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2024

Cardinal Water Plant Summary Report

Prepared by: Eric Wemerman

Prepared For: Council

1/28/2025

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Introduction

Schedule 22 of Ontario Regulation 170/03 mandates the preparation and submission of summary reports to Municipal Council by March 31st of the following year. These reports must detail any non-compliance with the Act, Regulations, Permits, licenses, or orders, along with the corrective measures implemented. Furthermore, the reports must include a summary of flow rates and quantities in relation to the approved capacities, enabling an evaluation of the system's ability to accommodate both current and future uses.

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

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Executive Summary

In 2024 the average daily treated flow leaving the Cardinal Water Plant was 403 m^3/day or 11.4 % of the rated capacity for the system. The maximum daily flow was 750 m^3/day**.** Elevated water consumption typically occurs in the summer months, during semi-annual fire hydrant flushing and water main breaks. Routine 3rd party calibration and maintenance activities are performed as per manufacturers guidelines and Environmental Compliance Approvals. Operational and preventative maintenance, repairs and capital projects demonstrate the Cardinal Water System is being proactively maintained. A summary of system complaints and corrective actions completed are summarized in this report.

Common Acronyms

MECP: Ministry of Environment, Conservation, Parks

DWQMS: Drinking Water Quality Management System

PTTW: Permit to Take Water

SCADA: Supervisory Control and Data Acquisition

IECBL: Industrial Electric Brockville Limited

NSF: National Sanitation Foundation

PVC: Poly Vinyl Chloride

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Table of Contents

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Process Summary

The Cardinal Water System receives its raw water supply from the St. Lawrence River through a single intake line with an intake structure located approximately 60 meters off-shore at a depth of 6 meters. Water is taken into the water plant via gravity. Zebra mussel chlorination with Sodium Hypochlorite occurs at the intake structure when the river temperature increases to 12 degrees Celsius. Raw water chlorination occurs in the raw well when river temperature is below 12 degrees Celsius. Raw water passes through two basket screens to remove any larger debris before being pumped via one of three vertical turbine low lift pumps into two flocculation tanks. Polyaluminum-Chloride (PAC) is injected along the way and flash mixing occurs. Particulates in the raw water bind with the PAC to create floc before flowing via gravity to the four Ecodyne dual media filter systems. The Ecodyne filter media is comprised of one layer of anthracite-coal and one layer of sand removes the floc from the stream. Effluent from each filter is continuously monitored by an individual inline turbidity analyzers and results are trended via a SCADA system. Filtered water then flows via gravity through a discharge header to the clearwell and distributed into three clearwell chambers. Chlorine residual and pH of the water in the clearwell are monitored via an inline chlorine analyzer and trended on SCADA. Water is pumped from the clearwell chambers via one of three vertical turbine high lift pumps and is post chlorinated. It continues through parallel Trojan UV Swift 12 reactors (operated lead/stand-by). Potable water then passes through a magnetic flow meter before entering the distribution system to users. Post chlorine residual and pH are continuously monitored via an inline chlorine analyzer and results trended on SCADA System.

Primary disinfection is met through a combination of chlorination (virus), ultraviolet irradiation (giardia) and filtration. The ultraviolet system is designed to achieve a minimum 1-log removal of giardia, by providing a minimum dose of 40 mj/cm^2, minimum UV transmittance of 86 %, at a maximum flow rate of 41 l/s. The zebra / pre-chlorine system is operated to meet the required Contact Time, (CT), based on the Procedure for Disinfection of Drinking Water in Ontario. Secondary disinfection is met through

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chlorination alone and is operated to maintain a minimum of 0.20mg/L of free residual chlorine in all parts of the system.

The distribution system includes a single elevated storage tank with a capacity of 1938 m^3, 85 hydrants, 135 isolation valves, 6 isolated sample stations and a network of piping largely composed of 100 mm, 150mm and 200 mm diameter polyvinyl chloride (PVC), asbestos cement, and cast iron. The Cardinal Drinking Water System services approximately 790 households.

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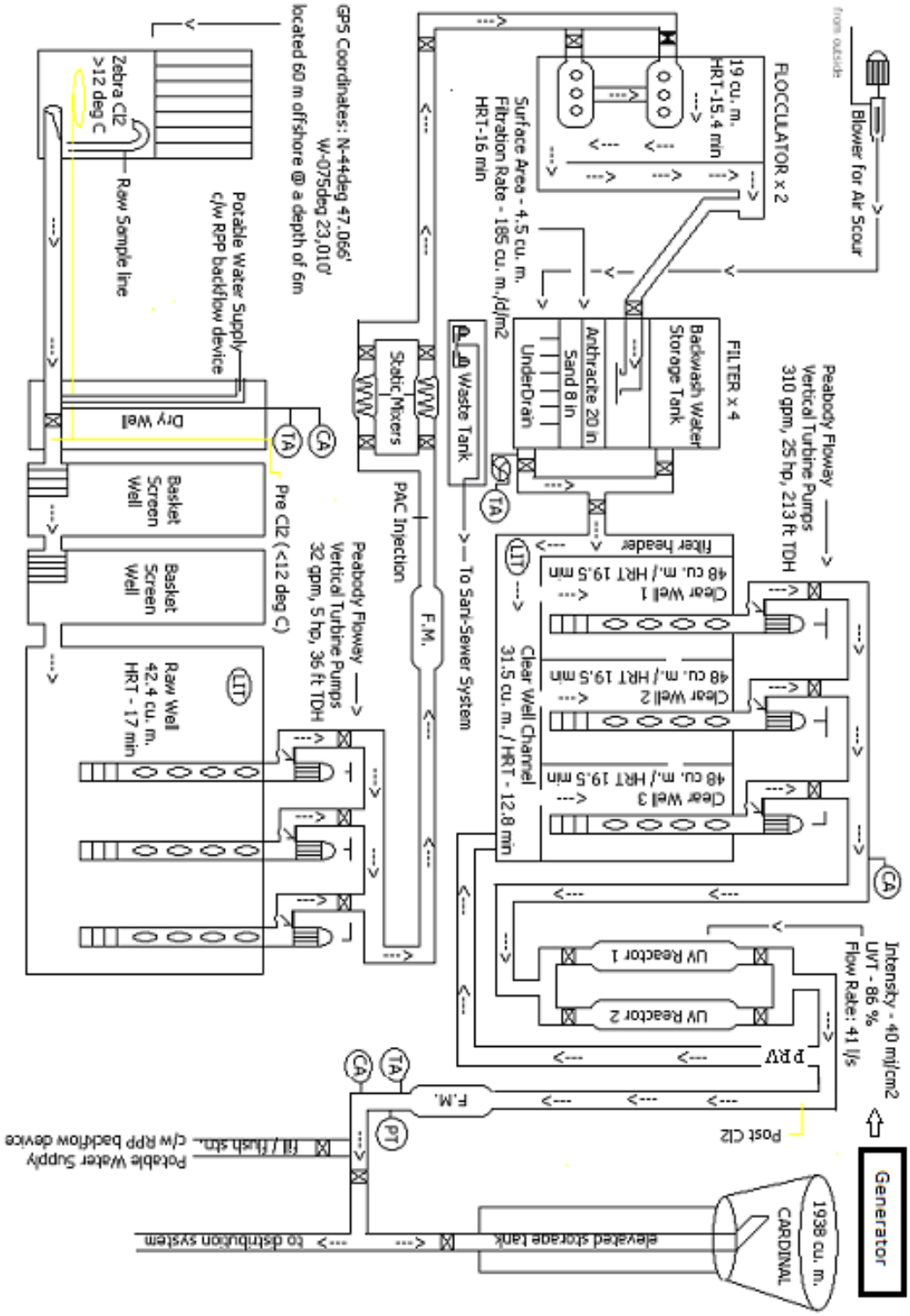
Below is the process schematic for the Cardinal Water Plant



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Staffing and Licensing

The table below lists the licensed operational staff at the end of the 2024 calendar year.

Name	Position	Licence #	Type	Class
Eric Wemerman	Chief Operator/ORO	61726	WT	II
		78182	WD	II
Aaron Campbell	Assistant Chief Operator	91541	WT	II
		95696	WD	II
Stephen Campbell	Operator	54771	WT	II
		73567	WD	II
Mark Simzer	Operator	93001	WT	II
		104867	WD	II
Tyler Selleck	Operator	113843	WT	II
			WD	II
Jarrett Crich	Operator in Training	OT126390	WT	OIT
		OT126391	WDS	OIT

Failure to meet the Act, Regulations, System Approvals or Orders

The MECP conducted a focused inspection of the Cardinal Water System on July 23, 2024. The inspection found no areas of non-compliance with regulatory requirements and no best management practice recommendations.

Tabulation of Monitoring Data

The following chart provides you with the numerical values for maximum flow and day rates. The graphs on page nine and ten of this report plot the corresponding numerical value in reference to the Permit to Take Water and Drinking Water License. Based on the values, the water system has the capability to meet the present demands of the system users with room for expansion**.** The average daily flow out of the facility was 403 cubic meters and the total water produced in 2024 was 147,507 cubic meters. This represents a decrease in water production of approximately 4.8% over 2023 volumes of 154,892 cubic meters.

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Month	Max Day Flow In (m^3/day)	Max Flow Rate In (L/min)	Max Day Flow Out (m^3/day)	Max Flow Rate Out (L/min)
January	554	1603	499	1326
February	505	1591	460	1280
March	631	1629	566	1589
April	688	1625	607	1217
May	744	1594	653	1159
June	717	1606	641	1182
July	595	1650	502	1167
August	586	1567	531	1196
September	838	1573	750	1291
October	649	1544	586	1187
November	579	1557	494	1162
December	587	1550	526	1158

Potable Water Produced VS Water Consumed

As previously mentioned, potable water production for 2024 totaled 147,507 cubic meters (147,507,000 liters). Records show total system water consumption in the amount of 104,765.47 cubic meters.

The difference between total water leaving the water plant and metered water from Rideau St Lawrence can be attributed to the following (but not limited to): Cardinal Water Pollution Control Plant, Public Works and Fire Hall water consumption, distribution leaks, semi-annual flushing of fire hydrants and water main breaks.

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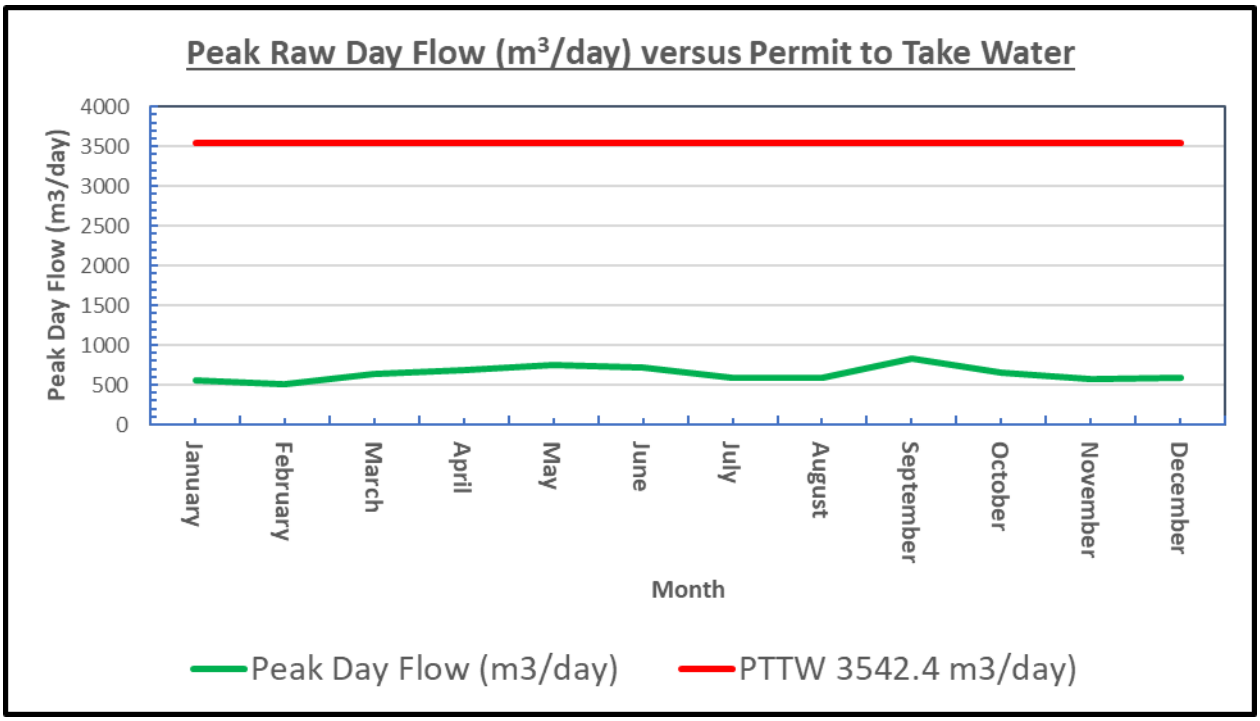

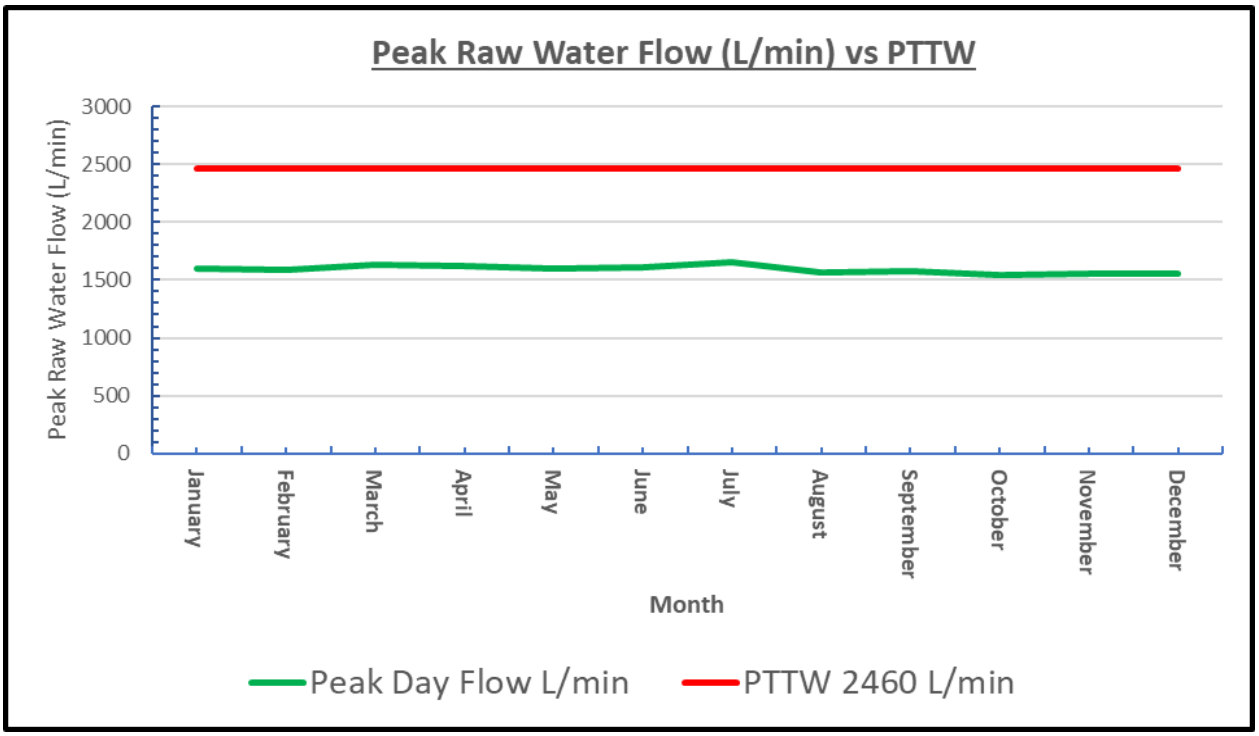

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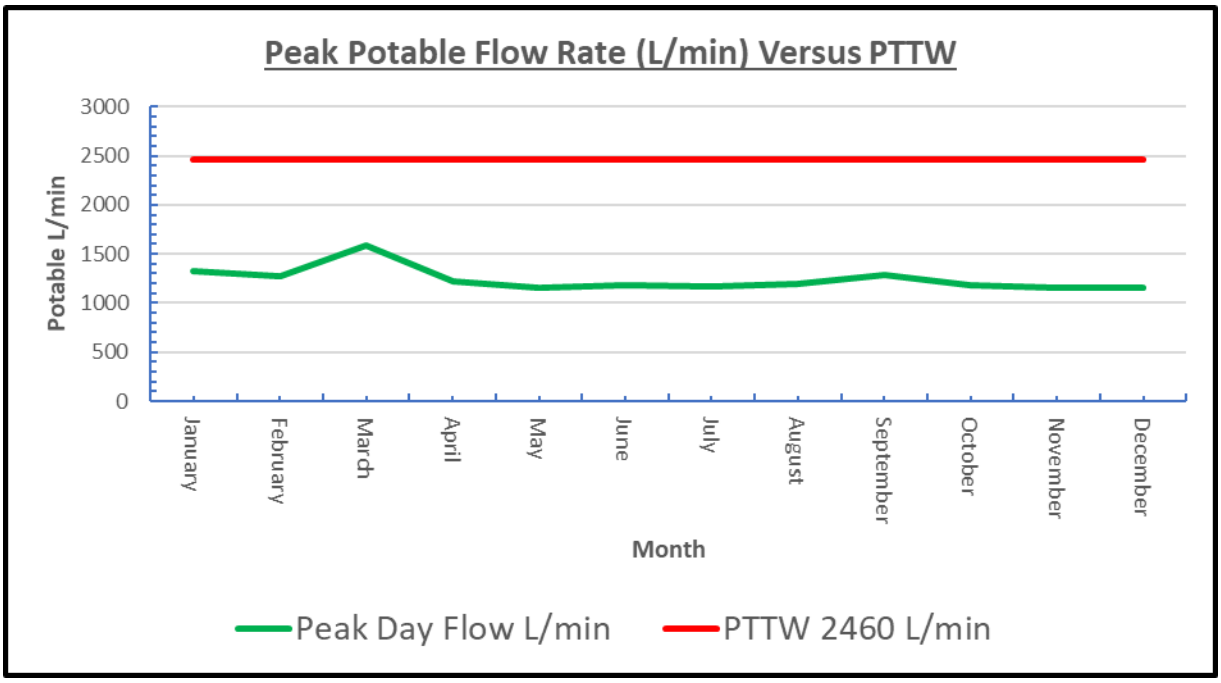

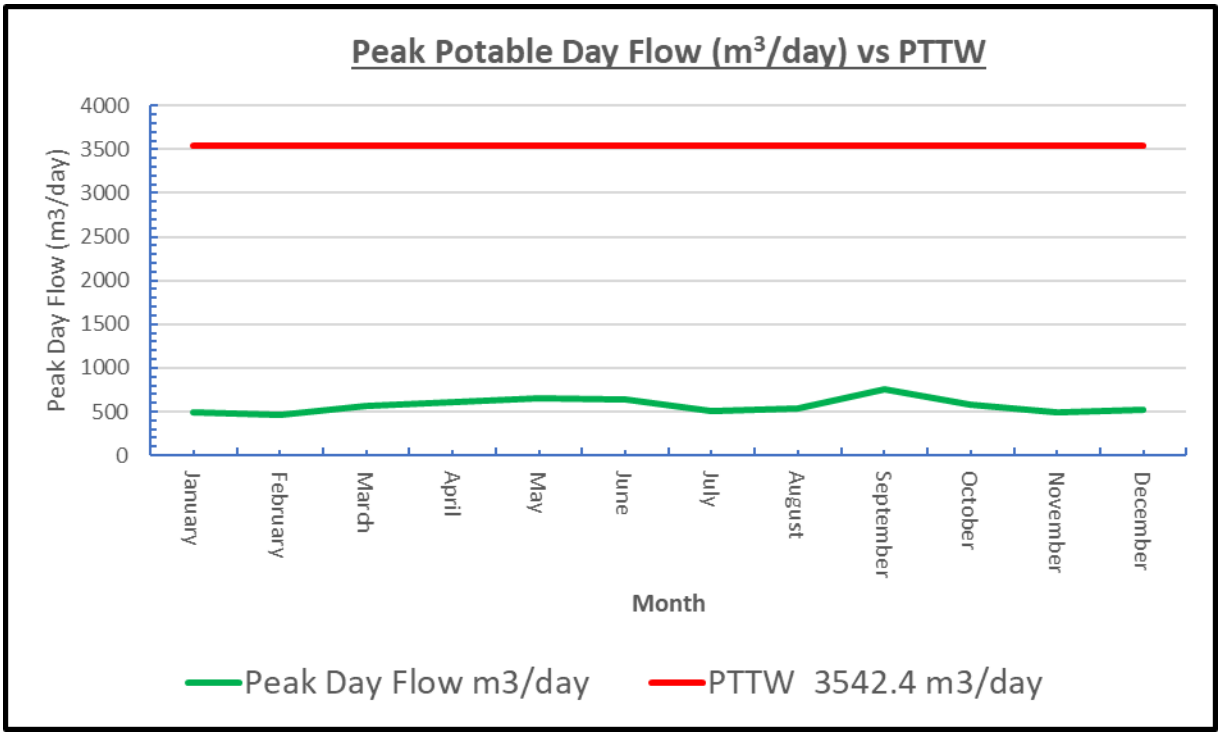

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Preventative Maintenance Program

Service Provider	System Component	Frequency
Capital Controls	Greyline Level Controllers/ Flow Meters- Service, repair, and verification.	Annual
Trojan UV	Trojan UV Swift 12	Semi-Annual
GAL Power	Generator	Semi-annual
Schneider Electric	SCADA System	Semi-annual
HACH	HACH laboratory equipment	Annual
Claude Bourck	Backflow Preventors	Annual
Dundee Marine	Intake inspection	Annual
Stelem-Lakeshore	Repair and service Fire Hydrants	As needed.
Landmark	ROV Inspection of Water Tower	Bi-annual
Drapeau Fire Protection	Fire Alarm System Inspection	Annual
Environmental Services	Inline Analyzer calibrations and laboratory equipment verifications.	Monthly
Environmental Services	Removal and inspection of basket screens	Semi-annual
Environmental Services	Drain and inspect filter system	Monthly
Environmental Services	Zebra & Raw chlorine System switchover	Semi-annual
Environmental Services	Pull, inspect, and clean basket screens	Semi-annual
Environmental Services	Fire Hydrant flushing and valve operation	Semi-annual

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2024 Capital Projects

Three capital projects were completed in 2024. The project, scope and costs are summarized below.

Project	Scope	Cost
Turbidity analyzer	Purchased turbidity analyzer	$11,046
Low lift pump starters	Replaced 3 low lift pump starters	$7,746
Water services (Reid Street)	Replaced twelve residential water services from water main to curb stop with Schedule K copper.	$77,820

Cardinal Water Plant Maintenance Summary

The following is a summary of scheduled and unplanned maintenance activities that occurred during the reporting period.

Date	System Component	Maintenance Activity
January 4, 2024	Generator	Inspected and serviced radiator.
January 18, 2024	UV System	Updated SCADA logic for UV valve communication.
February 15, 2024	Laboratory Equipment	HACH DR 3900 benchtop spectrophotometer purchased.
February 16, 2024	Alarm communication	Communicator panel and keypad replaced.
February 21, 2024	Compressor	Air supply lines replaced.
February 29, 2024	SCADA	Faulty FBM card replaced.
March 13, 2024	High Lift Pumps	High Lift Pump # 2 starter panel replaced.
March 25, 2024	Portable Generator	Repaired radiator.

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Date	System Component	Maintenance Activity
May 7, 2024	Laboratory	Annual re-certification completed.
May 14, 2024	High Lift Pumps	Replaced high lift pump # 3 starter panel
May 28, 2024	Chlorine pumps	Replaced raw chlorine pump.
May 30, 2024	Low Lift Pumps	Replaced low lift pump starter.
June 10, 2024	Turbidity Analyzer	Purchased spare turbidity analyzer.
June 24-25, 2024	Interior Lighting	Upgraded ceiling mounted light fixtures to LED.
June 25, 2024	Low Lift Pump starters	Replaced two low lift pump starters.
July 8-9, 2024	Flocculator Tanks	Drain, clean and inspect flocculator tanks.
August 15, 2024	UV # 1	Capital Controls replaced HDMI screen.
September 18, 2024	Generator	Fuel system inspection.
October 4, 2024	Fire Alarm System	Annual inspection completed.
October 17, 2024	Fire Alarm System	Replaced batteries in panel.
October 29, 2024	Heating System	Serviced boiler.
November 21, 2024	Filter valves	Filter 2A Mac valve controller replaced.
November 21, 2024	Heating System	Thermocouple replaced.

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2024 Cardinal Water Distribution Maintenance Summary

The following is a summary of maintenance activities that occurred in the Cardinal Distribution System.

Date	System	Maintenance Activity
April 2, 2024	Distribution	Repaired bent curb stop.
April 3, 2024	Tower	Bi-annual CCTV robotic inspection.
June 24, 2024	Fire Hydrants	Lakeshore Hydrant Services serviced four fire hydrants.
August-September 2024	Distribution	Replaced 12 residential water services on Reid Street (PVC to ¾ copper).
July 4, 2024	Fire Hydrants	Extended guard valve casing for hydrant on Walker Street.
August 21, 2024	Distribution	Repaired curb stop- County Road 2.
September 17, 2024	Sample Station	Replaced Walter St. Sample Station.
October 23, 2024	Water Tower	Replaced UPS Battery backup unit.
December 12, 2024	Distribution	Froze water service and replaced curb stop valve on First Street.
December 13, 2024	Distribution	Hand delivered two notices regarding high water consumption detection from residential water meters.
December 30, 2024	Distribution	Replaced leaking residential water service on George Street (PVC to ¾ copper).

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Drinking Water Quality Management System Activity Summary

The following DWQMS reviews, audits and exercises were completed in 2024 for the Cardinal Water System.

Date Completed	DWQMS Element	Review
January 11, 15, 17, 18, 2024	19	Internal Audit
January 17, 2024	7-8	Risk Assessment
March 6, 2024	14-15	Infrastructure
May 30, 2024	18	Emergency Table Top Exercise
June 5, 2024	19	NSF 3rd Party Audit
October 28, 2024	20	Management Review

Adverse Water Quality Incidents

The following Adverse Water Quality Incidents occurred in the Cardinal Drinking Water System for the reporting period.

Date	AWQI	Parameter	Standard	Result	Corrective Action	Completion Date
-	-	-	-	-	-	-

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Cardinal Water System Complaints

The following table summarizes complaints received and corrective actions undertaken in 2024.

Date	Complaint	Corrective Action
April 5, 2024	High water usage	Advised resident of high-water consumption. Running toilet was repaired by homeowner.
April 22, 2024	Outside tap not working	Outside tap was used to supply temporary water during the County Road 2 project. Plumber repaired tap.
July 9, 2024	Curb Stop	Raise curb stop ahead of driveway paving.
August 21, 2024	Water Pressure George Street	E/S investigated and determined internal plumbing issue with strainers.
October 1, 2024	Water Pooling on roadway (Geroge Street)	On call operator investigated and determined resident was draining pool. No water main or service leak.
December 7, 2024	Low water pressure	On call operator shut curb stop off due to a leak on private property (First St). Homeowner replaced water service to curb stop. New curb stop valve installed.
December 10, 2024	Water Quality	Resident concerned water is drying her skin. E/S attended, took chlorine residual (F-1.89 mg/l), advised water quality is monitored extensively and strict regulations are followed. Resident satisfied with result and issue appeared to be with hot water tank.
December 28, 2024	Water leak	Water service leak at 920 George Street. Water pressure normal. Replaced service on December 30th.