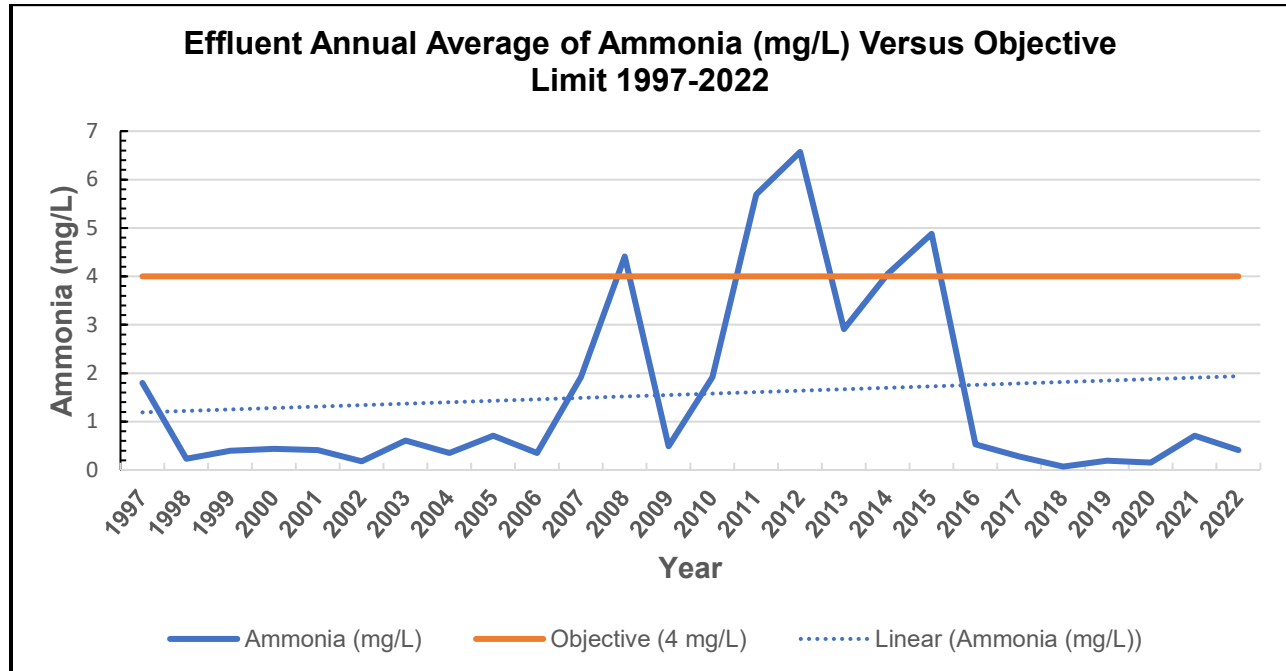
Effluent Total Suspended Solids Performance Summary



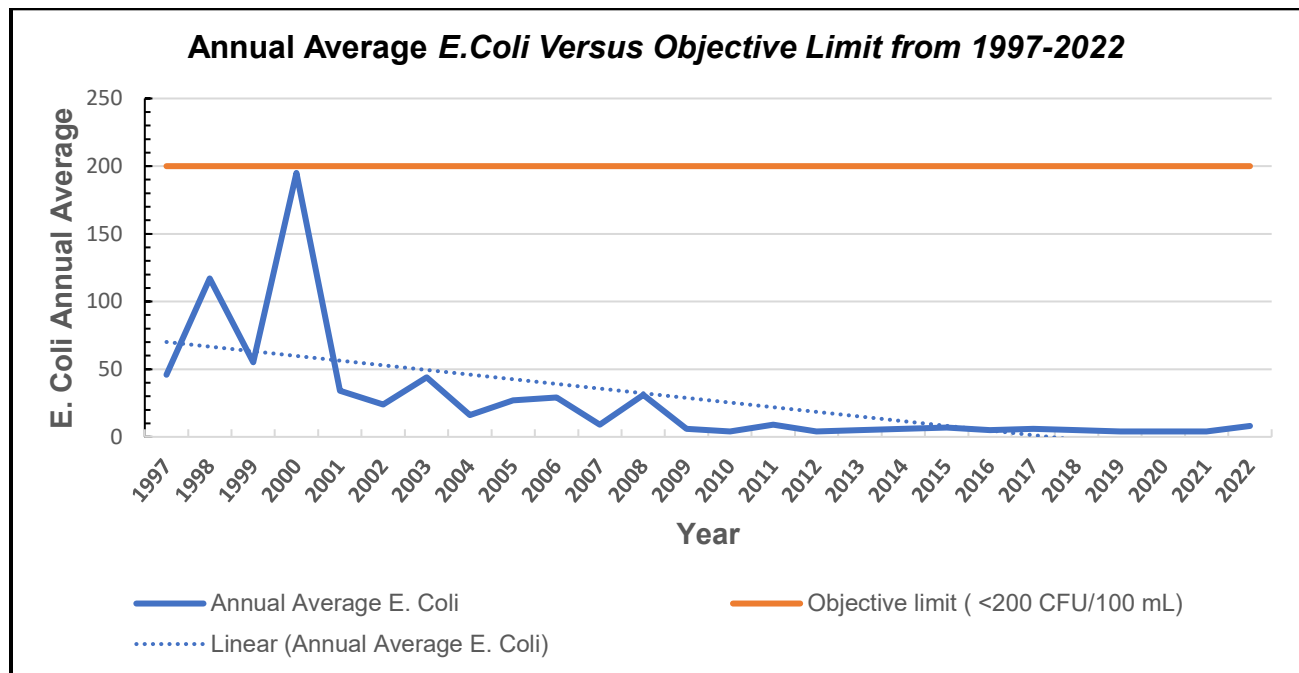
Effluent Total Phosphorus Performance Summary



Effluent Annual Ammonia Summary



Effluent E.Coli Summary



Regular assessment and striving for improvement will endeavor to ensure continued high performance, efficiency, and reliability of this facility.

Appendix A

2022 Annual Monitoring & Performance Report

2022				
ANNUAL AVERAGE EFFLUENT CONCENTRATIONS				
<u>Parameters</u>	<u>Units</u>	<u>Objectives</u>	<u>Compliance</u>	<u>Actual</u>
BOD ₅	mg/L	15.0	25.0	3.10
Suspended Solids	mg/L	15.0	25.0	3.60
Total Phosphorus	mg/L	<1.0	1.0	0.10
Am & Am Nitrogen	mg/L	4.0		0.41
<i>E. Coli</i>	cfu/100 mL	<200/100 mL		8.00
CBOD ₅	mg/L	15		3.00
ANNUAL AVERAGE EFFLUENT LOADING				
<u>Parameters</u>	<u>Units</u>	<u>Objectives</u>	<u>Compliance</u>	<u>Actual</u>
CBOD ₅	kg/day	36		2.9
BOD ₅	kg/day	36.6	61	3.0
Suspended Solids	kg/day	36.6	61	3.5
Total Phosphorus	kg/day	<2.4	2.4	0.1
Am & Am Nitrogen	kg/day	9.8		0.4

“Annual average concentration” means the arithmetic mean of the monthly average concentrations of a contaminant in the effluent calculated for a particular calendar year.”

“Annual average loading” means the value obtained by multiplying the annual average concentration of a contaminant by the average daily flow over the same calendar year.”

Appendix B

2022 Monthly Average Loadings

MONTHLY AVERAGE EFFLUENT LOADING						
<u>Month</u>	<u>BOD₅</u>	<u>Annual Compliance</u>	<u>Total Suspended Solids</u>	<u>Annual Compliance</u>	<u>Total Phosphorus</u>	<u>Annual Compliance</u>
	kg/day	kg/day	kg/day	kg/day	kg/day	kg/day
January	1.52	61.0	1.52	61.0	0.03	2.4
February	1.91	61.0	4.14	61.0	0.04	2.4
March	5.27	61.0	5.27	61.0	0.15	2.4
April	5.27	61.0	6.58	61.0	0.13	2.4
May	3.30	61.0	3.30	61.0	0.08	2.4
June	2.57	61.0	2.57	61.0	0.06	2.4
July	2.41	61.0	2.61	61.0	0.08	2.4
August	2.69	61.0	2.37	61.0	0.12	2.4
September	2.47	61.0	3.91	61.0	0.12	2.4
October	2.10	61.0	2.53	61.0	0.09	2.4
November	2.37	61.0	2.37	61.0	0.09	2.4
December	3.41	61.0	3.70	61.0	0.09	2.4

Appendix C

2022 Monthly Flow & Average Effluent Concentrations

	FLOWS			BIOCHEMICAL OXYGEN DEMAND			SUSPENDED SOLIDS			PHOSPHORUS			AMMONIA			CHEMICAL BIOLOGICAL DEMAND			E.Coli
2022	Total Flow	Avg Day Flow	Max Day Flow	AVG RAW	AVG EFF	REMOVAL	AVG RAW	AVG EFF	REMOVAL	AVG RAW	AVG EFF	REMOVAL	AVG RAW	AVG EFF	REMOVAL	AVG RAW	AVG EFF	REMOVAL	AVG EFF
Units	m³	m³	m³	mg/L	mg/L	%	mg/L	mg/L	%	mg/L	mg/L	%	mg/L	mg/L	%	mg/L	mg/L	%	Cfu/100mL
Month																			
January	15736	508	560	66	3.0	95	55	3.0	95	4.81	0.07	99	23.94	0.32	99	54.60	3.00	95	4
February	17832	637	1415	77	3.0	96	84	6.5	92	2.23	0.07	97	23.20	1.48	94	56.25	3.00	95	4
March	54497	1758	3707	36	3.0	92	46	3.0	93	1.31	0.09	93	8.80	0.62	93	23.25	3.00	87	5
April	52665	1756	3508	37	3.0	92	56	3.8	93	1.07	0.08	93	10.17	0.18	98	23.00	3.00	87	4
May	34054	1099	1496	54	3.0	94	61	3.0	95	2.01	0.07	96	14.62	0.07	100	31.40	3.00	90	5
June	25672	856	1097	47	3.0	94	62	3.0	95	2.00	0.07	97	17.63	0.16	99	38.50	3.00	92	17
July	24918	804	1484	76	3.0	96	69	3.3	95	2.87	0.10	97	22.88	0.96	96	63.50	3.00	95	38
August	24492	790	1083	66	3.4	95	71	3.0	96	2.37	0.16	93	18.12	0.39	98	46.00	3.00	93	4
September	24698	823	1202	85	3.0	96	95	4.8	95	2.66	0.15	94	16.88	0.29	98	76.75	3.00	96	2
October	21749	702	892	80	3.0	96	71	3.6	95	2.60	0.13	95	22.62	0.31	99	69.80	3.00	96	8
November	21908	730	1325	71	3.3	95	77	3.3	96	2.45	0.13	95	20.30	0.13	99	57.00	3.00	95	2
December	35282	1138	2877	60	3.0	95	66	3.3	95	2.05	0.08	96	13.68	0.03	100	53.00	3.00	94	2
TOTAL	353503																		
AVERAGE		967		63	3.1	95	68	3.6	95	2.37	0.10	95	17.7	0.41	98	49.4	3.00	93	8
MAXIMUM			3707	85.25	3.4		95	6.5		5	0.16		23.9	1.48		76.8	3.00		38
OBJECTIVE				15.0			15.0						4						<200
COMPLIANCE	Maximum Annual average: 2438 m³/day			25.0			25.0			<1.00						15			
	Peak flow Rate: 8900 m³/day																		

Appendix D

2022 Sludge Processing Performance Summary

2022										
Month	Waste Activated Sludge	Thickened Waste Activated Sludge			Digested Sludge			Volatile Solids	Reactor Temperatures	
	Volume (m ³)	Volume (m ³)	TS %	VS %	Volume (m ³)	TS %	VS %	% Reduction	R 1 °C	R 2 °C
January	206.80	39.3	4.25	64.1	46.6	3.13	47.6	45	34.8	49.2
February	286.53	56.4	4.24	68.1	74.7	3.10	50.3	46	32.7	61.3
March	316.89	64.6	4.16	66.3	89.2	3.11	52.9	40	31.4	61.9
April	263.00	50.9	4.15	63.0	68.7	3.32	48.0	39	36.8	58.2
May	156.17	41.7	4.21	63.7	42.0	3.44	46.6	40	42.9	52.7
June	157.12	35.0	4.37	62.9	35.9	3.51	47.6	39	49.5	46.6
July	191.99	44.4	4.51	65.0	50.6	3.77	44.9	42	47.8	55.3
August	204.74	45.5	4.27	61.7	51.2	3.44	48.8	36	42.0	65.2
September	220.32	46.8	4.19	61.5	53.5	3.42	46.3	38	38.8	63.7
October	278.12	76.8	4.06	60.5	54.8	3.36	47.2	36	34.6	62.9
November	343.42	63.6	4.13	64.3	79.9	3.21	49.4	40	32.3	62.6
December	515.96	70.4	3.77	64.5	100	3.34	52.3	28	28.0	59.8
Total	3141.06	635.3			747.3					
Average	261.76	52.94	4.19	63.80	62.27	3.34	48.50	39	37.62	58.28