Welland Wastewater Treatment Plant Annual Performance Summary Report Treatment and Collection Reporting Year: 2023

Niagara Region

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WW-T-1 Wastewater Treatment Process Description

The Welland Wastewater Treatment Plant (WWTP) is located at 505 River Road in the City of Welland and provides wastewater treatment to the City of Welland, Town of Pelham and portions of the City of Thorold. The Welland WWTP is a class IV conventional activated sludge treatment facility and has been designed to treat an average daily flow (ADF) of 54,550 cubic metres per day (m^3/d). This facility can fully treat all flows up to 65,000 m^3/d and provides primary storm treatment for flows greater than 65,000 m^3/d up to a maximum flow rate of 118,000 m^3/d.

The Welland WWTP operates under the following Ministry of Environment, Conservation and Parks (MECP) approvals:

Environmental Compliance Approval (ECA) - Sewage: 3922-C9PJKZ, issued April 3, 2022
Environmental Compliance Approval (ECA) - Air: 8-2198-99-006, issued October 20, 1999
Environmental Compliance Approval (ECA) - Air: 8-2140-98-006, issued July 29, 1998

The Welland WWTP uses the following processes to treat wastewater:

- Raw Influent Pumping
- Imported Sewage Receiving
- Screening
- Grit Removal
- Phosphorus Removal
- Primary Treatment
- Secondary Treatment (Aeration and Settling)
- Disinfection (Chlorination and Dechlorination)
- Solids Handling – sludge digestion and transportation

Raw Influent Pumping: Wastewater from the collection system enters the wastewater treatment plant into a wet well, equipped with raw sewage pumps. The wet well provides a low point for the collection system to discharge to. The raw sewage pumps then lift the wastewater from the well (low point) to the beginning of the treatment process (high point) to allow the remainder of the treatment process to occur by gravity.

Imported Sewage Receiving Station: To provide service to Niagara Region residents outside the wastewater servicing area, the Welland WWTP accepts imported sewage from commercial haulers. Receiving stations are situated to ensure all imported sewage receives full treatment.

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

Grit Removal: Grit tanks equipped with coarse bubble diffusers are used to remove grit from wastewater. Heavy suspended material such as sand and small stones (grit) is settled to the

bottom of the tanks while lighter organic particles are kept in suspension and pass through the tanks for further treatment. The grit removed is dewatered for landfill disposal.

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

Primary Treatment: Primary clarifiers are large tanks that allow the incoming wastewater to slow down. The slower speed allows heavier solids to fall from the wastewater to the bottom of the tank. Sludge collected at the bottom of the primary clarifiers is removed and sent to the solids handling process.

For flows up to 65,000m^3/d, the liquid portion of the wastewater flows from the primary clarifiers to the secondary treatment process receiving full treatment. Under high flow or wet weather conditions, flows greater than 65,000 m^3/d to a maximum flow of 118,000 m^3/d are diverted (bypassed) around the secondary treatment process and go directly to disinfection. This is called a secondary bypass.

Secondary Treatment:

Aeration Tank: Large tanks are equipped with air diffusers to add fine bubbles into the wastewater. This oxygen-enriched environment encourages microorganisms (or “bugs”) to remove dissolved and suspended organics and nutrients. Activated sludge is returned to the aeration process to ensure enough bugs are present to provide adequate wastewater treatment.

Secondary Clarifiers: Secondary clarifiers receive effluent from the aeration tanks which separates the microorganism population and remaining solids. Solids settle as activated sludge on the bottom of the clarifier while a clean effluent flows from the clarifiers to be disinfected and discharged to the environment. A portion of the activated sludge collected on the bottom of the clarifier is pumped back to the front of the aeration tanks to ensure a healthy microbial population. 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 from April 1 to October 31 each year. Adequate contact time is provided by 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 River.

Solids Handling

Anaerobic Digestion: Sludge from the primary clarifiers is pumped to one of two (2) primary anaerobic digesters, which overflow into one (1) secondary digester for thickening. Anaerobic digestion allows a further breakdown of pollutants and pathogens in the collected sludge. The

digested sludge is transported from site for further treatment such as land application or dewatering at the Garner Road Biosolids Facility.

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

Review of 2023 Plant Flows

Table WW-T-1 below outlines the volume of sewage treated at the Welland WWTP during the reporting year. It also outlines how much Imported Sewage was received at site for treatment.

Table WW-T-1: Table of Welland WWTP Design Flows, 2023 Treated Flows and Reported Imported Sewage Volumes

Flow Statistic	Value
Design Average Daily Flow (ML/d)	54.550
Design Peak Flow Rate - Dry Weather (ML/d)	65.000
Design Peak Flow Rate - Wet Weather (ML/d)	118.000
Total Volume Processed (ML)	14,527.107
Annual Average Daily Flow (MLD)	39.800
% Annual Average Daily Flow Utilization	73%
% Increase/Decrease over prior year	10%
Volume Imported Sewage Received (ML)	17.636
% Increase/Decrease Imported Sewage over prior year	-54%
Imported Sewage as % of Flow	0.12%

Reviewing the treated flows in 2023, it was observed that, on average, the plant is utilizing 73% of its design Average Daily Flow capacity. This indicates that the facility has the hydraulic capacity to meet the needs of the collection system with room for additional future flows that may be added from development. If the utilization becomes greater than 80%, plant expansions should be considered.

Daily flows to the plant were reviewed. In 2023, there were 57 instances where the flow to the plant was greater than the design Average Daily Flow, amounting to approximately 16% of the year. These instances occurred during times of wet weather or heavy snow melt. The Welland WWTP collection system receives flow from a portion of combined sewers and is impacted by wet weather.

A review of the monthly average daily flow rate for the prior 10-year period was also completed. This can be observed below in Figure WW-T-1 below. No trends were observed the average flow at the plant is increasing or decreasing. Spikes during typical wet weather

seasons further support increased flows are occurring due to remaining combined sewers and Inflow and Infiltration present in the collection system.

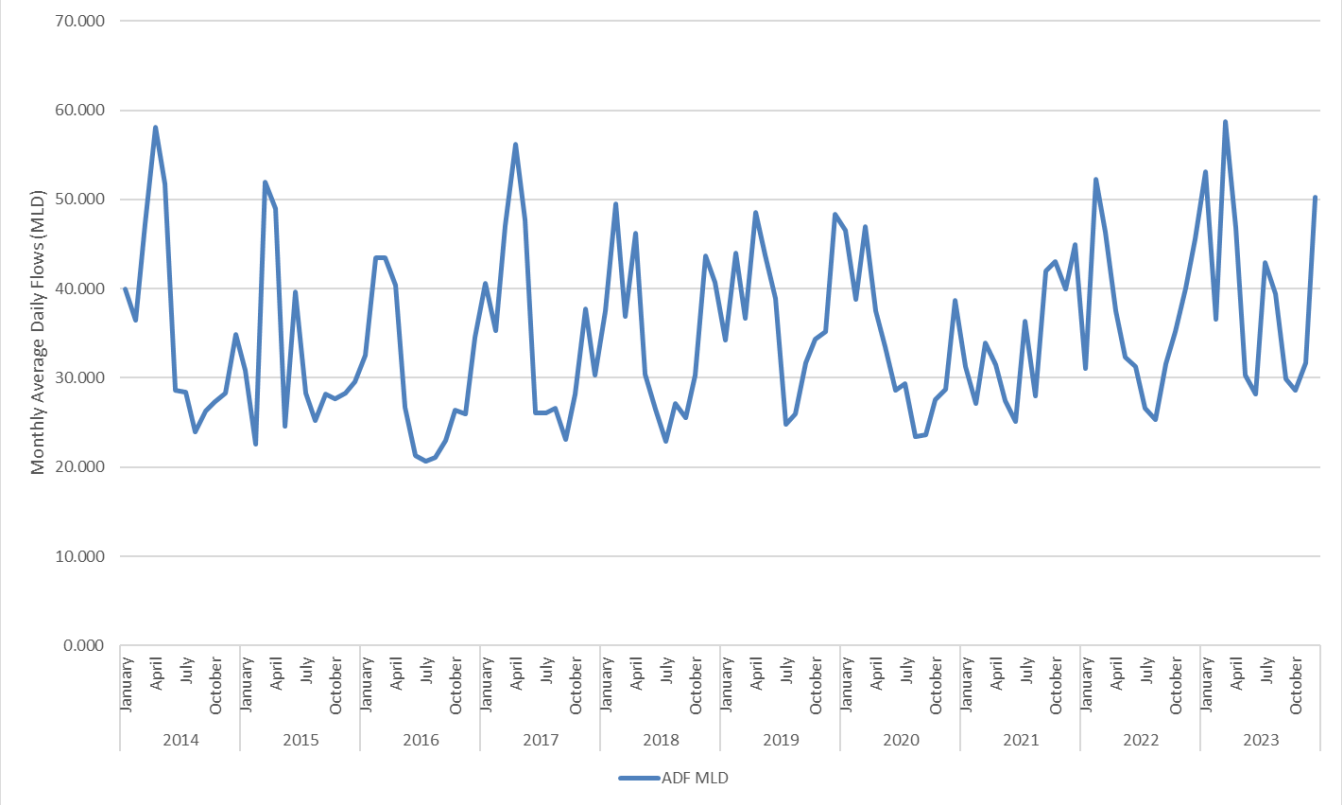

Figure WW-T-1: Graph displaying the Monthly Average Daily Flow Rate in Megalitres per Day (MLD)

The volume of imported sewage received at this facility decreased by 54%. The decrease in volume was directly related to less haulage from a local sewage generator. No operational issues were encountered with receipt and treatment of imported sewage in 2023.

Review of Influent Sampling and Monitoring Activities

In 2023, 104 samples of influent were collected and tested. An annual summary of influent sampling can be observed in Table WW-T-5 below.

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 displayed as kilograms of pollutant per day or kg/d. Below in Figure WW-T-2, is a graph depicting four commonly monitored pollutant loadings to the plant for the period of 2021-2023.

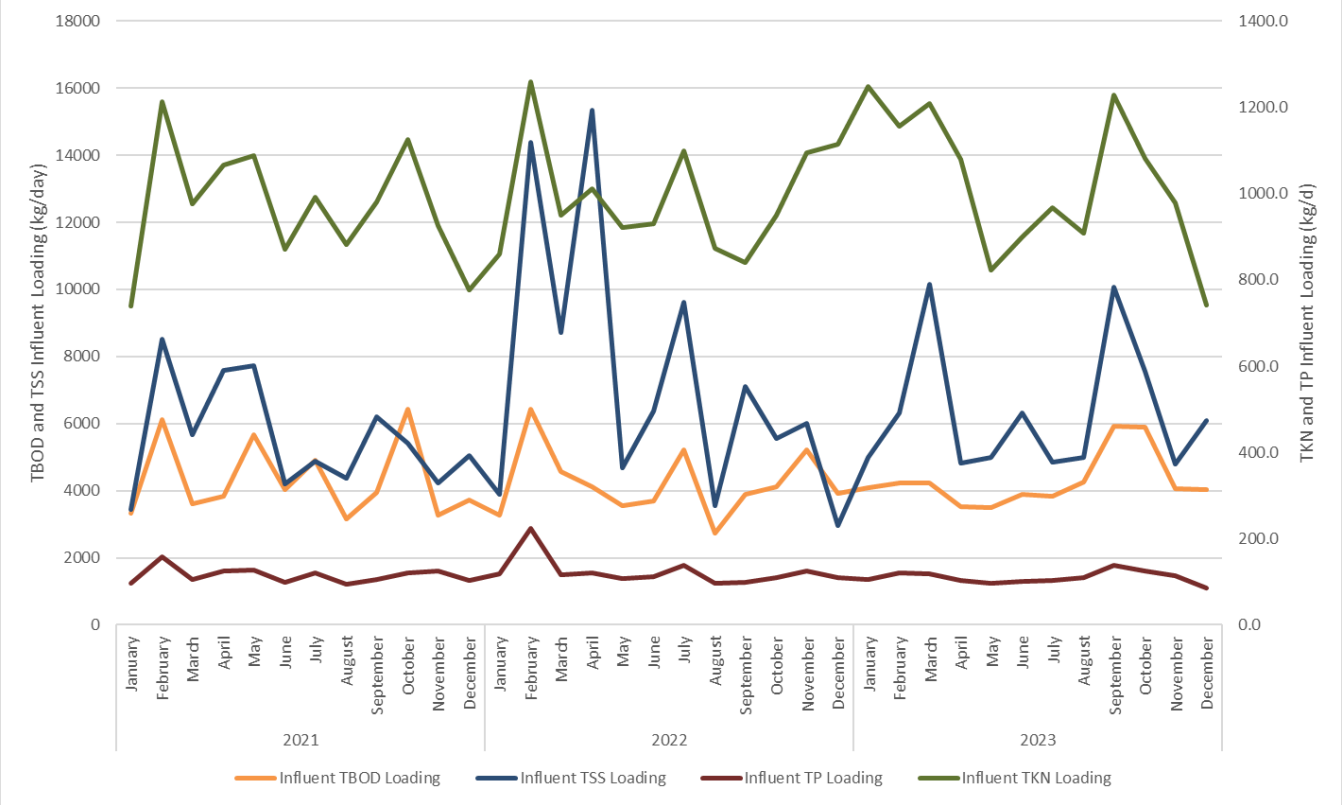

Figure WW-T-2: Figure of monthly plant loadings to the Welland WWTP for Total Biochemical Oxygen Demand (TBOD), Total Suspended Solids (TSS), Total Kjeldahl Nitrogen (TKN) and Total Phosphorus (TP), in kg/d, for the period 2021 to 2023.

The trend shows no large changes in calculated loadings for TBOD, TSS, TKN and TP for the past three years.

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, 52 samples of imported sewage were collected and submitted for testing by an ISO 17025:2017 accredited laboratory. 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 WW-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	3,361	325	220	2,316	2,042	3,886	1,539	5,450	2,894	1,431	2,826	531
Total Suspended Solids	mg/L	350	7,160	247	221	7,749	14,987	4,358	2,205	6,192	5,546	3,451	8,925	1,107
Total Kjeldahl Nitrogen	mg/L	100	230.16	163.75	23.63	247.03	478.60	1136.25	598.00	144.63	508.80	680.10	304.60	73.52
Phosphorus	mg/L	10	51.78	54.18	30.35	49.45	126.56	81.45	55.25	74.58	62.10	49.88	63.57	8.32
Total Solids	mg/L	-	9,562	2,750	2,460	8,748	16,442	8,833	4,160	6,675	6,560	6,540	9,998	2,814
Total Volatile Solids	mg/L	-	7,980.0	885.0	685.0	6,037.5	9,904.0	4,530.0	2,075.0	3,917.5	4,850.0	2,855.0	6,522.0	1,134.0
Arsenic	mg/L	1	0.12	0.02	0.01	0.05	0.06	0.07	0.02	0.04	0.04	0.04	0.12	0.04
Cadmium	mg/L	0.7	0.05	0.01	0.00	0.02	0.02	0.02	0.01	0.02	0.01	0.02	0.05	0.01
Chromium	mg/L	3	0.23	0.02	0.02	0.08	0.24	0.11	0.04	0.06	0.06	0.06	0.16	0.14
Cobalt	mg/L	5	0.05	0.01	0.00	0.02	0.04	0.02	0.01	0.01	0.01	0.02	0.05	0.02
Copper	mg/L	3	1.32	0.40	0.33	1.04	7.10	0.73	0.52	4.28	2.37	0.36	3.59	5.72
Lead	mg/L	1	0.13	0.02	0.03	0.08	0.45	0.08	0.07	0.24	0.06	0.07	0.20	0.17
Mercury	ug/L	10	0.87	0.16	0.05	0.21	2.59	0.54	0.28	0.53	1.32	0.31	2.56	0.34
Molybdenum	mg/L	5	0.25	0.24	0.18	1.69	0.81	0.03	0.08	0.07	0.04	0.03	0.17	0.27
Nickel	mg/L	2	0.08	0.01	0.02	0.08	0.20	0.06	0.04	0.13	0.05	0.04	0.11	0.07
Selenium	mg/L	1	0.12	0.02	0.01	0.05	0.05	0.07	0.02	0.04	0.04	0.05	0.13	0.04
Zinc	mg/L	3	2.67	1.15	1.40	4.73	28.34	2.73	2.73	8.98	4.30	2.08	5.70	1.42
Aluminum	mg/L	-	9.19	0.61	2.93	14.68	83.61	7.56	17.77	30.72	12.46	13.19	36.16	9.96
Antimony	mg/L	5	0.24	0.04	0.03	0.10	0.10	0.14	0.04	0.07	0.07	0.09	0.24	0.09
Barium	mg/L	-	0.24	0.03	0.07	0.33	2.29	0.24	0.20	2.67	0.42	0.24	0.69	0.34
Beryllium	mg/L	-	0.12	0.02	0.01	0.04	0.05	0.07	0.02	0.04	0.04	0.04	0.12	0.04
Boron	mg/L	-	2.66	1.40	0.55	1.53	1.08	1.35	0.45	0.75	0.95	0.85	2.54	1.02
COD	mg/L	-	11,292	770	414	10,142	15,488	9,323	4,820	7,165	9,673	4,763	11,308	1,940
Conductivity	us/cm	-	2,088	3,980	3,351	2,743	2,292	11,125	5,530	2,560	3,740	2,490	2,746	1,869
Iron	mg/L	-	22.62	4.04	7.86	21.37	114.13	12.22	22.62	28.55	18.65	23.79	38.75	117.30
Manganese	mg/L	-	1.16	0.48	0.48	0.98	3.52	0.39	0.61	0.83	0.59	0.79	1.11	0.36
pH		6-11	6.72	7.48	7.33	7.08	7.22	7.53	8.03	7.38	6.98	7.18	7.36	7.32
Silver	mg/L	5	0.12	0.02	0.01	0.05	0.06	0.07	0.02	0.04	0.04	0.04	0.12	0.04
Tin	mg/L	5	0.26	0.05	0.04	0.15	0.38	0.14	0.11	0.40	0.12	0.09	0.34	0.11
Vanadium	mg/L	-	0.05	0.01	0.01	0.04	0.15	0.04	0.03	0.14	0.03	0.04	0.07	0.02

Review of Final Effluent Sampling and Monitoring Activities

Final Effluent sampling is conducted twice weekly and submitted for analysis to an ISO 17025:2017 accredited laboratory for compliance purposes. In 2023, 142 samples of final effluent were collected and tested. Individual as well as monthly average results are reviewed and compared to the objective and compliance limits stated in the facility ECA. Table WW-T-3 below summarizes the number of monthly objective and compliance limit exceedances at the Welland WWTP in the reporting year.

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

Parameter	ECA Monthly Concentration Objective	ECA Monthly Concentration Limit	ECA Monthly Average Loading Limit	Number of Monthly Objective Concentration Exceedances	Number of Monthly Limit Concentration Exceedances	Number of Monthly Limit Loading Exceedances
pH[1]	6.0-9.5	-	-	0	-	-
Carbonaceous Biochemical Oxygen Demand (CBOD)	15 mg/L	25 mg/L	1362.5 kg/d	0	0	0
Total Suspended Solids (TSS)	15 mg/L	25 mg/L	1362.5 kg/d	2	1	0
Total Phosphorus (TP)	0.5 mg/L	1.0 mg/L	54.5 kg/d	3	0	0
Total Ammonia Nitrogen November 1 to April 30	10 mg/L	20 mg/L	-	0	0	-
Total Ammonia Nitrogen May 1 to October 31	5 mg/L	10 mg/L	-	0	0	-
Total Residual Chlorine[2] (TRC)	non-detect	0.02 mg/L	-	0	0	-
E-Coli (Geomean)[2]	100 MPN/100 mL	200 MPN/100 mL	-	0	0	0

[1] pH must meet objectives at all times (inclusive)
[2] Only during disinfection season, April 01 - October 31

Welland WWTP failed to achieve the monthly average compliance limit for Total Suspended Solids (TSS) in November. This non-compliance was reported verbally to the local MECP office as well as followed up with a non-compliance report. The monthly objective for TSS was also not met during the month of December. Both are covered in more detail in section WW-T-3 Operating Issues Encountered below.

The monthly objective for Total Phosphorus (TP) was not met in May, July and November.

The ECA for the Welland WWTP requires that samples of the final effluent be collected and tested when the plant is in high flows and a secondary bypass occurs. The sample of the final effluent during these events includes fully treated effluent as well as sewage that has received primary treatment only and has bypassed the secondary treatment process. As these samples include a portion of flow that does not receive full treatment, samples collected during secondary bypass may have elevated results. This reason contributed to the objective exceedances in May, July, November and December with above objective results observed during high flow events.

During this reporting year, the plant performance to achieve total ammonia objectives and limits was improved greatly over 2022 with no monthly objective limits or failures observed.

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

- CBOD – 6%
- TSS – 27%
- TP – 25%
- Ammonia – 4%
- E.Coli – 0%

Final Effluent sample results did not exceed the ECA objective greater than 50% of the time. The plant continues to effectively treat all wastewater received. An annual summary of monthly average final effluent sample results can be observed in Table WW-T-5 below.

Effluent Quality Assurance Measurements and Control Measures

To ensure Welland 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

Deviations from Scheduled Sampling Days

Compliance sampling activities at the Welland WWTP are scheduled 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, four (4) deviations from the scheduled sampling days occurred. Table WW-T-4 below provides the instances where a deviation occurred and a reason for the deviation.

The 2024 sampling schedule is available upon request.

Table WW-T-4: Table of sampling schedule deviations

Sampling Date Deviation	Sample Type(s)	Reason
04-Apr-2023	E coli	Plant in secondary bypass – no grab samples collected as per ECA
04-May-2023	Influent	Sampler malfunction, collected following day.
24-Aug-2023	040 Hauled Waste	Dropped by lab, new sample requested and submitted August 30.
23-Oct-2023	Influent, Primary Effluent and Final Effluent	Influent sampler malfunction, full set of samples submitted following day

Table WW-T-5: Annual Summary of Welland 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 # of Samples
Influent - Monthly Average TSS (mg/L)	94	173	173	103	165	224	113	127	337	265	151	121	171	
Number of Influent TSS Samples	10	8	8	8	10	8	9	9	8	9	9	8		104
Influent - Monthly Average TBOD (mg/L)	77	116	72	75	115	138	89	108	198	206	128	80	117	
Number of Influent TBOD Samples	10	8	8	8	10	8	9	9	8	9	9	8		104
Influent - Monthly Average TP (mg/L)	2.0	3.3	2.0	2.2	3.2	3.6	2.4	2.8	4.6	4.4	3.6	1.7	3.0	
Number of Influent TP Samples	10	8	8	8	10	8	9	9	8	9	9	8		104
Influent - Monthly Average TKN (mg/L)	23.52	31.63	20.58	22.99	27.13	31.96	22.52	23.07	41.04	37.82	30.84	14.73	27	
Number of Influent TKN Samples	10	8	8	8	10	8	9	9	8	9	9	8		104
Total Plant Flows (ML)	1,645.975	1,023.939	1,820.407	1,407.078	938.740	844.742	1,332.346	1,221.009	897.342	885.682	951.581	1,558.266	14,527.107	
Daily Average (MLD)	53.096	36.569	58.723	46.903	30.282	28.158	42.979	39.387	29.911	28.570	31.719	50.267	39.800	
Maximum Flow (ML)	94.309	79.927	111.118	112.268	60.225	62.228	92.380	80.560	79.830	51.816	57.830	99.169	**MAX**	112.268
Minimum Flow (ML)	33.927	27.877	37.617	25.755	21.474	20.613	28.073	28.526	25.203	22.190	23.049	30.531	**MIN**	20.613
Volume Imported Sewage Received (ML)	2.357	1.898	2.611	1.816	1.840	1.168	1.147	1.085	0.970	1.045	1.012	0.686	17.636	
Final Effluent - Monthly Average TSS (mg/L)	8.7	5.7	9.0	8.1	11.1	9.0	14.9	9.9	11.5	9.1	27.1	21.2	12.1	
Final Effluent - Average Daily TSS Loading (kg/d)	462	208	529	380	336	253	640	390	344	260	860	1066	482	
Number of Final Effluent TSS Samples	15	10	17	12	11	8	14	14	8	9	11	13		142
Final Effluent - Monthly Average CBOD (mg/L)	6.9	4.5	8.2	4.6	4.6	5.6	7.5	6.6	4.9	4.1	8.5	10.2	6.4	
Final Effluent - Average Daily CBOD Loading (kg/d)	366	165	482	216	139	158	322	260	147	117	270	513	253	
Number of Final Effluent CBOD Samples	15	10	17	12	11	8	14	14	8	9	11	13		142
Final Effluent - Monthly Average TP (mg/L)	0.22	0.26	0.24	0.25	0.54	0.48	0.60	0.30	0.41	0.33	0.85	0.48	0.41	
Final Effluent - Average Daily TP Loading (kg/d)	11.68	9.51	14.09	11.73	16.35	13.52	25.79	11.82	12.26	9.43	26.96	24.13	16.45	
Number of Final Effluent TP Samples	15	10	17	12	11	8	14	14	8	9	11	13		142
Final Effluent - Monthly Average TKN (mg/L)	6.74	6.13	5.33	3.35	3.60	5.23	3.41	2.64	3.50	4.98	6.51	6.18	4.80	
Number of Final Effluent TKN Samples	15	10	17	12	11	8	14	14	8	9	11	13		142
Final Effluent - Monthly Average NH_3 (mg/L)	4.21	3.85	3.31	1.75	1.41	2.82	1.04	0.92	1.46	3.09	2.92	3.27	2.50	
Final Effluent - Average Daily NH_3 Loading (kg/d)	223.53	140.79	194.37	82.08	42.70	79.41	44.70	36.24	43.67	88.28	92.62	164.37	99.67	
Number of Final Effluent NH_3 Samples	15	10	17	12	11	8	14	14	8	9	11	13		142
Final Effluent - Monthly Average NO_3 (mg/L)	9.09	12.14	7.34	10.53	15.95	11.29	9.97	10.43	12.40	13.26	12.57	8.28	11.10	
Number of Final Effluent NO_3 Samples	15	10	17	12	11	8	14	14	8	9	11	13		142
Final Effluent - Monthly Average NO_2 (mg/L)	0.50	0.52	0.38	0.48	0.74	0.48	0.43	0.54	0.66	0.69	0.96	0.64	0.59	
Number of Final Effluent NO_2 Samples	15	10	17	12	11	8	14	14	8	9	11	13		142
Final Effluent - Monthly Geomean E.Coli (MPN/100mL)				5	3	6	9	4	8	5			6	

Measured Parameter	January	February	March	April	May	June	July	August	September	October	November	December	Total / Average	Total # of Samples
Number of Final Effluent E.Coli Samples				14	18	18	18	18	16	18				120
Final Effluent - Monthly Average TRC (mg/L)				0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00	
Number of Final Effluent TRC Samples				30	31	30	31	31	30	31				214
Final Effluent - Monthly Average Temperature (°C)	10.90	10.44	9.49	12.11	14.81	17.91	20.36	20.69	20.19	18.61	15.59	13.85	15.41	
Number of Final Effluent Temperature Samples	15	10	15	8	11	8	13	14	8	9	11	12		134
Final Effluent - Monthly Average pH	7.50	7.33	7.34	7.24	7.15	7.15	7.32	7.36	7.21	7.17	7.10	7.26	7.26	
Number of Final Effluent pH Samples	15	10	12	8	11	8	13	14	8	9	11	12		131

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

Failure to Continuously Disinfect – April 2023

At approximately 7:30 a.m. of April 15, the operator testing for process chlorine residuals found no chlorine residual present in the chlorine contact tanks. Further investigation found that the duty disinfection pump had failed. The pump was in operation but was not pumping chlorine to the contact tanks. No alarms or indication that there was an issue with the pump were communicated through the SCADA program to the operator delaying immediate correction of this issue.

Upon discovery, the operator turned on the standby pump, which also failed. Maintenance staff attended the site and found debris in the pumps preventing normal operation. Both the duty and standby pumps were flushed to remove any debris that may be present. Normal system operation was resumed at approximately 10:15 a.m.

The failure to continuously disinfect the final effluent was reported to the MECP and followed up with a non-compliance report. Corrective actions have been taken to prevent reoccurrence.

TSS Monthly Compliance Limit Exceedance – November 2023

In November 2023, the Welland WWTP failed to meet the ECA compliance monthly average limit for TSS of 25 mg/L. The monthly average TSS for November was calculated as 27.1 mg/L.

The non-compliance was reported verbally to the MECP and a follow up non-compliance report was completed and submitted.

The exceedance can be attributed to a secondary clarifier out of service combined with a wet weather/high flow event. The solids from the out of service clarifier had been transferred to an adjacent clarifier resulting in low settleability of the solids of the adjacent clarifier. This settleability issue combined with high flows from a wet weather event caused solids to carryover into the final effluent. The final effluent TSS result for this single day caused the monthly average to be greater than 25 mg/L. If this result were removed from the calculation of the average, the TSS average for the month would have been 14.4 mg/L.

As a corrective action, when a secondary clarifier is taken out of service, all best efforts will be undertaken to distribute the transfer of the remaining solids among all operating secondary clarifiers, in order to mitigate settleability issues.

WW-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 Welland WWTP:

- Secondary clarifier #4 corner sweep and scum collection mechanism rebuild
- Rebuild of secondary clarifier #2 chain, flight, sprockets and cross collectors
- Grit classifier drive repairs
- Aeration blower check valve replacement
- Return activated sludge pump #4 replacement including isolation and check valves
- Replacement of boiler water recirculation pump
- Repairs on primary digester #2
- Maintenance support of the Welland WWTP capital upgrade

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

Planned Capital Upgrades

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

- Welland WWTP phase one upgrades – construction completed in 2023

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.

During the reporting year 2023, no Notices of Modification were completed.

No Notice of Modification forms were completed in previous reporting years. No status update is required.

Proposed Works – Status Update

ECA 3922-C9PJKZ includes Proposed Works including:

- Raw sewage pumping station: replacement of 3 raw sewage pumps
- Screening – 2 new screen channels and mechanical screens
- Modifications to the grit removal system
- Improvements to primary clarifier scum system
- Aeration system upgrades – installation of fine bubble air diffuser system and blowers
- Replacement of phosphorus removal system

All proposed works have been completed. Raw sewage pumps have been installed and are operational.

WW-T-5 Summary Calibration Activities

Flow Meter Calibration – Influent, Effluent and Imported Sewage

Flow meters measuring discharges to the environment are calibrated at minimum, once per calendar year. Below in Table WW-T-6 provides a summary of flow meter calibration.

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

Meter Name	Date Calibrated	Comments
Welland Influent Storm Meter	2023-04-13	Passed
Welland Influent Primary Meter	2023-04-13	Passed
Welland Influent Storm Meter	2023-11-28	Passed
Welland Influent Primary Meter	2023-11-08	Passed

Calibration certificates are available upon request.

Flows at the Welland WWTP are measured by combining the metered wastewater volumes flowing to both the conventional primary clarifiers (influent primary meter) and the storm primary clarifiers (influent storm meter).

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, calibration or verification on all effluent monitoring equipment is completed. A summary of annual calibration/verification activities are available in Table WW-T-7 below.

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

Equipment Description	Date Calibrated	Comments
DR 1900 Spectrophotometer	2023-08-09	Passed
Chlorine Portable Pocket Colorimeter	2023-08-09	Passed
HQ40D Portable Meter with LDO Probe	2023-08-09	Passed
COD Reactor (Hach DRB 200)	2023-08-09	Passed
Thermo Star A111 pH Meter	2023-08-09	Passed.
Balance (ML204T)	2023-09-12	Passed

Calibration certificates are available upon request.

WW-T-6 Solids Handling

Processed Organics Received

No processed organic waste was received at the Welland WWTP in 2023.

Volume Sludge Generated and Removed From Site

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

Table WW-T-8: Summary of Sludge Removed from Site 2023

Month	2023 Volume Sludge Hauled (ML)	Prior Year Volume Sludge Hauled (ML)
January	6.721	5.897
February	5.420	5.116
March	6.591	6.070

Month	2023 Volume Sludge Hauled (ML)	Prior Year Volume Sludge Hauled (ML)
April	5.203	5.507
May	6.114	5.810
June	6.851	8.672
July	5.593	6.591
August	5.637	6.677
September	5.550	6.417
October	6.547	6.244
November	5.420	6.244
December	6.808	5.984
TOTAL	**72.454**	**75.230**

A 4% decrease in sludge removed from site in 2023 versus reporting year 2022 was observed. 2022 sludge volume was increased due to digester cleanout activities.

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

Sludge Quality Monitoring

Digested sludge is sampled and analyzed bi-weekly to meet regulatory requirements of the Garner Road Biosolids Facility and Welland WWTP ECA and 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 biosolids analysis from the Welland WWTP is included in Table WW-T-9.

WW-T-7 Complaints

No complaints were received in 2023 regarding the operation of the Welland WWTP. Three complaints were received regarding operation of the collection system and are included in section 0 below.

Table WW-T-9: Summary of Monthly Average Biosolids Results

Analyte	Units	NMA Limits	January	February	March	April	May	June	July	August	September	October	November	December
Total Solids	%	-	2.55	2.60	1.90	2.50	1.90	1.75	2.40	3.50	2.30	1.80	2.60	2.20
Ammonia as N	mg/Kg	-	520	710	630	680	703	510	640	735	605	447	545	510
Nitrate+Nitrite	mg/Kg	-	0.98	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Phosphorus	mg/Kg	-	22,900	13,326	21,800	21,450	24,800	23,200	22,100	21,000	20,900	23,100	23,550	21,400
Arsenic	mg/Kg	170	7.19	6.80	9.15	12.25	5.82	9.35	5.02	5.43	6.04	9.84	2.49	12.89
Cadmium	mg/Kg	34	0.55	0.25	0.50	0.50	0.50	0.50	0.50	0.50	0.55	0.53	0.75	0.50
Chromium	mg/Kg	2,800	71.35	42.15	76.90	70.80	58.93	56.45	67.55	79.70	80.95	67.20	79.65	74.55
Cobalt	mg/Kg	340	2.60	2.22	3.95	4.40	3.83	3.70	4.70	4.40	4.55	2.07	1.80	3.85
Copper	mg/Kg	1,700	389	215	360	342	395	389	372	371	372	440	500	372
Lead	mg/Kg	1,100	27.00	14.61	23.00	24.00	19.33	15.00	22.00	44.50	38.00	129.33	139.00	54.50
Mercury	mg/Kg	11	0.15	0.16	0.26	0.38	0.25	0.28	0.25	0.24	0.24	0.20	0.19	0.35
Molybdenum	mg/Kg	94	13.50	7.06	10.00	8.00	10.67	13.00	18.50	19.50	18.50	16.00	14.00	13.50
Nickel	mg/Kg	420	33.95	15.86	28.60	26.75	17.63	18.75	14.35	27.90	28.20	27.20	37.10	22.20
Potassium	mg/Kg	-	4,060	2,489	5,975	7,105	5,620	5,380	3,570	3,980	3,400	3,367	2,970	3,165
Selenium	mg/Kg	34	2.52	2.58	2.57	2.12	3.49	2.40	2.56	2.26	2.44	1.57	2.16	1.87
Zinc	mg/Kg	4,200	549	290	534	502	562	555	587	597	553	589	632	489

WW-T-8 Bypasses, Overflows, other situations outside Normal Operating, Spills and Abnormal Discharge Events

Bypasses and Overflows

There were 36 secondary bypass events at the Welland WWTP in 2023. Secondary bypasses from this facility receive partial treatment prior to discharge to the environment including screening, grit removal, phosphorus removal, settling (solids removal), chlorination and dechlorination (from April 1 to October 31). Table WW-T-10 provides a monthly breakdown of bypass events occurring at the Welland WWTP during the reporting period.

Table WW-T-10: Annual Summary of Secondary Bypass Events by Month

Month	Number of Secondary Bypass Events	Total Volume (ML)
January	4	138.168
February	1	28.777
March	6	291.315
April	2	163.408
May	1	3.569
June	2	25.692
July	5	143.095
August	5	56.996
September	1	18.754
October	0	0.000
November	3	14.724
December	6	150.472
Total	**36**	**1,034.970**

The ECA for the Welland WWTP requires that a sample of the final effluent combined with secondary bypass flow be sampled every day the facility is in bypass mode. All results are to be included in the calculation of the final effluent monthly average compliance results.

Secondary bypass results are included in the Final Effluent sampling and monitoring covered in section WW-T-2 above.

There was a secondary bypass event on September 7, 2023, where a sample of the final effluent was not collected and tested for the entire duration that the plant was in secondary bypass mode. This was identified during completion of quarterly compliance reporting and the MECP was notified. Corrective actions have been taken to prevent reoccurrence in the future.

The Welland WWTP continues to meet ECA compliance limits sampling final effluent during secondary bypass events.

Situations Outside of Normal Operating Conditions

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

There were no situations 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 to safely complete required maintenance to critical equipment. If 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 WW-T-11 summarizes spills that occurred at the Welland WWTP in 2023.

Table WW-T-11: Summary of spills occurring at the Welland WWTP during the reporting year

Spill Date	MECP Incident Number	Description of Spill
No spills occurred at the Welland WWTP in 2023.		

Abnormal Discharges

An abnormal discharge is a discharge to the environment that is abnormal in quality or quantity. There was one instance where final effluent was discharged without continuous disinfection. Full details of this instance is included in section WW-T-3 above.

WW-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 WW-T-2, Welland WWTP provides effective secondary treatment. The Final Effluent annual average quality achieved in 2023 were below the secondary treatment equivalent MECP design objectives.

Summary of Efforts – Procedure F-5-1 and F-5-5 – Bypassing from Combined Sewer Systems

The Welland WWTP receives sewage from portions of the City of Welland where combined sewer systems still exist. Procedure F-5-1 and F-5-5 require that a staged program be developed for the ultimate goal of total containment and treatment of all sewage flows.

Being a two-tier system, Niagara Region works closely with the City of Welland, Town of Pelham and City of Thorold to reduce bypasses at the wastewater treatment plant. Pollution Prevention and Control Plans (PPCP) are undertaken by area municipalities with support and participation from Niagara Region. As well, Niagara Region undergoes a Master Servicing Plan every five years to identify areas that require I&I reduction or capacity increases based on expected development growth in the area. Both studies take into consideration impacts from wet weather and provide recommended actions to reduce wet weather overflows/bypasses.

Niagara Region participates in a cost sharing strategy with lower tier municipalities to fund overflow reduction projects and pollution prevention and control plan updates. In 2023, Niagara Region had an approved budget totaling $4.0M for the overflow reduction cost sharing program. Five (5) projects were approved for cost sharing in the City of Welland with Niagara Region contributing $688,392 to support overflow reduction activities. One (1) project was approved for cost sharing for the Town of Pelham with Niagara Region contributing $1.2M for sanitary sewer replacements.

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. As Welland WWTP services a collection system that is impacted by wet weather flow, fully treating the combined sewage and stormwater is not

feasible. Welland is equipped with storm treatment for flows greater than 65,000 m^3/d, up to a maximum flow of 118,000 m^3/d. Two Primary clarifiers provide storm treatment to wet weather flow. Flows greater than the plant design peak flow of 65,000 m^3/d are diverted around the secondary treatment process and recombine with the final effluent prior to discharge to the Welland River. Flows to the storm treatment system receive screening, grit removal, phosphorus removal, settling (solids removal), chlorination and dechlorination (from April 1 to October 31). It recombines and is sampled with the final effluent prior to discharge to the environment.

Samples collected and tested of the combined secondary bypass and final effluent continue to meet ECA compliance limits.

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 as well as sampling and monitoring of industrial discharges on a routine basis to ensure that they meet the Sewer Use By-law limits.

WW-C-1 Overview of the Welland WWTP Collection System

The Welland WWTP collection system is a class III system that collects wastewater from domestic, commercial and industrial sources from the City of Welland, the southwest portion of the City of Thorold and the Town of Pelham. The collection system consists of the following:

- Local sanitary sewers
- 35.1 kilometres of regional gravity mains
- 22.5 kilometres of regional force mains
- 12 pumping stations:
    - Daimler Woods Sewage Pumping Station
    - Dain City Sewage Pumping Station and Sewage Detention Tank
    - Feeder Road Sewage Pumping Station
    - Foss Road Sewage Pumping Station
    - George Street Sewage Pumping Station
    - Hurricane Road Sewage Pumping Station
    - Kelly Street Sewage Pumping Station and Sewage Detention Tank
    - Ontario Road Sewage Pumping Station
    - Park Lane Sewage Pumping Station
    - Seaway Heights Sewage Pumping Station
    - South Street Sewage Pumping Station
    - Towpath Road Sewage Pumping Station
- Lyons Creek Sewage Detention Facility
- 2 Sanitary Sewer Overflows (SSOs) on Niagara Region infrastructure

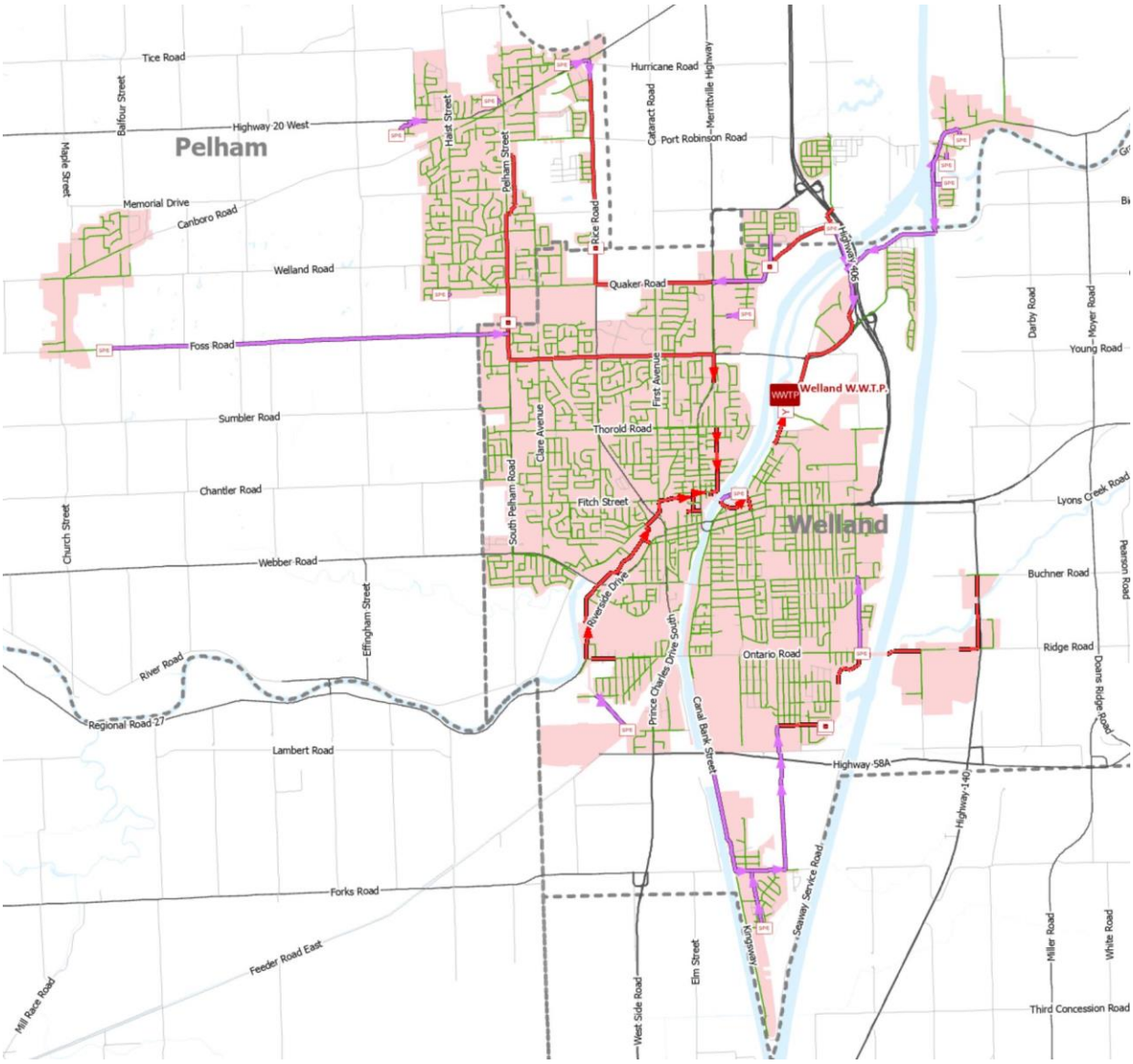

Figure WW-C-1: Map of Welland WWTP Collection System

The collection system is operated under a two-tier system, where the area municipalities owns and operates local gravity sanitary sewers and Niagara Region owns and operates sewage pumping stations, forcemains, larger gravity sanitary sewers or trunk sewers and some sewage detention facilities. It is classified as a combined sewer system. This means there are a small portion of pipes still remaining in the system that were designed to collect sanitary sewage and storm water in a single pipe. Combined sewers are no longer allowed to be constructed in Ontario and are being replaced with separate sewer systems as funding allows. Combined systems are heavily impacted during wet weather and snow melt events. While the majority of the collection system is separated, the separated 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:

- Welland Wastewater Catchment System, 007-W604, issue number 1

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

WW-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 Welland 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 WW-C-1 details the total length of sewers inspected over the past four years.

Table WW-C-1- CCTV Program Summary

Measurement in Kilometers (km)	2020	2021[3]	2022	2023
Inspection Length (km)	37.9	18.5	59.3	33.0

[3] 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.

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.

WW-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.

The emergency replacement of the Dain City SPS forcemain resulting from plugging of the forcemain in 2019 is nearing completion with final connection anticipated for the first quarter of 2024. Increased enforcement sampling and monitoring activities continue in the Dain City sewershed.

Gravity Trunk Sewers

Operational issues continue to be experienced in the siphon that conveys sewage below the Welland Canal from the east side of Welland in 2023. A blockage of the siphon occurred in March of 2022 causing a surcharge of the sewers downstream of the siphon and a spill to the environment. Smartcovers were installed in 2023 to notify Niagara Region staff of high levels in the sewer upstream of the siphon. This is used to identify when cleaning is required. Cleaning is occurring on an approximately monthly basis.

Environmental Enforcement staff continue to monitor the area. Inspections were conducted on the weekends in 2023 to try to identify any source of industrial influence that may be occurring. Increased monitoring and sampling of industries in this area is ongoing.

WW-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 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 Welland Collection System:

- Pump and rail replacement at South Street
- Ontario Road/Ridge Road Siphon maintenance and cleaning (ongoing)
- Rebuild of the Towpath SPS biobed

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

Planned Capital Upgrades

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

- George Street SPS Station Upgrades – completed in 2023
- Quaker Road trunk sewer replacement – in construction
- Emergency replacement of Dain City SPS forcemain – in construction
- Dain City SPS Station upgrades – in design
- Mill Street Area Sanitary Sewer Improvements (in partnership with City of Welland)
- Broadway trunk sewer replacement (in partnership with City of Welland)

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.

WW-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 WW-C-2 below provides a summary of calibrations completed in the collection system in 2023.

Table WW-C-2 - Summary of Calibration Activities Undertaken in the Welland Collection System

Equipment Description	Date Calibrated	Comments
Dain City SPS Station Discharge Flow Meter	2023-04-20	Passed
Foss Road SPS Station Discharge Flow Meter	2023-04-13	Passed
Foss Road SPS Station Discharge Flow Meter	2023-11-29	Passed
Hansler Flume	2023-04-13	Passed
Hansler Flume	2023-11-08	Passed
Kelly Street SPS Station Discharge Flow Meter	2023-04-13	Passed
Kelly Street SPS Station Discharge Flow Meter	2023-11-16	Passed
Pelham Flume	2023-05-26	Passed
Pelham Flume	2023-11-29	Passed
Rice Road Flume	2023-05-26	Passed
Rice Road Flume	2023-11-21	Passed
Towpath Road SPS Pump 1 Discharge Flow Meter	2023-04-13	Passed
Towpath Road SPS Pump 2 Discharge Flow Meter	2023-04-13	Passed
Towpath Road SPS Pump 1 Discharge Flow Meter	2023-11-08	Passed
Towpath Road SPS Pump 2 Discharge Flow Meter	2023-11-08	Passed

Calibration certificates are available upon request.

WW-C-6 Summary of Complaints

Two (2) odour complaints were received in 2023 regarding the operation of the Welland collection system. When a complaint is received, Operations staff attend the site to verify the complaint. Corrective actions are taken as needed upon verification of any issue. All complaints and corrective actions taken are recorded and available.

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

Collection System Overflows

The Welland wastewater collection system is classified as a combined sewer system. This means the collection systems consists of a small portion of sewers that are designed to collect both sanitary and storm water while most sewers are separated. Collection system overflows occur during wet weather events due to combined sewers but also because of inflow and infiltration of storm water into sections of the sewage collection system that are separate. Overflows are necessary to prevent basement flooding and to protect downstream infrastructure and wastewater treatment processes.

Table WW-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, is available on the Region's website (www.niagararegion.ca/living/sewage/cso)..

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

Overflow Location	Overflow Date	Overflow Volume (ML)	Overflow Duration (hhh:mm)	BOD Loading (kg/d)	TSS Loading (kg/d)	TP Loading (kg/d)	TKN Loading (kg/d)	E.Coli[4] (MPN/100 mL)	Was the Overflow Disinfected (Yes/No)	Were Any Adverse Impacts Observed (Yes/No)	Corrective Actions Taken
No Collection System Overflow Events in 2023											

[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 to safely complete required maintenance to critical equipment. If 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 WW-C-4 summarizes spills that occurred in the Welland collection system in 2023.

Table WW-C-4: Summary of Spills Occurring in the Welland Collection System

Spill Date	MECP Incident Number	Description of Spill
2023-04-24	1-3FDEQC	**Unplanned Spill – Foss Road SPS Forcemain Strike** On April 24, Niagara Region dispatch were notified of a possible forcemain break on Foss Road in Welland. Niagara Region staff attended the site and break was caused by a strike to the forcemain by a contractor with excavation equipment. Spillage from the forcemain strike was confined in the trench the excavator was digging. A pump was used to pump the spilled sewage to a sanitary sewer maintenance hole nearby. No sewage was spilled outside the trench area. The forcemain was repaired and the station was returned to normal service.
2023-09-12	1-3U0HS5	**Unplanned Spill – Foss Road SPS Forcemain Strike** On September 12, Niagara Region staff were notified by City of Welland staff of a suspected spill of sewage on Foss Road in Welland. Staff attending the site determined that the Foss Road SPS forcemain had been struck by a contractor while working in the area performing directional-drill boring operations. A vacuum truck was dispatched to site to remove spilled sewage from a nearby ditch. Spill containment activities were continued until a contractor was available to excavate and repair the break. Repairs to the forcemain were completed, tested and the station was returned to normal service. All

Spill Date	MECP Incident Number	Description of Spill
		spill material was contained to the nearby ditch and no adverse impacts were observed.
2023-10-17	1-3XVN96	**Unplanned Spill – Air Relief Valve Failure Towpath SPS** On October 17, Niagara Region staff were notified of a spill coming out of an access chamber on the Towpath SPS property. Maintenance crews were dispatched to site. The spill was caused by a mechanical failure of an air relief valve housed in the access chamber. Station pumps were shutdown to stop the spill of sewage and allow maintenance staff access to the failed air relief valve. The valve was isolated and the station was returned to normal service. Vacuum trucks were brought to site to undertake vacuuming of the ditches and swales impacted by the spill.

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

Projects Undertaken to Reduce Bypasses or Overflows

Being a two-tier system, Niagara Region works closely with the City of Welland, Town of Pelham and City of Thorold 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. Five (5) projects were approved for cost sharing in the City of Welland with Niagara Region contributing $688,392 to support overflow reduction activities. One (1) project was approved for cost sharing for the Town of Pelham with Niagara Region contributing $1.2M for sanitary sewer replacements.

The Niagara Region is working collaboratively with sewer improvement and replacement projects in the City of Welland. Two projects are being undertaken, the Broadway trunk sewer replacement and the Mill Street sewer improvement projects, that will help reduce I&I from the collection system.

There were no overflows from the Niagara Region portion of the Welland collection system in 2023.

Public Reporting of Bypasses and Overflows

Niagara Region reports all bypass and overflow events 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 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.