



**Seaway (Port Colborne) Wastewater
Treatment Plant
Annual Performance Report –
Treatment and Collection
Reporting Year: 2023**

Table of Contents:

Seaway Wastewater Treatment Plant Annual Performance Report (SW-T)

Table of Contents:.....	1
List of Tables:.....	2
List of Figures:	2
SW-T-1 Wastewater Treatment Process Description	4
SW-T-2 Review of Plant Flows, Influent and Imported Sewage Sampling and Monitoring	6
Review of 2023 Plant Flows.....	6
Review of Influent Sampling and Monitoring Activities.....	7
Review of Imported Sewage Sampling and Monitoring.....	8
Review of Final Effluent Sampling and Monitoring Activities.....	10
Effluent Quality Assurance Measurements and Control Measures	11
Deviations from Scheduled Monitoring Program.....	14
SW-T-3 Description of Operating Problems Encountered and Corrective Actions Taken	14
SW-T-4 Summary of Major Maintenance Activities and Capital Works	14
Summary of Maintenance Carried out on Major Equipment	14
Planned Capital Upgrades	15
Summary and Update of Notice of Modifications Completed	15
Proposed Works – Status Update.....	15
SW-T-5 Summary Calibration Activities.....	15
Flow Meter Calibration – Influent, Effluent and Imported Sewage	15
Effluent Monitoring Equipment Calibration/Verification	16
SW-T-6 Solids Handling	17
Processed Organics Received.....	17
Volumes of Sludge Generated and Removed From Site	17
Sludge Quality Monitoring.....	18
SW-T-7 Complaints	19
SW-T-8 Bypasses, Overflows, Other Situations Outside Normal Operating, Spills and Abnormal Discharge Events	19
Bypasses and Overflows.....	19
Situations Outside of Normal Operating Conditions.....	21
Spills	21
Abnormal Discharges.....	21
SW-T-9 Summary of Efforts to Achieve Conformance with F-5-1 and/or F-5-5.....	22
Summary of Efforts – Procedure F-5-1 – Secondary Treatment Equivalent	22
Summary of Efforts – Procedure F-5-1 – Sewage Bypass/Overflow from Nominally Separated System	22
Excess Primary Treatment Capacity.....	22
Industrial Waste	23
Summary of Efforts – Procedure F-5-5	23

List of Tables:

Table SW-T-1: Table of Seaway WWTP 2023 Treated and Imported Sewage Flows..... 6
Table SW-T-2: Table of Imported Sewage monthly average analysis results..... 9
Table SW-T-3: Evaluation of Final Effluent sample results to ECA objectives and compliance limits 10
Table SW-T-5: Annual Summary of Plant and Imported Sewage Flows, Influent and Effluent Sampling and Monitoring Results 12
Table SW-T-4: Table of 2023 sampling schedule deviations..... 14
Table SW-T-6: Summary of Flow Meter Calibration 16
Table SW-T-7: Summary of Calibration/Verification of Effluent Monitoring Equipment 16
Table SW-T-8: Summary of Sludge Removed from Site 17
Table SW-T-9: Summary of Monthly Average Sludge Results 18
Table SW-T-10: Annual Summary of Overflow Events by Month 19
Table SW-T-11: 2023 Seaway WWTP Overflow Sampling Results 20
Table SW-T-12: Summary of spills occurring at the Seaway WWTP during the reporting year21

List of Figures:

Figure SW-T-1: Graph displaying the Monthly Average Daily Flow Rate in MLD 7
Figure SW-T-2: Figure of monthly plant loadings to the Seaway WWTP for Total Biological Oxygen Demand (TBOD), Total Suspended Solids (TSS), Total Kjeldahl Nitrogen (TKN) and Total Phosphorus (TP), in kilograms per day (kg/d), for the period 2021 to 2023..... 8

Seaway Wastewater Collection System Annual Performance Report (SW-C)

List of Tables..... 3
 List of Figures 3
 SW-C-1 Overview of the Seaway WWTP Collection System 24
 SW-C-2 Summary and Interpretation of Collection System Monitoring Data..... 26
 Monitoring of Pump Station Operations 26
 Sanitary Sewer Closed-Circuit Television Inspection Program 26
 Flow Monitoring..... 27
 SW-C-3 Summary of Operating Issues Encountered and Corrective Actions Taken 27
 Pump Stations and Forcemains 27
 Gravity Trunk Sewers 27
 SW-C-4 Summary of Major Maintenance, Capital Projects and Pre-Authorized Alterations.... 27
 Summary of Maintenance Carried out on Major Equipment 27
 Planned Capital Upgrades 28
 Summary of Pre-Authorized Alterations Undertaken 28
 SW-C-5 Summary of Calibration Activities 29
 SW-C-6 Summary of Complaints..... 29
 SW-C-7 Summary of Collection System Overflows and Spills..... 29
 Collection System Overflows 29
 Collection System Spills..... 31
 SW-C-8 Summary of Efforts to Reduce WWTP Bypasses/Overflows and Collection System
 Overflows..... 31
 Projects Undertaken to Reduce Bypasses or Overflows..... 31
 Public Reporting of Bypasses and Overflows 32

List of Tables

Table SW-C-1: CCTV Program Summary 27
 Table SW-C-2: Summary of Collection System Calibration Activities 29
 Table SW-C-4: Collection System Overflow Event Details 30
 Table SW-C-3: Summary of Spills Occurring in the Seaway Collection System..... 31

List of Figures

Figure SW-C-1: Map of Seaway WWTP Collection System 25

SW-T-1 Wastewater Treatment Process Description

The Seaway (Port Colborne) Wastewater Treatment Plant (WWTP) is located at 30 Prosperity Avenue in the City of Port Colborne and provides wastewater treatment to areas within the City of Port Colborne. The Seaway WWTP is a class III conventional activated sludge treatment facility designed to treat an average daily flow (ADF) of 19,600 cubic meters per day (m³/d). This facility has a design peak flow rate up to 45,360 m³/d. Flows more than 45,360 m³/d are diverted to a storm water tank to be reintroduced later for treatment or in cases of excessive flows, to overflow to the environment in order to protect WWTP assets.

The Seaway WWTP operates under the following MECP approvals:

Environmental Compliance Approval (Sewage): 8325-AWPRYR, Issued June 13, 2018

Environmental Compliance Approval (Air): 8-2080-95-006, Issued June 19, 1995

The Seaway WWTP uses the following processes to treat wastewater:

- Imported Sewage Receiving
- Screening
- Grit Removal
- Primary Treatment
- Phosphorus Removal
- Secondary Treatment
- Disinfection (Chlorination/Dechlorination)
- Solids Handling – sludge digestion, storage and transportation
- Storm Treatment

Imported Sewage Receiving Station: To provide service to Niagara Region residents and businesses outside of the wastewater collection system servicing area, the Seaway WWTP accepts imported sewage from commercial haulers as well as recreational vehicle holding tank disposals. Receiving stations are situated to ensure all received sewage receives full treatment.

Screening: Mechanically cleaned screens remove rags and large debris that could damage pumps and process equipment downstream. Screenings are collected and sent for disposal in landfill.

Grit Removal: Grit vortex tanks each equipped with a mixer separate heavy suspended materials such as sand and gravel (grit) from lighter organic particles that are kept in suspension and pass through the tanks with the wastewater for further treatment. The grit is collected, dewatered and sent for disposal at landfill.

Primary Treatment: Large rectangular clarifiers cause the flow of wastewater to slow down, allowing lighter solids to settle to the bottom or float to the surface. A raking system (flights and

chains) rakes the solids (sludge) settled at the bottom of the tanks into a hopper where it is pumped to the primary digester for further treatment. The raking system also pushes floating solids such as oils and grease into a collection trough where it is also pumped to the primary digester. The remaining clarified wastewater flows over a weir and onto secondary treatment and phosphorous removal processes.

Phosphorus Removal: A coagulant, ferric chloride, is added to the treatment process to aid in phosphorus and suspended solids removal.

Secondary Treatment:

Aeration Tank: Aeration tanks are used to remove dissolved solids, nutrients and suspended organics. Diffused air is bubbled throughout the wastewater to encourage microorganisms (or “bugs”) to consume material in the wastewater. The mixture of wastewater and microorganisms is known as mixed liquor and moves on to secondary clarification.

Secondary Clarifiers: Secondary clarifiers receive effluent from the aeration tanks in the form of mixed liquor. The flow of wastewater is slowed allowing solids to settle quickly leaving a clear clarified effluent on top. The clarified effluent water flows over a weir and onto further treatment. The solids settled at the bottom of the clarifier is a mixture of microorganisms and settled solids and is called activated sludge. Activated sludge is pumped back to the front of the aeration tanks to ensure a large healthy microbial population exists for continuous treatment. Excess activated sludge is ‘wasted’ or removed from the process and sent to the primary clarifiers for thickening.

Disinfection (chlorination/dechlorination):

Chlorine in the form of liquid sodium hypochlorite is added into the effluent stream for pathogen control year-round. Adequate contact time is provided in the chlorine contact chamber. As chlorine can be toxic to aquatic species, disinfected effluent is dechlorinated with a sodium bisulphite solution before being discharged to the Welland Canal.

Solids Handling

Anaerobic Digestion: Sludge is pumped from the primary clarifiers to the primary digesters. Sludge undergoes anaerobic digestion to break down wastes and to form a thicker digested sludge. Digested sludge from site is transported to the Garner Road Biosolids Facility for dewatering and further treatment to produce a product which can be used for land application or as fertilizer.

Storm Treatment: During times of wet weather, inflow and infiltration (I&I) can occur in the collection system resulting in high flows of sewage and storm water to the treatment plant. To protect the plant processes from high flows, flows greater than the design peak flow of 45,360 m³/d are diverted to a storm water system. Storm flows diverted to the storm treatment system receive screening, grit removal, settling (solids removal), chlorination and dechlorination prior

to discharge to the Welland Canal via the WWTP outfall. The storm system includes a storage tank that, during wet weather, can hold approximately 5,670 m³. This volume is returned to the plant for full treatment when wet weather events are over.

SW-T-2 Review of Plant Flows, Influent and Imported Sewage Sampling and Monitoring

Review of 2023 Plant Flows

Table SW-T-1 below outlines the volume of sewage treated at the Seaway WWTP during the reporting year. It also outlines the volume of Imported Sewage that was received at the site for treatment.

Table SW-T-1: Table of Seaway WWTP 2023 Treated and Imported Sewage Flows

Flow Statistic	Value
Design Average Daily Flow (ML/d)	19.600
Design Peak Flow Rate (ML/d)	45.360
Total Volume Processed (ML)	4,157.770
Annual Average Daily Flow (MLD)	11.391
% Annual Average Daily Flow Utilization	58%
% Increase/Decrease over prior year	11%
Volume Imported Sewage Received (ML)	26.242
% Increase/Decrease Imported Sewage over prior year	4%
Imported Sewage as % of Flow	0.63%

Reviewing the treated flows in 2023, it was observed that, on average, the plant utilized 58% of its design Average Daily Flow (ADF). This indicates that the facility has the hydraulic capacity to meet the needs of the collection system with room for additional flows that may be added from future developments. Where the average becomes greater than 80%, plant expansion should be considered.

Daily flows to the plant were reviewed. In 2023, there were 35 instances where the flow to the plant was greater than the design Average Daily Flow, amounting to approximately 10% of the year. These instances occurred during times of wet weather or heavy snow melt suggesting increased flows are occurring due to Inflow and Infiltration.

A review of the monthly average daily flow rate for the prior 10-year period was completed. This can be observed below in Figure SW-T-1 below. There has been a small decline in average daily flows over the 10-year period possibly the result of improvements in the

collection system or changes in weather patterns. Spikes during typical wet weather seasons further support increased flows are occurring due to Inflow and Infiltration.

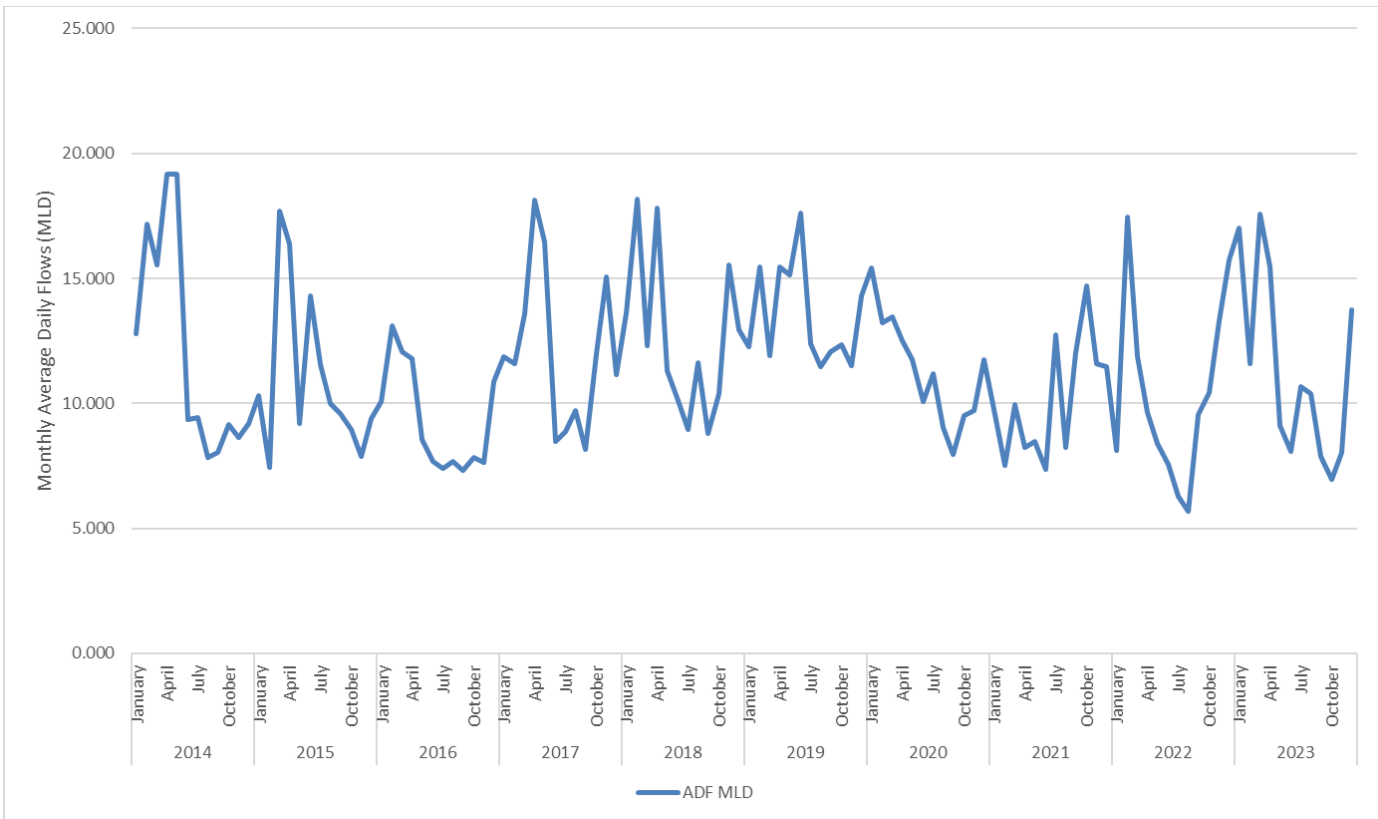


Figure SW-T-1: Graph displaying the Monthly Average Daily Flow Rate in MLD

The volume of Imported Sewage received at this facility did not significantly change in 2023 with an increase of 4% observed over the prior reporting period. The imported sewage received at Seaway WWTP largely originates from rural residential sources in Port Colborne and the surrounding municipalities.

Review of Influent Sampling and Monitoring Activities

In 2023, 103 samples of influent were collected and tested. An annual summary of influent sampling can be observed in Table SW-T-4.

Although the volume of sewage is an important consideration for the effective operation of a wastewater treatment plant, another important factor to monitor is plant loading. Plant loading displays if the strength of the sewage received at the plant is getting stronger or weaker. Stronger sewage may impact the amount of sewage the plant can treat effectively.

Plant loading is calculated by measuring the average strength of a pollutant per liter of influent sewage and multiplying it by the average volume of sewage received. This is generally displayed as kilograms of pollutant per day or kg/d. Below in Figure SW-T-2, is a graph depicting four commonly monitored pollutant loadings to the plant for the period of 2021-2023.

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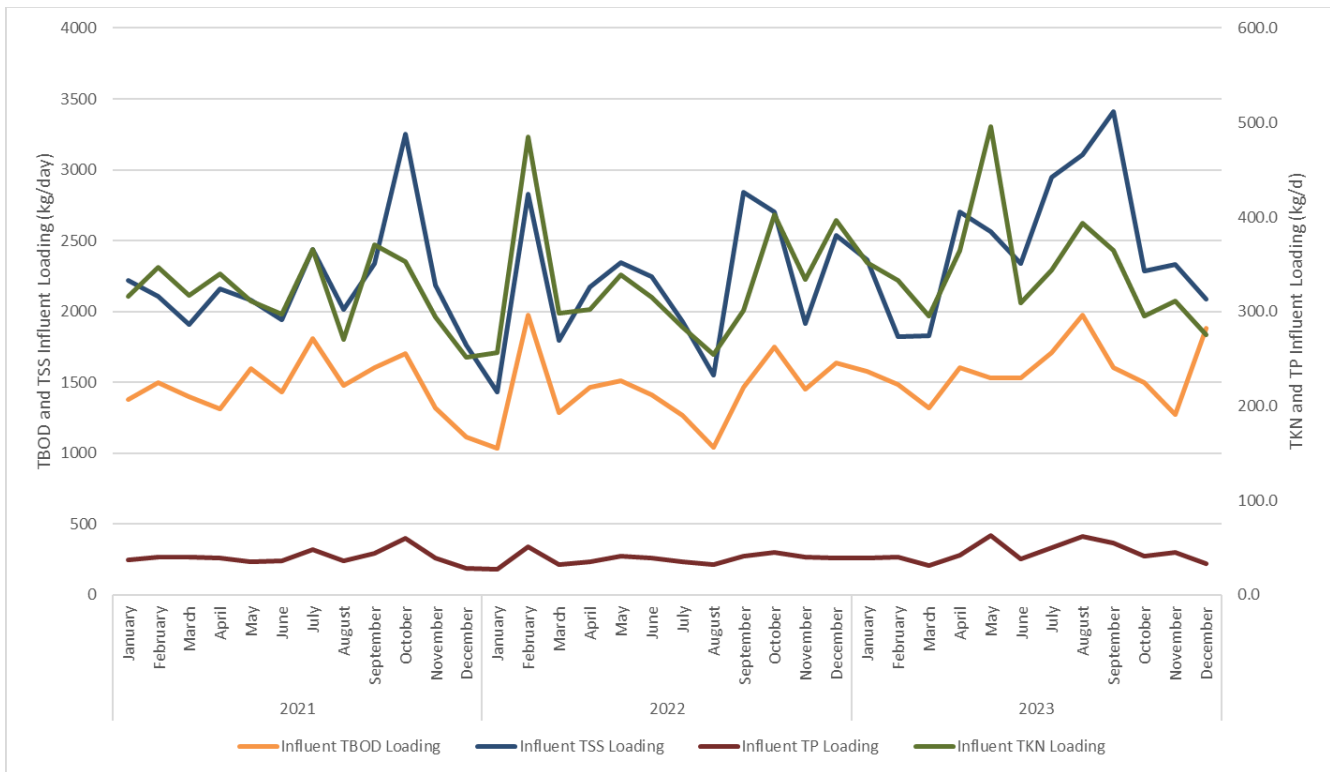


Figure SW-T-2: Figure of monthly plant loadings to the Seaway WWTP for Total Biological Oxygen Demand (TBOD), Total Suspended Solids (TSS), Total Kjeldahl Nitrogen (TKN) and Total Phosphorus (TP), in kilograms per day (kg/d), for the period 2021 to 2023.

Reviewing the calculated loadings for TBOD, TSS, TKN and TP for the past 3 years, influent loadings are up slightly indicating a minor increase in the strength of sewage being received at the site. Peaks in loading coincide with periods of increased imported sewage receipt at the plant. A slight increase in the loading has been observed and could be attributed to inflow and infiltration efforts ongoing in the City of Port Colborne. Loading trends will continue to be monitored.

Review of Imported Sewage Sampling and Monitoring

Imported Sewage is sampled bi-weekly to ensure sewage being received will not have an adverse impact to the treatment process or the beneficial re-use of biosolids resulting from the wastewater treatment process. In 2023, twenty-six (26) samples of Imported Sewage were collected and submitted for testing. Results were reviewed and compared to the Niagara Region Sewer Use By-law. Where exceedances of the by-law were noted, the source of the imported sewage is investigated. Exceedances of treatable parameters (BOD, TP, TSS, pH) are allowable under the SUBL.

Table SW-T-2: Table of Imported Sewage monthly average analysis results

Analyte	Units	SUBL Limit	January	February	March	April	May	June	July	August	September	October	November	December
T BOD	mg/L	300	445	255	370	2,457	2,436	260	300	448	3,529	2,249	5,271	590
Total Suspended Solids	mg/L	350	336	75	167	1,670	5,438	280	146	230	9,850	3,465	14,352	217
Total Kjeldahl Nitrogen	mg/L	100	274.0	118.5	120.5	1,487	1,570	74.3	102.5	213.0	668.5	198.0	1,822	143.5
Phosphorus	mg/L	10	33.1	13.9	15.3	91.1	116.6	9.1	11.6	20.9	305.9	25.6	232.5	14.6
Total Solids	mg/L	-	1,550	795	1,205	22,200	7,773	805	1,165	1,100	9,820	4,660	37,655	1,065
Total Volatile Solids	mg/L	-	655	320	580	4015	4957	405	570	535	6600	3177	17350	480
Arsenic	mg/L	1	0.03	0.02	0.01	0.04	0.06	0.02	0.02	0.02	0.03	0.01	0.11	0.02
Cadmium	mg/L	0.7	0.01	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.02	0.00	0.04	0.01
Chromium	mg/L	3	0.03	0.02	0.01	0.05	0.06	0.02	0.02	0.02	0.05	0.01	0.11	0.02
Cobalt	mg/L	5	0.01	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.04	0.01
Copper	mg/L	3	0.40	0.08	0.47	1.44	0.92	0.20	0.33	0.03	1.61	0.17	0.14	0.14
Lead	mg/L	1	0.03	0.02	0.02	0.10	0.06	0.02	0.02	0.02	0.08	0.01	0.11	0.02
Mercury	ug/L	10	0.35	0.06	0.05	0.36	0.42	0.05	0.05	0.05	4.67	0.50	1.25	0.06
Molybdenum	mg/L	5	0.02	0.01	0.00	0.02	0.05	0.00	0.00	0.00	0.04	0.01	0.03	0.01
Nickel	mg/L	2	0.01	0.01	0.01	0.02	0.06	0.01	0.01	0.01	0.07	0.01	0.04	0.01
Selenium	mg/L	1	0.04	0.02	0.01	0.05	0.06	0.02	0.02	0.02	0.03	0.01	0.11	0.02
Zinc	mg/L	3	0.68	0.15	0.34	2.05	2.50	0.20	0.20	0.13	4.80	0.49	0.62	0.25
Aluminum	mg/L	-	0.94	0.13	1.13	5.17	6.89	1.37	0.26	2.22	526.31	1.35	1.26	1.14
Antimony	mg/L	5	0.06	0.03	0.02	0.07	0.11	0.03	0.03	0.03	0.06	0.03	0.26	0.04
Barium	mg/L	-	0.07	0.05	0.05	0.27	0.19	0.06	0.02	0.03	1.17	0.06	0.12	0.04
Beryllium	mg/L	-	0.03	0.02	0.01	0.04	0.06	0.02	0.02	0.02	0.03	0.01	0.11	0.02
Boron	mg/L	-	0.60	0.30	3.15	0.80	1.13	0.30	0.30	0.30	0.70	0.27	2.60	0.40
COD	mg/L	-	825	503	932	6,600	9,224	627	697	1,040	10,923	7,017	12,910	1,024
Conductivity	us/cm	-	3,115	1,660	1,930	33,955	9,662	1,204	1,800	2,360	2,075	2,507	29,125	1,910
Iron	mg/L	-	3.39	2.71	1.84	5.40	9.19	0.74	0.48	0.66	17.77	1.85	0.94	1.81
Manganese	mg/L	-	0.34	0.14	0.14	0.32	0.52	0.06	0.06	0.07	1.55	0.11	0.31	0.14
pH		6-11	7.6	7.7	7.4	8.2	7.8	7.5	7.5	7.5	7.1	7.0	8.5	7.5
Silver	mg/L	5	0.03	0.02	0.01	0.04	0.09	0.02	0.02	0.02	0.03	0.01	0.11	0.02
Tin	mg/L	5	0.07	0.03	0.06	0.07	0.11	0.03	0.03	0.04	0.07	0.05	0.26	0.04
Vanadium	mg/L	-	0.01	0.01	0.01	0.02	0.04	0.01	0.01	0.01	0.02	0.01	0.05	0.02

Review of Final Effluent Sampling and Monitoring Activities

In 2023, there were 103 samples of final effluent collected and tested. Individual as well as monthly average results are reviewed and compared to the objective and compliance limits stated in the facility’s ECA.

Table SW-T-3 below summarizes the number of monthly objective and compliance limit exceedances at the Seaway WWTP during the reporting year.

Table SW-T-3: Evaluation of Final Effluent sample results to ECA objectives and compliance limits

Parameter	ECA Monthly Concentration Objective	ECA Monthly Concentration Limit	ECA Annual Concentration Limit	Number of Objective Concentration Exceedances	Number of Monthly Limit Concentration Exceedances	Annual Average Concentration (mg/L)	Monthly Loading Limit (kg/d)	Annual Loading Limit (kg/d)	Number of Monthly Loading Limits Exceeded	Annual Average Loading (kg/d)
pH ¹	6.0-9.5	6.0-9.5	-	0	0	-	-	-	-	-
Carbonaceous Biochemical Oxygen Demand (CBOD)	15 mg/L	-	25 mg/L	0	-	4.1	-	490	-	46
Total Suspended Solids (TSS)	15 mg/L	-	25 mg/L	0	-	4.8	-	490	-	55
Total Phosphorus (TP)	0.5 mg/L	0.77 mg/L	-	0	0	-	15.1	-	0	-
Total Residual Chlorine (TRC)	0.01 mg/L	0.02 mg/L	-	0	-	-	-	-	-	-
<i>E-Coli (geomean)</i>	200 MPN/100 mL	200 MPN/100 mL	-	0	0	-	-	-	-	-

¹ pH must meet objectives/limits at all times (inclusive)

Seaway WWTP did not have any instances where the monthly average for a pollutant exceeded the ECA objective or limits. The annual average concentrations and loadings were also achieved in 2023.

A review of individual sample results against ECA objectives was also completed. Below summarizes the percentage of samples that were over the ECA objective:

- CBOD – 0%
- TSS – 1%
- TP – 5%
- E.Coli – 0%

Final effluent sample results did not exceed the ECA objectives greater than 50% of the time. The plant continues to effectively treat all wastewater received for treatment. An annual summary of monthly average final effluent sample results can be observed in Table SW-T-4 below.

Effluent Quality Assurance Measurements and Control Measures

To ensure Seaway WWTP continues to produce a high-quality effluent the following measures have been implemented:

- Development and implementation of a Wastewater Quality Management System (WWQMS) program
 - This program promotes an environment of continuous improvement for all staff impacting the quality of wastewater
- Compliance samples are analyzed by an ISO 17025:2017 accredited laboratory unless sample results are required to be collected in the field at the time of sampling
- Standard Operating Procedures (SOPs) are in place to support proper sampling and field measurements
- A compliance sampling schedule is created each year to ensure regulatory requirements are being met, as a minimum
- Equipment used in the monitoring and measurement of Final Effluent quality are calibrated annually

Table SW-T-4: Annual Summary of Plant and Imported Sewage Flows, Influent and Effluent Sampling and Monitoring Results

Measured Parameter	January	February	March	April	May	June	July	August	September	October	November	December	Total / Average	Total Samples Collected
Influent - Monthly Average TSS (mg/L)	139	157	104	175	281	289	276	299	433	328	290	152	244	
Number of Influent TSS Samples	9	8	8	9	9	8	9	9	8	10	8	8		103
Influent - Monthly Average TBOD5 (mg/L)	93	128	75	104	168	189	160	190	204	215	158	137	152	
Number of Influent TBOD5 Samples	9	8	8	9	9	8	9	9	8	10	8	8		103
Influent - Monthly Average TP (mg/L)	2.3	3.5	1.8	2.7	6.9	4.7	4.7	6.0	7.0	5.9	5.6	2.4	4.5	
Number of Influent TP Samples	9	8	8	9	9	8	9	9	8	10	8	8		103
Influent - Monthly Average TKN (mg/L)	20.72	28.70	16.81	23.60	54.34	38.28	32.21	37.87	46.34	42.45	38.60	20.04	33.33	
Number of Influent TKN Samples	9	8	8	9	9	8	9	9	8	10	8	8		103
Total Plant Flows (ML)	526.909	324.705	544.358	463.697	282.706	242.639	331.022	321.823	236.296	215.757	241.479	426.379	4157.770	
Daily Average (MLD)	16.997	11.597	17.560	15.457	9.120	8.088	10.678	10.381	7.877	6.960	8.049	13.754	11.391	
Maximum Flow (ML)	43.393	31.491	41.530	38.486	15.278	12.498	22.519	24.889	24.939	11.904	18.715	32.942	MAX	43.393
Minimum Flow (ML)	9.374	7.585	10.700	8.489	6.853	6.580	6.410	6.676	5.721	5.714	6.075	7.445	MIN	5.714
Volume Imported Sewage Received (ML)	1.411	1.318	2.035	2.118	2.102	2.361	3.286	3.246	2.677	2.211	1.724	1.754	26.242	
Final Effluent - Monthly Average TSS (mg/L)	4.9	3.8	4.1	4.6	3.9	3.3	3.2	4.2	4.1	5.9	7.0	8.6	4.8	
Final Effluent - Average Daily TSS Loading (kg/d)	83	44	72	71	36	27	34	44	32	41	56	118	55	
Number of Final Effluent TSS Samples	9	8	8	9	9	8	9	9	8	10	8	8		103
Final Effluent - Monthly Average CBOD5 (mg/L)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.3	4.4	4.0	4.0	4.1	
Final Effluent - Average Daily CBOD5 Loading (kg/d)	68	46	70	62	36	32	43	42	34	31	32	55	46	
Number of Final Effluent CBOD5 Samples	9	8	8	9	9	8	9	9	8	10	8	8		103
Final Effluent - Monthly Average TP (mg/L)	0.15	0.20	0.13	0.13	0.14	0.17	0.25	0.28	0.34	0.42	0.24	0.26	0.23	
Final Effluent - Average Daily TP Loading (kg/d)	2.55	2.32	2.28	2.01	1.28	1.37	2.67	2.91	2.68	2.92	1.93	3.58	2.57	
Number of Final Effluent TP Samples	9	8	8	9	9	8	9	9	8	10	8	8		103
Final Effluent - Monthly Average TKN (mg/L)	0.89	1.23	0.80	0.98	1.01	1.01	0.97	1.01	1.05	1.26	1.15	1.10	1.04	
Number of Final Effluent TKN Samples	9	8	8	9	9	8	9	9	8	10	8	8		103
Final Effluent - Monthly Average NH3 (mg/L)	0.07	0.21	0.05	0.07	0.08	0.07	0.06	0.09	0.06	0.06	0.06	0.07	0.08	
Number of Final Effluent NH3 Samples	9	8	8	9	9	8	9	9	8	10	8	8		103
Final Effluent - Monthly Average NO3 (mg/L)	9.42	12.65	8.33	11.03	14.47	15.45	11.49	11.80	14.25	17.17	15.01	8.99	12.51	
Number of Final Effluent NO3 Samples	9	8	8	9	9	8	9	9	8	10	8	8		103
Final Effluent - Monthly Average NO2 (mg/L)	0.37	0.40	0.14	0.18	0.43	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.36	
Number of Final Effluent NO2 Samples	9	8	8	9	9	8	9	9	8	10	8	8		103
Final Effluent - Monthly Geomean E.Coli (mpn/100mL)	3	2	2	3	2	3	2	2	3	2	2	3	2	
Number of Final Effluent E.Coli Samples	9	8	8	8	10	8	8	10	8	9	9	8		103

Niagara Region – Seaway (Port Colborne) Wastewater System
 2023 Annual Performance and Summary Report - Treatment

Measured Parameter	January	February	March	April	May	June	July	August	September	October	November	December	Total / Average	Total Samples Collected
Final Effluent - Monthly Average TRC (mg/L)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Number of Final Effluent TRC Samples	31	28	31	30	31	30	31	31	30	31	30	31		365
Final Effluent - Monthly Average Temperature (°C)	9.96	10.13	10.91	13.47	15.20	18.41	19.82	19.41	21.56	19.43	18.89	16.36	16.13	
Number of Final Effluent Temperature Samples	9	8	8	9	9	8	9	9	8	10	9	8		104
Final Effluent - Monthly Average pH	7.18	7.10	7.09	7.11	7.06	6.98	7.14	7.12	7.29	7.20	6.72	7.54	7.13	
Number of Final Effluent pH Samples	9	8	8	9	9	8	9	9	8	10	9	8		104

Deviations from Scheduled Monitoring Program

Compliance sampling activities at the Seaway WWTP follow a scheduled monitoring program to ensure all provincial and federal requirements are met. A schedule is prepared for the upcoming year and is submitted to the MECP as part of the annual reporting requirement.

In 2023, three (3) deviations occurred from the scheduled sampling days. Table SW-T-5 below provides the instances where a deviation occurred and a reason for the deviation.

The 2024 sampling schedule is available upon request.

Table SW-T-5: Table of 2023 sampling schedule deviations

Sampling Date	Deviation	Sample Type(s)	Reason
2023-01-03		Digested sludge	No sample available
2023-03-02		Influent, Final Effluent	Operator error. No samples submitted.
2023-11-07		Final Effluent E.Coli	Sample not put in cooler. Submitted the following day.

SW-T-3 Description of Operating Problems Encountered and Corrective Actions Taken

There were no operating problems encountered in 2023.

SW-T-4 Summary of Major Maintenance Activities and Capital Works

Summary of Maintenance Carried out on Major Equipment

Niagara Region works to keep wastewater infrastructure in a state of good repair. Maintenance activities completed include regular preventative maintenance (PM) activities and normal and emergency equipment repair or replacement. Where a substantial amount of upgrade is required, this work is carried out under the capital works program.

Below is a summary of normal and emergency repairs carried out on major equipment at the Seaway WWTP:

- South primary clarifier head shaft replacement
- Grit valve actuator replacement
- Hot water boiler line repairs, blower building
- Imported sewage pump and area repairs

This list does not include PM activities. PMs are completed and tracked in a computerized maintenance management system. PMs completed during the reporting year are available upon request.

Planned Capital Upgrades

The following is a list of capital upgrades forecasted for the Seaway WWTP:

- Standby generator upgrades
- Electrical upgrades (MCC Panels)
- Ferric system upgrades (tank and piping replacement)
- Biosolids handling and digester refurbishment
- Influent channel repairs

Summary and Update of Notice of Modifications Completed

Through the facility ECA, MECP has given System Owners the ability to complete low risk changes to a treatment plant without requiring approval from the MECP. These modifications are documented on a Notice of Modification form and are signed off by the Owner or delegate of the system. Any pre-authorized modifications must be reported on annually to the MECP.

Ferric Chloride Storage Upgrades – October 2021

A Notice of Modification was submitted under ECA 8325-AWPRYR for the Seaway WWTP in October 2021 for the replacement of two ferric chloride storage tanks and all associated process piping with equivalent tanks and piping. At the end of 2022, one tank and associated process piping was put in place. A different tank manufacturer was used for the project and the tank size is a bit larger than the previous tanks. As a result, both tanks cannot fit into the existing spill containment area and a larger spill containment area needs to be constructed. The project is expected to conclude in 2025.

No new Notice of Modification forms were completed in the 2023 calendar year.

Proposed Works – Status Update

There were no Proposed Works to be reported on for the 2023 reporting period.

SW-T-5 Summary Calibration Activities

Flow Meter Calibration – Influent, Effluent and Imported Sewage

Flow meters measuring flows discharging to the environment are calibrated at minimum, once per calendar year. Below in

Table SW-T-6 provides a summary of flow meter calibration.

Table SW-T-6: Summary of Flow Meter Calibration

Meter Name	Date Calibrated	Comments
Seaway Final Effluent Meter	2023-04-18	Pass
Seaway Storm Flow Meter	2023-04-18	Pass
Seaway Final Effluent Meter	2023-11-08	Pass
Seaway Storm Flow Meter	2023-11-08	Pass

Calibration certificates are available upon request.

The volume of Imported Sewage received at site is reported by the sewage hauler on submitted paper manifests. No calibration required.

Effluent Monitoring Equipment Calibration/Verification

It is a requirement to calibrate, or, where unable to calibrate, verify equipment that is used to measure effluent quality.

Some effluent monitoring equipment calibration or verification is completed daily or as used by operations staff such as pH meter calibration or verification of the Total Residual Chlorine colorimeter.

Once annually, a third-party contractor performs calibration or verification on all effluent monitoring equipment. A summary of third-party calibration/verification activities are available in Table SW-T-7. below. Calibration certificates are available upon request.

Table SW-T-7: Summary of Calibration/Verification of Effluent Monitoring Equipment

Equipment Description	Date Calibrated	Comments
DR 1900 Spectrophotometer	2023-08-09	Pass
Chlorine Portable Pocket Colorimeter	2023-08-09	Pass
Symphony VWR Meter with pH	2023-08-09	Pass
HQ40D with DO probe	2023-08-09	Pass
COD Reactor (Hach DRB 200)	2023-08-09	Pass
Balance – Sartorius	2023-09-12	Pass
Balance – Mettler Toledo	2023-09-12	Pass

SW-T-6 Solids Handling

Processed Organics Received

No processed organics were received at the Seaway WWTP during the reporting period. Seaway does not typically receive processed organics.

Volumes of Sludge Generated and Removed From Site

Solids removed from the treatment process are thickened, digested and transported from site for further processing and beneficial re-use. All sludge removed from the Seaway WWTP is taken to Niagara Region’s Garner Road Biosolids Facility where it is stored, further thickened and either sent for land application or for dewatering and conversion to a pelletized fertilizer. Table SW-T-8 provides a summary of 2022 and 2023 sludge volumes removed from site.

Table SW-T-8: Summary of Sludge Removed from Site

Month	2023 Volume Sludge Hauled (ML)	Prior Year Volume Sludge Hauled (ML)
January	2.038	1.821
February	1.908	1.908
March	2.125	2.168
April	2.038	2.081
May	2.515	2.298
June	2.385	2.341
July	2.211	1.951
August	2.558	2.168
September	2.081	1.995
October	2.211	1.951
November	2.125	2.211
December	0.954	2.125
TOTAL	25.149	25.019

There was no significant change in the volume of sludge hauled from the facility in 2023. Seaway WWTP is equipped with two primary digesters that provide anaerobic digestion and storage of solids. The WWTP is currently operating with one primary digester in-service allowing for maintenance to take place on the other digester unit.

No changes are anticipated for sludge handling in 2024 at the Seaway WWTP.

Sludge Quality Monitoring

Sludge is sampled and analyzed bi-weekly to meet the regulatory requirements of the Garner Road Biosolids Facility ECA and to maintain our ability to beneficially re-use biosolids. Results are trended and compared to Nutrient Management Act (NMA) limits. Where a trend is detected, investigations are initiated to identify potential sources of the pollutant and correct any issue identified. Average monthly results for 2023 sludge analysis from the Seaway WWTP is included in Table SW-T-9 below.

Table SW-T-9: Summary of Monthly Average Sludge Results

Analyte	Units	NMA Limits	January	February	March	April	May	June	July	August	September	October	November	December
Total Solids	%	-	1.60	2.00	1.70	2.10	1.50	1.70	1.50	1.57	1.65	1.35	1.60	1.50
Ammonia as N	mg/Kg	-	370	235	300	250	355	235	260	253	245	175	225	385
Nitrate+Nitrite	mg/Kg	-	0.99	1.00	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00	1.00
Phosphorus	mg/Kg	-	9,933	17,250	19,500	18,100	23,350	21,050	21,750	24,533	19,000	20,250	20,400	20,450
Arsenic	mg/Kg	170	9.64	7.47	9.71	7.32	7.05	5.10	6.10	5.10	6.62	6.92	5.45	7.29
Cadmium	mg/Kg	34	0.25	0.50	0.50	0.63	0.55	0.50	0.50	0.63	0.65	0.60	0.55	0.50
Chromium	mg/Kg	2,800	22.81	37.65	44.55	39.13	55.70	43.00	44.70	46.53	40.15	43.35	48.10	60.55
Cobalt	mg/Kg	340	1.73	4.00	3.55	3.83	3.45	4.20	4.70	5.57	4.70	6.40	2.45	4.95
Copper	mg/Kg	1,700	233	376	420	415	415	516	523	535	555	581	514	531
Lead	mg/Kg	1,100	9.62	18.50	25.00	28.70	23.50	24.50	18.00	26.33	20.00	24.50	37.00	77.50
Mercury	mg/Kg	11	1.02	1.54	0.21	0.35	0.47	0.52	0.38	1.03	0.74	1.75	0.62	0.27
Molybdenum	mg/Kg	94	4.04	7.00	5.00	6.00	10.50	8.50	10.00	10.33	9.50	12.00	9.50	11.00
Nickel	mg/Kg	420	32.37	60.70	59.80	51.70	61.85	63.65	59.10	79.77	76.60	64.15	60.15	69.05
Potassium	mg/Kg	-	2,419	4,090	4,385	4,600	4,375	3,220	3,290	2,553	2,765	3,185	2,825	3,110
Selenium	mg/Kg	34	3.75	3.19	3.01	4.09	3.10	3.95	3.25	3.82	3.37	6.76	4.05	3.31
Zinc	mg/Kg	4,200	278	403	485	468	808	658	722	734	755	802	703	673

SW-T-7 Complaints

There were no complaints received in 2023 regarding the operation of the Seaway WWTP.

SW-T-8 Bypasses, Overflows, Other Situations Outside Normal Operating, Spills and Abnormal Discharge Events

Bypasses and Overflows

There was one (1) overflow event at the Seaway WWTP in 2023. Plant overflows from this facility receive preliminary treatment prior to discharge including screening, grit, settling (solids removal), chlorination and dechlorination. Table SW-T-10 provides a monthly breakdown of overflow events occurring at the Seaway WWTP during the reporting period.

Table SW-T-10: Annual Summary of Overflow Events by Month

Month	Number of Overflow Events	Total Volume (ML)
January	0	0.000
February	0	0.000
March	1	6.395
April	0	0.000
May	0	0.000
June	0	0.000
July	0	0.000
August	0	0.000
September	0	0.000
October	0	0.000
November	0	0.000
December	0	0.000
Total	1	6.395

Overflow events are sampled and submitted for analysis. Overflow events are to be sampled at the start of an event and every 8 hours during an event. Results for plant overflow event samples collected in 2023 are shown in Table SW-T-11 below.

Table SW-T-11: 2023 Seaway WWTP Overflow Sampling Results

Date	TBOD (mg/L)	Total Suspended Solids (mg/L)	Phosphorus (total) (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia as N (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	E.Coli (mpn/100 mL)
2023-03-04/ Event Start	20	3	0.12	0.80	0.13	4.60	0.10	1,000
2023-03-05/ Eight Hour Sample	20	17	0.38	3.50	1.60	2.00	0.10	199,000

Situations Outside of Normal Operating Conditions

The MECP defines “Normal Operating Conditions” as when all unit process(es), excluding Preliminary Treatment System, in a treatment train is operating within its design capacity.

The Seaway WWTP did not operate outside of Normal Operating Conditions during the reporting year.

Spills

Niagara Region strives to maintain and operate wastewater infrastructure so spills to the environment do not occur. However, circumstances arise where a spill occurs due to equipment malfunction, failure or other reasons. Occasionally, a planned spill may be required in order to safely complete required maintenance to critical equipment. In the event that this is necessary, approval from the MECP is obtained in advance.

All spills are reported to the MECP Spills Action Centre upon discovery and follow up written reports are completed and submitted to the MECP and Environment and Climate Change Canada as required by regulation. Below in Table SW-T-12 summarizes spills that occurred at the Seaway WWTP in 2023.

Table SW-T-12: Summary of spills occurring at the Seaway WWTP during the reporting year

Spill Date	MECP Incident Number	Description of Spill
No spills at the plant in 2023		

Abnormal Discharges

An abnormal discharge is a discharge to the environment that is abnormal in quality or quantity. There were no abnormal discharges from the Seaway WWTP during this reporting year.

SW-T-9 Summary of Efforts to Achieve Conformance with F-5-1 and/or F-5-5

Summary of Efforts – Procedure F-5-1 – Secondary Treatment Equivalent

Procedure F-5-1 states wastewater treatment facilities are to provide treatment of wastewater to a minimum of secondary treatment equivalence. This means the WWTP should be designed to meet objectives of 15 mg/L for CBOD and TSS and 1 mg/L for TP.

As demonstrated above in section SW-T-1 and Table SW-T-4, Seaway consistently achieved effluent quality that met or exceeded design objectives. The Final Effluent annual average quality achieved in 2023 was equivalent with the MECP design objectives for advanced treatment plants. The observed annual averages for both CBOD and TSS were less than 5 mg/L while the annual average TP concentration of the Final Effluent was less than 0.3 mg/L.

Summary of Efforts – Procedure F-5-1 – Sewage Bypass/Overflow from Nominally Separated System

Procedure F-5-1 states that bypasses and overflows from nominally separated systems are not allowed except in emergency situations. Emergency situations include protection from basement flooding, preventing damage to WWTP equipment or pumping stations or to prevent treatment process washout.

The Seaway WWTP experiences high flow conditions that require overflows to occur due to inflow and infiltration in the collection system to prevent emergency situations. Being a two-tier system, Niagara Region works closely with the City of Port Colborne to reduce overflows at the wastewater treatment plant. Niagara Region participates in a cost sharing strategy with lower tier municipalities to fund overflow reduction projects. In 2023, Niagara Region had an approved budget totaling \$4.0M for the overflow reduction cost sharing program. Two (2) projects were approved for cost sharing in the City of Port Colborne with Niagara Region contributing \$220,000 to support inflow and infiltration reduction.

Excess Primary Treatment Capacity

F-5-1 allows for excess primary treatment where it is impractical or uneconomical to provide secondary treatment to wet weather flow. Seaway is equipped with one storm tank that provides excess primary treatment to wet weather flow. Flows greater than the plant design peak flow of 45,360 m³/d are diverted to the storm systems. Storm flows diverted to the storm treatment system receive screening, grit removal, settling (solids removal), chlorination and dechlorination prior to discharge to the Welland Canal via the plant outfall.

The storm system also acts as a storage tank during wet weather and can hold approximately 5,670 m³ in the tank prior to an overflow occurring. This volume is returned to the plant for full treatment when the wet weather event is over.

Industrial Waste

Industrial waste can contain material that can have negative impacts on collection system infrastructure as well as the wastewater treatment process itself. Upsets to the treatment process can cause a plant to become non-compliant with ECA objectives and limits. To protect our infrastructure, the Niagara Region has a Sewer Use By-law in place. Environmental Enforcement Officers conduct industry inspections, sampling and monitoring of industrial discharges on a routine basis to ensure that they meet the Sewer Use By-law limits.

Summary of Efforts – Procedure F-5-5

The MECP Procedure F-5-5 applies to combined sewage systems. The Seaway wastewater collection system is considered nominally separated. This procedure does not apply.

SW-C-1 Overview of the Seaway WWTP Collection System

The Seaway WWTP collection system is a class II system that collects wastewater from domestic, commercial and some industrial sources from the municipality of Port Colborne. The collection system consists of the following:

- Local sanitary sewers
- 1.2 kilometres of regional gravity mains
- 18.2 kilometres of regional force mains
- 17 pumping stations:
 - Arena Sewage Pumping Station
 - City Hall Sewage Pumping Station
 - Clark Street Sewage Pumping Station
 - East Side Sewage Pumping Station
 - Elm Street Sewage Pumping Station
 - Fares Street Sewage Pumping Station
 - Fretz Street Sewage Pumping Station
 - Industrial Park Sewage Pumping Station
 - Main Street Sewage Pumping Station
 - Nickel Street Sewage Pumping Station
 - Omer Avenue Sewage Pumping Station
 - Oxford Road Sewage Pumping Station
 - Rosemount North Sewage Pumping Station
 - Rosemount South Sewage Pumping Station
 - Steele Street Sewage Pumping Station
 - Sugarloaf Sewage Pumping Station
 - Union Street Sewage Pumping Station
- A total of five Sanitary Sewage Outfalls (SSO) at five of the seventeen pumping stations

Niagara Region – Seaway (Port Colborne) Wastewater System
2023 Annual Performance and Summary Report - Collection

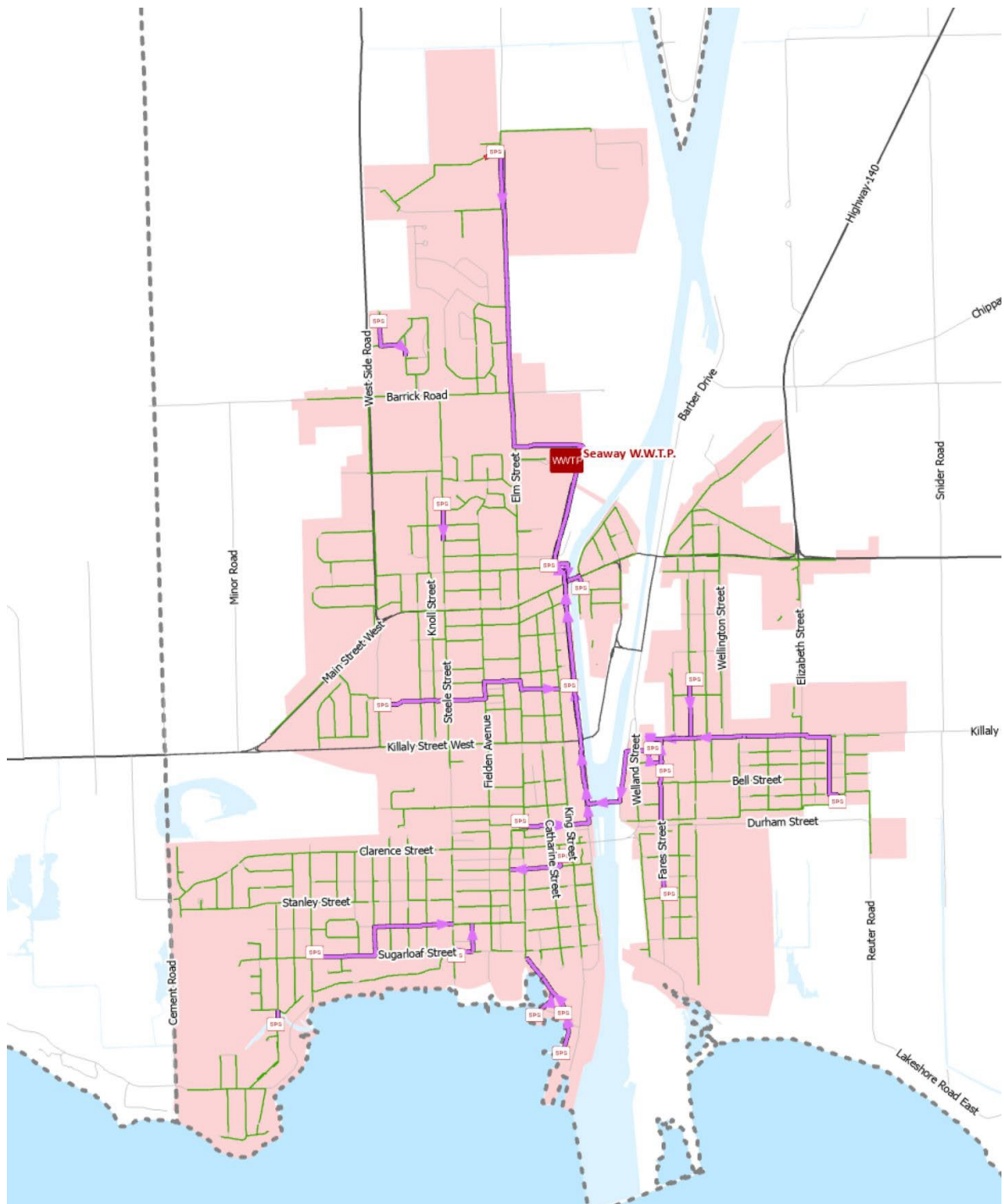


Figure SW-C-1: Map of Seaway WWT Collection System

The collection system is operated under a two-tier system, where the City of Port Colborne owns and operates local gravity sanitary sewers and Niagara Region owns and operates sewage pumping stations, forcemains and larger gravity sanitary sewers or trunk sewers. It is classified as a nominally separated system meaning that storm water is collected separately from sanitary sewage but the system may still be impacted by inflow and infiltration from

sources such as roof leaders, foundation drains, leaky pipes and joints and maintenance holes.

The collection system operates under the following Consolidated Linear Infrastructure ECA:

- Port Colborne Trunk Wastewater Collection System, 007-W601, issue number 1

Annual reporting has been prepared to meet the requirements of this approval.

SW-C-2 Summary and Interpretation of Collection System Monitoring Data

Monitoring of Pump Station Operations

Pump stations operate through automatic control and are monitored continuously using Supervisory Control and Data Acquisition (SCADA). Stations alarms are programmed to alert the operations staff at the Seaway WWTP 24 hours a day of potential issues including but not limited to high wet well levels, pump faults, communication failures and standby generator status. Operators will respond to station alarms as required to ensure proper station operation.

Station operation is trended in SCADA. SCADA trends are reviewed daily by operations staff to evaluate station performance. Operators will look at pump cycle times, station discharge flow and pump duty rotation to identify potential issues. Where potential issues are identified, work orders are generated for follow up by maintenance staff.

In addition to SCADA monitoring, monthly station inspections are completed by operations staff. This includes inspection of the station and testing of standby generator equipment.

Sanitary Sewer Closed-Circuit Television Inspection Program

Niagara Region owns and maintains 145 kilometers of trunk sanitary gravity sewers, 161 kilometers of sanitary forcemains, and 2,093 sanitary access chambers across 11 municipalities. Approximately 85% of its conventional trunk sanitary gravity system is inspected using closed-circuit television (CCTV) once every three years. The remaining 15% is large diameter trunk sewers, which are inspected once every 10 to 15 years due to the necessity for specialized equipment to access and inspect sewers that have continuous high flow levels.

Table SW-C-1 details the total length of sewers inspected over the past four years.

Table SW-C-1: CCTV Program Summary

Measurement in Kilometers (km)	2020	2021 ²	2022	2023
Inspection Length (km)	37.9	18.5	59.3	33.0

Observations from the inspections are recorded for structural and operational deficiencies of the pipes. Operational deficiencies (blockage from grease, roots, debris) are addressed through the cleaning/flushing program. Structural deficiencies (broken, fractured, surface damage, holes) as well as Inflow and Infiltration are forwarded for consideration in the asset management plan and capital upgrade program.

Flow Monitoring

Niagara Region monitors sewer flows at 158 locations. Flow monitoring information is used for municipal Pollution Prevention and Control Plans (PPCPs), Master Servicing Plans (MSPs) including the 2021 Water and Wastewater MSP, Inflow and Infiltration studies, billing, development planning, and capital project design.

SW-C-3 Summary of Operating Issues Encountered and Corrective Actions Taken

Pump Stations and Forcemains

No operational issues were experienced at the pump stations or associated forcemains in 2023.

Gravity Trunk Sewers

No operational issues were experienced with gravity trunk sewers in 2023.

SW-C-4 Summary of Major Maintenance, Capital Projects and Pre-Authorized Alterations

Summary of Maintenance Carried out on Major Equipment

Niagara Region works to keep wastewater infrastructure in a state of good repair. Maintenance activities completed include regular preventative maintenance (PM) activities and

² 2021 marked the end of one inspection contract and the start of a new contract. Delays in the procurement process due to competing priorities resulted in a gap in inspection contracts. As a result, the length of sewers inspected in 2021 was less than in prior years.

normal and emergency equipment repair or replacement. Where a substantial amount of upgrade is required, this work is carried out under the capital works program.

Below is a summary of normal and emergency repairs carried out on major equipment in the Seaway Collection System:

- Rosemount South SPS pump replacement (2)
- Fares Street SPS pump rail replacement
- East Side SPS biobed leachate pump replacement
- Oxford SPS pump repair
- Clarke Street SPS pump repair
- Arena Street SPS pump repair
- Main Street SPS pump repair
- Rosemount North SPS pump replacement
- Rebuild of Elm Street SPS biobed (ongoing)
- Elm Street SPS hoist replacement
- Support capital project activity including East Side and Arena SPS

This list does not include PM activities. PMs are completed and tracked in a computerized maintenance management system. PM completed during the reporting year are available upon request.

Planned Capital Upgrades

The following is a list of capital upgrades forecasted for the Seaway Collection System:

- City Hall SPS and Forcemain upgrades
- East Side SPS and forcemain upgrades
- Oxford SPS capacity and sustainability upgrades

Summary of Pre-Authorized Alterations Undertaken

Through collection system ECAs, MECP has given System Owners the ability to complete low risk changes to a sewage pumping station, forcemain or gravity main without requiring further approval from the MECP. These modifications are documented on an applicable MECP form and signed off by the Owner or delegate of the system. Any pre-authorized modifications must be reported on annually to the MECP.

During the reporting year 2023, no pre-authorized modifications were completed.

No pre-authorized works were completed and therefore, there were no alterations that would pose a significant threat to drinking water.

SW-C-5 Summary of Calibration Activities

Collection system overflow meters are calibrated at minimum once per year. Other instrumentation used in process control is calibrated on an as needed basis. Table SW-C-2 below provides a summary of calibrations completed in the collection system in 2023.

Table SW-C-2: Summary of Collection System Calibration Activities

Equipment Description	Date Calibrated	Comments
No equipment calibrations required.		

Calibration certificates are available upon request.

SW-C-6 Summary of Complaints

One (1) odour complaint was received in 2023 regarding the operation of the Seaway collection system. When a complaint is received, Operations staff investigate the complaint and try to identify any source of odour. Where odours are confirmed and related to the operation of the collection system, corrective actions are taken as needed. All complaints are recorded along with corrective actions taken.

SW-C-7 Summary of Collection System Overflows and Spills

Collection System Overflows

Although the Seaway wastewater collection system is nominally separated, collection system overflows occur during wet weather events due to inflow and infiltration of storm water into the sewage collection system. Overflows are necessary to prevent basement flooding and to protect downstream infrastructure and wastewater treatment processes.

Table SW-C-3 provides a summary of collection system overflows that occurred during the reporting year. The table includes volume discharge, overflow durations as well as pollutant loading to the environment.

More [information on sewage overflows and inflow and infiltration](http://www.niagararegion.ca/living/sewage/cso), is available on the Region's website (www.niagararegion.ca/living/sewage/cso).

Table SW-C-3: Collection System Overflow Event Details

Overflow Location	Overflow Date	Overflow Volume ³ (ML)	Overflow Duration (hhh:mm)	BOD Loading (kg)	TSS Loading (kg)	TP Loading (kg)	TKN Loading (kg)	E.Coli ⁴ (mpn/100 mL)	Was the Overflow Disinfected (Yes/No)	Were Any Adverse Impacts Observed (Yes/No)	Corrective Actions Taken
Union Street SPS	2023-01-04	0.337	018:04	13.5	24.3	0.42	2.53	470,000	No	No	Awaited End of Event
Union Street SPS	2023-03-04	1.000	013:54	20.0	31.0	0.52	3.50	1,000	No	No	Awaited End of Event
Union Street SPS	2023-04-01	0.347	009:00	10.1	16.7	0.56	5.14	1,960,000	No	No	Awaited End of Event
Union Street SPS	2023-12-27	0.417	009:00	0.0	46.3	0.29	2.42	550,000	No	No	Awaited End of Event

³ Overflows are not metered. Volumes provided are estimates.

⁴ E.Coli sampling and analysis is required April 01 to October 31 annually.

Collection System Spills

Niagara Region strives to maintain and operate wastewater infrastructure so spills to the environment do not occur. However, circumstances arise where a spill occurs due to equipment malfunction, failure or other reasons. Occasionally, a planned spill may be required in order to safely complete required maintenance to critical equipment. In the event that this is necessary, approval from the MECP is obtained in advance.

All spills are reported to the MECP Spills Action Centre upon discovery and follow up written reports are completed and submitted to the MECP and Environment and Climate Change Canada as required by regulation. Below in Table SW-C-4 summarizes spills that occurred in the Seaway collection system in 2022.

Table SW-C-4: Summary of Spills Occurring in the Seaway Collection System

Spill Date	MECP Incident Number	Description of Spill
2023-05-28	1-3HFT6F	<p>Union Street SPS – Forcemain Break</p> <p>A spill was reported to the Niagara Region. A failure of the Union Street SPS was suspected. Upon excavation, a crack was observed along the side of the forcemain. The forcemain was repaired, successfully tested and returned to service. The spillage was contained to the site excavation area and no contents of this spill impacted an open body of water.</p>

SW-C-8 Summary of Efforts to Reduce WWTP Bypasses/Overflows and Collection System Overflows

Projects Undertaken to Reduce Bypasses or Overflows

The Seaway WWTP experiences high flow conditions that require overflows to occur due to inflow and infiltration in the collection system to prevent emergency situations. Being a two-tier system, Niagara Region works closely with the City of Port Colborne to reduce overflows at the wastewater treatment plant. Niagara Region participates in a cost sharing strategy with lower tier municipalities to fund overflow reduction projects. In 2023, Niagara Region had an approved budget totaling \$4.0M for the overflow reduction cost sharing program. Two projects were approved for cost sharing in the City of Port Colborne with Niagara Region contributing \$220,000 to support overflow reduction.

The Seaway collection system had four overflow events occurs at Union Street SPS in 2023.

Public Reporting of Bypasses and Overflows

Niagara Region reports all [bypass and overflow events](https://www.niagararegion.ca/living/sewage/CSO/Reporting/CSOLocations.aspx) publicly on the Niagara Region website (<https://www.niagararegion.ca/living/sewage/CSO/Reporting/CSOLocations.aspx>)

Niagara Region updates the data on recent overflows four times a year and displays any overflows that may have occurred in the past 12 months.

A [listing of overflow data back to 2008](https://niagaraopendata.ca/dataset/combined-sewage-overflow) is available through the Niagara Open Data website (<https://niagaraopendata.ca/dataset/combined-sewage-overflow>)

An active project is underway to improve public reporting of bypasses and overflows including making the data available in near real time.