

THE TOWNSHIP OF ST. JOSEPH



RICHARDS LANDING

WATER POLLUTION CONTROL PLANT

2023 ANNUAL REPORT



January 1 to December 31, 2023



Richards Landing WPCP



Table of Contents

Introduction	Page 3
Water Pollution Control Plant Process General Description	
Sewage Works	
Primary Clarification	Page 4
Secondary Clarification	
Secondary Treatment	
Flow Equalization	
Disinfection	
Phosphorous Removal	
Secondary Clarification	
Control Building	Page 5
Figure 1 - Process Flow Diagram	
WPCP Flows 2023	
Compliance Effluent Quality	Page 6
▪ BOD Results	
▪ Total Phosphorous Results	
▪ Total Suspended Solids Results	
▪ pH Results	
▪ E. Coli Results	
2023 Repairs and Maintenance	Page 7
Chemicals Utilized	
Biosolids	
2023 Upgrades	
Glossary of Terms	Page 8



Richards Landing WPCP



Introduction

The Richards Landing Water Pollution Control Plant (WPCP) Performance Report provides staff, stakeholders, and customers with an overview of the performance of the Richards Landing WPCP in 2023. Furthermore, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment, Conservation, and Parks (MECP). The enclosed 2023 report for the above reference facility summarizes the performance and related activities in accordance with Environmental Compliance approval ECA #6203-BRGHW3. The performance report demonstrates the commitment of ensuring that the WPCP continues to deliver wastewater services to our customers in an environmentally responsible manner.

The Sewage Treatment Plant is situated on the west side of the community at the end of Shore Road. The plant forms part of the sewage collection and treatment system comprising the underground sewage collection system and Sewage Pumping Station located on Hwy 548 and Russell Street.

For a description of terms and abbreviations used in this report, refer to the glossary at the end of the report.

Water Pollution Control Plant Process General Description

The Township of St. Joseph operates a sewage treatment plant that is situated at the east side of the community on Marguerite Street and forms part of the sewage collection and treatment system which includes the underground sewer collection system and a sewage pumping station located on Russell Street. The sewage flows by gravity to the sewage pumping station from where it is pumped to the sewage treatment plant. The sewage pumping station is designed for a 20-year peak flow and is supplied with emergency power from the generator located at the water plant. The sewage treatment plan is a modern rotating biological contactor RBC design followed by a secondary clarification system. The disinfected effluent is then discharged by gravity via a sewage outfall line to a diffuser located 450m offshore which is designed to dilute and disperse the effluent away from the shore to protect downstream domestic and recreational users.

Wastewater is collected in sanitary sewers in the Richards Landing service area and is conveyed to the treatment facility. Aluminum sulphate is added at the station to enhance the settling of solids and phosphorus removal.

Sewage Works

The Sewage Pumping Station is designed for a 20-year peak flow of 17.8 L/s at a TDH of 46 m and is supplied with emergency power from the generator located at the Water Plant.

The MECP has approved treatment to secondary level (15 mg/L BOD, 15 mg/L TSS & 1.0 mg/L Total Phosphorous) for discharge of effluent to St. Mary's River. The disinfected effluent is discharged by gravity via a sewage outfall line to a diffuser located 450m offshore and designed to provide adequate dispersion and dilution of the effluent to ensure the effluent is directed away from the shore, to protect downstream domestic and recreational users. The plant is equipped with a 75KW generator for emergency power. A brief description of the sewage plant and a Process Flow Diagram follows.



Richards Landing WPCP



Primary Clarification

The Sewage Treatment Plant comprises of a sewage flow splitter box with a manually raked bar screen. Adjacent to the splitter box is a composite sampler which collects composite samples of raw sewage for testing purposes. The flow is directed into two primary clarification and sludge storage septic tanks with a total volume of approximately 540m³ which includes approximately six months' storage volume for primary and secondary sludge. These tanks overflow through two weirs into the equalization tanks.

Flow Equalization

Flow is directed into the two aerated equalization tanks, with a total flow equalization capacity of approximately 230m³ equipped with three submersible pumps (two duty and one standby) each having a rated capacity of 6.7 L/s at 3.3m TDH, and coarse bubble air-diffusion system equipped with air blower having a capacity of 230m³/h against 38kPa.

Secondary Treatment

Comprising of three 3.6m diameter by 6.1m long Rotating Biological Contactor Units with a total of 22,850 m² bio support media divided into four separate stages and equipped with one air blower and supplementary air diffusion system for the first two stages and having a capacity of 255m³/h against 23.5kPa.

Secondary Clarification

Three secondary clarifiers, each approximately 3.5m x 3.5m dimensions and each equipped with one air-lift sludge return pump and one air lift surface skimmer.

Phosphorous Removal

A chemical phosphorous removal system comprising one aluminum sulfate (alum) storage tank, day tank, transfer pump and three positive displacement diaphragm metering pumps feeding alum to the head of the clarifiers.

Disinfection

Disinfection of the final effluent is completed by UV irradiation.



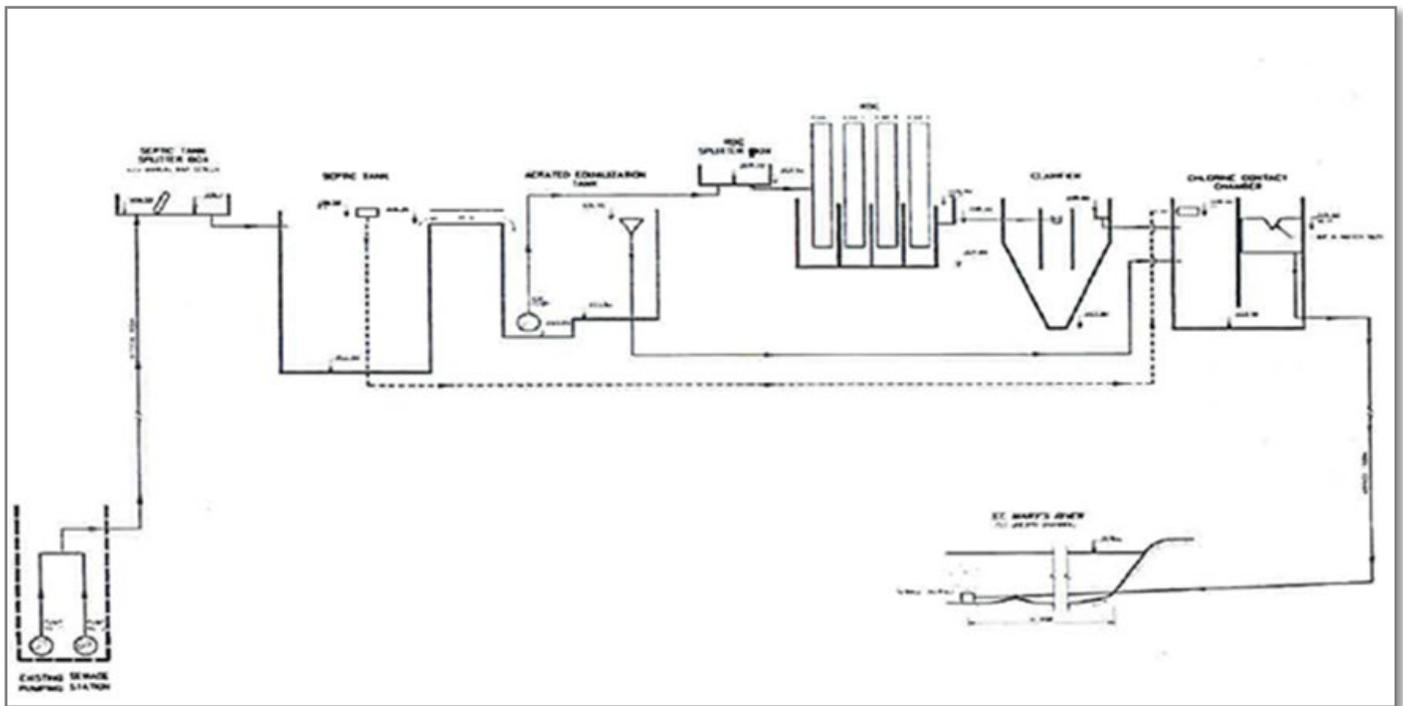
Richards Landing WPCP



Control Building

A 135m² control building situated on top of the equalization tanks and housing the chemical storage and feeding facilities, air blowers, standby power, electrical and control panels. The overall plant has been designed to run manually with automatic controls for pumps, air lift pumps and scum skimmer. Levels are monitored automatically, and the plant effluent flow charted electronically. The plant effluent flow in turn controls the level of alum dosage to the clarifier. All major components of the plant are monitored, and alarms are activated via a telephone line to the relevant personnel in case of an emergency. Overall, the plant is very functional in terms of the original design criteria of simplicity in design and maintenance with low operational costs.

Figure 1 - Process Flow Diagram



WPCP Flows 2023

Richards Landing WWTP flows are calculated by the level in the final effluent channel's parshall flume. The flow meter is calibrated annually by a PUC instrument technician for maintaining accuracy of flow recording.

Flows (m3)	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
Total	3,245	2,898	3,365	6,815	6,700	5,768	5,750	5,136	4,946	4,312	3,245	3,473
Avg	105	104	109	227	216	192	185	166	165	139	108	112
Max	187	176	140	357	321	229	212	338	212	187	188	154

April experienced the highest monthly flows 227 for average day, and max of 357m³/d – 53.7 and 84.5% of the rated capacity of 422.5m³/d.



Richards Landing WPCP



Compliance Effluent Quality

During the period of this report, there were three reports sent to the SAC and APH due to UV failures – two events where power interruptions tripped the UV breaker and the secondary effluent was released prior to an operator arriving at the treatment plant. A third event was reported due to compromised UV dose (low transmittance) with high flows directed into the facility.

A detailed summary documents the final effluent quality results for each required parameter for the period of January 1st to December 31st, 2023. The following parameters are documented in the certificate of approval with regulatory limits defined: CBOD, Total Phosphorous, Total Suspended Solids, pH, and E. coli. Monthly results for raw and final effluent sampling are represented as a month average of all samples collected (Accredited Lab and PUC in-house testing).

BOD Results:

CBOD	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Raw (mg/L)	124	94.8	117.5	69.0	82.5	98.0	192	108.5	102.5	58.1	112.3	7.4
Effluent (mg/L)	7.3	2.5	4.2	3.3	7.8	2.2	2.2	3.3	<1	1.8	<1	1.1
ECA Objective	15	15	15	15	15	15	15	15	15	15	15	15
ECA Limit	25	25	25	25	25	25	25	25	25	25	25	25
% Removal	94.1	97.4	96.4	95.2	90.5	97.8	98.9	97.0	100	96.9	100	85.1
Loading kg/d	0.8	0.3	0.5	0.7	1.7	0.4	0.4	0.5	0.0	0.3	0.0	0.2

All 2023 effluent results for CBOD are below the defined limits of the Environmental Compliance Approval including the monthly average effluent loading limit of 10.5 kg/d.

Total Phosphorous Results:

TP	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Raw (mg/L)	3.96	3.84	3.32	2.26	3.19	5.20	6.87	5.33	6.16	5.04	5.21	4.84
Effluent (mg/L)	0.55	0.44	0.44	0.21	0.26	0.26	0.13	1.0	0.40	0.19	0.30	0.35
ECA Objective	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
ECA Limit	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
% Removal	86.1	88.5	86.7	90.7	91.8	95.0	98.1	81.2	93.5	96.2	94.2	92.8
Loading kg/d	0.057	0.045	0.048	0.048	0.056	0.049	0.024	0.166	0.067	0.026	0.032	0.040

All 2023 results for Total Phosphorous are below the limits of the Environmental Compliance Approval (except for August – at the limit of 1.0mg/L). All 12 months did not exceed the monthly average effluent loading limit of 0.4 kg/d.

Total Suspended Solids Results:

TSS	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Raw (mg/L)	102.8	55.5	70.3	46.8	61.1	75.8	156.8	93.3	166.5	115.3	183	122.8
Effluent (mg/L)	24.9	18.0	21.5	15.3	21.0	15.8	9.6	25.8	13.9	10.8	8.9	12.9
ECA Objective	15	15	15	15	15	15	15	15	15	15	15	15
ECA Limit	25	25	25	25	25	25	25	25	25	25	25	25
% Removal	75.8	67.6	69.4	67.3	65.6	79.2	93.9	72.3	91.7	90.6	95.1	89.5
Loading kg/d	2.6	1.9	2.3	3.5	4.5	3.0	1.8	4.3	2.3	1.5	1.0	1.5

All 2023 results for Total Suspended Solids are below the limit of the Environmental Compliance Approval (except for August). All 12 months did not exceed the monthly average effluent loading limit of 10.5 kg/d.



Richards Landing WPCP



pH Results:

pH	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Average	7.8	8.5	7.0	7.9	7.6	7.7	7.3	7.8	7.3	7.9	6.9	7.1
ECA Obj.	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5
ECA Limit	6.0 - 9.5	6.0 - 9.5	6.0 - 9.5	6.0 - 9.5	6.0 - 9.5	6.0 - 9.5	6.0 - 9.5	6.0 - 9.5	6.0 - 9.5	6.0 - 9.5	6.0 - 9.5	6.0 - 9.5

All 2022 results for pH are within the defined objectives and limits of the Environmental Compliance Approval.

E. Coli Results:

E. Coli	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Geomean	2.0	1.4	1.0	1.7	1.3	1.7	1.5	6.2	5.4	1.3	1.0	1.4
ECA Objective	100	100	100	100	100	100	100	100	100	100	100	100
ECA Limit	200	200	200	200	200	200	200	200	200	200	200	200

E. Coli CFU/100mL

All 2023 results for monthly Geometric Mean for E. Coli are below the defined objective and limit of the Environmental Compliance Approval.

2023 Maintenance and System Upgrades:

- Treated effluent flow system (channel Milltronics) calibrated by PUC Staff
- Routine maintenance on RBC's (grease bearings)
- Routine maintenance of blowers (grease and oil)
- Sludge hauling to Richards Landing's Landfill drying beds
- UV lamp quartz sleeve kits replacement
- Purchase of new Flygt pump for Sewage Lift station
- Purchase new chain, sprocket, and motor for RBC
- New eyewash /shower installed at chemical area

Chemicals Utilized

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Alum used (L)	730	735	810	1,262	1,116	992	1,018	841	1,050	770	750	800
Alum Dose (mg/L)	146	164.8	156.4	120.3	10.8.2	111.8	115.1	106.5	137.9	116.1	150	149.7

Biosolids

Karhi's Contracting hauled approximately 96m³ of sludge to the drying beds located at the Township of St. Joseph Landfill site (C of A #A561701).



Appendix C - Glossary of Terms

Biosolids - Organic material recovered from wastewater sludge.

BOD5 (biochemical oxygen demand 5) is a five-day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand.

Bypass - Any discharge from the works that does not undergo any treatment or only undergoes partial treatment before it is discharged to the environment.

CBOD5 (carbonaceous biochemical oxygen demand 5) - A five-day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample.

ECA (Environmental compliance approval) - The primary regulatory document for each water pollution control plant, replaces previous Certificates of Approval.

E. Coli (Escherichia coli) - Refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius.

Final effluent - Sewage discharge through the water pollution control plant outfall after undergoing the full train of unit processes as listed in the Environmental Compliance Approval.

Grab sample - A single sample taken at a specific moment in time, when evaluated provides a snapshot of the conditions at the time the sample was retrieved.

HMI – human machine interface – for operational control of equipment and setpoints for PLC control

kg (kilogram) - Basic unit of mass in the metric system

kg/d (kilogram per day) - kilograms recorded in a 24-hour period

m³ (Cubic meter) - Volume measurement, (1 m³ = 1000 litres).

m³/d (cubic meter per day) - Flow measurement, volume of liquid treated in a 24-hour period.

Max. (maximum) - The highest amount, value, or degree attained or recorded.

Maximum Flow Rate - The peak or highest flow recorded during a specific period; usually in a 24-hour period.

mg/L (milligram per litre) - This is a measure of the concentration of a parameter in water, sometimes referred to as parts per million (ppm).

Min. (minimum) - The least quantity or amount possible.

MECP (Ministry of the Environment, Conservation and Parks) – The Provincial regulatory agency responsible for overseeing the water and wastewater industries in Ontario. Their primary functions include approval for new or expanding facilities, inspections, and investigations. Previously known as Ministry of the Environment and Climate Change (MOECC) and Ministry of the Environment (MOE).

Monthly average concentration - The arithmetic means of all daily concentrations of a contaminant in the effluent sampled or measured, or both, during a calendar month.



Richards Landing WPCP



Monthly average loading - Calculated by multiplying the monthly average concentration of a contaminant by the monthly average daily flow over the same calendar month.

Nitrate Nitrogen - Is a salt or ester of nitric acid, containing the NO_3^- ion. Nitrates are the most water soluble of salts and play a major part in the nitrogen cycle and nitrate pollution.

N/A - not applicable

Peak flow rate - The maximum rate of sewage flow for which the plant or process unit was designed.

pH - Index of hydrogen ion activity, pH is defined as the negative logarithm of hydrogen ion concentration in moles per litre. The pH may range from 0 - 14, where zero is most acidic, fourteen most basic and seven neutral.

PLC – Programmable Logic Controller

Rated capacity - The average daily flow for which the works are approved to manage.

Raw influent - Raw wastewater entering the water pollution control plant before treatment.

RBC - Rotating Biological Contactor

SCADA – Supervisory Control and Data Acquisition

Sludge - The settleable solids separated from liquids during processing.

Total ammonia nitrogen - Ammonia exists in two forms in the water: NH_3 (unionized ammonia) NH_4^+ (ionized ammonia) Together, these two forms of ammonia are referred to as TAN (total ammonia nitrogen).

Temperature - A measure of the warmth or coldness of an object or substance with reference to a standard value.

Total annual loading - Calculated by adding the calculated total monthly load discharged for each calendar year.

Total monthly loading - Calculated by multiplying the total monthly flow by the monthly average concentration.

TP (total phosphorus) - A laboratory analyses to determine the total amount of non-soluble and soluble phosphorus present in the wastewater.

TSS (total suspended solids) - A laboratory analyses to measure particles that are larger than 2 microns found in the wastewater.

TS (total solids) - Is a measure of the suspended and dissolved solids in wastewater and in biosolids.

Unionized ammonia nitrogen - Un-ionized ammonia refers to all forms of ammonia in water except for the ammonium ion (NH_4^+).

WPCP - Water Pollution Control Plant - A facility composed of a variety of treatment processes that collectively treat wastewater.