Gulf Islands and Port Renfrew Wastewater Facilities Environmental Monitoring Program 2024 Report

Capital Regional District | Parks, Recreation & Environmental Services, Environmental Protection

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GULF ISLANDS AND PORT RENFREW WASTEWATER FACILITIES
ENVIRONMENTAL MONITORING PROGRAM
2024 REPORT

EXECUTIVE SUMMARY

This report summarizes the 2024 results of the Wastewater and Marine Environment Program (WMEP) for the wastewater treatment plants (WWTP) operated by the Capital Regional District (CRD) in the Gulf Islands and Port Renfrew. Two of these WWTPs (Ganges and Schooner) discharge ultraviolet disinfected, secondary treated effluent; two WWTPs (Cannon and Port Renfrew) discharge secondary treated effluent; and one (Maliview) discharges secondary treated effluent mixed with fine-screened effluent during high flows. The program includes regular monitoring, as stipulated by the BC Ministry of Environment and Parks (ENV), either through permits or registrations under the Municipal Wastewater Regulation (*Environmental Management Act*). In addition, there are monitoring requirements under the federal Wastewater Systems Effluent Regulations (*WSER*) for the Ganges and Schooner treatment plants, as their average daily flow volumes exceed minimum thresholds.

The CRD also monitors all five WWTP influents and effluents on a monthly basis to assess treatment plant performance and predict risk to aquatic life and human health. Staff also monitor sludge (mixed liquor) from the Ganges WWTP facility and from the Burgoyne Bay waste transfer facility to provide data to assist the CRD's Regional Source Control Program (RSCP). Finally, marine environment surface water monitoring is required every four years for these facilities to assess outfall performance and potential for impacts to human health. Surface water sampling is also required in the event of emergency or planned bypass/overflow.

GANGES WWTP

Final Effluent

The CRD analyzed wastewater influent and effluent for conventional and priority substances, plus effluent for acute toxicity. In 2024, none of the daily effluent flows from the Ganges WWTP exceeded the allowable maximum. There was one exceedance of provincial and federal regulatory requirements for fecal coliforms in Ganges wastewater. Effluent quality met all requirements for carbonaceous biochemical oxygen demand (CBOD), total suspended solids (TSS), unionized ammonia, and total residual chlorine results. Like previous years, concentrations of total residual chlorine (used in washing the membranes) exceeded the permitted level in a number of samples, but this was most likely an artefact of taking the measurements using a relatively insensitive field-based test kit.

Of the 196 priority substances analyzed in effluent, 81 parameters were detected at standard detection limits (conventionals, nutrients, metals, total phenols, naphthalene, phenanthrene, diethyl phthalate and isophorone). Effluent concentrations were within similar ranges relative to previous years. Most priority substances in the effluent were below the BC Water Quality Guidelines (BC WQG) before the predicted minimum receiving water dilution of 419:1. Only cyanide weak acid dissociable (WAD), cadmium, copper and lead exceeded BC WQG in undiluted effluent. All substances were below BC WQG after the minimum dilution calculation was applied (the predicted concentration of effluent in the marine water column within the initial dilution zone [IDZ, the area up to 100 metres (m) away from the outfall].

Toxicity Testing

The effluent sample from July 2024 failed the 96-hour Rainbow trout acute toxicity test. A resample was collected in September 2024, and tests were run both with and without ammonia stabilization. The ammonia stabilized test passed, while the non-stabilized test failed. This confirms that ammonia accumulation was the cause of the test failures, and ammonia stabilization will be used for Ganges toxicity tests going forward. The Daphnia acute toxicity test also passed, consistent with previous testing conducted from 2011-2022.

Sludge (Mixed Liquor)

Ganges WWTP sludge (mixed liquor) met the criteria for BC Organic Matter Recycling Regulations (OMRR) Class A Biosolids in 2024 for all regulated parameters.

Receiving Water

Routine receiving water monitoring was required and conducted in the fall of 2024. All fecal coliform and enterococci results were low. Monitoring is scheduled to be repeated next in 2028, unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter or one day duration in the summer.

Next Steps

WMEP staff will continue to share priority pollutant and sludge (mixed liquor) results with the RSCP.

MALIVIEW WWTP

Wastewater

The Maliview WWTP produces secondary treated effluent when instantaneous flows are equivalent to or less than 60 m^3/d. For instantaneous flows equivalent to or greater than 60 m^3/d, the plant produces a final effluent that is a blend of secondary treated and fine-screened effluents. As such, there are different regulatory limits for this facility depending on whether the flows are above or below 60 m^3/day. The flow-splitting process responds to instantaneous peak flows, rather than daily flows, and bypass events can occur despite total daily flows of less than 60 m^3/d. Bypass events occurred, despite flow being less than 60 m^3/d on 91% of the days in 2024. Flow also bypassed the secondary treatment process and received screening on days where the total flow was greater than 60 m^3/d, but the flow to the secondary treatment process was less than 60 m^3/d on 7% of the days. Flows exceeded the allowable maximum of 250 m^3/d for total combined daily flows as a result of heavy rain events in December 2024. Flow to the secondary treatment plant exceeded 60 m^3/d on 27% of the days in 2024, resulting in a portion of the effluent bypassing the secondary treatment process of the plant to be treated solely by fine screening.

The combined final effluent exceeded low flow (<60 m^3/d) registration limits for TSS and for CBOD in seven monthly samples, representing 14% of the low flow sampling events. The combined final effluent did not exceed high flow (>60 m^3/d) registration limits in any samples. The remaining wastewater parameters were in compliance.

Toxicity Testing

Effluent from July 2024 failed the 96-hour Rainbow trout acute toxicity test, as in previous years. The toxicity test was not ammonia stabilized, which may be considered for future years.

Receiving Water

Routine receiving water monitoring was required and conducted in the fall of 2024. All fecal coliform and enterococci results were low. Monitoring is scheduled to be repeated next in 2028, unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter or one day duration in the summer.

Next Steps

WMEP staff will continue to investigate ways to eliminate regulatory compliance violations. CRD staff and a contracting engineer have developed a detailed design for an upgrade to the facility to increase capacity and treatment reliability. Construction is expected to begin in 2025.

SCHOONER WWTP

Wastewater

Substantial facility upgrades were completed to the Schooner WWTP in 2024, with commissioning of the plant in November 2024. Three daily flow volumes exceeded regulatory limits in 2024, representing 0.9% of the year. All scheduled monthly effluent compliance parameters met regulatory criteria in 2024 during regular flow events. However, while samples were not collected during power outages, it is assumed that the provincial fecal coliform limit was exceeded during these events, as the ultraviolet (UV) system cannot operate during outages. These events should no longer happen as back-up power was part of the site upgrades.

Toxicity Testing

Effluent from July 2024 passed the 96-hour Rainbow trout acute toxicity test. Additional toxicity testing was conducted in November 2024 as part of the commissioning process of the upgraded treatment plant. This test also passed.

Receiving Water

Routine receiving water monitoring was required and conducted in the fall of 2024. All fecal coliform and enterococci results were low. Samples were also analyzed for total metals on one day of the 5-in-30. All results were below applicable guidelines except for three values, which were likely outliers and/or momentary fluctuations. An enhanced monitoring program will be in place for two years, as required by ENV after commissioning of the new plant. This program will consist of additional 5-in-30 sampling events, taking place in summer 2025, winter 2025 and summer 2026. Monitoring will also be required if there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter or one day duration in the summer.

Next Steps

Substantial upgrades to the Schooner WWTP and collection system were completed in 2024, and facility commissioning commenced in November 2024. Optimization of the plant operations will continue.

CANNON WWTP

Wastewater

The Cannon WWTP exceeded regulatory limits for flow nine times in 2024, representing 3% of the year. As of November 2024, all flow to Cannon was pumped onward for treatment and discharge at the upgraded Schooner WWTP. TSS exceeded regulatory criteria once in 2024. All other effluent compliance parameters met criteria.

Toxicity Testing

Effluent from July 2024 failed the 96-hour Rainbow trout acute toxicity test, as in 2022 and 2023, likely because the toxicity test was not ammonia stabilized.

Receiving Water

Routine receiving water monitoring was required and conducted in the fall of 2024. There were only three days of the 5-in-30 collected at Cannon WWTP as once effluent was fully diverted to the Schooner WWTP, it was deemed unnecessary to continue sampling around the Cannon outfall. All fecal coliform and enterococci results were low.

Next Steps

Now that the Schooner WWTP replacement has been completed, the Cannon WWTP has been decommissioned and serves only as a storage tank and pump station. All flows are pumped to the new Schooner WWTP facility.

PORT RENFREW WWTP

Wastewater

The Port Renfrew WWTP exceeded regulatory limits for flow two times in 2024, representing 0.5% of the year. All effluent compliance parameters met regulatory criteria in 2024.

Toxicity Testing

Effluent from July 2024 passed the 96-hour Rainbow trout acute toxicity test.

Receiving Water

Routine receiving water monitoring was required and conducted in the summer of 2024. All geomeans were low. There was one fecal coliform result of 160 CFU/100 mL. Monitoring is scheduled to be repeated next in 2028, unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter or one day duration in the summer.

Next Steps

CRD staff and consultants completed a feasibility study in 2015 to improve/increase the treatment plant capacity and ensure ongoing effective operation of the treatment plant and conveyance system into the future. Grant funding will be required in order to complete any upgrades to this system. Updates to the facility asset management plans are underway, and a phased implementation plan is anticipated pending funding.

BURGOYNE BAY WASTE TRANSFER FACILITY

Burgoyne Bay waste transfer facility sludge met the criteria for BC OMRR Class A Biosolids in 2024 for all regulated parameters.

GULF ISLANDS AND PORT RENFREW WASTEWATER FACILITIES
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Terms & Abbreviations

BOD	Biochemical Oxygen Demand
CBOD	Carbonaceous Biochemical Oxygen Demand
CFU	colony-forming unit
CRD	Capital Regional District
EIR	Environmental Impact Report
ENV	Ministry of Environment and Parks
FC	Fecal Coliform
FS	Fine screened
I&I	Inflow and Infiltration
IDZ	Initial Dilution Zone
ISO	International Organization for Standardization
L	Litre
m^3	Cubic metre
mg/L	Milligrams per litre
mL	Millilitre
MWR	Municipal Wastewater Regulation
NH_3	Ammonia
OMRR	Organic Matter Recycling Regulations
pH	Potential of Hydrogen
RBC	Rotating biological contactor
REMP	Receiving Environment Monitoring Program
RSCP	Regional Source Control Program
TCMP	[2-chloro-6- (trichloro methyl) pyridine]
TF	Total daily flow
TSS	Total Suspended Solids
UV	Ultraviolet
WAD	Weak acid dissociable cyanide
WMEP	Wastewater Marine Environment Program
WQG	Water Quality Guidelines
WSER	Wastewater Systems Effluent Regulations
WWTP	Wastewater Treatment Plant

GULF ISLANDS AND PORT RENFREW
WASTEWATER AND MARINE ENVIRONMENT PROGRAM
2024 REPORT

1.0 INTRODUCTION

This report summarizes the 2024 results of the Wastewater and Marine Environment Program (WMEP) for the wastewater treatment plants (WWTP) operated by the Capital Regional District (CRD) in the Gulf Islands and Port Renfrew. Two of these WWTPs (Ganges and Schooner) discharge ultraviolet disinfected, secondary treated effluent; two plants (Cannon and Port Renfrew) discharge undisinfected, secondary treated effluent; and one plant (Maliview) discharges undisinfected, secondary treated effluent combined with fine-screened effluent during high flows. The locations of these five facilities are presented in Figure 1.1. The WMEP includes regular monitoring, as stipulated by the BC Ministry of Environment and Parks (ENV) either through a permit or registrations under the Municipal Wastewater Regulation (MWR)[1]. In addition, effective January 1, 2013, new monitoring requirements came into effect under the federal Wastewater Systems Effluent Regulations (WSER) for the Ganges WWTP and Schooner WWTP facilities. The three remaining facilities (Maliview, Cannon and Port Renfrew WWTPs) do not require monitoring under the federal WSER, due to their low volumes of discharge. Monitoring is also conducted to assess treatment plant performance and potential for impacts to the marine environment, aquatic life and human health.

1.1 Wastewater Monitoring

Wastewater monitoring components are summarized in Table 1.1. WWTP-specific regulatory compliance limits for applicable parameters, and associated sampling and analytical methodologies, are discussed in the individual sections of this report.

1.1.1 Compliance and Treatment Plant Performance Monitoring

All wastewater discharges (effluents) were monitored for flow, total suspended solids (TSS), biochemical oxygen demand (BOD), carbonaceous biochemical oxygen demand (CBOD) and fecal coliform (FC) bacteria. All treatment plant influents were monitored for TSS, BOD and FC bacteria. Two plants (Schooner and Ganges) were monitored for additional parameters, such as ammonia (NH_3), pH and total residual chlorine.

1.1.2 Toxicity Testing

Annual toxicity testing is a requirement under the MWR registrations for the Ganges and Schooner WWTPs and was initiated on a voluntary basis for the remaining facilities beginning in 2021. Effluent from each treatment plant was collected in July 2024 and analyzed for toxicity to Rainbow trout (96-h LC50 test). As in previous years, the Ganges sample was also analyzed for toxicity to *Daphnia*.

1.1.3 Priority Substances

Wastewater influent and effluent from the Ganges WWTP were analyzed for a list of priority substances, as stipulated in the MWR registration for this facility. Priority substance results were compared to water quality guidelines (WQG) set to protect aquatic life (BCMoE&CCS, 2017; 2019a). These data were also used to assess the quality of the final effluent and the effectiveness of the CRD's Regional Source Control Program (RSCP).

1.1.4 Ganges Wastewater Treatment Plant Sludge

The Ganges WWTP produces sludge (mixed liquor) with the objective of meeting Class A Biosolids guidelines, in accordance with the pathogen reduction and vector attraction reduction processes in the BC Organic Matter Recycling Regulations (OMRR) (BCMoE&CCS, 2017b). Ganges WWTP sludge (mixed liquor) is a by-product of sewage treatment, which is de-watered prior to monitoring. The intent of this mixed liquor monitoring was originally to assess suitability for land application. However, Ganges WWTP mixed

[1] formerly the Municipal Sewage Regulation of the *Environmental Management Act*

liquor is currently transferred to a septage treatment facility on Vancouver Island and no land application takes place. Mixed liquor sampling (at a reduced frequency) is still of benefit to the RSCP to help assess the effectiveness of their various campaigns by providing partitioning information between the solid and liquid fractions of the treatment process.

1.1.5 Burgoyne Bay Waste Transfer Facility

The Burgoyne Bay waste transfer facility is located on Salt Spring Island and collects septage from Salt Spring Island (Ganges WWTP and Maliview WWTP), Pender Island (Schooner WWTP and Cannon WWTP) and from Saturna Island. Material is then disposed of at GFL Environmental SPL Wastewater Recovery Centre (Langford, BC). Monitoring is undertaken to characterize the septage prior to disposal and to inform the CRD's RSCP initiatives. The Burgoyne Bay facility is not designed to produce a biosolids product as defined in the OMRR. However, as a reference point, the results of the analyses performed on the septage are compared to the quality criteria established in Schedule 4 of the OMRR for Class A biosolids.

Figure 1.1 - Ganges, Maliview Estates, Schooner Way, Cannon Crescent and Port Renfrew Outfall Locations

Outfall Pipe

N

CAPITAL REGIONAL DISTRICT
Environmental Services

Projection: Universal Transverse Mercator Zone 10 North
North American Datum 1983

December 22, 2005
Technologist: SR
Gan_Mal_Bck_Mag_PR_Outfalls.mxd

Ganges and Maliview

Galiano Island
Porlier Pass Dr
Maliview Outfall
Walkers Hook Rd
North End Rd
Stark Rd
Robinson Rd
Bullocks Lake
Lower Ganges Rd
Upper Ganges Rd
Mansell Rd
Long Harbour Rd
Rainbow Rd
GANGES
Nose Point Rd
Scott Point Dr
Fulford-Ganges Rd
Cranberry Rd
Ganges Outfall
Salt Spring Island
Cusheon Lake Rd
Cusheon Lake
Stewart Rd
0 0.5 1 2 3 4 5 Kilometers

Schooner Way and Cannon Crescent

North Pender Island
Galleon Way
Shoal Rd
Schooner Way
Buck Lake
Bosun Way
Bedwell Harbour Rd
Scarff Rd
Ketch Rd
Privateers Rd
Schooner Outfall
Magic Lake
Pirates Rd
Cannon Outfall
0 250 500 1,000 1,500 2,000 Meters

Port Renfrew

Deering Rd
Port Renfrew Outfall
Pacheena First Nation Reserve
PORT RENFREW
Parkinson Rd
Juan de Fuca Electoral Area
0 50 100 200 300 400 500 Meters

Table 1.1 Summary of 2024 Wastewater and Surface Water Components of the Gulf Islands and Port Renfrew WMEP

Component	Parameter	Frequency and Stations
Wastewater	Flow	Daily: **Ganges**, **Maliview**, **Schooner**, **Cannon**, **Port Renfrew**
	Provincial compliance and treatment plant performance monitoring: • Influent: TSS, BOD, fecal coliform • Secondary Effluent: TSS, fecal coliform • Disinfected Secondary Effluent: TSS, BOD, CBOD, fecal coliform, NH_3, pH	Once per month: **Ganges**, **Schooner**
	Provincial compliance and treatment plant performance monitoring: • Influent: TSS, BOD, fecal coliform • Secondary Effluent: TSS, BOD, CBOD, fecal coliform, NH_3, pH • Combined Final Effluent (Secondary + Fine-screened): TSS, BOD, CBOD, fecal coliform, NH_3, pH	Once per month: **Maliview**
	Provincial compliance and treatment plant performance monitoring: • Influent: TSS, BOD • Secondary Effluent: TSS, BOD, CBOD, fecal coliform, NH_3, pH	Once per month: **Ganges, Maliview, Schooner, Cannon**, **Port Renfrew**
	Federal compliance monitoring: • Final Effluent: TSS, CBOD, unionized ammonia @ 15ºC, total residual chlorine	Once per month (reported quarterly): **Ganges, Schooner**
	Influent and effluent priority substances	Once per year: **Ganges**
	Effluent toxicity	Once per year: **Ganges Harbour (required)**, **Schooner (required), Maliview (voluntary), Cannon (voluntary), Port Renfrew (voluntary)**
	Sludge (mixed liquor)	Once per month: **Ganges** Quarterly: **Burgoyne**
Receiving Water	Surface water indicator bacteria (fecal coliform and enterococci)	**Ganges WWTP** five days of sampling in a 30-day period* **Maliview WWTP** five days of sampling in a 30-day period* **Schooner WWTP** five days of sampling in a 30-day period^ **Cannon WWTP** five days of sampling in a 30-day period* **Port Renfrew WWTP** five days of sampling in a 30-day period*

Notes:

*Receiving water sampling was conducted this year (2024), and is next required in 2028, unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter and one day duration in the summer.

^Receiving water sampling was conducted this year (2024) and will be conducted on a biannual basis for the next two years, as part of the new REMP for the upgraded Schooner WWTP (Appendix C3). Samples will also be analyzed for metals on one day of each 5-in-30.

1.2 Receiving Water Monitoring

Receiving environment monitoring was not historically undertaken routinely for all five of the small CRD wastewater facilities. In 2010, discussions with ENV led to the requirement for such monitoring, with the inter-year frequency of monitoring dependent on the size of the facility. In addition, intra-year sampling frequency was changed from monthly to five sets of daily samples collected over a 30-day period (5-in-30) to allow for a more direct comparison of bacterial indicators to relevant human health protection criteria. In addition, enterococci are now analyzed as well as fecal coliforms, as enterococci persist longer in the marine environment and have a more direct link to human health impacts.

For the five small facilities that are the subject of this report, the monitoring programs were added and/or revised to comprise a 5-in-30 sampling program once every four years. Emergency sampling is also required after planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter or one day duration in the summer. If the results from a single day of emergency sampling indicate no impact to the receiving environment (i.e., results less than human health guidelines), then no repeat emergency sampling is required for similar events of the same duration or less during that same wet weather season. If impacts are observed during the emergency sampling (i.e., results higher than human health guidelines), then sampling must repeat every few days until all results are below human health guidelines.

Pre-2010 monitoring programs sampled surface water only (0.5 to 1 m below the surface). The receiving water sampling programs now include sampling of near-surface stations at a depth mid-way between the surface and seafloor, in addition to surface samples, at stations at the edge of the initial dilution zone (IDZ). The IDZ is defined as the area 100 m around the outfall and is where BC WQG must be met. In addition to the IDZ sampling stations, surface samples are collected at two stations approximately 200 m up-current and down-current from the outfalls (Figure 1.2, Figure 1.3, Figure 1.4, Figure 1.5 and Figure 1.6).

The 2024 sampling year represents year four of the current round of this four-year monitoring cycle and included routine receiving environment monitoring. The next routine 5-in-30 sampling, as per the four-year cycle, will be required in 2028.

Any 2024 non-routine/emergency receiving environment sampling events are described in subsequent sections.

Figure 1.2 Ganges Surface Monitoring Locations

Outfall Pipe

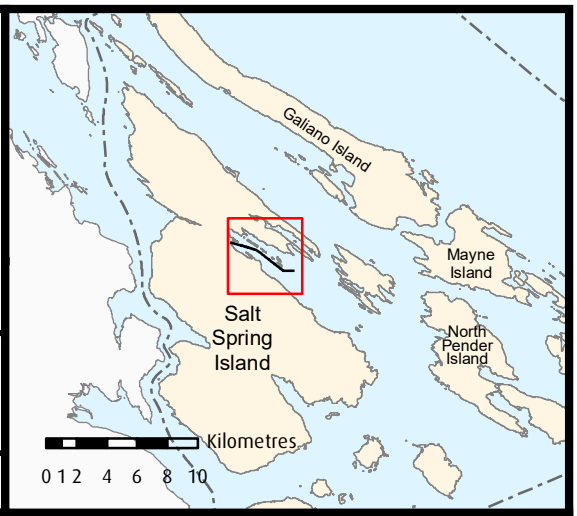
01 = Sampling Station

Making a difference...together

Metres

0 250 500 1,000 1,500

Projection: UTM ZONE 10N NAD 83



Ganges Harbour

Welbury Point

05 04 01 03 02 06

Swanson Channel

N W E S

CRD - Facilities Management & Engineering Services - Apr 01, 2019 - Technologist: sruljancich - Map Document: SurfaceSamplesGanges0rtho2019.mxd

Figure 1.3 Maliview Surface Monitoring Locations

Outfall Pipe

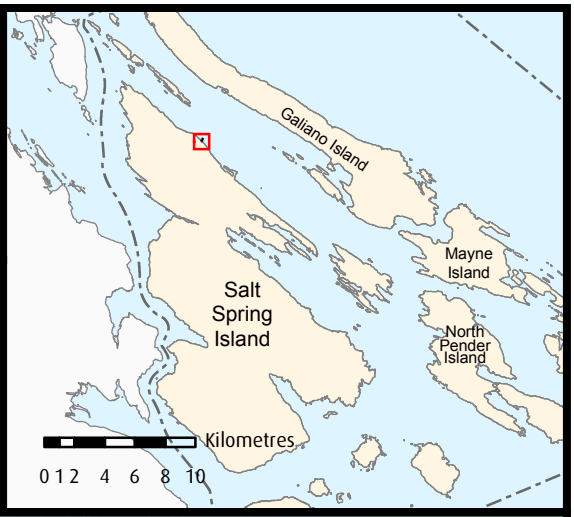
01 = Sampling Station

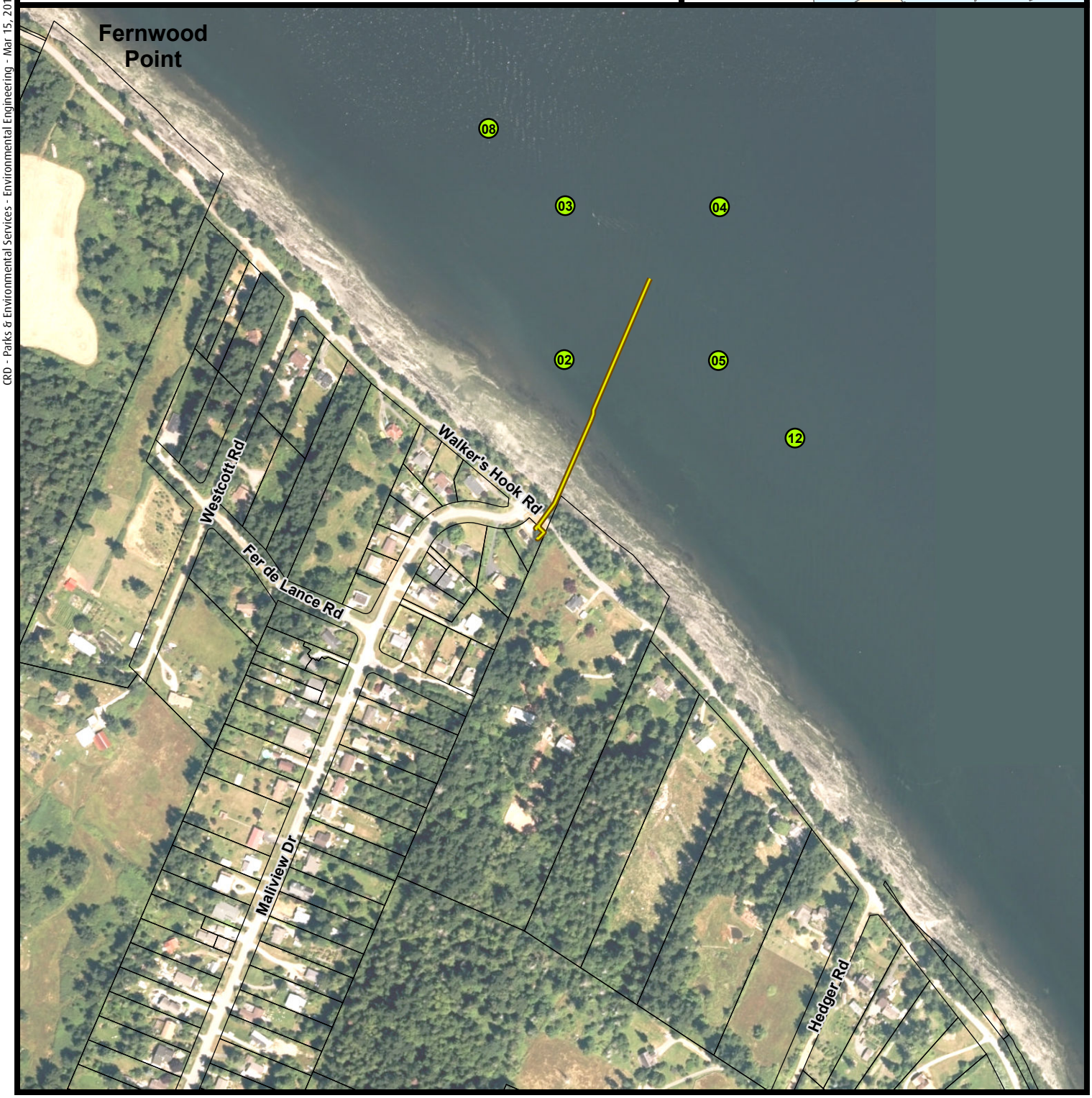
Making a difference...together

Metres

0 50 100 200 300

Projection: UTM ZONE 10N NAD 83





CRD - Parks & Environmental Services - Environmental Engineering - Mar 15, 2017 - Technologist: SR - Map Document: SurfaceSamplesMailiviewOrtho.mxd

Figure 1.4 Schooner Way Surface Water Monitoring Locations

Outfall Pipe

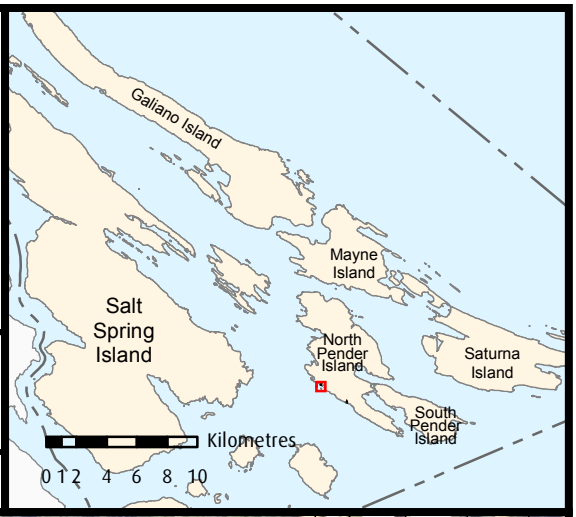
01 = Sampling Station

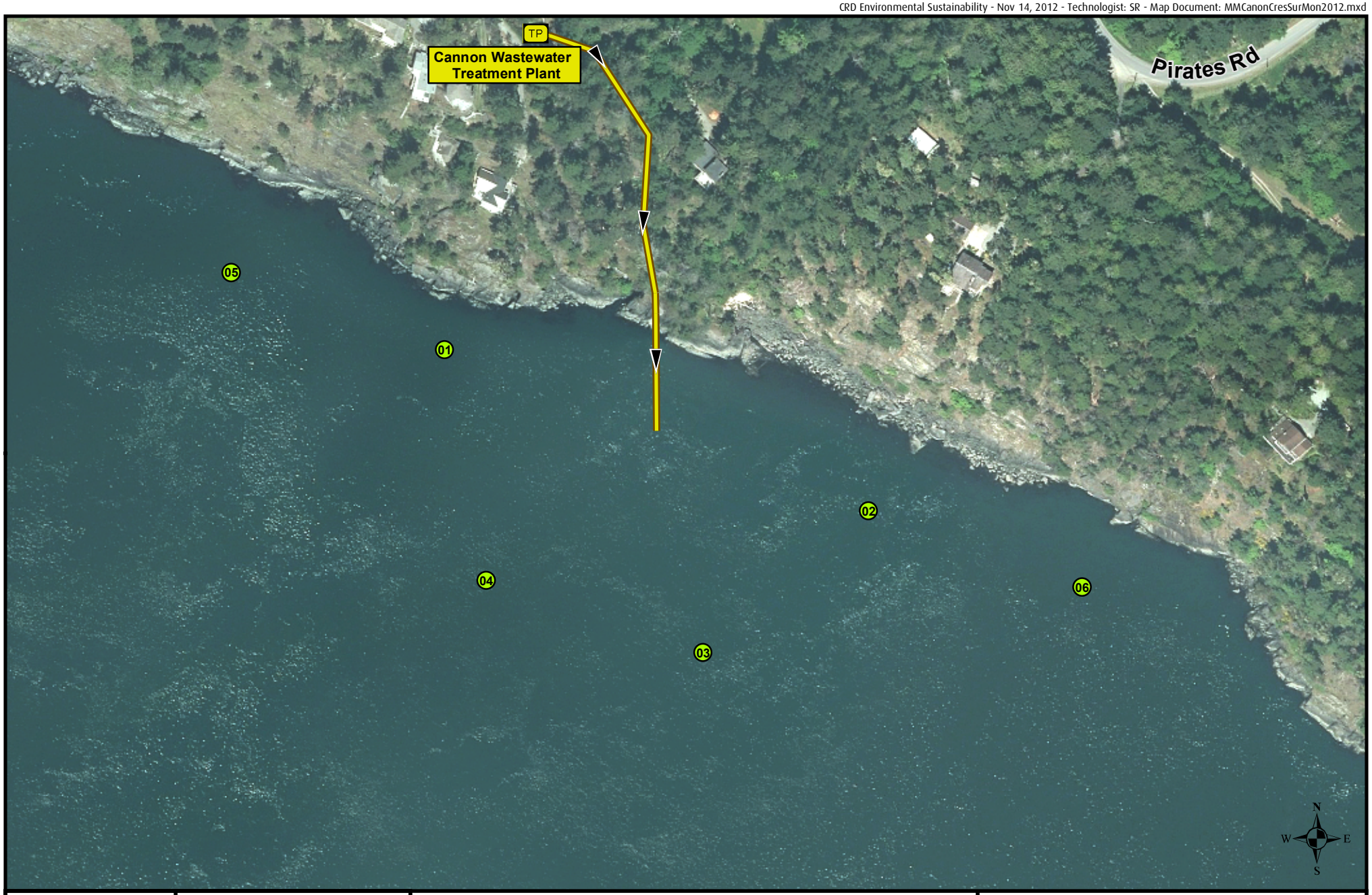
Making a difference...together

Metres

0 10 20 40 60 80 100

Projection: UTM ZONE 10N NAD 83





Making a difference...together

Metres

0 12.5 25 37.5 50

Projection: UTM ZONE 10N NAD 83

Sampling Stations

Outfall Pipe

FIGURE 1.5
CANNON CRESCENT SURFACE SAMPLING

Figure 1.6 Port Renfrew Shoreline and Receiving Water Station Locations

Sampling Station

Outfall Pipe

Making a difference...together

Metres

0 25 50 100 150 200 250

Projection: UTM ZONE 10N NAD 83

PRS-06
PRS-05
PRS-04
PRRW-03
PRRW-06
PRRW-02
PRRW-04
PRS-03
PRRW-05
PRRW-01
PRS-01
PRS-02
Clo-Oose Dr
Harris Cove Rd
Deering Rd
Queesto Dr
Tsonoqua Dr
Tsonoqua Dr
Klanamith St
Parkinson Rd
Deering Rd

Capital Regional District

CRD - Facilities Management & Engineering Services - Jun 30, 2021 - Technologist: sruljancich - Map Document: SurfaceSamplesPortRenfrew2021.mxd

2.0 METHODOLOGY

2.1 Wastewater Monitoring

COMPLIANCE AND TREATMENT PLANT PERFORMANCE MONITORING

Influent and effluent samples from all five facilities were collected as grab samples at the frequency noted in Table 1.1.

Laboratory analyses were conducted at the McLoughlin Point WWTP laboratory, the Saanich Peninsula WWTP laboratory or Bureau Veritas Laboratories (BV Labs, Burnaby, BC). All labs are ISO certified as per provincial and federal regulatory requirements. TSS was determined gravimetrically using glass fiber filters dried at 105°C (APHA, 1998). BOD was determined by five-day oxygen depletion at 20°C using an oxygen meter (APHA, 1998). CBOD was determined by five-day oxygen depletion at 20°C with TCMP [2-chloro-6-(trichloro methyl) pyridine] as a nitrification inhibitor and using an oxygen meter (APHA, 1998). Fecal coliforms were enumerated using 0.45 µm membrane filters incubated on mFC medium at 44.5°C for 24 hours (APHA, 1998). Enterococci was determined by membrane-filtration technique, followed by incubation on mEI agar (an enzyme substrate medium) for 24 hours at 41°C. Nitrite was determined by diazotization colourimetry. Nitrate was determined by cadmium reduction, followed by diazotization colourimetry. The concentration of unionized ammonia was calculated using the measured concentration of total ammonia and the pH corrected to 15ºC.

Means reported for fecal coliform and enterococci are geometric (logarithmic) means. Means for all other parameters are arithmetic. Mean daily loadings were calculated from mean concentrations and mean daily flows. Annual loadings were calculated from mean concentrations and total annual flows. Values of half the detection limit were used for non-detect results.

TOXICITY TESTING

Effluent toxicity samples for each of the WWTPs were collected by grab sampling. Testing was conducted using standardized and approved protocols by ISO certified Nautilus Environmental (Burnaby, BC). Effluent toxicity was determined using the 96-hour acute toxicity test (EPS 1/RM/13) with juvenile Rainbow trout (*Oncorhynchus mykiss*). Five effluent concentrations plus one control were tested, with 10 test organisms per concentration. The number of organisms surviving over the testing period was recorded.

An additional toxicity test was conducted at the Ganges WWTP only. Effluent toxicity was further assessed using the 48-hour acute toxicity test (EPS 1/RM/14 with 2016 amendments) with <24-hour old neonate *Daphnia magna*. Five effluent concentrations plus one control were tested, with 10 test organisms per concentration. The number of organisms surviving over the testing period was recorded.

PRIORITY SUBSTANCES

At Ganges WWTP, influent and effluent samples were collected as composite samples for priority substance analysis at routine detection limits. The composite samples were collected by an ISCO automated sampler, with 400 mL of wastewater collected every 30 minutes over a 24-hour period. The composite samples were then split into smaller sample bottles for individual analyses and preserved before shipping to BV Labs. An additional grab sample was collected for those parameters not suited for composite collection. Analytical detection limits were chosen to allow for comparison to BC WQG.

SLUDGE

Dewatered sludge (mixed liquor) at Ganges WWTP was sampled monthly and analyzed for 34 metals and moisture content by BV Labs. Results were compared to the BC OMRR (BCMoE&CCS, 2017b) biosolids limits. These regulations stipulate the land uses that are acceptable for the tested biosolids according to the concentrations of a select group of substances. The regulations are set to protect human and environmental health.

Sludge at the Burgoyne Bay waste transfer facility was sampled quarterly and analyzed for 34 metals and moisture content by BV Labs. Results were also compared to the BC OMRR (BCMoE&CCS, 2017b) biosolids limits.

2.2 Receiving Water Monitoring

RECEIVING WATER SURFACE WATER MONITORING

Routine receiving environment sampling was conducted in 2024. Each facility was sampled 5 times in 30 days (5-in-30) for bacterial indicators. In addition, the substantive upgrade to the Schooner WWTP triggered a requirement for increased receiving environment monitoring. This enhanced Receiving Environment Monitoring Program (REMP) (Appendix C3) included additional sampling depths, plus analysis of total metals from one day of the 5-in-30. The REMP program will be repeated on a biannual basis for two years, at which point the results will be reviewed with ENV. If impact to the receiving environment is low, sampling frequency will be reduced again to every four years.

Additionally, once effluent was entirely diverted from the Cannon WWTP outfall to the Schooner WWTP (November 2024), receiving environment sampling was no longer conducted at Cannon.

There was no non-routine/emergency receiving environment sampling required in 2024. Routine receiving environment sampling will be conducted next at Ganges, Maliview and Port Renfrew WWTPs in 2028. 5-in-30 receiving environment sampling will be conducted next at Schooner WWTP in summer 2025, winter 2025, and summer 2026.

3.0 GANGES WWTP

3.1 Introduction

The Ganges WWTP is located on the east side of Salt Spring Island (Figure 1.1). It discharges UV disinfected secondary treated effluent into Ganges Harbour through a 4,800 m outfall at a depth of 16 m. Because the average daily flow of this facility exceeds 100 m^3/day, both provincial and federal regulatory requirements must be met by this facility. Total residual chlorine must also be measured, but only when chlorine is used when washing the membranes.

The facility is regulated under BC MWR Registration RE-05521, dated April 28, 2005. Provincial and Federal regulatory requirements are described in Table 3.1.

Table 3.1 Ganges WWTP Regulatory Requirements

Parameter	Regulatory Requirement	
	Provincial	Federal
Maximum daily flow	<1,198 m^3/d	---
CBOD	max 25 mg/L	average 25 mg/L
TSS	max 25 mg/L	average 25 mg/L
Fecal coliform	max 1,000 CFU/100 mL	---
Unionized ammonia @15°C	---	max 1.25 mg/L
Total residual chlorine	---	average 0.02 mg/L
Toxicity test	96-hr Rainbow trout (pass)	---

This registration also has a requirement for receiving water monitoring. Routine monitoring was required at this facility for this reporting year (2024) and is next required in 2028 unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter and one day duration in the summer which would trigger non-routine or emergency sampling.

The following section reports the results from the Ganges Wastewater Treatment Plant WMEP (Table 3.2).

Table 3.2 Ganges Wastewater Treatment Plant WMEP

Component	Parameter	Frequency
Wastewater	Flow	Daily
	Provincial compliance and treatment plant performance monitoring: • Influent: TSS, BOD, fecal coliform • Secondary effluent: TSS, fecal coliform • Disinfected secondary effluent: TSS, BOD, CBOD, fecal coliform, ammonia, pH	Once per month
	Effluent toxicity: • Rainbow trout 96-hour • *Daphnia magna* 48-hour	Once per year
	Federal compliance monitoring: • Final effluent: TSS, CBOD, unionized ammonia, total residual chlorine	Once per month
	Influent and effluent priority substances[1]	Once per year
	Sludge (mixed liquor)	Once per month
Receiving Water	Indicator bacteria (fecal coliform and enterococci)	2024, 2028, 2032

Notes:
[1]All priority substances are listed in Appendix A3.

3.2 Results

3.2.1 Wastewater Monitoring

COMPLIANCE AND TREATMENT PLANT PERFORMANCE MONITORING

In 2024, all daily flows met regulatory limits for the Ganges WWTP (Table 3.3 and Appendix A1).

Compliance and treatment plant monitoring data (Table 3.4, Appendix A2) show that effluent quality was consistent with previous years for all parameters (CRD, 2011 to 2024). There was one fecal coliform exceedance in May 2024. All other compliance parameters met regulatory limits. Overall, the treatment plant removed 98% of the TSS and >99% of the fecal coliform bacteria from the influent.

Total residual chlorine was measured 10 times in 2024, as part of federal regulations, to monitor levels resulting from chlorine used to clean the treatment plant membranes. Concentrations of total residual chlorine exceeded the permitted level 90% of the time in disinfected secondary effluent. However, this was most likely an artefact, due to measurements taken using a relatively insensitive field-based test kit that has a detection limit the same as the federal guideline of 0.02 mg/L. The reliability of test kit results near the detection limit is low. CRD staff are investigating alternative chlorine test methods for use in the future.

Compliance data was reported to ENV on a monthly basis, with individual environmental impact reports (EIR) issued if there was an incident at the plant. There were four EIRs issued at Ganges WWTP in 2024 as a result of:

- partial treatment bypass from high influent flow as a result of heavy rain (January);
- fecal coliform exceedance (May);
- failed toxicity test (July); and
- clogged sewer resulting in sewage overflow to ditch.

Table 3.3 Ganges WWTP 2024 Annual Flow Summary

Month	Mean Flow (m^3/d)	Minimum Flow (m^3/d)	Maximum Flow (m^3/d)	Total Flow (m^3)	Number of Samples	Permit Violations (%)
January	529	438	781	16,405	31	0
February	456	388	678	13,215	29	0
March	524	434	657	16,243	31	0
April	487	432	578	14,606	30	0
May	452	427	493	14,013	31	0
June	434	387	512	13,026	30	0
July	448	399	508	13,899	31	0
August	431	366	506	13,347	31	0
September	408	375	495	12,246	30	0
October	448	367	741	13,886	31	0
November	559	416	808	16,773	30	0
December	522	399	924	16,185	31	0
Annual	**475**	**366**	**924**	**173,844**	**366**	**0**

Notes:
Provincially regulated maximum daily flow = 1,198 m^3/d

Table 3.4 Ganges WWTP 2024 Compliance and Treatment Plant Performance Monitoring Annual Summary

Source	Compliance Monitoring				Treatment Plant Performance Monitoring				
	Flow (m^3/d)	TSS (mg/L)	CBOD (mg/L)	Fecal Coliform (CFU/100 mL)	BOD (mg/L)	Ammonia (mg N/L)	Unionized Ammonia @15°C (mg N/L)	Total Residual Chlorine (mg/L)	pH
Influent									
Regulatory limit	---	---	---	---	---	---	---	---	---
Mean	475	253	---	6,420,575	282	---	---	---	---
Minimum	366	43	---	120,000	64	---	---	---	---
Maximum	924	444	---	45,000,000	439	---	---	---	---
Regulatory violations (%)	---	---	---	---	---	---	---	---	---
Number of samples	366	12	---	12	12	---	---	---	---
Secondary effluent									
Regulatory limit	---	---	---	---	---	---	1.25	0.02	---
Mean	475	6	---	43,004	---	---	---	---	---
Minimum	366	1	---	2,650	---	---	---	---	---
Maximum	924	25	---	249,800	---	---	---	---	---
Percent reduction (from influent)	---	98	---	99	---	---	---	---	---
Regulatory violations	---	---	---	---	---	---			---
Number of samples	366	12	---	12	---	---			---
Disinfected secondary effluent									
Regulatory limit	1,198	25	25	1,000	---	---	1.25	0.02	---
Mean	475	4.3	1.5	150	1.9	6.04	0.1135	0.05	7.4
Minimum	366	<2	<2	<1	<3	0.10	<0.1	0.02	7.2
Maximum	924	15	3	1,200	3.27	32	0.47	0.08	7.7
Percent reduction (from influent)	---	98	---	>99	99	---	---	---	---
Regulatory violations (%)	0	0	0	8	---	---	0	90	---
Number of samples	366	12	12	12	12	12	11	10	12

TOXICITY TESTING

In 2024, disinfected effluent from July 23 failed the 96-hour Rainbow trout acute toxicity test. A resample was collected on September 9, and the toxicity test reran using both the standard method and the ammonia corrected method. The ammonia corrected method passed, confirming that the previous toxicity results were due to high ammonia concentrations. Moving forward, the Ganges plant will continue to use the ammonia corrected test methodology to mitigate any effects of the ammonia on the test. In addition, the Ganges WWTP aeration system is currently under design review for a comprehensive upgrade. These improvements will aid with the nitrification process that will lower ammonia levels.

As in previous years (2012-2023), disinfected effluent from July passed the 48-hour *Daphnia magna* acute toxicity test, corresponding to an LC50 of >100%. The *Daphnia* test is not required but was conducted to maintain consistency with other CRD discharge monitoring programs where toxicity testing is required.

PRIORITY SUBSTANCES

Of the 196 priority substances analyzed in Ganges WWTP effluent (Appendix A3), 81 parameters were detected at standard detection limits (conventionals, nutrients, metals, total phenols, naphthalene, phenanthrene, diethyl phthalate, and isophorone). Influent results can also be found in Appendix A3.

In 2024, most priority substance concentrations in the Ganges WWTP effluent were below BC WQG (BCMoE&CCS, 2017a and 2019a) in undiluted effluent, before discharge to the environment (Appendix A3). Only cyanide WAD, cadmium, copper and lead exceeded BC WQG in undiluted effluent. All substances were below BC WQG after the near surface dilution factor of 419:1 was applied. This 419:1 dilution factor was determined by oceanographic modelling and is the predicted dilution factor to occur near the surface at the edge of the outfall IDZ (Seaconsult Marine Research Ltd, 1994).

SLUDGE (MIXED LIQUOR)

Results of sludge (mixed liquor) analysis were compared to BC OMRR Biosolids Class A criteria to assess the quality of the sludge produced at the Ganges WWTP (Appendix A4). This class rating identifies biosolids as the highest quality that can be produced according to ENV requirements. Class A Biosolids can be used in land applications (limits are set to protect human and environmental health) with an approved land application plan. Ganges WWTP mixed liquor is not applied to land but is transferred to a Vancouver Island septage treatment facility for disposal. However, the mixed liquor monitoring results are still valuable information for the RSCP to help assess the success of their codes of practice (e.g., those in place for dental offices).

The 2024 Ganges WWTP sludge (mixed liquor) results for regulated parameters had concentrations well below the criteria for Class A Biosolids. Historically, mercury levels have been elevated at times in Ganges sludge, but these have declined steadily over time (Figure 3.1).

3.2.2 Receiving Water Monitoring

RECEIVING WATER BACTERIA INDICATORS

Routine receiving water monitoring was required in 2024. Results are presented in Table 3.5. All individual results as well as geomeans were well below WQG, with the maximum value of 5 CFU/100 mL for *enterococci* and 4 CFU/100 mL for fecal coliforms.

The next routine receiving water 5-in-30 sampling will be conducted in the fall of 2028.

Table 3.5 Ganges 2024 receiving water sampling results, CFU/100 mL

Station	Site	Depth	Nov-06		Nov-15		Nov-26		Nov-28		Dec-09		Geomean		Minimum		Maximum	
			Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.
Gan-01	100m NE	top	<1	2	5	1	<1	<1	3	4	<1	1	1.1	1.3	0.5	0.5	5.0	4.0
		middle	<1	<1	<1	<1	<1	<1	3	1	<1	<1	0.7	0.6	0.5	0.5	3.0	1.0
Gan-02	100m SE	top	<1	2	1	<1	1	<1	2	2	<1	<1	0.9	0.9	0.5	0.5	2.0	2.0
		middle	2	<1	1	1	<1	2	1	2	1	1	1.0	1.1	0.5	0.5	2.0	2.0
Gan-03	100m SW	top	<1	1	1	<1	<1	<1	2	<1	<1	<1	0.8	0.6	0.5	0.5	2.0	1.0
		middle	2	<1	1	<1	1	<1	2	2	1	1	1.3	0.8	1.0	0.5	2.0	2.0
Gan-04	100m NW	top	<1	3	1	<1	<1	<1	<1	2	<1	1	0.6	1.1	0.5	0.5	1.0	3.0
		middle	2	<1	<1	<1	1	<1	2	<1	<1	2	1.0	0.7	0.5	0.5	2.0	2.0
Gan-05	200m NW	top	<1	1	<1	<1	<1	<1	1	3	<1	1	0.6	0.9	0.5	0.5	1.0	3.0
Gan-06	200m NE	top	<1	4	<1	1	<1	<1	2	<1	<1	<1	0.7	0.9	0.5	0.5	2.0	4.0

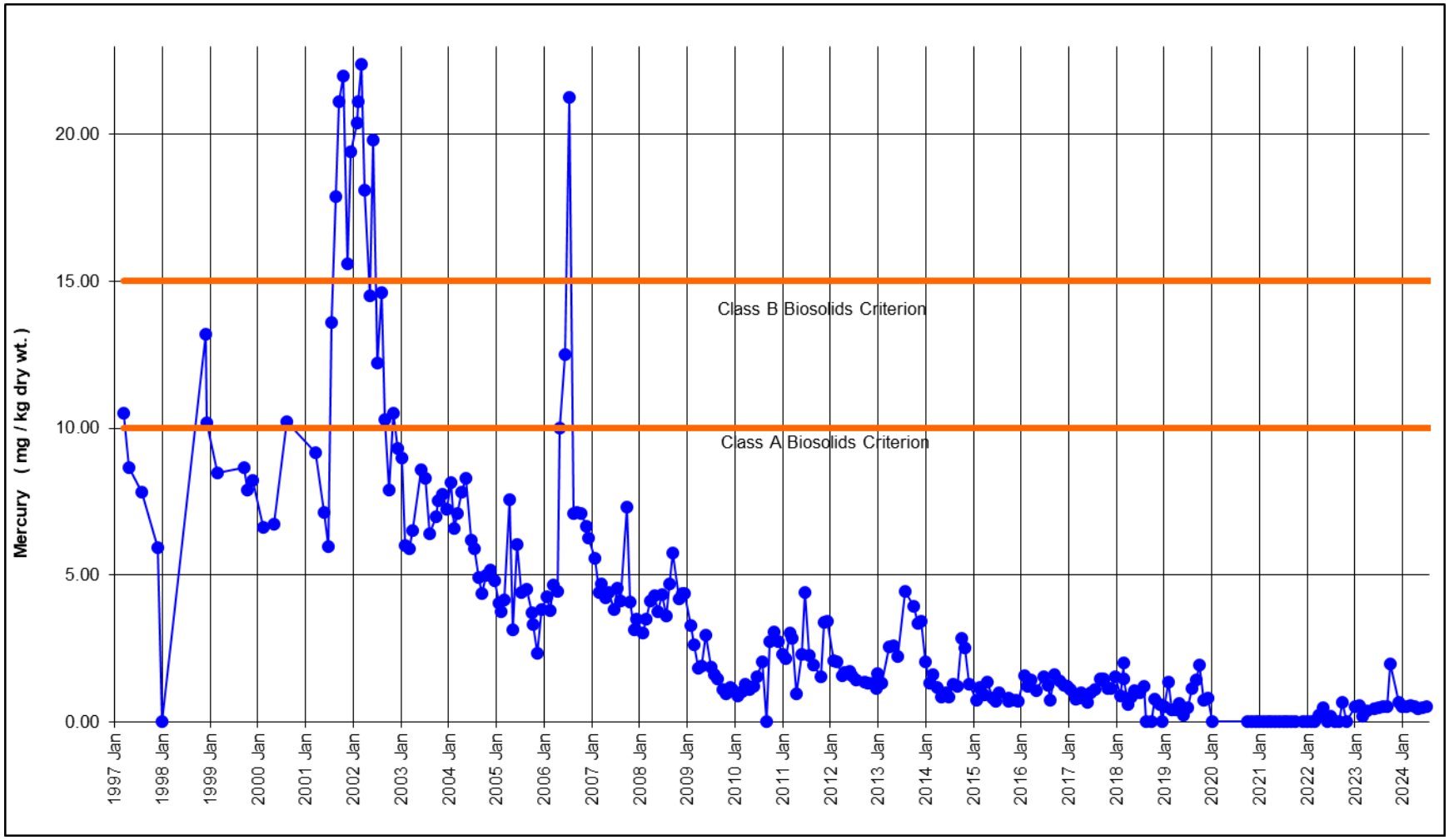


Figure 3.1 Ganges WWTP Mixed Liquor Mercury Levels (1997 to 2024)

3.3 Recommendations

CONTINUE TO SHARE RESULTS WITH THE CRD REGIONAL SOURCE CONTROL PROGRAM

Effluent priority pollutant and sludge (mixed liquor) results are valuable to the RSCP. Effluent priority pollutant monitoring is a requirement of the provincial registration for this facility and must continue, but sludge (mixed liquor) monitoring is not. It is recommended that sludge (mixed liquor) sampling continue to allow the RSCP to assess the effectiveness of their initiatives.

4.0 MALIVIEW WWTP

4.1 Introduction

The Maliview WWTP is located on the east side of Salt Spring Island (Figure 1.1). It discharges treated effluent into Trincomali Channel through a 213 m outfall at a depth of 14 m below sea level. The original primary treatment plant was upgraded to a secondary treatment facility in July 2006.

The facility is registered under BC MWR Registration RE-00242, as amended in June 2007.

Flows up to 60 m^3/d receive secondary treatment using the rotating biological contactor (RBC) and flows greater than 60 m^3/d (greater than twice the mean daily dry weather flow) receive preliminary treatment using fine screens. Both effluent streams are combined before discharge. Blending effluent streams is an option available under the MWR to deal with high effluent flows. Historically (prior to 2013), monitoring was done separately on the RBC and fine-screened portions of the effluent, and final effluent quality was predicted using a combination of the two effluent quality results and the relative flow volumes. In December 2012, a sampling point was installed that allowed for direct sampling of the combined final effluent quality. As such, the fine-screened effluent sampling point was abandoned in 2013 and replaced with the new combined final effluent sampling point. Compliance requirements are as follows:

Table 4.1 Maliview WWTP Regulatory Requirements

Parameter	Regulatory Requirements	
Maximum daily secondary flow	60 m^3/d	
Maximum daily fine-screened flow	190 m^3/d	
Maximum daily total flow	250 m^3/d	
	Flows up to 60 m^3/d	**Flows over 60 m^3/d**
Maximum CBOD	45 mg/L	130 mg/L
Maximum TSS	45 mg/L	130 mg/L

This registration also has a requirement for receiving water monitoring. Routine monitoring was required at this facility for this reporting year (2024) and is next required in 2028 unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter and one day duration in the summer which would trigger non-routine or emergency sampling.

The following section reports the results from the Maliview Wastewater Treatment Plant WMEP (Table 4.2).

Table 4.2 Maliview Wastewater Treatment Plant WMEP

Component	Parameter	Frequency
Wastewater	Flow	Daily
	Compliance and treatment plant performance monitoring: • Influent: TSS, BOD, fecal coliform • Secondary fine-screened effluent: TSS, BOD, CBOD, fecal coliform, NH_3, pH • Combined final effluent: TSS, BOD, CBOD, fecal coliform, NH_3, pH	Once per month
	Effluent toxicity (voluntary): • Rainbow trout 96-hour	Once per year
Receiving Water	Indicator bacteria (fecal coliform and enterococci)	2024, 2028, 2032

4.2 Results

4.2.1 Wastewater Monitoring

COMPLIANCE AND TREATMENT PLANT PERFORMANCE MONITORING

Flow data, including exceedances, are summarized for effluent discharged from the fine screens (bypassing the secondary treatment unit) in Table 4.3, for the secondary treatment unit in Table 4.4, and for the entire facility in Table 4.5. The complete flow data set is presented in Appendix B1.

The RBC component of the Maliview WWTP was not designed to treat the volume of effluent that it presently receives, particularly when it is rainy and significant inflow and infiltration (I&I) enters the conveyance system. In addition, the process that splits flow between the RBC and the fine screens responds to instantaneous peak flows, rather than total daily flows. This results in frequent fine-screening events on days that the RBC unit is not operating at full capacity, as measured by the total daily flow. Finally, the strength of influent has been steadily increasing in recent years, often exceeding the treatment specifications of the RBC. All these conditions make it challenging for this facility to be in compliance with provincial regulatory limits.

Total effluent flows discharged from the Maliview WWTP exceeded the permitted allowable maximum of 250 m^3/d in December 2024 due to heavy rain events. Flow bypassed the secondary treatment process and received fine screening only, despite a secondary flow of less than 60 m^3/d, on 331 days (91% of the time). Flow also bypassed the secondary treatment process and received screening on days where the total flow was greater than 60 m^3/d, but the flow to the secondary treatment process was less than 60 m^3/d on 7% of the days. Flow to the secondary treatment plant exceeded 60 m^3/d on 27% of the days in 2024, resulting in a portion of the effluent bypassing the secondary treatment process of the plant to be treated solely by fine screening.

CRD staff and a contracting engineer have developed a detailed design for an upgrade to the facility to increase capacity and treatment reliability. Construction is expected to begin in 2025. It should also be noted that repairs were made in the summer of 2019 to the upstream conveyance system to reduce I&I. Since these repairs, the frequency and volume of flow limit exceedances have been substantially reduced; wet weather peak flows have been reduced to almost half of previous years, but extreme wet weather still leads to overflows.

Compliance data was reported to ENV on a monthly basis, with EIRs issued if there was an incident at the plant. There were eight EIRs issued at Maliview WWTP in 2024, as a result of:

- TSS exceedance (May),
- Mechanical breakdown (June),
- CBOD exceedance (July, August)
- Mechanical breakdown (November)
- Power outage resulting in bypass (November)
- Flow exceedance as a result of heavy rain event (December),
- Flow exceedance as a result of heavy rain event plus discharge from resident's basement (December).

Compliance and treatment plant monitoring data is summarized in Table 4.6 and the complete data set is presented in Appendix B2. The secondary treatment unit removed approximately 80% of the TSS, 74% of fecal coliform and 78% of total BOD. The combined final effluent exceeded low flow (<60 m^3/d) limits for TSS and CBOD on seven sampling days, representing 14% of the low flow sampling events. The combined final effluent did not exceed high flow limits for TSS or CBOD on any of the sampling days.

TOXICITY TESTING

Beginning in 2021, toxicity testing was conducted at each of the Gulf Islands/Port Renfrew facilities in order to maintain consistency across the region. The effluent sample from July 2024 failed the 96-hour Rainbow trout acute toxicity test. The toxicity test was not ammonia stabilized, which may be considered for future years. Once the plant upgrades are completed and treatment is functioning optimally, ammonia stabilization should no longer be required.

Table 4.3 Maliview WWTP 2024 Fine-screened Effluent Flow Summary

Month	Mean Daily Flow (m^3/d)	Min Daily Flow (m^3/d)	Max Daily Flow (m^3/d)*	Total Flow (m^3)
January	58	18	156	1,793
February	36	15	94	1,032
March	26	2	93	820
April	3	0	14	82
May	0	0	1	2
June	0	0	2	2
July	0	0	0	0
August	0	0	1	1
September	0	0	5	5
October	9	0	63	291
November	55	17	116	1,657
December	67	15	252	2,086
Annual	**21**	**0**	**252**	**7,768**

Notes:
*Permitted maximum daily flow = 190 m^3/d.

Table 4.4 Maliview WWTP 2024 Secondary Effluent Flow Summary

Month	Mean Daily Flow (m^3/d)	Min Daily Flow (m^3/d)	Max Daily Flow (m^3/d)*	Total Flow (m^3)
January	68	50	95	2,105
February	61	46	71	1,777
March	64	52	74	1,972
April	54	4	73	1,605
May	41	25	64	1,275
June	38	21	66	1,134
July	22	13	33	680
August	23	11	33	708
September	29	17	48	859
October	44	11	90	1,375
November	70	59	85	2,094
December	71	56	91	2,202
Annual	**49**	**4**	**95**	**17,784**

Notes:
*Provincially regulated maximum daily flow = 60 m^3/d.

Table 4.5 Maliview WWTP 2024 Total Effluent Flow Summary

Month	Total Daily Flow				Days TF <60 (2° flow only expected)	Days 2° flow <60, but FS discharged	Days TF >60 (blended flow expected)	Days Exceeded Regulatory Maximum (250 m3/d)
	Mean	Min	Max	Total				
January	126	71	218	3,897	0	26	31	0
February	97	74	151	2,818	0	19	29	0
March	90	68	159	2,792	0	25	31	0
April	56	4	78	1,687	14	25	16	0
May	41	25	64	1,276	30	28	1	0
June	38	21	67	1,136	28	30	2	0
July	22	13	33	680	31	31	0	0
August	23	11	33	709	31	30	0	0
September	29	17	48	864	30	29	0	0
October	54	11	152	1,666	19	29	12	0
November	125	84	201	3,751	0	29	30	0
December	138	78	339	4,288	0	30	31	6
Annual Total	**70**	**4**	**339**	**25,560**	**183**	**331**	**183**	**0.5**

Notes:
Permitted maximum daily total flow = 250 m^3/d.
Permitted maximum daily fine-screened flow = 190 m^3/d.
Flow splitting threshold (max. flow that can be handled by the RBC secondary treatment process) = 60 m^3/d.
FS = fine-screened.
2° = secondary treated flow.
TF = total daily flow (combined FS and 2°).
The flow splitting mechanism responds to instantaneous peak flow, so can get FS flow even when TF <60 m3/day.

Table 4.6 Maliview WWTP 2024 Compliance and Treatment Plant Performance Monitoring Annual Summary

Source	Compliance Monitoring				Treatment Plant Performance Monitoring		
	Flow (m^3/d)	TSS (mg/L)	CBOD (mg/L)	FC (CFU/100 mL)	BOD (mg/L)	NH_3 (mg/L N)	pH
Influent							
Regulatory Limit	250	---	---	---	---	---	---
Mean	70	235	---	3,826,003	234	---	---
Minimum	4	63	---	480,000	94	---	---
Maximum	339	619	---	27,000,000	480	---	---
Regulatory Violations	0.5	---	---	---	---	---	---
Number of Samples	366	12.	---	12	12	---	---
Secondary Effluent							
Regulatory Limit	60	45	45	---	---	---	---
Mean	49	34	28	422,723	36	29.9	6.8
Minimum	4	16	12	18,000	14	3.86	0.0
Maximum	95	74	90	5,400,000	88	56.1	7.5
Percent Reduction (%)	---	85	---	89	85	---	---
Regulatory Violations	41	0	0	---	---	---	---
Number of Samples	365.	12	12	12	12	12	12
Fine-Screened Effluent[1]							
Regulatory Limit	190	---	---	---	---	---	---
Mean	21	---	---	---	---	---	---
Minimum	0	---	---	---	---	---	---
Maximum	252	---	---	---	---	---	---
Percent Reduction	---	---	---	---	---	---	---
Regulatory Violations (%)	0.5	---	---	---	---	---	---
Number of Samples	366	---	---	---	---	---	---
Combined Final Effluent[2]							
Regulatory Limit[3]	250	45 / 130	45 / 130	---	---	---	---
Mean	70	46	43	996,998	51	31	7.5
Minimum	4	19	12	77,000	13	9	7.1
Maximum	339	96	93	6,300,000	109	57	7.7
Percent Reduction (%)	---	80	---	74	78	---	---
Regulatory Violations (%)	0.5	14 / 0	57 / ---	---	---	---	---
Number of Samples	366	7 / 5	7 / 12	12	12	12	12
Discharged Effluent							
Mean	70	40	39	996,998	51	30.4	7.1
Percent Reduction (%)	---	83	---	74	78	---	---

Notes: [1] No fine-screened effluent samples were collected in 2023. See footnote 2.

[2] Historically, the values for final effluent were calculated using individual secondary and fine-screened effluent quality values along with their relative flow volume proportions. In 2013, the fine-screened effluent sampling point was abandoned and replaced by direct sampling of final combined (secondary + screened) effluent quality via a new combined sampling point that was installed in December 2012.

[3] Regulatory limits for TSS and CBOD are dependent upon whether average daily flow is above or below 60 m3/day. Limits are 45 mg/L if flows are below 60 m^3/day and 130 mg/L if above 60 m^3/day.

4.2.2 Receiving Water Monitoring

RECEIVING WATER BACTERIA INDICATORS

Routine receiving water monitoring was required in 2024. Results are presented in Table 4.7. All individual results as well as geomeans were well below WQG, with the maximum value of 3 CFU/100 mL for *Enterococci* and 5 CFU/100 mL for fecal coliforms.

The next routine receiving water 5-in-30 sampling will be conducted in the fall of 2028.

4.3 Recommendations

INVESTIGATE WAYS TO ELIMINATE REGULATORY COMPLIANCE VIOLATIONS

Substantial upgrades to the Maliview WWTP are required to eliminate all regulatory compliance violations for this facility. Repairs were made in the summer of 2019 to the upstream conveyance system to reduce I&I. Since these repairs, the frequency and volume of flow limit exceedances have been substantially reduced; wet weather peak flows have been reduced to almost half of previous years, but extreme wet weather will still lead to overflows. Staff and consultants have developed a detailed design for a new treatment plant that will resolve flow and effluent quality issues. Construction is expected to begin in 2025.

Table 4.7 Maliview 2024 Receiving Water Sampling Results, CFU/100 mL

Station	Site	Depth	Nov-06		Nov-15		Nov-26		Nov-28		Dec-09		Geomean		Minimum		Maximum	
			Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.
Mal-02	100m SW	top	<1	<1	1	1	<1	<1	<1	<1	<1	3	0.6	0.8	0.5	0.5	1	3
		middle	<1	<1	1	2	<1	1	<1	<1	3	3	0.8	1.1	0.5	0.5	3.0	3
Mal-03	100m NW	top	<1	1	1	5	1	2	<1	<1	<1	1	0.7	1.4	0.5	0.5	1.0	5.0
		middle	2	3	1	2	<1	1	<1	<1	1	<1	0.9	1.1	0.5	0.5	2.0	3.0
Mal-04	100m NE	top	<1	<1	1	2	1	1	1	<1	2	<1	1.0	0.8	0.5	0.5	2.0	2.0
		middle	1	<1	<1	1	1	<1	<1	<1	<1	1	0.7	0.7	0.5	0.5	1.0	1.0
Mal-05	100m SE	top	<1	1	<1	2	1	1	<1	<1	2	2	0.8	1.1	0.5	0.5	2.0	2
		middle	1	<1	<1	1	<1	3	2	<1	1	1	0.9	0.9	0.5	0.5	2.0	3.0
Mal-08	200m NW	Top	<1	1	2	<1	<1	<1	2	1	<1	<1	0.9	0.7	0.5	0.5	2.0	1.0
Mal-12	200m SE	top	1	<1	<1	1	1	3	1	1	<1	1	0.8	1.1	0.5	0.5	1.0	3

5.0 SCHOONER WWTP

5.1 Introduction

The Schooner WWTP is located on the southwest side of North Pender Island (Figure 1.1). It discharges ultraviolet disinfected secondary treated effluent into Swanson Channel through a 198 m outfall at a depth of 8 m below sea level. Because the average daily flow of this facility exceeds 100 m^3/day, both provincial and federal regulatory requirements must be met.

The facility is regulated under BC MWR Registration RE-01693 dated November 15, 2000. Provincial and federal regulatory requirements are described in Table 5.1.

Table 5.1 Schooner WWTP Regulatory Requirements

Parameter	Regulatory Requirement	
	Provincial	Federal
Maximum daily flow	640 m^3/d	---
CBOD	max 45 mg/L	average 25 mg/L
TSS	max 45 mg/L	average 25 mg/L
Fecal coliform	200 CFU/100 mL	---
Unionized ammonia	---	max 1.25 mg/L
Total residual chlorine	---	average 0.02 mg/L
Toxicity test	96-hr Rainbow trout	---

This registration also has a requirement for receiving water monitoring. Routine monitoring was required at this facility for this reporting year (2024) and is next required in 2028 unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter and one day duration in the summer which would trigger non-routine or emergency sampling. Receiving environment was enhanced in accordance with the new REMP developed as a result of the substantial upgrade to the treatment plant.

The following section reports the results from the Schooner Wastewater Treatment Plant WMEP (Table 5.2).

Table 5.2 Schooner Wastewater Treatment Plant WMEP

Component	Parameter	Frequency
Wastewater	Flow	Daily
	Compliance and treatment plant performance monitoring: • Influent: TSS, BOD, fecal coliform • Secondary Effluent: TSS, fecal coliform, unionized NH_3, total residual chlorine • Disinfected secondary effluent: TSS, BOD, CBOD, fecal coliform, NH_3, pH, unionized NH_3	Once per month
	Federal compliance monitoring: • Final Effluent: TSS, CBOD, unionized ammonia, total residual chlorine, pH	Once per month (reported quarterly)
	Effluent toxicity	Once per year
Surface Water	Indicator bacteria (fecal coliform and enterococci)	2024, 2028, 2032

5.2 Results

5.2.1 Wastewater Monitoring

COMPLIANCE AND TREATMENT PLANT PERFORMANCE MONITORING

Flow data are summarized in Table 5.3 and the complete data set is presented in Appendix C1. In 2024, three total daily flow values, representing 0.9% of the year, from the Schooner WWTP exceeded the allowable maximum, consistent with recent years.

Monthly compliance and treatment plant performance monitoring data are summarized in Table 5.4 and the complete data set is presented in Appendix C2. In 2024, all other monthly compliance parameters at the Schooner WWTP were within compliance limits, except for fecal coliforms, which exceeded 17% of the time. In addition, while samples were not collected during the power outages described below, it is assumed that the provincial fecal coliform limit was exceeded during these events, as the UV system cannot operate during power outages. The treatment plant removed approximately 95% of the TSS, >99% of the fecal coliform and 97% of the total BOD it received. Chlorine is not used at this facility, so is not monitored with respect to federal WSER requirements.

Compliance data was reported to ENV on a monthly basis, with EIRs issued if there was an incident at the plant. There were 16 EIRs issued at Schooner WWTP in 2024, as a result of:

- Power outages (January, February, July and August);
- Fecal coliform exceedances (January, October);
- Flow exceedances (January);
- TSS exceedance (August);
- High inflow resulting in excessive foaming that overflowed to land (November);
- Equipment offline and emergency storage overfilled and discharged to environment (November);
- Heavy rain event and emergency storage overfilled and discharged to environment (December); and
- Heavy rain events resulting in unplanned bypass (December).

TOXICITY TESTING

As in previous years (2012-2023), the disinfected effluent sample from July 2024 passed the 96-hour Rainbow trout acute toxicity test. An additional toxicity test was conducted in November 2024, as part of the enhanced monitoring with commissioning of the upgraded treatment plant. This test also passed the acute toxicity test.

Table 5.3 Schooner WWTP 2024 Effluent Flow Annual Summary

Month	Mean Flow (m^3/d)	Min Flow (m^3/d)	Max Flow (m^3/d)*	Total Flow (m^3)	Permit Violations (%)
January	391	212	938	12,131	9.7
February	342	285	462	9,906	0
March	316	266	462	9,791	0
April	255	222	324	7,658	0
May	203	178	237	6,308	0
June	190	145	257	5,701	0
July	191	153	237	5,912	0
August	186	141	225	5,752	0
September	194	113	595	5,242	0
October	238	91	402	4,524	0
November	245	72	536	7,350	0
December	331	188	484	9,254	0.0
Annual	**257**	**72**	**938**	**89,529**	**0.9**

Notes:
*Provincially regulated maximum daily flow = 640 m^3/d.

Table 5.4 Schooner WWTP 2024 Compliance Annual Summary

Source	Compliance Monitoring				Treatment Plant Performance Monitoring				
	Flow (m^3/d)	TSS (mg/L)	CBOD (mg/L)	FC (CFU/100 mL)	BOD (mg/L)	Ammonia (mg/L N)	Unionized Ammonia@15°C (mg/L N)	Total Residual Chlorine (mg/L)	pH
Influent									
Regulatory Limit	640	---	---	---	---	---	---	---	---
Mean	257	178	---	3,433,982	181	---	---	---	---
Minimum	72	83	---	120,000	48	---	---	---	---
Maximum	938	350	---	42,000,000	333	---	---	---	---
Regulatory violations (%)	0.9	---	---	---	---	---	---	---	---
Number of samples	348	12	---	12	12	----	---	---	---
Secondary Effluent									
Regulatory Limit	---	---	---	---	---	---	---	---	---
Mean	257	9	---	16,741	---	---	---	---	---
Minimum	72	2	---	6	---	---	---	---	---
Maximum	938	13	---	400,000	---	---	---	---	---
Percent Reduction	---	95	---	100	---	---	---	---	---
Regulatory violations	---	---	---	---	---	---	---	---	---
Number of samples	348	12	---	12	---	---	---	---	---
Disinfected Secondary Effluent									
Regulatory Limit	640	Max: 45 Avg: 25	Max: 45 Avg: 25	200	---	---	1.25	0.02	---
Mean	257	8	3	72	6	1	0.045	---	6.6
Minimum	72	<2	<3	<1	<3	<0.1	<0.0005	---	6.0
Maximum	938	17	5	400	26	6	<0.1	---	7.3
Percent Reduction	---	95	---	100	97	---	---	---	---
Regulatory violations (%)	0.9	0	0	16.7	---	---	0	---	---
Number of samples	348	12	12	12	12	12	11		12

Notes:
Data is comprised of routine, monthly sampling results.

5.2.2 Receiving Water Monitoring

Routine receiving water monitoring was required in 2024. Results are presented in Table 5.5. All individual results as well as geomeans were well below WQG, with the maximum value of 2 CFU/100 mL for *enterococci* and 4 CFU/100 mL for fecal coliforms. Samples from one day of the 5-in-30 were also analyzed for total metals (Table 5.6). All results were below applicable WQG, except for two cadmium values, and one copper value. The cadmium values minimally exceeded the long-term criteria. As these values were likely brief elevations, it is unlikely to exceed over the long-term. More data is required to evaluate whether these exceedances are a trend. The copper exceedance is most likely an error, as it differs so greatly from the other values, taken from other stations at most 300 m away.

An enhanced monitoring program (Appendix C3) will be in place for two years, as required by ENV after commissioning of the new plant. This program will consist of additional 5-in-30 sampling events, taking place in summer 2025, winter 2025 and summer 2026. Monitoring will also be required if there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter or one day duration in the summer.

Table 5.5 Schooner 2024 Receiving Water Sampling Results, CFU/100 mL

Station	Site	Depth	Nov-06		Nov-15		Nov-26		Nov-28		Dec-09		Geomean		Minimum		Maximum	
			Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.
Sch-03	100 m SE	top	1	1	<1	<1	<1	<1	2	<1	<1	<1	0.8	0.6	0.5	0.5	2.0	1.0
		middle	2	2	2	<1	<1	<1	<1	1	<1	<1	0.9	0.8	0.5	0.5	2.0	2.0
		bottom	<1	<1	<1	<1	<1	<1	<1	2	<1	<1	0.5	0.7	0.5	0.5	0.5	2.0
Sch-04	100 m WSW	top	2	4	<1	<1	<1	<1	<1	1	<1	<1	0.7	0.9	0.5	0.5	2.0	4.0
		middle	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0.5	0.5	0.5	0.5	0.5	0.5
		bottom	1	3	<1	<1	<1	<1	1	2	<1	<1	0.7	0.9	0.5	0.5	1.0	3.0
Sch-05	100 m NW	top	1	<1	<1	<1	<1	1	1	1	<1	<1	0.7	0.7	0.5	0.5	1.0	1.0
		middle	<1	1	<1	<1	<1	1	<1	<1	<1	<1	0.5	0.7	0.5	0.5	0.5	1.0
		bottom	<1	<1	<1	<1	<1	1	<1	<1	1	<1	0.6	0.6	0.5	0.5	1.0	1.0
Sch-06	100 m S	top	2	3	<1	<1	<1	<1	<1	1	1	<1	0.8	0.8	0.5	0.5	2.0	3.0
		middle	<1	1	1	1	<1	1	1	1	1	<1	0.8	0.9	0.5	0.5	1.0	1.0
		bottom	1	<1	<1	<1	<1	1	2	1	<1	1	0.8	0.8	0.5	0.5	2.0	1.0
Sch-10	200 m SSE	top	1	<1	<1	<1	<1	<1	<1	<1	1	<1	0.7	0.5	0.5	0.5	1.0	0.5
Sch-14	200 m W	top	1	2	1	1	<1	2	<1	<1	<1	<1	0.7	1.0	0.5	0.5	1.0	2.0

Table 5.6 Schooner Fall 2024 Receiving Water Sampling Results, Total Metals (µg/L)

Station	Site	Depth	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper
Sch-03	100 m SE	top	25.3	<0.5	1.77	9.4	<0.5	<0.5	3960	0.084	367	<0.5	<0.05	0.76
		middle	35.1	<0.5	1.71	8.9	<0.5	<0.5	4100	0.139*	367	<0.5	<0.05	0.5
		bottom	29.5	<0.5	1.69	8.7	<0.5	<0.5	4060	0.097	358	<0.5	<0.05	1.75
Sch-04	100 m WSW	top	19.7	<0.5	1.72	8.8	<0.5	<0.5	3820	0.066	338	<0.5	<0.05	<0.5
		middle	37.4	<0.5	3.19	18.2	<0.5	<0.5	7800	0.145*	721	<0.5	0.124	0.99
		bottom	32.2	<0.5	2.51	12.1	<0.5	<0.5	5240	0.068	446	0.61	<0.05	<0.5
Sch-05	100 m NW	top	32.5	<0.5	2.18	8.3	<0.5	<0.5	4280	0.066	391	<0.5	<0.05	9.43^
		middle	53.5	<0.5	1.68	8.2	<0.5	<0.5	4120	0.071	363	<0.5	<0.05	<0.5
		bottom	46.4	<0.5	1.82	8.7	<0.5	<0.5	4090	0.078	346	<0.5	<0.05	<0.5
Sch-06	100 m S	top	68.3	<0.5	1.86	8.9	<0.5	<0.5	4320	0.073	376	<0.5	<0.05	<0.5
		middle	21.2	<0.5	2.03	8.7	<0.5	<0.5	4230	0.091	357	0.52	<0.05	<0.5
		bottom	41.7	<0.5	1.67	8.4	<0.5	<0.5	4110	0.06	365	<0.5	<0.05	0.54
Sch-10	200 m SSE	top	31.6	<0.5	1.83	8.6	<0.5	<0.5	4160	0.069	369	<0.5	<0.05	<0.5
Sch-14	200 m W	top	34.1	<0.5	1.72	8.6	<0.5	<0.5	4180	0.076	365	<0.5	<0.05	0.71
Water Quality Guideline (if applicable)				12.5						0.12		56		<2 (lt), 3 (st)

Notes: *Value minimally exceeds the criteria. In addition, the criteria is a long-term exposure limit, and as this exceedance was likely a brief elevation, is unlikely to exceed over the long-term. ^Value is most likely an error, as it differs so greatly from the others. lt=long-term, st=short term

Table 5.6 continued

Station	Site	Depth	Hardness (as CaCO3)	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Phosphorus	Potassium	Selenium
Sch-03	100 m SE	top	5610	22	0.059	147	1140	2.21	<0.0019	9.75	0.32	102	344	<0.5
		middle	5600	<10	<0.05	151	1140	2.04	<0.0019	9.15	<0.2	86	344	<0.5
		bottom	5450	10	0.054	149	1110	2.3	<0.0019	9.51	0.99	100	337	<0.5
Sch-04	100 m WSW	top	5110	<10	0.063	141	1030	2.09	<0.0019	8.58	<0.2	68	315	<0.5
		middle	10700	47	0.058	284	2150	4.33	<0.0019	18	0.33	160	668	<0.5
		bottom	6560	43	<0.05	190	1320	2.46	<0.0019	10.6	<0.2	130	396	<0.5
Sch-05	100 m NW	top	5780	25	<0.05	155	1170	2.69	<0.0019	9.12	3.86	132	346	<0.5
		middle	5500	13	<0.05	150	1120	2.65	<0.0019	9.56	<0.2	85	338	<0.5
		bottom	5360	15	<0.05	150	1090	2.23	<0.0019	8.72	0.4	84	324	<0.5
Sch-06	100 m S	top	5690	12	<0.05	160	1150	2.37	<0.0019	10.2	<0.2	95	347	<0.5
		middle	5750	14	<0.05	155	1180	2.16	<0.0019	9.29	<0.2	77	343	<0.5
		bottom	5520	10	0.062	150	1120	2.35	<0.0019	9.16	<0.2	61	334	<0.5
Sch-10	200 m SSE	top	5600	14	<0.05	151	1140	2.45	<0.0019	9.15	<0.2	78	339	<0.5
Sch-14	200 m W	top	5550	16	<0.05	153	1130	2.24	<0.0019	9.05	<0.2	82	339	<0.5
Water Quality Guideline (if applicable)					<2 (lt), 140 (st)			100			8.3			2

Notes: lt=long-term, st=short term

Table 5.6 continued

Station	Site	Depth	Silicon	Silver	Strontium	Sulfur	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc
Sch-03	100 m SE	top	1540	<0.05	6740	874	<0.05	<1	<5	2.55	1.97	<3
		middle	1570	<0.05	6920	816	<0.05	<1	<5	2.57	2.03	<3
		bottom	1500	<0.05	6730	803	<0.05	<1	<5	2.49	1.74	5.4
Sch-04	100 m WSW	top	1460	<0.05	6310	748	<0.05	<1	<5	2.3	2.08	<3
		middle	3040	<0.05	13200	1620	<0.05	<1	<5	4.84	3.55	<3
		bottom	2150	<0.05	8120	967	<0.05	<1	<5	3.13	1.7	<3
Sch-05	100 m NW	top	1630	<0.05	6930	831	<0.05	<1	<5	2.65	1.88	<3
		middle	1540	<0.05	6670	847	<0.05	<1	<5	2.58	2	<3
		bottom	1480	<0.05	6560	792	<0.05	<1	<5	2.45	2.17	<3
Sch-06	100 m S	top	1590	<0.05	7020	834	<0.05	<1	<5	2.59	2.1	<3
		middle	1500	<0.05	6920	839	<0.05	<1	<5	2.71	2.2	<3
		bottom	1510	<0.05	6630	812	<0.05	<1	<5	2.62	1.99	3.5
Sch-10	200 m SSE	top	1540	<0.05	6770	834	<0.05	<1	<5	2.6	2.33	<3
Sch-14	200 m W	top	1550	<0.05	6710	786	<0.05	<1	<5	2.59	2.25	<3
Water Quality Guideline (if applicable)				1.5 (lt), 3 (st)		1.5 (lt), 3 (st)						10 (lt), 55 (st)

Notes: lt=long-term, st=short term

5.3 Recommendations

COMMISSIONING OF NEW WWTP

The new Schooner WWTP was completed in October 2024, with commissioning beginning in November 2024. The new plant is expected to have excellent effluent quality, with enhanced monitoring for a minimum of two years.

6.0 CANNON WWTP

6.1 Introduction

The Cannon WWTP is located on the southwest side of North Pender Island (Figure 1.1). It discharges undisinfected secondary effluent into Swanson Channel through a 60 m outfall at a depth of 31 m below sea level.

The facility is regulated under BC MWR Permit PE-00220 dated April 28, 1981. Regulatory requirements are described in Table 6.1.

Table 6.1 Cannon WWTP Regulatory Requirements

Parameter	Regulatory Requirement
Maximum daily flow	68 m^3/d
Maximum CBOD	45 mg/L
Maximum TSS	60 mg/L

This registration also has a requirement for receiving water monitoring. Routine monitoring was required at this facility for this reporting year (2024). This facility has now been decommissioned and serves only as a holding tank/pump station for the Schooner WWTP. Therefore, receiving environment monitoring is no longer required, unless there are planned bypasses or plant failures/overflows.

The following section reports the results from the Cannon Wastewater Treatment Plant WMEP (Table 6.2).

Table 6.2 Cannon Wastewater Treatment Plant WMEP

Component	Parameter	Frequency
Wastewater	Flow	Daily
	Compliance and treatment plant performance monitoring • Influent: TSS, CBOD, fecal coliform • Secondary Effluent: TSS, BOD, CBOD, fecal coliform, NH_3, pH	Once per month
	Effluent toxicity (voluntary): • Rainbow trout 96-hour	Once per year
Receiving Water	Indicator bacteria (fecal coliform and enterococci)	2024, 2028, 2032

6.2 Results

6.2.1 Wastewater Monitoring

COMPLIANCE AND TREATMENT PLANT PERFORMANCE MONITORING

In 2024, nine total daily flows, representing 3.0% of the year, from the Cannon WWTP exceeded the allowable maximum (Table 6.3, Appendix D1). Flow exceedances occurred in January and October. Effluent quality was similar to previous years. Monthly compliance and treatment plant performance monitoring data are summarized in Table 6.4 and the complete data set is presented in Appendix D2. In 2024, TSS exceeded the regulatory limit one time, representing 10% of sampled dates. All other regulatory parameters met compliance limits.

Overall, the treatment plant removed approximately 90% of the TSS, 98% of the fecal coliform and 94% of the BOD from the influent.

Compliance data was reported to ENV on a monthly basis, with EIRs issued if there was an incident at the plant. There were 10 EIRs issued at Cannon WWTP in 2024, as a result of heavy rainfall events resulting in flow exceedance (January and October).

TOXICITY TESTING

Beginning in 2021, toxicity testing was conducted at each of the Gulf Islands/Port Renfrew facilities in order to maintain consistency across the region. The undisinfected secondary effluent sample from July 2024 failed the 96-hour Rainbow trout acute toxicity test. The toxicity test was not ammonia stabilized, which is the likely cause of the effluent toxicity.

Table 6.3 Cannon WWTP 2024 Annual Flow Summary

Month	Mean Flow (m^3/d)	Min Flow (m^3/d)	Max Flow (m^3/d)	Total Flow (m^3)	Permit Violations (%)
January	61	31	115	1,876	26
February	43	24	57	1,259	0
March	40	25	54	1,266	0
April	30	15	38	909	0
May	34	16	51	1,040	0
June	32	13	44	948	0
July	34	16	41	1,048	0
August	37	24	45	1,097	0
September	29	18	63	824	0
October	25	16	81	781	3
November	21	5	31	166	0
December	---	---	---	---	---
Annual	**36**	**5**	**115**	**11,214**	**3%**

Notes:
Provincially regulated maximum daily flow = 68 m^3/d.

Table 6.4 Cannon WWTP 2024 Compliance and Treatment Plant Performance Monitoring Annual Summary

Source	Compliance Monitoring				Treatment Plant Performance Monitoring		
	Flow (m^3/d)	TSS (mg/L)	CBOD (mg/L)	FC (CFU/100 mL)	BOD (mg/L)	NH_3 (mg/L N)	pH
Influent							
Regulatory Limit	---	---	---	---	---	---	---
Mean	36	175	---	15,284,444	228	---	---
Minimum	5	26	---	960,000	53	---	---
Maximum	115	580	---	79,000,000	593	---	---
Permit Violations (%)	3%	---	---	---	---	---	---
Number of Samples	311	10	---	9	10	---	---
Secondary Effluent							
Regulatory Limit	68	60	45	---	---	---	---
Mean	36	18	8	271,510	14	20	7.3
Minimum	5	2	<3	1,200	6	<0.10	6.7
Maximum	115	72	24	890,000	30	55	7.6
Percent Reduction	---	90	---	98	94	---	---
Permit Violations (%)	3	10	0	---	---	---	---
Number of Samples	311	10	12	10	10	10	10

6.2.2 Receiving Water Monitoring

Routine receiving water monitoring was required in 2024. Results are presented in Table 6.5. All individual results as well as geomeans were well below WQG, with the maximum value of 3 CFU/100 mL for *enterococci* and 7 CFU/100 mL for fecal coliforms.

As effluent is no longer discharged out the Cannon WWTP, there will be no future routine receiving water sampling.

Table 6.5 Cannon WWTP 2024 Receiving Water Sampling Results, CFU/100 mL

Station	Site	Depth	Nov-06		Nov-15		Nov-26		Geomean		Minimum		Maximum	
			Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.
Can-01	100m NW	top	<1	4	<1	<1	1	<1	0.6	1.0	0.5	0.5	1.0	4.0
		middle	3	<1	<1	<1	<1	<1	0.9	0.5	0.5	0.5	3.0	0.5
Can-02	100m NE	top	1	<1	<1	<1	<1	1	0.6	0.6	0.5	0.5	1.0	1.0
		middle	2	<1	<1	<1	<1	<1	0.8	0.5	0.5	0.5	2.0	0.5
Can-03	100m SE	top	<1	3	1	<1	<1	<1	0.6	0.9	0.5	0.5	1.0	3.0
		middle	<1	<1	<1	<1	<1	<1	0.5	0.5	0.5	0.5	0.5	0.5
Can-04	100m SW	top	<1	2	<1	1	<1	1	0.5	1.3	0.5	1.0	0.5	2.0
		middle	<1	1	<1	1	<1	1	0.5	1.0	0.5	1.0	0.5	1.0
Can-05	200m NW	top	1	3	1	7	<1	<1	0.8	2.2	0.5	0.5	1.0	7.0
Can-06	200m NE	top	<1	1	<1	<1	<1	<1	0.5	0.6	0.5	0.5	0.5	1.0

Notes:
Receiving environment sampling was ceased once effluent was no longer discharged out the Cannon WWTP outfall, therefore there are only three days of receiving environment sampling for this facility

6.3 Recommendations

FACILITY DECOMMISSIONED

The new Schooner WWTP has been commissioned and the Cannon WWTP decommissioned, with all flows pumped to the Schooner WWTP. Therefore, regular monitoring of the Cannon WWTP effluent will no longer be required.

7.0 PORT RENFREW WWTP

7.1 Introduction

The Port Renfrew WWTP is located on the southeast corner of Port San Juan on Vancouver Island (Figure 1.1). It discharges undisinfected secondary treated effluent into Port San Juan through an 81 m outfall at a depth of 3 m.

The facility is regulated under BC MWR Permit PE-00312 dated April 15, 1992. Regulatory requirements are described in Table 7.1.

Table 7.1 Port Renfrew WWTP Regulatory Requirements

Parameter	Regulatory Requirement
Maximum daily flow	220 m^3/d
Maximum CBOD	45 mg/L
Maximum TSS	60 mg/L

This registration also has a requirement for receiving water monitoring. Routine monitoring was required at this facility for this reporting year (2024) and is next required in 2028 unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter and one day duration in the summer which would trigger non-routine or emergency sampling.

The following section reports the results from the Port Renfrew Wastewater Treatment Plant WMEP (Table 7.2).

Table 7.2 Port Renfrew Wastewater Treatment Plant WMEP

Component	Parameter	Frequency
Wastewater	Flow	Daily
	Compliance and treatment plant performance monitoring: • Influent: TSS, BOD, fecal coliform • Secondary Effluent: TSS, BOD, CBOD, fecal coliform, NH_3, pH	Once per month
	Effluent toxicity (voluntary): • Rainbow trout 96-hour	Once per year
Receiving Water	Indicator bacteria (fecal coliform and enterococci)	2024, 2028, 2032

7.2 Results

7.2.1 Wastewater Monitoring

COMPLIANCE AND TREATMENT PLANT PERFORMANCE MONITORING

Flow data are summarized in Table 7.3 and the complete data set is presented in Appendix E1. In 2024, there were two exceedances for daily flows at the Port Renfrew WWTP, representing 0.5% of the year's flow. Average monthly flow was similar to recent years.

Monthly compliance and treatment plant performance monitoring data are summarized in Table 7.4 and the complete data set is presented in Appendix E2. All compliance parameters were below regulatory limits. The treatment plant removed approximately 95% of the TSS, 95% of the BOD and >99% of the fecal coliforms.

Compliance data was reported to ENV on a monthly basis, with EIRs issued if there was an incident at the plant. There were two EIRs issued at Port Renfrew WWTP in 2024, as a result of:

- Degradation and subsequent disconnection of wastewater pipe (July); and
- Overflow due to heavy rain (October).

TOXICITY TESTING

Beginning in 2021, toxicity testing was conducted at each of the Gulf Islands/Port Renfrew facilities in order to maintain consistency across the region. The undisinfected secondary effluent sample from July 2024 passed the 96-hour Rainbow trout acute toxicity test.

Table 7.3 Port Renfrew WWTP 2024 Flow Summary

Month	Mean Flow (m^3/d)	Min Flow (m^3/d)	Max Flow (m^3/d)*	Total Flow (m^3)	Permit Violations (%)
January	66	27	164	2,047	0.0
February	44	25	103	1,270	0
March	45	26	87	1,399	0
April	41	25	82	1,235	0
May	39	29	52	1,207	0
June	38	25	74	1,146	0
July	36	28	57	1,105	0
August	49	36	78	1,509	0
September	40	25	71	1,214	0
October	74	32	379	2,279	6
November	63	32	129	1,897	0
December	72	31	124	2,217	0
Annual	**51**	**25**	**379**	**18,525**	**0.5**

Notes:
Provincially regulated maximum daily flow = 220 m^3/d

Table 7.4 Port Renfrew WWTP 2024 Compliance and Treatment Plant Performance Monitoring Annual Summary

Source	Compliance Monitoring				Treatment Plant Performance Monitoring		
	Flow (m^3/d)	TSS (mg/L)	CBOD (mg/L)	FC (CFU/100 mL)	BOD (mg/L)	NH^3 (mg/L N)	pH
Influent							
Regulatory Limit	---	---	---	---	---	---	---
Mean	51	395	---	4,598,075	272	---	---
Minimum	25	43	---	180,000	<89	---	---
Maximum	379	1150	---	25,000,000	827	---	---
Permit Violations (%)	0.5	---	---	---	---	---	---
Number of Samples	366	12	---	12	12	---	---
Secondary Effluent							
Regulatory Limit	220	60	45	---	---	---	---
Mean	51	18	3	9,882	12	0.3	6.9
Minimum	25	4	<3	2,500	3	<0.1	6.0
Maximum	379	54	8	65,000	32	1.2	7.8
Percent Reduction	---	95	---	100	95	---	---
Permit Violations (%)	0.5	0	0	---	---	---	---
Number of Samples	366	12	12	12	12	12	12

7.2.2 Receiving Water Monitoring

RECEIVING WATER BACTERIA INDICATORS

Routine receiving water monitoring was required in 2024. Results are presented in Table 7.5. All geomeans were well below WQG. The maximum value for *enterococci* was 13 CFU/100 mL and 160 CFU/100 mL for fecal coliforms.

The next routine receiving water 5-in-30 sampling will be conducted in the summer of 2028.

Table 7.5 Port Renfrew WWTP 2024 Receiving Water Sampling Results, CFU/100 mL

Station	Site	Depth	Jul-18		Jul-25		Aug-01		Aug-08		Aug-15		Geomean		Minimum		Maximum	
			Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.	Ent	F.C.
PRS-01	200	top	<1	12	<1	35	<1	6	<1	14	<1	26	0.5	15.6	0.5	6	0.5	35
PRS-02	100	top	<1	16	1	26	1	1	2	23	13	160	1.7	17.3	0.5	1	13	160
PRS-03	200	top	<1	9	2	41	4	17	<1	16	<1	15	1.0	17.2	0.5	9	4	41
PRS-04	100	top	<1	2	<1	28	1	<1	<1	11	<1	6	0.6	4.5	0.5	0.5	1	28
PRS-05	100	top	<1	5	<1	37	<1	4	<1	16	<1	1	0.5	6.5	0.5	1	0.5	37
PRS-06	200	top	4	42	<1	26	<1	<1	<1	19	<1	4	0.8	8.4	0.5	0.5	4	42

7.3 Recommendations

MAINTAIN EFFECTIVENESS AND RELIABILITY OF THE TREATMENT PROCESS

Staff and consultants completed a feasibility study in 2015 to improve/increase the treatment plant capacity and ensure ongoing effective operation of the treatment plant and conveyance system into the future. Grant funding will be required in order to complete any upgrades to this system. Updates to the facility asset management plans are underway, and a phased implementation plan is anticipated pending funding.

8.0 BURGOYNE BAY WASTE TRANSFER FACILITY

8.1 Introduction

The Burgoyne Bay waste transfer facility is located on Salt Spring Island and collects septage from Salt Spring Island (Ganges WWTP and Maliview WWTP), Pender Island (Schooner WWTP and Cannon WWTP) and from Saturna Island. Material is then disposed of at GFL Environmental SPL Wastewater Recovery Centre (Langford, BC). Monitoring is undertaken to characterize the septage prior to disposal and to inform the CRD's RSCP initiatives. The Burgoyne Bay facility is not designed to produce a biosolids product as defined in the OMRR. However, as a reference point, the results of the analyses performed on the septage are compared to the quality criteria established in Schedule 4 of the OMRR for Class A biosolids.

8.2 Results

The Burgoyne Bay waste transfer facility met all quality criteria for Class A biosolids (Appendix F1). This exceedance currently has no implications for disposal as this comparison is for information purposes only (to assess the end-product quality) and is not intended to characterize the material as a biosolids product. All other results were below the quality criteria for Class A biosolids.

8.3 Recommendations

WMEP staff will continue to characterize the septage collected at the facility in order to inform the RSCP program.

9.0 REFERENCES

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APPENDIX A

GANGES WWTP

Appendix A1 Ganges WWTP Effluent Flow 2024 (m^3/day)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	473	519	657	444	467	425	418	423	441	380	627	399
2	493	427	617	492	493	449	431	417	454	406	563	428
3	458	431	572	578	448	512	459	439	422	421	464	419
4	474	417	539	563	447	418	465	432	413	442	639	436
5	539	441	548	502	450	447	461	407	419	367	472	436
6	521	453	530	503	462	419	445	425	400	382	442	422
7	467	403	509	478	443	404	422	390	398	395	465	440
8	532	420	517	506	466	437	423	366	388	402	449	462
9	781	419	524	506	431	404	399	366	416	407	665	443
10	616	388	501	501	447	413	452	396	396	395	532	430
11	578	443	566	456	448	420	466	377	433	377	764	439
12	563	437	514	465	444	453	460	388	400	384	588	478
13	438	426	524	495	478	456	479	383	441	374	808	502
14	505	434	535	453	447	447	445	435	440	374	708	588
15	531	424	527	479	461	445	414	454	375	384	507	424
16	501	436	522	466	467	422	418	445	396	406	556	526
17	529	430	517	512	461	432	430	467	386	402	590	576
18	529	414	505	509	486	424	452	493	406	501	587	924
19	529	411	467	485	472	459	461	440	409	741	583	779
20	529	470	475	469	428	461	465	416	393	638	665	559
21	529	529	495	432	452	415	459	451	377	582	542	537
22	529	478	434	480	449	441	444	459	384	466	552	510
23	529	471	522	471	435	387	433	444	376	445	572	485
24	529	437	470	465	427	439	467	506	378	440	614	468
25	529	429	502	514	433	421	508	431	495	424	534	456
26	529	461	492	486	464	423	466	496	435	509	499	898
27	529	487	597	481	457	430	461	432	389	533	489	603
28	529	678	544	475	442	437	435	423	389	559	457	653
29	529	604	529	474	441	447	465	423	421	473	416	534
30	529	---	523	466	435	439	455	455	376	458	424	491
31	529	---	469	---	432	---	441	468	---	419	---	440
Min	438	388	434	432	427	387	399	366	375	367	416	399
Max	781	678	657	578	493	512	508	506	495	741	808	924
Mean	529	456	524	487	452	434	448	431	408	448	559	522
Total Flow	16,405	13,215	16,243	14,606	14,013	13,026	13,899	13,347	12,246	13,886	16,773	16,185

Annual Min	**366**
Annual Max	**924**
Annual Mean	**475**

Note: shading indicates exceedance of regulatory limit (1,198 m^3).

Appendix A2 Ganges WWTP Compliance and Treatment Plant Performance 2024

Date	Influent			Secondary Effluent (Undisinfected)		Secondary Effluent (Disinfected)							
	TSS (mg/L)	BOD (mg/L)	FC (CFU/100 mL)	TSS (mg/L)	FC (CFU/100 mL)	TSS (mg/L)	BOD (mg/L)	CBOD (mg/L)	FC (CFU/100 mL)	NH_3 (mg/L N)	Unionized NH_3 (mg/L N)	TRC (mg/L)	pH
Regulatory Limit						25		25	1000		1.25	0.02	
January	423	356	120,000	0.5	38,730	<2.5	03.1	<3	0250	<0.1	---	0.05	7.3
February	240	209	10,000,000	1	4,806	03	<3	<3	02	<0.1	<0.1	0.07	7.2
March	268	439	4,100,000	01.5	32,939	03	<3	<3	<1	<0.1	<0.1	0.03	7.3
April	316	313	35,000,000	3.5	18,166	02	<3	<3	0270	<0.1	<0.1	---	7.4
May	43	80	3,500,000	07.55	19,621	02	<3	<3	01200	<0.1	<0.1	0.07	7.3
June	140	205	7,200,000	12	35,777	02	03.04	02.59	<1	04.7	00.018	0.04	7.3
July	49	64	3,400,000	024.5	99,197	011	03.27	<2.43	05	026.7	00.36	0.08	7.7
August	287	328	16,000,000	01	249,800	07	<3	<3	063	031.8	00.47	0.03	7.7
September	444	428	21,000,000	04.5	7,700	015	<3	<3	<1	08.5	<0.1	---	7.3
October	164	238	20,000,000	04	3,030	02	<3	<3	<1	<0.1	<0.1	0.02	7.3
November	292	327	1,100,000	4.5	3,633	<2	<3	<3	<2	<0.1	<0.1	0.04	7.4
December	373	392	45,000,000	2	2,650	02	<3	<3	<1	<0.1	<0.1	0.04	7.4
Mean	253	282	6,420,575	5.5	43,004	4.3	1.91	1.5	149	6	0.11	0.05	7.4
Min	43	64	120,000	1	2,650	<2	<3	<2.43	<1	<0.1	<0.1	0.02	7.2
Max	444	439	45,000,000	24.5	249,800	15	3.27	3	1200	31.8	0.47	0.08	7.7
n	12	12	12	12	12	12	12	12	12	12	11	10	12
Mean Daily Loading	kg/day	kg/day		kg/day		kg/day				kg/day	kg/day	kg/day	
	120	134	---	2.6	---	2.0	---	---	---	2.85	0.05	0.02	---

Notes:
TSS = total suspended solids, BOD = biochemical oxygen demand, CBOD = carbonaceous biochemical oxygen demand, FC = fecal coliforms, TRC = total residual chlorine, NH_3 = ammonia
Shading indicates exceedance of regulatory limit, --- no sample.

Appendix A3 Ganges WWTP Priority Substances Analyzed in Influent and Effluent 2024

Parameter	Units	MDL	Ganges Influent	Ganges Effluent	Effluent Diluted	Loading (kg/year)	BC WQG	CCME / HC WQG
CONVENTIONALS								
Alkalinity - Carbonate	mg/L	1	<1	<1	ND	ND		
alkalinity - Bicarbonate	mg/L	1	250	210	0.5	33,189,450		
Alkalinity - Hydroxide	mg/L	1	<1	<1	ND	ND		
Alkalinity - Phenolphthalein - Ph 8.3	mg/L	1	<1	<1	ND	ND		
Alkalinity - Total - Ph 4.5	mg/L	1	200	180	0.43	28,448,100		
BOD	mg/L	2	620	4.8	0.01	758,616		
CBOD	mg/L	2	540	3.8	0.01	600,571		
COD	mg/L	10	1,450	50	0.12	7,902,250		
chloride	mg/L	1	77	88	0.21	13,907,960		
total/SAD cyanide	mg/L	0.0005	0.0019	0.002	0.00001	370		
WAD cyanide	mg/L	0.0005	0.002	0.002	0.00001	332	0.001	
hardness (as CaCO3)	mg/L	0.5	62	78.2	0.19	12,359,119		
hardness (as CaCO3) D								
oil & grease, mineral	mg/L	2	2.8	<2	ND	ND		
oil & grease, total	mg/L	1	31	<1	ND	ND		
organic carbon	mg/L	5	130	25	0.06	3,951,125		
pH	pH	0	7	8.05	0.02	N/A		
pH @ 15° C	pH	0	7	7.54	N/A	N/A		
conductivity	µS/cm	2	790	730	1.7	N/A		
sulfide	mg/L	0.002	0.18	0.01	0.00002	1,565		
sulphate	mg/L	1	24	21	0.05	3,318,945		
TSS	mg/L	1	630	10	0.02	1,580,450		
BACTERIOLOGY								
Enterococci	CFU/100 mL	10	1,800,000	<10	ND	ND	35 geomean / 70 single sample	35 geomean / 70 single sample
NUTRIENTS								
N - NH3 (as N)	mg/L	0.015	1.4	1.3	0.003	205,459	19.7	
N - NH3 (As N) - Unionized	mg/L	0.0005	0	0.012	0.00003	1,897		
N - NO2 (as N)	mg/L	0.005	<0.005	0.09	0.0002	13,481		
N - NO3 (as N)	mg/L	0.02	<0.02	0.15	0.0003	23,075		
N - NO3 + NO2 (as N)	mg/L	0.02	<0.02	0.23	0.001	36,666		
N - TKN (as N)	mg/L	1	57	26	0.06	4,093,366		
N - Total (As N)	mg/L	1	57	26	0.06	4,124,975		

Parameter	Units	MDL	Ganges Influent	Ganges Effluent	Effluent Diluted	Loading (kg/year)	BC WQG	CCME / HC WQG
P - Po4 - Ortho (As P)	mg/L	0.015	3.4	1.20	0.003	189,654		
METALS DISSOLVED								
aluminum	µg/L	0.5	22	21	0.05	3,351		
antimony	µg/L	0.02	0.07	0.21	0.001	34		
arsenic	µg/L	0.02	0.46	0.31	0.001	49		
barium	µg/L	0.02	8	8.71	0.02	1,377		
beryllium	µg/L	0.01	<0.01	<0.01	ND	ND		
bismuth	µg/L	0.005	0.0895	0.15	0.0004	24		
boron	µg/L	10	98	123	0.29	19,440		
cadmium	µg/L	0.005	0.01	0.02	0.00004	2.53		
calcium	mg/L	0.05	15	16	0.04	2,512,916		
chromium	µg/L	0.1	0.37	0.40	0.001	63		
cobalt	µg/L	0.005	0.22	0.20	0.0005	32		
copper	µg/L	0.05	10	4.69	0.01	741		
iron	µg/L	1	232	70.8	0.17	11,190		
lead	µg/L	0.005	0.46	0.32	0.001	50		
lithium	µg/L	0.5	6.69	6.25	0.01	988		
magnesium	mg/L	0.05	5.0	4.13	0.01	652,726		
manganese	µg/L	0.05	75	47	0.11	7,444		
mercury	µg/L	0.0019	0.0119	<0.0019	ND	ND		
molybdenum	µg/L	0.05	<0.05	0.09	0.0002	15		
nickel	µg/L	0.02	2.89	1.06	0.003	168		
phosphorus	µg/L	2	6,050	1310	3.1	207,039		
potassium	mg/L	0.05	19	18	0.04	2,844,810		
selenium	µg/L	0.04	0.44	0.09	0.0002	14		
silicon	µg/L	50	2,050	1,900	4.5	300,286		
silver	µg/L	0.005	0.02	0.013	0.00003	2.05		
sodium	mg/L	0.05	58.7	70.9	0.17	11,205,391		
Strontium	µg/L	0.05	70.1	68.4	0.16	10,810		
sulfur	mg/L	3	7.1	8.4	0.02	1,327,578		
thallium	µg/L	0.002	0	<0.002	ND	ND		
tin	µg/L	0.2	0.68	0.71	0.002	112		
titanium	µg/L	0.5	0.69	<0.5	ND	79		
uranium	µg/L	0.002	0.01	<0.002	ND	0.3		
vanadium	µg/L	0.2	<0.2	<0.2	ND	ND		
zinc	µg/L	0.1	9	71.7	0.17	11,332		

Parameter	Units	MDL	Ganges Influent	Ganges Effluent	Effluent Diluted	Loading (kg/year)	BC WQG	CCME / HC WQG
METALS - TOTAL								
aluminum	µg/L	3	853	527	1.3	83,290		
antimony	µg/L	0.02	0.70	0.32	0.001	50		
arsenic	µg/L	0.02	0.9	0.83	0.002	132	12.5	12.5
barium	µg/L	0.05	33	34	0.08	5,295		
beryllium	µg/L	0.01	0.012	<0.01	ND	ND	100	
cadmium	µg/L	0.005	0.3	0.24	0.001	37	0.12	0.12
calcium	mg/L	0.25	17	21	0.05	3,382,163		
chromium	µg/L	0.1	3.1	2.2	0.01	351		
cobalt	µg/L	0.01	0.645	0.6	0.001	94		
copper	µg/L	0.1	631	347	0.83	54,842	<2 (lt), 3 (st)	
iron	µg/L	5	2,810	2,990	7.1	472,555		
lead	µg/L	0.02	71	75	0.18	11,838	≤2 (lt), 140 (st)	
magnesium	mg/L	0.25	4.8	6.0	0.014	953,011		
manganese	µg/L	0.1	87	104	0.25	16,437		
mercury	µg/L	0.0019	0.114	0.005	0.00001	0.838		0.16
molybdenum	µg/L	0.05	1.2	0.68	0.002	107		
nickel	µg/L	0.1	6	6.6	0.016	1,035	8.3	
phosphorus	µg/L	5	7,490	8,210	20	1,297,549		
potassium	mg/L	0.25	16	21	0.05	3,271,532		
selenium	µg/L	0.04	0.6	0.31	0.001	50	2	
silver	µg/L	0.01	3.0	0.356	0.001	56	1.5 (lt), 3 (st)	7.5
thallium	µg/L	0.002	0.02	0.015	0.00004	2.39		
tin	µg/L	0.2	1.7	2.62	0.01	414		
zinc	µg/L	1	744	809	2	127,858	10 (lt), 55 (st)	
METALS - OTHER								
chromium III	mg/L	0.005	<0.005	<0.005	ND	ND	56	
chromium VI	mg/L	0.005	<0.005	<0.005	ND	ND		
methyl mercury	ng/L	0.05	0.59	<0.05	ND	ND		
ALDEHYDES								
acrolein	µg/L	2.8	6.8	<2.8	ND	ND		
CHLORINATED PHENOLICS								
2,4 + 2,5 dichlorophenol	µg/L	0.5	<0.5	<0.5	ND	ND		
2-chlorophenol	µg/L	0.5	<0.5	<0.5	ND	ND		
2,4,6-trichlorophenol	µg/L	0.5	<0.5	<0.5	ND	ND		
4-chloro-3-methylphenol	µg/L	1	<1	<1	ND	ND		

Parameter	Units	MDL	Ganges Influent	Ganges Effluent	Effluent Diluted	Loading (kg/year)	BC WQG	CCME / HC WQG
pentachlorophenol	µg/L	0.5	<0.5	<0.5	ND	ND		
PHENOLIC COMPOUNDS								
total phenols	mg/L	0.0015	0.05	0.003	0.00001	443		
NON-CHLORINATED PHENOLICS								
2,4-dimethylphenol	µg/L	2.5	<2.5	<2.5	ND	ND		
2,4-dinitrophenol	µg/L	6.5	<6.5	<6.5	ND	ND		
2-methyl-4,6-dinitrophenol	µg/L	2.5	<2.5	<2.5	ND	ND		
2-nitrophenol	µg/L	2.5	<2.5	<2.5	ND	ND		
4-nitrophenol	µg/L	2.5	<2.5	<2.5	ND	ND		
phenol	µg/L	2.5	14.5	<2.5	ND	ND		
POLYCYCLIC AROMATIC HYDROCARBONS (PAH)								
2-chloronaphthalene	µg/L	0.25	<0.25	<0.25	ND	ND		
2-methylnaphthalene	µg/L	0.01	0.052	<0.01	ND	ND	0.0202	
acenaphthene	µg/L	0.01	<0.01	<0.01	ND	ND	6	
acenaphthylene	µg/L	0.01	<0.01	<0.01	ND	ND		
anthracene	µg/L	0.01	0.012	<0.01	ND	ND		
benzo[a]anthracene	µg/L	0.01	<0.01	<0.01	ND	ND		
benzo[a]pyrene	µg/L	0.005	<0.005	<0.005	ND	ND	0.01	
benzo[b]fluoranthene	µg/L	0.01	<0.01	<0.01	ND	ND		
benzo(b)fluoranthene + benzo(j)fluoranthene	µg/L	0.01	<0.01	<0.01	ND	ND		
benzo[ghi]perylene	µg/L	0.02	<0.02	<0.02	ND	ND		
benzo(k)fluoranthene	µg/L	0.01	<0.01	<0.01	ND	ND		
chrysene	µg/L	0.01	<0.01	<0.01	ND	ND	0.1	
dibenzo(a,h)anthracene	µg/L	0.02	<0.02	<0.02	ND	ND		
fluoranthene	µg/L	0.01	0	<0.01	ND	ND		
fluorene	µg/L	0.01	0.20	<0.01	ND	ND	12	
indeno(1,2,3-c,d)pyrene	µg/L	0.02	<0.02	<0.02	ND	ND		
naphthalene	µg/L	0.01	0	0.018	0.00004	2.84	1	1.4
phenanthrene	µg/L	0.01	0	0.016	0.00004	2.53		
pyrene	µg/L	0.01	0	<0.01	ND	ND		
PAH-high molecular weight	µg/L	0.02	0	<0.02	ND	ND		
PAH-low molecular weight	µg/L	0.05	0.41	<0.05	ND	ND		
Total PAH	µg/L	0.05	0.47	<0.05	ND	ND		
SEMIVOLATILE ORGANICS								
bis(2-ethylhexyl)phthalate	µg/L	5	10.1	<5	ND	ND		
butylbenzyl phthalate	µg/L	2.5	<2.5	<2.5	ND	ND		

Parameter	Units	MDL	Ganges Influent	Ganges Effluent	Effluent Diluted	Loading (kg/year)	BC WQG	CCME / HC WQG
diethyl phthalate	µg/L	0.25	1.78	0.91	0.00	144		
dimethyl phthalate	µg/L	0.25	<0.25	<0.25	ND	ND		
di-n-butyl phthalate	µg/L	5	<5	<5	ND	ND		
di-n-octyl phthalate	µg/L	0.25	<0.25	<0.25	ND	ND		
MISC SEMIVOLATILE ORGANICS								
bis(2-chloroethoxy)methane	µg/L	0.25	<0.25	<0.25	ND	ND		
bis(2-chloroethyl)ether	µg/L	0.25	<0.25	<0.25	ND	ND		
bis(2-chloroisopropyl)ether	µg/L	0.25	<0.25	<0.25	ND	ND		
hexachlorobutadiene	µg/L	0.25	<0.25	<0.25	ND	ND		
hexachlorocyclopentadiene	µg/L	0.25	<0.25	<0.25	ND	ND		
hexachloroethane	µg/L	0.25	<0.25	<0.25	ND	ND		
isophorone	µg/L	0.25	0.33	0.31	0.001	49		
nitrobenzene	µg/L	0.25	<0.25	<0.25	ND	ND		
N-nitrosodimethylamine	µg/L	1	<1	<1	ND	ND		
N-nitrosodi-n-propylamine	µg/L	1	<1	<1	ND	ND		
VOLATILE ORGANIC COMPOUNDS								
MONOCYCLIC AROMATIC HYDROCARBONS								
1,2,4-trichlorobenzene	µg/L	0.2	<0.2	<0.2	ND	ND		5.4
1,2-dichlorobenzene	µg/L	0.5	<0.5	<0.5	ND	ND		42
1,2-diphenylhydrazine	µg/L	0.05	<0.05	<0.05	ND	ND		
1,3-dichlorobenzene	µg/L	0.5	<0.5	<0.5	ND	ND		
1,4-dichlorobenzene	µg/L	0.5	<0.5	<0.5	ND	ND		
2,6-dinitrotoluene	µg/L	0.25	<0.25	<0.25	ND	ND		
3,3-dichlorobenzidine	µg/L	0.5	<0.5	<0.5	ND	ND		
4-bromophenyl phenyl ether	µg/L	0.05	<0.05	<0.05	ND	ND		
4-chlorophenyl phenyl ether	µg/L	0.25	<0.25	<0.25	ND	ND		
benzene	µg/L	0.4	<0.4	<0.4	ND	ND	110	110
ethylbenzene	µg/L	0.4	<0.4	<0.4	ND	ND	250	25
m & p xylenes	µg/L	0.4	<0.4	<0.4	ND	ND		
o-xylene	µg/L	0.4	<0.4	<0.4	ND	ND		
styrene	µg/L	0.5	<0.5	<0.5	ND	ND		
toluene	µg/L	0.4	1	<0.4	ND	ND		215
xylenes	µg/L	0.4	<0.4	<0.4	ND	ND		
CHLORINATED ALIPHATIC								
1,1,1,2-tetrachloroethane	µg/L	0.5	<0.5	<0.5	ND	ND		
1,1,1-trichloroethane	µg/L	0.5	<0.5	<0.5	ND	ND		

Parameter	Units	MDL	Ganges Influent	Ganges Effluent	Effluent Diluted	Loading (kg/year)	BC WQG	CCME / HC WQG
1,1,2,2-tetrachloroethane	µg/L	0.5	<0.5	<0.5	ND	ND		
1,1,2-trichloroethane	µg/L	0.5	<0.5	<0.5	ND	ND		
1,1-dichloroethane	µg/L	0.5	<0.5	<0.5	ND	ND		
1,1-dichloroethene	µg/L	0.5	<0.5	<0.5	ND	ND		
1,2-dichloroethane	µg/L	0.5	<0.5	<0.5	ND	ND		
1,4-dioxane	µg/L	0.45	<2.3	<0.45	ND	ND		
2,4-dinitrotoluene	µg/L	0.25	<0.25	<0.25	ND	ND		
alpha-terpineol	µg/L	5	8.1	<5	ND	ND		
bromomethane	µg/L	1	<1	<1	ND	ND		
chlorobenzene	µg/L	0.5	<0.5	<0.5	ND	ND		
chlorodibromomethane	µg/L	1	<1	<1	ND	ND		
chloroethane	µg/L	1	<1	<1	ND	ND		
chloroethene	µg/L	0.5	<0.5	<0.5	ND	ND		
chloromethane	µg/L	1	<1	<1	ND	ND		
ALIPHATIC								
1,2-dibromoethane	µg/L	0.2	<0.2	<0.2	ND	ND		
1,2-dichloropropane	µg/L	0.5	<0.5	<0.5	ND	ND		
acrylonitrile	µg/L	1	<1	<1	ND	ND		
cis-1,2-dichloroethene	µg/L	1	<1	<1	ND	ND		
cis-1,3-dichloropropene	µg/L	1	<1	<1	ND	ND		
dibromomethane	µg/L	2	<2	<2	ND	ND		
methyl tertiary butyl ether	µg/L	4	<4	<4	ND	ND	440	5,000
tetrabromomethane	µg/L	50	<50	<50	ND	ND		
tetrachloroethene	µg/L	0.5	<0.5	<0.5	ND	ND		
tetrachloromethane	µg/L	0.5	<0.5	<0.5	ND	ND		
trans-1,2-dichloroethene	µg/L	1	<1	<1	ND	ND		
trans-1,3-dichloropropene	µg/L	1	<1	<1	ND	ND		
trichloroethene	µg/L	0.5	<0.5	<0.5	ND	ND		
trichlorofluoromethane	µg/L	4	<4	<4	ND	ND		
trichloromethane	µg/L	1	10	<1	ND	ND		
TRIHALOMETHANES								
bromodichloromethane	µg/L	1	<1	<1	ND	ND		
dichlorodifluoromethane	µg/L	2	<2	<2	ND	ND		
tribromomethane	µg/L	1	<1	<1	ND	ND		
KETONES								
4-Methyl-2-Pentanone	µg/L	10	<10	<10	ND	ND		

Parameter	Units	MDL	Ganges Influent	Ganges Effluent	Effluent Diluted	Loading (kg/year)	BC WQG	CCME / HC WQG
dimethyl ketone	µg/L	15	27	<15	ND	ND		
methyl ethyl ketone	µg/L	50	<50	<50	ND	ND		

Notes:

Shading indicates WQG exceedance; *dilution calculated from maximum concentration.
BC WQG = British Columbia Water Quality Guidelines, CCME WQG = Canadian Council of Ministers of the Environment Water Quality Guidelines, HC = Health Canada WQG
(lt) = long term, (st) = short term
NM indicates not measured; ND indicates non detect; --- value not available.

Appendix A4 Ganges WWTP Sludge (Mixed Liquor) Concentrations 2024

Regulated Parameters (mg/kg dry)	Class A Biosolids Limit (mg/kg dry)*	# of samples	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Metals															
arsenic	75	12	1.56	1.57	2.16	1.64	1.56	1.61	1.51	1.62	1.76	5.01	3.06	2.53	2.30
cadmium	20	12	0.543	0.622	1.22	0.894	0.686	0.68	0.66	0.65	1.02	1.67	0.74	0.77	0.89
chromium	1,060	12	6.99	7.58	8.79	8.38	6.82	6.46	6.66	6.21	7.98	20.7	12.3	10.90	9.81
cobalt	151	12	1.5	1.42	1.74	1.28	1.16	1.23	1.07	1.1	1.34	4.265	2.47	2.37	1.88
copper	757	12	530	553	650	462	393	387	363	360	455	730	413	535	497
lead	505	12	9.2	9.4	12.3	10.6	8.61	7.99	8.04	7.62	8.76	18.26	9.88	10.50	10.6
mercury	5	12	0.518	0.538	0.567	0.516	0.433	0.466	0.531	0.446	0.578	1.01	0.442	0.42	0.56
molybdenum	20	12	3.1	3.11	3.82	3.27	3.215	3.25	3.18	3.2	3.47	6.515	3.28	3.26	3.74
nickel	181	12	10.5	10.9	13.6	10.8	10.55	10.2	9.21	8.88	10.5	23.1	13.4	14.0	12.8
selenium	14	12	1.89	1.91	2.33	2.29	2.34	2.15	2.02	1.97	2.54	3.82	1.82	2.10	2.38
thallium	5	12	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
vanadium	656	12	3.5	3.9	4.4	2.8	1.95	2	1.2	2.5	2.5	21.2	15.4	11.50	6.86
zinc	1,868	12	277	272	330	276	287.5	281	322	323	393	546	272	302	337
Unregulated Parameters (mg/kg dry)	**Class A Biosolids Limit (mg/kg dry)***	**# of samples**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Mean**
Conventionals															
moisture	n/a	12	99	99	99	99	99	99	99	99	100	99	99	99	99
Metals															
aluminum	n/a	12	2,480	2,160	2,390	1,370	1,510	1,190	1,150	1,070	2,390	10,205	6,840	5,300	3,555
antimony	n/a	12	0.740	0.800	1.030	0.990	0.965	1.25	1.020	0.960	0.920	1.92	1.02	0.96	1.10
barium	n/a	12	64.0	52.8	62.1	69.3	52.4	43.5	38.2	36.3	43.0	133	69	55.9	64.6
beryllium	n/a	12	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
bismuth	n/a	12	12.5	12.4	15.9	13.9	14.3	17.0	17.8	17.4	21.6	37.6	17.4	17.8	19.1
boron	n/a	12	21.0	19.8	28.8	31.5	26.6	30.5	23.1	29.4	45.9	70.7	41.5	49.2	36.8
calcium	n/a	12	9,210	10,200	11,600	9,590	9,070	9,080	9,380	8,890	9,360	18,085	9,360	10,000	10,784
iron	n/a	12	4,050	4,250	5,140	3,720	3,195	2,950	2,830	2,740	3,690	13,375	8,360	7,220	5,578
lithium	n/a	12	1.63	1.71	1.89	1.67	1.42	1.32	1.16	1.16	1.36	7.40	5.37	4.46	2.81
magnesium	n/a	12	4,840	4,780	5,150	4,270	4,450	4,580	4,480	5,020	6,010	11,420	5,750	5,820	5,889
manganese	n/a	12	136	142	156	131	125	117	103	98	121	301	167	172	157

Unregulated Parameters (mg/kg dry)	Class A Biosolids Limit (mg/kg dry)*	# of samples	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
phosphorus	n/a	12	16,700	19,100	24,300	18,500	19,250	20,400	18,800	20,800	24,600	42,250	20,300	19,700	23300
potassium	n/a	12	8,900	10,600	13,200	10,400	11,050	12,200	10,400	12,400	13,100	21,350	11,600	12,200	12,843
silver	n/a	12	4.53	4.12	4.05	3.37	3.00	3.80	3.77	4.23	7.74	14.45	6.20	5.68	5.88
sodium	n/a	12	9,740	6,890	7,790	6,540	7,080	7,310	7,330	8,250	7,310	9,795	6,740	7,120	7,769
soluble 2:1 pH	n/a	12	6.05	6.14	6.62	6.08	6.60	6.41	5.90	6.50	6.59	6.49	6.58	6.67	6.41
Strontium	n/a	12	54.00	46.30	57.40	48.60	45.30	39.90	36.40	37.10	42.10	91.15	53.10	50.30	52.72
tin	n/a	12	13.3	13.5	15.9	13.7	14.1	13.6	13.4	13.3	15.2	25.3	11.7	10.9	15.2
titanium	n/a	12	23.70	30.10	28.40	37.30	16.65	17.80	15.00	17.60	21.80	83.35	52.10	33.70	34.11
total solids	n/a	12	0.9	1.1	0.9	0.6	0.75	0.9	0.8	0.8	0.3	0.9	1.4	0.8	1
tungsten	n/a	12	<0.5	<0.5	0.54	0.63	0.55	0.9	0.7	<0.5	0.65	0.82	<0.5	0.54	0.62
uranium	n/a	12	0.184	0.193	0.195	0.141	0.118	0.126	0.118	0.113	0.114	0.381	0.238	0.240	0.190
zirconium	n/a	12	1.28	2.78	1.42	3.26	2.96	2.67	4.09	2.26	3.27	1.055	1.07	0.55	2

Notes:
Shading indicates exceedance of regulatory limit.

--- sample was not collected.

** From Organic Matter Recycling Regulation (B.C. Reg. 18/2002, Schedule 4 Section 3, February 28, 2019) which references Trade Memorandum T-4-93 'Safety Guidelines for Fertilizers and Supplements' (Sept 1997) and contains maximum acceptable metal concentrations based on annual application rates (mg metal/kg product) 4400 kg/ha –yr.*

APPENDIX B

MALIVIEW WWTP

Appendix B1 Maliview WWTP Effluent Flow 2024 (m^3/day)

Day	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec		
	F-S	Sec	T-C	F-S	Sec	T-C	F-S	Sec	T-C	F-S	Sec	T-C	F-S	Sec	T-C	F-S	Sec	T-C	F-S	Sec	T-C	F-S	Sec	T-C	F-S	Sec	T-C	F-S	Sec	T-C	F-S	Sec	T-C	F-S	Sec	T-C
1	25	60	85	94	57	151	93	66	159	12	60	72	1	43	44	0	38	38	0	33	33	0	21	21	0	27	27	0	29	29	25	64	89	26	63	89
2	21	59	80	64	50	114	54	60	114	14	64	78	0	47	47	0	36	36	0	31	31	1	25	25	0	22	22	0	29	29	57	71	128	25	66	91
3	21	50	71	52	54	105	59	64	123	8	64	72	0	45	45	0	48	48	0	29	29	0	19	19	0	26	26	0	25	25	64	73	137	23	74	97
4	27	61	88	45	57	102	55	70	124	7	65	71	0	50	50	1	66	66	0	25	25	0	24	24	0	23	23	0	27	27	44	73	117	17	68	85
5	24	58	82	34	55	89	61	64	125	7	65	72	0	48	48	2	65	67	0	27	27	0	27	27	0	26	26	0	32	32	60	59	119	18	64	82
6	27	64	91	27	63	90	38	61	98	3	68	71	0	53	53	0	54	54	0	24	24	0	26	26	0	24	24	0	39	39	47	71	118	23	61	84
7	42	68	109	23	61	84	33	61	94	1	73	74	0	40	40	0	46	46	0	23	23	0	19	19	0	20	20	0	28	28	31	67	98	15	63	78
8	38	67	105	21	64	85	27	59	86	4	60	64	0	48	48	0	48	48	0	19	19	0	22	22	0	26	26	0	24	24	22	65	87	21	68	89
9	66	81	147	19	66	84	28	61	89	3	55	58	0	37	37	0	38	38	0	14	14	0	21	21	0	27	27	0	26	26	17	67	84	30	71	101
10	103	95	198	19	62	81	26	57	82	1	64	65	1	44	44	0	41	41	0	21	21	0	22	22	0	17	17	0	29	29	62	72	134	19	65	84
11	81	72	153	17	62	78	28	54	82	2	59	61	0	42	42	0	40	40	0	22	22	0	23	23	0	24	24	0	29	29	54	68	122	22	67	89
12	42	74	116	63	66	129	16	52	68	1	61	62	0	44	44	0	39	39	0	27	27	0	24	24	0	24	24	0	28	28	111	80	191	22	71	93
13	29	74	103	38	46	84	33	62	95	3	60	63	0	45	45	0	37	37	0	25	25	0	11	11	0	30	30	0	29	29	69	70	139	22	65	87
14	26	78	104	41	63	104	24	63	87	2	61	63	0	25	25	0	34	34	0	22	22	0	19	19	0	30	30	0	28	28	116	85	201	30	64	94
15	34	76	109	38	63	101	17	60	77	5	61	66	0	37	37	0	35	35	0	23	23	0	18	18	0	39	39	0	27	27	79	76	155	50	56	106
16	22	58	80	21	63	83	20	62	82	0	56	56	0	37	37	0	39	39	0	28	28	0	14	14	0	40	40	0	11	11	59	69	128	46	64	110
17	22	69	91	17	62	79	16	58	74	0	54	54	0	35	35	0	39	39	0	20	20	0	22	22	0	34	34	1	42	42	73	79	152	59	68	127
18	21	66	86	15	64	79	12	68	80	0	53	53	0	35	35	0	34	34	0	20	20	0	19	19	0	32	32	0	30	30	70	66	136	130	77	206
19	18	64	82	17	61	78	6	67	73	0	51	51	0	35	35	0	39	39	0	20	20	0	24	24	0	26	26	4	35	38	53	62	115	252	84	336
20	28	68	96	24	57	81	7	69	76	0	45	45	0	38	38	0	32	32	0	21	21	0	25	25	0	30	30	46	79	124	52	69	120	123	89	212
21	62	67	128	27	54	81	4	67	71	0	44	44	0	37	37	0	30	30	0	17	17	0	21	21	0	29	29	63	90	152	64	63	127	98	84	182
22	67	75	142	50	63	113	2	67	69	0	39	39	0	42	42	0	29	29	0	19	19	0	22	22	0	25	25	28	73	100	55	70	125	76	81	157
23	106	79	184	57	71	128	8	62	70	0	4	4	1	40	41	0	29	29	0	13	13	0	24	24	0	30	30	20	76	95	57	69	126	82	81	163
24	107	71	178	38	71	109	16	67	82	0	38	38	0	41	41	0	30	30	0	16	16	0	21	21	0	27	27	14	66	80	58	70	128	75	67	141
25	110	69	178	34	68	102	17	74	91	0	45	45	0	39	39	0	21	21	0	18	18	0	30	30	0	17	17	7	67	73	62	72	134	70	70	140
26	93	68	161	27	68	95	10	65	75	0	36	36	0	36	36	0	30	30	0	20	20	0	31	31	5	42	47	1	60	61	54	73	127	69	75	144
27	73	72	145	15	57	71	13	71	84	6	58	64	0	45	45	0	31	31	0	20	20	0	21	21	0	48	48	10	62	72	42	72	114	248	91	339
28	119	75	194	16	65	81	25	69	94	2	60	62	0	64	64	0	31	31	0	22	22	0	29	29	0	42	42	24	65	89	37	71	108	117	77	194
29	156	62	218	85	71	156	35	70	105	4	43	46	0	38	38	0	26	26	0	19	19	0	33	33	0	33	33	20	69	89	32	70	102	122	77	199
30	110	50	160	---	---	---	23	66	89	0	45	45	0	35	35	0	33	33	0	24	24	0	28	28	0	28	28	31	66	97	32	67	99	87	76	163
31	81	60	141	---	---	---	19	64	83	---	---	---	0	38	38	---	---	---	0	24	24	0	29	29	---	---	---	26	63	89	---	---	---	70	66	136
Min	18	50	71	15	46	71	2	52	68	0	4	4	0	25	25	0	21	21	0	13	13	0	11	11	0	17	17	0	11	11	17	59	84	15	56	78
Max	156	95	218	94	71	156	93	74	159	14	73	78	1	64	64	2	66	67	0	33	33	1	33	33	5	48	48	63	90	152	116	85	201	252	91	339
Mean	58	68	126	36	61	97	26	64	90	3	54	56	0	41	41	0	38	38	0	22	22	0	23	23	0	29	29	9	44	54	55	70	125	67	71	138
Total Flows	1,793	2,105	3,897	1,032	1,777	2,809	820	1,972	2,792	82	1,605	1,687	2	1,275	1,276	2	1,134	1,136	0	680	680	1	708	709	5	859	864	291	1,375	1,666	1,657	2,094	3,751	2,086	2,202	4,288

Annual Min	**0**	**4**	**4**
Annual Max	**252**	**95**	**339**
Annual Mean	**21**	**49**	**70**

Notes:
F-S: Fine-screened; Sec: Secondary; T-C: Total combined.
Shading indicates exceedance of regulatory limit (250m^3/day T-C).

Appendix B2 Maliview WWTP Compliance and Treatment Plant Performance 2024

Date	Influent			Secondary Effluent (Undisinfected)						Secondary Effluent Final Combined (secondary + screened)							
	TSS (mg/L)	BOD (mg/L)	FC (CFU/ 100 mL)	TSS (mg/L)	BOD (mg/L)	CBOD (mg/L)	FC (CFU/ 100 mL)	NH_3 (mg/L N)	pH	TSS (mg/L)	TSS Applicable Limit (mg/L)	BOD (mg/L)	CBOD (mg/L)	CBOD Applicable Limit (mg/L)	FC (CFU/ 100 mL)	Ammonia (mg/L N)	pH
January	63	146	25,000,000	16	15	15	18,000	4	7.2	92	130	65	61	130	6,300,000	9	7.1
February	150	183	3,600,000	22	18	12	200,000	17	7.4	19	130	17	12	130	330,000	18	7.4
March	73	184	550,000	27	23	22	82,000	18	7.4	24	130	18	18	130	77,000	17	7.5
April	247	216	6,700,000	52	37	32	800,000	42	7.5	35	45	36	33	130	780,000	39	7.4
May	619	480	7,200,000	74	88	90	2,400,000	50	7.3	70	45	109	93	45	1,600,000	51	7.4
June	354	316	9,100,000	37	51	64	2,300,000	42	7.5	43	45	54	32	45	1,700,000	43	7.6
July	136	351	27,000,000	50	58	51	3,800,000	56	7.5	40	45	55	57	45	3,500,000	52	7.5
August	449	326	7,400,000	31	64	56	5,400,000	52	7.5	36	45	67	59	45	4,600,000	57	7.6
September	86	180	5,800,000	28	38	37	350,000	39	7.5	40	45	39	43	45	490,000	40	7.5
October	212	94	740,000	18	14	12	230,000	14	7.3	19	45	13	13	45	200,000	14	7.3
November	298	194	480,000	38	23	20	63,000	10	7.4	96	130	106	72	45	900,000	17	7.7
December	130	140	1,100,000	18	22	12	240,000	14	0.0	36	130	38	24	130	2,000,000	14	7.6
Mean	235	234	3,826,003	34	36	28	422,723	30	6.8	46	---	51	43	---	996,998	31	7.5
Min	63	94	480,000	16	14	12	18,000	4	0.0	19	---	13	12	---	77,000	9	7.1
Max	619	480	27,000,000	74	88	90	5,400,000	56	7.5	96	---	109	93	---	6,300,000	57	7.7
n	12	12	12	12	12	12	12	12	12	12	---	12	12	---	12	12	12
Mean Daily Loading	kg/day			kg/day				kg/day	---	kg/day	---			---		kg/day	---
	18	---	---	1.2	---	---	---	1.6	---	2.7	---	---	---	---	---	2.1	---

Notes:
TSS and CBOD shading indicates exceedance of the applicable regulatory limit.
FC = Fecal Coliforms, TSS = total suspended solids, BOD = biochemical oxygen demand, CBOD = carbonaceous biochemical oxygen demand, TRC = total residual chlorine, NH_3 = ammonia
TSS/CBOD secondary effluent (disinfected limit) = 45 mg/L when flow ≤60, and = 130 mg/L when flow >60.

APPENDIX C

SCHOONER WWTP

Appendix C1 Schooner WWTP Effluent Flow 2024 (m^3/day)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	230	460	462	324	237	199	204	196	---	---	227	185
2	220	424	409	276	216	200	177	199	---	---	251	192
3	221	386	361	304	217	237	176	210	---	---	230	220
4	217	402	364	262	228	257	182	225	595	---	250	232
5	212	369	348	255	223	241	179	222	140	---	245	196
6	220	352	327	269	220	227	190	217	218	---	218	188
7	229	316	324	274	208	195	181	195	168	---	206	234
8	214	287	306	261	204	214	167	192	196	---	209	267
9	363	297	317	269	191	216	174	170	201	---	275	277
10	622	310	312	246	208	216	176	182	155	---	291	246
11	397	363	271	291	204	200	179	183	164	---	292	205
12	352	347	315	263	201	195	184	177	165	---	294	230
13	332	330	302	256	194	183	181	153	113	---	536	204
14	338	332	310	251	179	183	197	144	138	---	281	212
15	317	322	284	239	179	179	187	178	221	---	291	212
16	274	302	285	229	181	175	153	155	260	91	283	247
17	279	321	295	222	203	189	164	172	204	156	292	284
18	288	311	287	234	207	175	165	180	158	159	270	484
19	293	330	308	228	207	162	184	167	135	201	270	454
20	294	311	280	247	195	166	171	141	232	362	72	466
21	349	322	266	255	208	157	182	156	162	352	228	421
22	454	316	277	243	213	167	202	165	178	402	347	420
23	639	301	274	234	182	172	206	153	161	340	241	433
24	559	312	344	231	199	178	195	208	175	247	207	417
25	509	312	327	232	219	170	218	189	181	222	187	363
26	455	299	290	258	222	152	203	224	198	200	210	380
27	454	285	304	255	204	145	232	209	178	215	190	461
28	658	425	310	271	189	203	237	206	187	237	194	467
29	938	462	302	245	193	164	230	184	181	220	188	419
30	663	---	316	234	178	184	231	176	178	222	186	413
31	541	---	314	---	199	---	205	224	---	190	---	422
Min	212	285	266	222	178	145	153	141	113	91	72	185
Max	938	462	462	324	237	257	237	225	595	402	536	484
Mean	391	342	316	255	203	190	191	186	194	239	249	318
Total Flows	12,131	9,906	9,791	7,658	6,308	5,701	5,912	5,752	5,242	3,816	7,461	9,851

Notes: shading indicates exceedance of regulatory limit (640 m^3/day), --- indicates no data available

Annual Min	**72**
Annual Max	**938**
Annual Mean	**257**

Appendix C2 Schooner WWTP Compliance and Treatment Plant Performance 2024

Date	Influent			Secondary Effluent		Secondary Effluent Disinfected						
	TSS (mg/L)	BOD (mg/L)	FC (CFU/ 100 mL)	TSS (mg/L)	FC (CFU/ 100 mL)	TSS (mg/L)	BOD (mg/L)	CBOD (mg/L)	FC (CFU/ 100 mL)	NH_3 (mg/L N)	pH	Unionized NH_3 (mg/L)
Regulatory Limit						45 max / 25 mean		45 max / 25 mean	200			1.25
January	85	104	590,000	13	230,000	14	05.23	04.09	400	<0.1	6.9	---
February	184	137	2,600,000	8	290,000	8	04.78	04.2	14	00.42	6.9	<0.1
March	89	48	950,000	7	26,000	7	<3	<3	<1	<0.1	6.9	<0.1
April	257	261	42,000,000	8	31,000	9	03.83	<3	3	<0.1	6.7	<0.1
May	350	278	12,000,000	11	8,200	11	04.36	<3	1	01.34	6.6	<0.1
June	176	214	8,300,000	12	58,000	5	04.75	03.03	4	00.1	6.6	<0.0005
July	83	151	5,100,000	8	47,000	8	04.69	03.07	19	00.178	6.5	<0.1
August	290	333	11,000,000	9	48,000	7	05.12	03.17	33	00.46	6.0	<0.1
September	115	104	3,000,000	11	35,000	11	025.6	03.26	29	<0.1	6.4	<0.1
October	108	215	5,200,000	12	400,000	17	06.53	05.06	360	05.78	7.3	<0.1
November	103	103	120,000	2	6	2	<3	<3	1	<0.1	6.5	<0.1
December	300	219	4,200,000	2	100	4	<3	<3	1	<0.1	6.2	<0.1
Mean	178	181	3,433,982	9	16,741	8	6	3	72	1	6.6	0.045
Min	83	48	120,000	2	6	<2	<3	<3	<1	<0.1	6.0	<0.0005
Max	350	333	42,000,000	13	400,000	17	26	5	400	6	7.3	<0.1
n	12	12	12	12	12	12	12	12	12	12.0	12	12
Mean Daily Loading	kg/day			kg/day		kg/day				kg/day		kg/day
	46	---	---	2.2	---	2.1	---	---	---	0.2	---	0.012

Notes:
TSS = total suspended solids, BOD = biochemical oxygen demand, CBOD = carbonaceous biochemical oxygen demand, FC = fecal coliforms, TRC = total residual chlorine, NH_3 = ammonia
--- data not collected.
Shading indicates exceedance of regulatory limit.

Appendix C3

Magic Lake Estates
Proposed Receiving Environmental Monitoring Program

Capital Regional District | Parks, Recreation & Environmental Services, Environmental Protection

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MAGIC LAKE ESTATES PROPOSED RECEIVING ENVIRONMENT MONITORING PROGRAM
FEBRUARY 2025

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MAGIC LAKE ESTATES PROPOSED RECEIVING ENVIRONMENT MONITORING PROGRAM
FEBRUARY 2025

1.0 INTRODUCTION

This document proposes a receiving environment monitoring program (REMP) for the first two years of operation of the new Schooner Way Wastewater Treatment Plant (WWTP), located on Pender Island. Previously, wastewater was treated at the Cannon Crescent WWTP (BC MWR Permit PE-0220) and at the Schooner Way WWTP (BC MWR Registration RE-01693). Treatment works at these two plants were at capacity and there were frequent flow and water quality exceedances and power outages.

The Capital Regional District (CRD) has been working with the Magic Lake Estates Water and Sewer Local Services Committee to address aging and failing sewer infrastructure in Magic Lake Estates (MLE). In February 2020, the CRD submitted an application under the Investing in Canada Infrastructure Program – Green Infrastructure Environmental Quality to apply for funding to complete the upgrades. The grant was approved, and the Shared Cost Agreement dated November 15, 2021, with a total of $7,709,350 split between the Government of Canada (40%), the Province of British Columbia (33.33%), and the CRD (26.67%).

A significant portion of the grant is for upgrading Schooner WWTP and installing a pump station at Cannon, (to pump to Schooner WWTP), so that the Cannon WWTP can be decommissioned. The upgrades at Schooner WWTP include the following key components:

- Headworks (fine screen and wash-press) to remove all solids greater than 2 mm;
- Equalization tank which attenuates the varying flow rates to maintain a constant feed rate through the plant;
- Membrane bioreactor (MBR) secondary treatment for the wastewater;
- Effluent disinfection by means of UV lamps;
- Various process mechanical equipment, such as: transfer pumps, blowers and instrumentation; and
- Back-up power generator to keep the plant in operation during any utility power outages.

The MBR process consistently produces high-quality effluent and has a high removal efficiency of contaminants such as biochemical oxygen demand, total suspended solids, ammonia and bacteria. Extensive discussions were held with staff from the Ministry of Environment and Parks (ENV) about the upgrades including pre-application meetings and application submissions during the re-registration of Schooner WWTP under registration number RE-01693. There will be a significant environmental benefit by diverting wastewater flows from Cannon, (with higher TSS criteria and no disinfection), to Schooner, where it will be treated to a higher quality and be 100% disinfected.

The CRD is confident that the effluent from the upgrade plant will meet the regulations in Table 1 as committed in our re-registration application.

This proposed REMP has been signed off by Chris Lowe, as a Qualified Person (QP).

Table 1 Permitted Regulations for Schooner WWTP

Parameter	WSER Limits (Note 1)	MWR Limits (Note 2)
Maximum permitted flow (m^3/day)	---	≤ 756
TSS (mg/L	average ≤ 25	max. 45
BOD (mg/L)	average ≤ 25 (Note 3)	max 45 (Note 4)
Un-ionized ammonia (NH_3-N) (mg/L N)	max 1.25 at 15°C	---
Fecal coliforms (cfu/100mL)	---	≤ 200 (Note 5)
100% 96-hr LC_{50} toxicity test	pass	pass

Notes:
Note 1 – Federal Wastewater Systems Effluent Regulations (WSER, 2012)
Note 2 – BC ENV Municipal Wastewater Regulation (MWR, 2012)
Note 3 – Carbonaceous Biochemical Oxygen Demand (CBOD) for WSER
Note 4 – Biochemical Oxygen Demand (BOD) for MWR
Note 5 – Based on Environmental Impact Statement (EIS, CRD, 2000)

Substantial facility upgrades to the wastewater collection system, and to the Schooner WWTP were undertaken in 2023 and 2024, with completion and subsequent facility commissioning in September 2024.

All wastewater is now treated at the new Magic Lake Estates WWTP and discharged through the previous Schooner marine outfall.

The Capital Regional District (CRD) requested a flow increase from the previous maximum daily discharge of 640 m^3/d to 756 m^3/d. As this increase is greater than a 10% increase in flow, BC ENV requires the CRD to submit an updated REMP, with an increased sampling frequency for a minimum of two years. After the two years, the monitoring data will be assessed, and the REMP re-evaluated as to whether this increased frequency is still needed.

2.0 CURRENT RECEIVING ENVIRONMENT MONITORING PROGRAM

Receiving environment monitoring was not historically undertaken at the Schooner Way WWTP. In 2010, discussions with ENV led to the requirement for such monitoring. Sampling frequency was changed from monthly to five sets of weekly samples collected over a 30-day period (5-in-30) to allow for a more direct comparison of bacterial indicators to relevant human health protection criteria. Enterococci were analyzed as well as fecal coliforms, as enterococci persist longer in the marine environment and have a more direct link to human health impacts. This 5-in-30 program is conducted over one 5-week period, with the recommended time frame for the program during October and November, when there will be high flows due to fall rains.

For the former Schooner Way WWTP, the monitoring programs were added and/or revised to comprise a 5-in-30 sampling program once every four years. Emergency sampling is also required after planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter or one day duration in the summer. If the results from a single day of emergency sampling indicate no impact to the receiving environment (i.e., results less than Environment Canada (EC) human health guidelines), then no repeat sampling is required for similar events of the same duration or less during that same wet weather season. If impacts are observed during the emergency sampling (i.e., results higher than EC human health guidelines), then sampling must be repeated every few days until all results are below EC human health guidelines.

Pre-2010 monitoring programs sampled surface water only (0.5 to 1 m below the surface). Post-2010, the receiving water sampling programs were updated to include sampling of near-surface stations (Figure 1) at a depth mid-way between the surface and seafloor at stations at the edge of the initial dilution zone (IDZ). The IDZ is defined as the area 100 m around the outfall and is where BC WQG must be met. In addition to the IDZ sampling stations, surface samples are collected at two stations approximately 200 m with and against prevailing currents adjacent to the outfalls.

3.0 HISTORICAL RESULTS

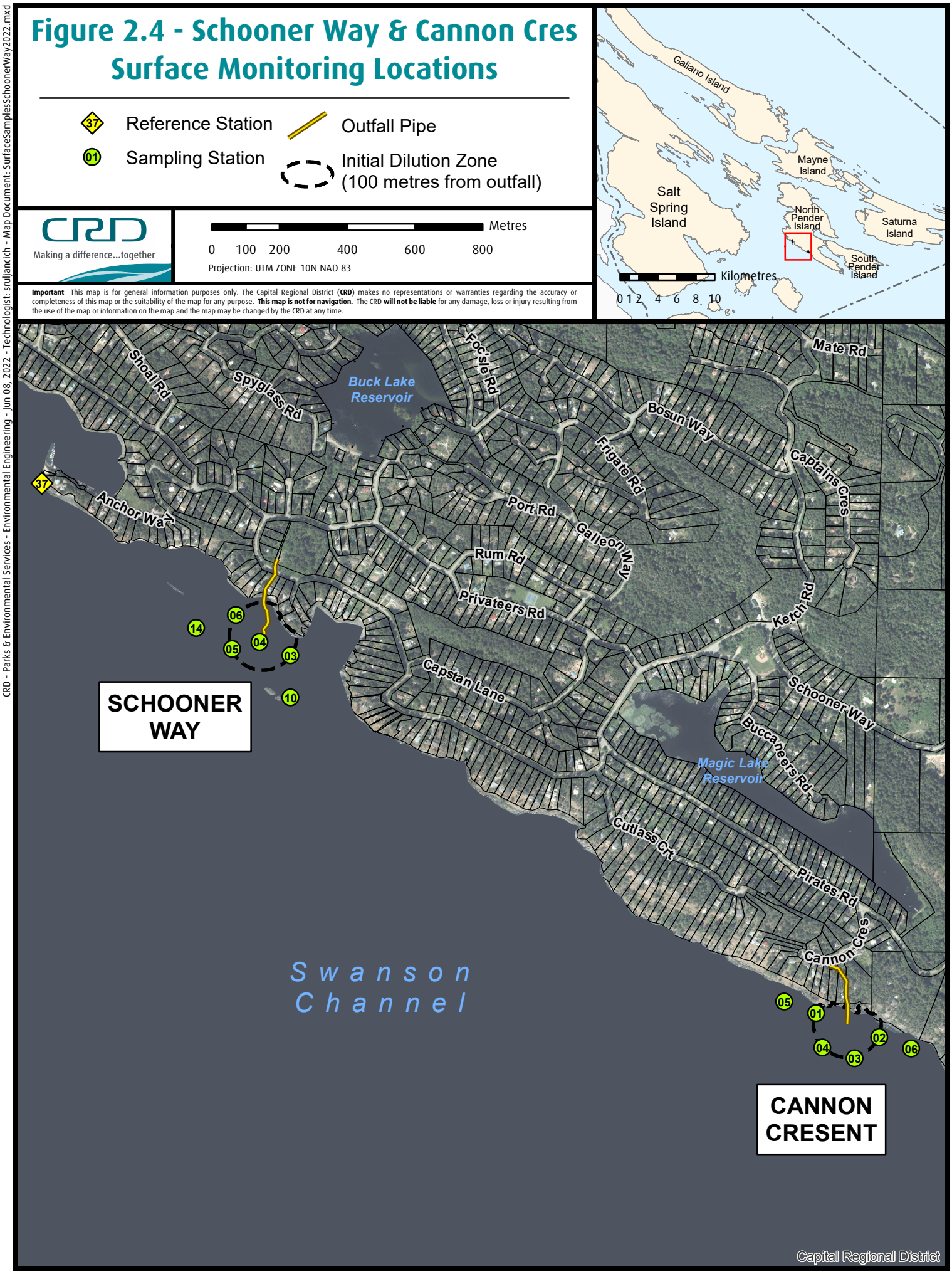
Previous routine and emergency receiving environment sampling results were consistently well below regulatory guidelines. Table 2 contains flow rates from 2020/2021 that preceded emergency overflow sampling, while Table 3 is the subsequent emergency overflow sampling results. Table 4 contains results from the routine receiving environment sampling conducted in 2020, prior to treatment plant upgrades.

Table 2 Schooner WWTP Flow Data on Flow Exceedance Days (all data presented as m^3/day)

	Schooner WWTP flow (max permitted daily flow 640)
25-Dec-20	---
26-Dec-20	---
27-Dec-20	---
28-Dec-20	---
29-Dec-20	---
31-Dec-20	665
01-Jan-21	692
02-Jan-21	699
03-Jan-21	844
04-Jan-21	779
05-Jan-21	690
06-Jan-21	675
25-Nov-21	---
26-Nov-21	743
27-Nov-21	727
28-Nov-21	760
29-Nov-21	1094
30-Nov-21	788
01-Dec-21	---
02-Dec-21	---
12-Dec-21	694
13-Dec-21	---

Notes:
--- flow was below permitted limits

Figure 2.4 - Schooner Way & Cannon Cres Surface Monitoring Locations



CRD - Parks & Environmental Services - Environmental Engineering - Jun 08, 2022 - Technologist: srudjancich - Map Document: SurfaceSamplesSchoonerWay2022.mxd

Table 3 Schooner WWTP 2021 Overflow Sampling (all data presented as CFU/100 mL)

			6-Jan	14-Dec
Station	Location	Depth (m)	Enterococci	Enterococci
Sch-03	100 m SE	1	5	<1
		7	2	<1
Sch-04	100 m WSW	1	3	*
		7	29	*
Sch-05	100 m NW	1	1	1
		10	3	<1
Sch-06	100 m S	1	5	<1
		6	14	<1
Sch-10	200 m SSE	1	2	<1
Sch-14	200 m W	1	11	<1

Notes:
*not collected due to wind/weather

Table 4 Schooner WWTP Receiving Water 2020 (all data presented as CFU/100 mL)

Station	Site	Depth	Feb-25		Mar-04		Mar-06		Mar-09		Mar-19	
			Enterococci	Fecal Coliform	Enterococci	Fecal Coliform	Enterococci	Fecal Coliform	Enterococci	Fecal Coliform	Enterococci	Fecal Coliform
Sch-03	100 m SE	top	<1	1	<1	<1	<1	<1	<1	1	<1	<1
		middle	1	<1	<1	<1	<1	<1	<1	2	<1	<1
Sch-04	100 m WSW	top	<1	<1	<1	1	<1	<1	<1	<1	<1	1
		middle	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sch-05	100 m NW	top	<1	1	<1	<1	<1	<1	<1	<1	<1	<1
		middle	<1	<1	2	<1	2	<1	<1	<1	<1	<1
Sch-06	100 m S	top	<1	<1	<1	<1	1	1	<1	<1	<1	<1
		middle	<1	<1	<1	<1	1	<1	2	<1	<1	<1
Sch-10	200 m SSE	top	1	<1	2	<1	<1	<1	<1	<1	<1	<1
Sch-14	200 m W	top	<1	<1	<1	<1	1	1	<1	<1	<1	<1

4.0 PROPOSED RECEIVING ENVIRONMENT MONITORING PROGRAM

Comparison of the current REMP to guidelines provided by ENV indicate that the current receiving water sampling program will meet requirements with a few minor enhancements. Additions will include collection of samples from 1 m above the bottom sediments, total metals analysis on one of the sampling days, and water quality profile data using a hand-held water quality meter equipped with probes that measure temperature, pH, dissolved oxygen (DO), electrical conductivity (EC) and salinity. This water quality profile data should be collected at 1 m intervals until a depth of 20 m, at which point coarser measurements can be collected at 5 m intervals. Replicate samples should be collected to validate the precision of the sampling and measurement process. Table 5 compares the current REMP to the proposed REMP.

Table 5 Current and Proposed REMP Sampling Components, Schooner WWTP

Monitoring Activity	Current REMP	Proposed REMP
5-in-30 at 6 stations, bacteria at 1 m below surface	√	√
5-in-30 at 4 stations, bacteria at middle of water column	√	√
5-in-30 at 4 stations, bacteria at 1 m above seafloor		√
Total metals analysis on 1 day of the 5-in-30, at all stations and depths		√
Field replicate samples		√
Water profile data (temp, pH, DO, EC, salinity)		√

Initial wastewater sampling has already been conducted twice upon commissioning of the treatment plant. Results of this sampling indicates extremely high effluent quality (Table 6). Toxicity testing results are presented in Appendix A, with zero mortality or behavioural impacts at all effluent strengths.

Table 6 Wastewater sampling results, Schooner WWTP

Parameter	September 26, 2024	September 30, 2024
Un-ionized ammonia @ 15°C (mg/L)	0.0062	<0.00050
Biochemical oxygen demand (mg/L)	<2.0	<2.0
Biochemical oxygen demand (inhib.) (mg/L)	<2.0	<2.0
Total suspended solids (mg/L)	<1.0	3.2
Alkalinity (PP as CaCO3) (mg/L)	<1.0	<1.0
Alkalinity (Total as CaCO3) (mg/L)	10	1.0
Bicarbonate (HCO3) (mg/L)	13	1.3
Carbonate (CO3) (mg/L)	<1.0	<1.0
Hydroxide (OH) (mg/L)	<1.0	<1.0
Total ammonia (N) (µg/L)	64	6700
pH (15°C) (pH units)	8.59	5.48
Fecal coliforms (CFU/100mL)	1	2

5.0 PROPOSED RECEIVING ENVIRONMENT MONITORING PROGRAM FREQUENCY

To meet the requirements of ENV, the proposed REMP will also have an enhanced frequency of sampling. The current REMP requires routine sampling every four years. ENV requires increased sampling for a minimum of two years after commissioning of the treatment plant. To fulfill this requirement, the proposed receiving environment sampling program would be conducted on a biannual basis for the years 2024/2025 and 2025/2026, with sampling conducted in October/November of 2024, June/July of 2025,

October/November of 2025 and June/July of 2026. Based on historical receiving environment data for both routine and emergency sampling, it is expected that receiving water quality will continue to be excellent near the treatment plant outfall, and that after evaluation of the two years of sampling data, REMP frequency would be able to again decrease to once every four years. The current emergency sampling protocol would remain in place.

The first round of receiving environment sampling has been conducted at the Schooner WWTP, in November/December 2024. These results are found in Appendix B.

6.0 CONCLUSION

The CRD has proposed an updated REMP to fulfill the requirements of ENV for the new Schooner WWTP. It is expected that the receiving water quality results will continue to be excellent and well below regulatory guidelines.

APPENDIX A

WASTEWATER TOXICITY TESTING

Appendix A1 Rainbow Trout LC50 Toxicity Testing Schooner WWTP, November 7, 2024

Concentration	Temperature (°C)		Dissolved oxygen (mg/L)		pH		Conductivity (uS/cm)	Mortality (%)		Atypical behaviour (#)
% vol/vol	initial	96 hrs	initial	96 hrs	initial	96 hrs	initial	96 hrs	96 hrs	96 hrs
0	14	15	10.3	9.9	7.7	7.4	55	0	0	0
6.25	14	15	10.3	9.9	7.6	7.4	77	0	0	0
12.5	14	15	10.3	9.4	7.5	7.2	103	0	0	0
25	15	15	10.3	9.4	7.2	7.1	188	0	0	0
50	15	15	10.3	9.9	7.1	7.2	255	0	0	0
100	15	15	10.3	9.7	6.2	6.6	439	0	0	0

APPENDIX B

INITIAL RECEIVING ENVIRONMENT SAMPLING RESULTS

Date Sampled	Station	Parameter	Enterococci	Fecal Coliforms	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt
		State	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
		Units	CFU/100 mL	CFU/100 mL	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L
		Water Quality Guideline (if applicable)					12.5					0.12		56	
		Sample Depth													
2024-11-06	Schooner 3 top	1	1	1	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 3 middle	8	2	2	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 3 bottom	14	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 4 top	1	2	4	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 4 middle	7	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 4 bottom	13	1	3	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 5 top	1	1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 5 middle	10	<1	1	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 5 bottom	19	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 6 top	1	2	3	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 6 middle	5	<1	1	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 6 bottom	9	1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 10 top	1	1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 14 top	1	1	2	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 3 top	1	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 3 middle	7	2	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 3 bottom	13	<1	<1											
2024-11-15	Schooner 4 top	1	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 4 middle	5	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 4 bottom	11	<1	<1											
2024-11-15	Schooner 5 top	1	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 5 middle	10	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 5 bottom	19	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 6 top	1	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 6 middle	6	1	1	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 6 bottom	12	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 10 top	1	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 14 top	1	1	1	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 3 top	1	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 3 middle	6	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 3 bottom	11	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 4 top	1	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 4 middle	7	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 4 bottom	7	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 5 top	1	<1	1	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 5 middle	5	<1	1	---	---	---	---	---	---	---	---	---	---	---

Date Sampled	Station	Parameter	Enterococci	Fecal Coliforms	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt
		State	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
		Units	CFU/100 mL	CFU/100 mL	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L
		Water Quality Guideline (if applicable)					12.5					0.12		56	
		Sample Depth													
2024-11-26	Schooner 5 bottom	19	<1	1	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 6 top	1	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 6 middle	4.5	<1	1	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 6 bottom	10	<1	1	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 10 top	1	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 14 top	1	<1	2	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 3 top	1	2	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 3 middle	6	<1	1	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 3 bottom	12	<1	2	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 4 top	1	<1	1	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 4 middle	6	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 4 bottom	12	1	2	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 5 top	1	1	1	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 5 middle	10	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 5 bottom	20	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 6 top	1	<1	1	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 6 middle	6	1	1	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 6 bottom	11	2	1	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 10 top	1	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 14 top	1	<1	<1	---	---	---	---	---	---	---	---	---	---	---
2024-12-09	Schooner 3 top	1	<1	<1	25.3	<0.5	1.77	9.4	<0.5	<0.5	3960	0.084	367	<0.5	<0.05
2024-12-09	Schooner 3 middle	6	<1	<1	35.1	<0.5	1.71	8.9	<0.5	<0.5	4100	0.139*	367	<0.5	<0.05
2024-12-09	Schooner 3 bottom	12	<1	<1	29.5	<0.5	1.69	8.7	<0.5	<0.5	4060	0.097	358	<0.5	<0.05
2024-12-09	Schooner 4 top	1	<1	<1	19.7	<0.5	1.72	8.8	<0.5	<0.5	3820	0.066	338	<0.5	<0.05
2024-12-09	Schooner 4 middle	5	<1	<1	37.4	<0.5	3.19	18.2	<0.5	<0.5	7800	0.145*	721	<0.5	0.124
2024-12-09	Schooner 4 bottom	13	<1	<1	32.2	<0.5	2.51	12.1	<0.5	<0.5	5240	0.068	446	0.61	<0.05
2024-12-09	Schooner 5 top	1	<1	<1	32.5	<0.5	2.18	8.3	<0.5	<0.5	4280	0.066	391	<0.5	<0.05
2024-12-09	Schooner 5 middle	10	<1	<1	53.5	<0.5	1.68	8.2	<0.5	<0.5	4120	0.071	363	<0.5	<0.05
2024-12-09	Schooner 5 bottom	20	1	<1	46.4	<0.5	1.82	8.7	<0.5	<0.5	4090	0.078	346	<0.5	<0.05
2024-12-09	Schooner 6 top	1	1	<1	68.3	<0.5	1.86	8.9	<0.5	<0.5	4320	0.073	376	<0.5	<0.05
2024-12-09	Schooner 6 middle	7	1	<1	21.2	<0.5	2.03	8.7	<0.5	<0.5	4230	0.091	357	0.52	<0.05
2024-12-09	Schooner 6 bottom	14	<1	1	41.7	<0.5	1.67	8.4	<0.5	<0.5	4110	0.06	365	<0.5	<0.05
2024-12-09	Schooner 10 top	1	1	<1	31.6	<0.5	1.83	8.6	<0.5	<0.5	4160	0.069	369	<0.5	<0.05
2024-12-09	Schooner 14 top	1	<1	<1	34.1	<0.5	1.72	8.6	<0.5	<0.5	4180	0.076	365	<0.5	<0.05

*Value minimally exceeds the criteria. In addition, the criteria is a long-term exposure limit, and as this exceedance was likely a brief elevation, is unlikely to exceed over the long-term.

^Value is most likely an error, as it differs so greatly from the others

lt=long term, st=short term

Date Sampled	Station	Parameter	Copper	Hardness (as CaCO3)	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Phosphorus	Potassium	Selenium
		State	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
		Units	µg/L	mg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L
		Water Quality Guideline (if applicable)	<2 (lt), 3 (st)			<2 (lt), 140 (st)			100			8.3			2
		Sample Depth													
2024-11-06	Schooner 3 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 3 middle	8	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 3 bottom	14	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 4 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 4 middle	7	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 4 bottom	13	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 5 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 5 middle	10	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 5 bottom	19	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 6 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 6 middle	5	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 6 bottom	9	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 10 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 14 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 3 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 3 middle	7	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 3 bottom	13													
2024-11-15	Schooner 4 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 4 middle	5	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 4 bottom	11													
2024-11-15	Schooner 5 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 5 middle	10	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 5 bottom	19	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 6 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 6 middle	6	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 6 bottom	12	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 10 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 14 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 3 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 3 middle	6	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 3 bottom	11	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 4 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 4 middle	7	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 4 bottom	7	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 5 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 5 middle	5	---	---	---	---	---	---	---	---	---	---	---	---	---

Appendix C3

Date Sampled	Station	Parameter	Copper	Hardness (as CaCO3)	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Phosphorus	Potassium	Selenium
		State	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
		Units	µg/L	mg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L
		Water Quality Guideline (if applicable)	<2 (lt), 3 (st)			<2 (lt), 140 (st)			100			8.3			2
		Sample Depth													
2024-11-26	Schooner 5 bottom	19	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 6 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 6 middle	4.5	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 6 bottom	10	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 10 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 14 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 3 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 3 middle	6	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 3 bottom	12	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 4 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 4 middle	6	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 4 bottom	12	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 5 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 5 middle	10	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 5 bottom	20	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 6 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 6 middle	6	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 6 bottom	11	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 10 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 14 top	1	---	---	---	---	---	---	---	---	---	---	---	---	---
2024-12-09	Schooner 3 top	1	0.76	5610	22	0.059	147	1140	2.21	<0.0019	9.75	0.32	102	344	<0.5
2024-12-09	Schooner 3 middle	6	0.5	5600	<10	<0.05	151	1140	2.04	<0.0019	9.15	<0.2	86	344	<0.5
2024-12-09	Schooner 3 bottom	12	1.75	5450	10	0.054	149	1110	2.3	<0.0019	9.51	0.99	100	337	<0.5
2024-12-09	Schooner 4 top	1	<0.5	5110	<10	0.063	141	1030	2.09	<0.0019	8.58	<0.2	68	315	<0.5
2024-12-09	Schooner 4 middle	5	0.99	10700	47	0.058	284	2150	4.33	<0.0019	18	0.33	160	668	<0.5
2024-12-09	Schooner 4 bottom	13	<0.5	6560	43	<0.05	190	1320	2.46	<0.0019	10.6	<0.2	130	396	<0.5
2024-12-09	Schooner 5 top	1	9.43^	5780	25	<0.05	155	1170	2.69	<0.0019	9.12	3.86	132	346	<0.5
2024-12-09	Schooner 5 middle	10	<0.5	5500	13	<0.05	150	1120	2.65	<0.0019	9.56	<0.2	85	338	<0.5
2024-12-09	Schooner 5 bottom	20	<0.5	5360	15	<0.05	150	1090	2.23	<0.0019	8.72	0.4	84	324	<0.5
2024-12-09	Schooner 6 top	1	<0.5	5690	12	<0.05	160	1150	2.37	<0.0019	10.2	<0.2	95	347	<0.5
2024-12-09	Schooner 6 middle	7	<0.5	5750	14	<0.05	155	1180	2.16	<0.0019	9.29	<0.2	77	343	<0.5
2024-12-09	Schooner 6 bottom	14	0.54	5520	10	0.062	150	1120	2.35	<0.0019	9.16	<0.2	61	334	<0.5
2024-12-09	Schooner 10 top	1	<0.5	5600	14	<0.05	151	1140	2.45	<0.0019	9.15	<0.2	78	339	<0.5
2024-12-09	Schooner 14 top	1	0.71	5550	16	<0.05	153	1130	2.24	<0.0019	9.05	<0.2	82	339	<0.5

*Value minimally exceeds the criteria. In addition, the criteria is a long-term exposure limit, and as this exceedance was likely a brief elevation, is unlikely to exceed over the long-term.

^Value is most likely an error, as it differs so greatly from the others

lt=long term, st=short term

Date Sampled	Station	Parameter	Silicon	Silver	Strontium	Sulfur	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc
		State	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
		Units	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
		Water Quality Guideline (if applicable)		1.5 (lt), 3 (st)								10 (lt), 55 (st)
		Sample Depth										
2024-11-06	Schooner 3 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 3 middle	8	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 3 bottom	14	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 4 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 4 middle	7	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 4 bottom	13	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 5 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 5 middle	10	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 5 bottom	19	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 6 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 6 middle	5	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 6 bottom	9	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 10 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-06	Schooner 14 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 3 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 3 middle	7	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 3 bottom	13										
2024-11-15	Schooner 4 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 4 middle	5	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 4 bottom	11										
2024-11-15	Schooner 5 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 5 middle	10	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 5 bottom	19	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 6 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 6 middle	6	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 6 bottom	12	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 10 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-15	Schooner 14 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 3 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 3 middle	6	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 3 bottom	11	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 4 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 4 middle	7	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 4 bottom	7	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 5 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 5 middle	5	---	---	---	---	---	---	---	---	---	---

Date Sampled	Station	Parameter	Silicon	Silver	Strontium	Sulfur	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc
		State	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
		Units	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
		Water Quality Guideline (if applicable)		1.5 (lt), 3 (st)								10 (lt), 55 (st)
		Sample Depth										
2024-11-26	Schooner 5 bottom	19	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 6 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 6 middle	4.5	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 6 bottom	10	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 10 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-26	Schooner 14 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 3 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 3 middle	6	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 3 bottom	12	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 4 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 4 middle	6	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 4 bottom	12	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 5 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 5 middle	10	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 5 bottom	20	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 6 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 6 middle	6	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 6 bottom	11	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 10 top	1	---	---	---	---	---	---	---	---	---	---
2024-11-28	Schooner 14 top	1	---	---	---	---	---	---	---	---	---	---
2024-12-09	Schooner 3 top	1	1540	<0.05	6740	874	<0.05	<1	<5	2.55	1.97	<3
2024-12-09	Schooner 3 middle	6	1570	<0.05	6920	816	<0.05	<1	<5	2.57	2.03	<3
2024-12-09	Schooner 3 bottom	12	1500	<0.05	6730	803	<0.05	<1	<5	2.49	1.74	5.4
2024-12-09	Schooner 4 top	1	1460	<0.05	6310	748	<0.05	<1	<5	2.3	2.08	<3
2024-12-09	Schooner 4 middle	5	3040	<0.05	13200	1620	<0.05	<1	<5	4.84	3.55	<3
2024-12-09	Schooner 4 bottom	13	2150	<0.05	8120	967	<0.05	<1	<5	3.13	1.7	<3
2024-12-09	Schooner 5 top	1	1630	<0.05	6930	831	<0.05	<1	<5	2.65	1.88	<3
2024-12-09	Schooner 5 middle	10	1540	<0.05	6670	847	<0.05	<1	<5	2.58	2	<3
2024-12-09	Schooner 5 bottom	20	1480	<0.05	6560	792	<0.05	<1	<5	2.45	2.17	<3
2024-12-09	Schooner 6 top	1	1590	<0.05	7020	834	<0.05	<1	<5	2.59	2.1	<3
2024-12-09	Schooner 6 middle	7	1500	<0.05	6920	839	<0.05	<1	<5	2.71	2.2	<3
2024-12-09	Schooner 6 bottom	14	1510	<0.05	6630	812	<0.05	<1	<5	2.62	1.99	3.5
2024-12-09	Schooner 10 top	1	1540	<0.05	6770	834	<0.05	<1	<5	2.6	2.33	<3
2024-12-09	Schooner 14 top	1	1550	<0.05	6710	786	<0.05	<1	<5	2.59	2.25	<3

*Value minimally exceeds the criteria. In addition, the criteria is a long-term exposure limit, and as this exceedance was likely a brief elevation, is unlikely to exceed over the long-term.

^Value is most likely an error, as it differs so greatly from the others

lt=long term, st=short term

APPENDIX D

CANNON WWTP

Appendix D1 Cannon WWTP Effluent Flow 2024 (m^3/day)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	49	57	53	40	28	30	43	34	0	24	28	---
2	45	53	35	21	27	33	37	37	0	16	31	---
3	42	54	51	33	28	41	39	39	0	16	30	---
4	43	54	54	33	32	44	36	45	63	18	27	---
5	44	45	49	33	34	42	36	45	26	19	21	---
6	31	45	46	38	28	37	35	41	44	19	28	---
7	48	43	43	36	29	34	35	41	33	20	15	---
8	46	42	43	32	28	22	37	33	25	21	9	---
9	68	28	41	29	28	31	23	40	39	20	5	---
10	85	40	42	30	16	30	41	40	23	19	---	---
11	70	51	25	30	30	22	37	38	35	19	---	---
12	64	47	43	15	32	26	40	38	30	18	---	---
13	60	47	42	34	31	28	36	37	21	19	---	---
14	59	42	38	32	27	26	32	30	23	21	---	---
15	55	40	37	35	27	29	34	34	36	21	---	---
16	47	38	27	30	30	29	34	35	34	19	---	---
17	48	42	36	31	33	33	36	42	35	21	---	---
18	37	41	38	25	36	29	33	41	29	18	---	---
19	47	42	37	32	38	26	16	37	26	23	---	---
20	53	37	35	32	38	29	34	34	30	81	---	---
21	64	38	34	34	44	29	36	31	18	57	---	---
22	80	39	35	28	34	13	34	30	31	34	---	---
23	94	24	36	28	32	33	37	28	36	28	---	---
24	77	46	42	27	16	37	31	42	28	28	---	---
25	53	42	42	32	33	31	29	35	23	23	---	---
26	63	37	37	18	51	30	27	40	22	25	---	---
27	58	36	36	33	49	37	34	36	25	24	---	---
28	89	56	35	37	50	38	36	37	24	29	---	---
29	115	53	37	32	50	26	33	34	22	28	---	---
30	74	---	38	31	49	40	33	24	19	28	---	---
31	68	---	39	---	30	---	33	33	---	21	---	---
Min	31	24	25	15	16	13	16	24	18	16	5	---
Max	115	57	54	40	51	44	43	45	63	81	31	---
Mean	61	43	40	31	33	31	34	36	30	25	22	---
Total Flows	1,876	1,259	1,226	921	1,038	935	1,057	1,131	800	777	194	---

Notes:

Shading indicates exceedance of regulatory limit (68 m^3/day).

Annual Min	**5**
Annual Max	**115**
Annual Mean	**36**

Appendix D2 Cannon WWTP Compliance and Treatment Plan Performance 2024

Date	Influent			Secondary Effluent (Undisinfected)					
	TSS (mg/L)	BOD (mg/L)	FC (CFU/100 mL)	TSS (mg/L)	BOD (mg/L)	CBOD (mg/L)	FC (CFU/100 mL)	NH_3 (mg/L N)	pH
Regulatory Limit				60		45			
January	456	445	960,000	3	8	6.35	1,400	<0.1	6.8
February	214	238	0	29	7	4.5	280,000	07.93	7.2
March	73	86	1,400,000	4	10	3.36	1,200	01.92	7.0
April	580	593	11,000,000	8	11	4.33	47,000	012.3	7.6
May	26	53	5,100,000	7	13	5.03	810,000	023.9	7.3
June	176	204	9,200,000	13	10	10.7	56,000	020	7.5
July	31	124	3,900,000	28	30	21.8	210,000	047.2	7.6
August	58	251	21,000,000	72	30	23.5	410,000	055.3	7.6
September	95	218	79,000,000	12	14	3.4	890,000	033	7.6
October	41	67	6,000,000	2	6	<3	9,500	<0.1	6.7
November	---	---	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---	---	---
Mean	175	228	15,284,444	18	14	8	271,510	19.6	7.3
Min	26	53	960,000	2	6	<3	1,200	<0.10	6.7
Max	580	593	79,000,000	72	30	23.5	890,000	55.3	7.6
N	10	10	9	10	10	12	10	10.0	10
Mean Daily Loading	kg/day			kg/day				kg/day	
	6.3	---	---	0.6	---	---	---	0.7	---

Notes:
TSS = total suspended solids, BOD = biochemical oxygen demand, CBOD = carbonaceous biochemical oxygen demand, FC = fecal coliforms, NH_3 = ammonia
Shading indicates exceedance of regulatory limit, --- no sample

APPENDIX E

PORT RENFREW WWTP

Appendix E1 Port Renfrew WWTP Effluent Flow 2024 (m^3/day)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	53	70	87	46	39	39	42	56	47	34	64	43
2	43	50	75	28	41	49	38	57	43	36	53	39
3	41	44	70	35	39	71	31	49	37	32	50	32
4	57	38	61	35	37	74	32	51	33	56	117	32
5	61	32	44	30	44	57	33	45	30	50	65	34
6	74	30	40	30	49	41	33	37	34	44	45	45
7	47	25	31	37	46	43	35	50	36	34	36	119
8	55	34	42	71	38	39	32	42	36	40	39	75
9	106	27	46	82	32	47	35	44	25	38	74	50
10	71	32	75	52	34	30	32	54	32	40	62	44
11	54	54	67	47	43	28	32	49	32	41	79	34
12	43	56	76	55	39	28	33	47	28	34	81	31
13	52	43	56	45	30	32	35	48	39	39	129	43
14	56	36	39	42	29	28	37	41	46	66	103	80
15	54	30	35	35	32	34	30	36	46	48	63	64
16	39	32	32	32	34	32	35	41	43	50	81	65
17	38	47	30	31	33	43	33	42	34	48	86	103
18	27	49	28	29	35	37	30	47	34	168	62	124
19	68	43	26	25	35	25	28	54	29	379	49	98
20	56	27	26	35	38	34	39	43	29	238	68	84
21	53	30	28	35	46	30	37	52	30	134	64	72
22	66	34	31	29	37	34	32	46	37	89	57	84
23	72	32	37	27	35	32	30	54	43	61	70	82
24	69	34	35	30	34	32	32	78	41	45	55	64
25	87	64	35	37	34	30	37	55	69	39	48	80
26	71	52	28	47	47	32	30	54	71	80	40	108
27	106	37	40	54	52	28	40	57	68	85	32	84
28	164	103	41	66	46	32	39	45	55	78	34	111
29	117	87	56	49	52	45	51	42	43	50	41	98
30	78	---	49	41	46	40	57	47	45	53	50	114
31	70	---	38	---	32	---	44	48	---	53	---	81
Min	27	25	26	25	29	25	28	36	25	32	32	31
Max	164	103	87	82	52	74	57	78	71	379	129	124
Mean	66	44	45	41	39	38	36	49	40	74	63	72
Total Flows	2,047	1,270	1,399	1,235	1,207	1,146	1,105	1,509	1,214	2,279	1,897	2,217

Notes:
Shading indicates exceedance of regulatory limit (220 m^3/day).

Annual Min	**25**
Annual Max	**379**
Annual Mean	**51**

Appendix E2 Port Renfrew WWTP Compliance and Treatment Plant Performance 2024

Date	Influent			Secondary Effluent					
	TSS (mg/L)	BOD (mg/L)	FC (CFU/ 100 mL)	TSS (mg/L)	BOD (mg/L)	CBOD (mg/L)	FC (CFU/ 100 mL)	NH_3 (mg/L N)	pH
Regulatory Limit				60		45			
January	50	114	850,000	4	3	04	2500	<0.1	6.7
February	330	0289	4,500,000	9	10	5.75	2600	<0.1	6.6
March	227	0369	7,500,000	5	5	<4	31000	<0.1	7.8
April	1150	0827	17,000,000	14	5	<3	14000	<0.1	6.9
May	460	0420	25,000,000	34	30	8.15	14000	00.407	6.5
June	308	0395	6,600,000	31	21	4	6400	00.15	6.7
July	570	0425	23,000,000	54	32	4	65000	01.2	6.0
August	660	0645	5,400,000	10	5	<3	6900	00.9	7.7
September	528	0665	6,700,000	24	18	4.6	7300	00.17	7.2
October	43	096	1,300,000	14	7	<3	21000	00.177	6.8
November	252	0194	180,000	9	7	<3	8600	00.117	7.6
December	164	0247	5,700,000	12	7	<4	5800	<0.1	6.5
Mean	395	272	4,598,075	18	12	3	9,882	0.3	6.9
Min	43	<89	180,000	4	3	<3	2,500	<0.1	6.0
Max	1,150	827	25,000,000	54	32	8	65,000	1.2	7.8
N	12	12	12	12	12	12	12	12.0	12
Mean Daily Loading	kg/day			kg/day				kg/day	
	20	---	---	0.6	---	---	---	0.01	---

Notes:
TSS = total suspended solids, BOD = biochemical oxygen demand, CBOD = carbonaceous biochemical oxygen demand, FC = fecal coliforms, NH_3 = ammonia
--- data not calculated.
Shading indicates regulatory exceedance.

APPENDIX F

BURGOYNE BAY WASTE TRANSFER FACILITY

Appendix F1 Burgoyne Bay Waste Transfer Facility Septage Concentrations 2024

Regulated Parameters (mg/kg dry)	Class A Biosolids Limit (mg/kg dry)*	# of samples	Jan	Apr	Jul	Oct	Mean
Metals							
arsenic	75	4	3.43	3.28	2.53	3.67	3.23
cadmium	20	4	2.04	1.8	1.04	2.28	1.79
chromium	1,060	4	12	11.5	10.2	12.4	11.53
cobalt	151	4	3.01	2.64	1.39	1.81	2.21
copper	757	4	624	517	543	464	537
lead	505	4	11.4	11.4	13.9	13.9	12.7
mercury	5	4	0.75	0.776	0.366	0.415	0.58
molybdenum	20	4	6.06	5.95	5.53	6.11	5.91
nickel	181	4	13.6	13.2	11.7	12.2	12.7
selenium	14	4	2.39	2.41	2.44	2.71	2.49
thallium	5	4	<0.05	<0.05	<0.05	<0.05	<0.05
vanadium	656	4	5.7	5.6	5.4	7	5.93
zinc	1,868	4	729	707	894	722	763
Unregulated Parameters (mg/kg dry)	**Class A Biosolids Limit (mg/kg dry)***	**# of samples**	**Jan**	**Apr**	**Jul**	**Oct**	**Mean**
Conventionals							
moisture	n/a	4	98	98	99	98	98
Metals							
aluminum	n/a	4	5,160	5,270	11,300	14,900	9,158
antimony	n/a	4	1.3	1.25	1.62	1.77	1.49
barium	n/a	4	95.9	97.2	77.8	101	93.0
beryllium	n/a	4	<0.2	<0.2	<0.2	<0.2	<0.2
bismuth	n/a	4	29.8	27.3	111	29.1	49.3
boron	n/a	4	35.8	34.8	34.5	43.4	37.1
calcium	n/a	4	15,200	15,800	12,400	15,100	14,625
iron	n/a	4	3,790	3,750	3,210	4,200	3,738
lithium	n/a	4	2.27	2.02	2.74	2.75	2.45
magnesium	n/a	4	3,100	2,950	2,530	3,610	3,048
manganese	n/a	4	137	136	155	206	159
potassium	n/a	4	12100	11700	8820	12600	11305
silver	n/a	4	6,570	6,230	4,970	7,090	6,215
sodium	n/a	4	2.77	2.81	3.52	3.97	3.27
soluble (2:1) pH	n/a	4	5,420	5,180	11,100	7,570	7,318
strontium	n/a	4	5.91	6.09	5.75	7.23	6.25
tin	n/a	4	51.8	51.1	45.7	63.6	53.1
titanium	n/a	4	27.9	25.5	25	20.7	24.78
total solids	n/a	4	47.9	42.7	50.6	66.2	51.85
tungsten	n/a	4	1.8	1.8	1.2	1.9	1.68
uranium	n/a	4	0.7	0.71	0.62	1.13	0.8
zirconium	n/s	4	0.69	0.695	0.561	0.596	0.64

Notes:
Shading indicates exceedance of regulatory limit.
--- sample was not collected.
** From Organic Matter Recycling Regulation (B.C. Reg. 18/2002, Schedule 4 Section 3, February 28, 2019) which references Trade Memorandum T-4-93 'Safety Guidelines for Fertilizers and Supplements' (Sept 1997) and contains maximum acceptable metal concentrations based on annual application rates (mg metal/kg product) 4400 kg/ha –yr.*