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

Niagara Region

Table of Contents

Niagara Falls Wastewater Treatment Plant Annual Performance Report (NF-T)
List of Tables: 3
List of Figures: 3
List of Figures 4
NF-T-1 Wastewater Treatment Process Description 5
NF-T-2 Review of Plant Flows, Influent and Imported Sewage Sampling and Monitoring 7
Review of 2023 Plant Flows 7
Review of Influent Sampling and Monitoring Activities 9
Review of Imported Sewage Sampling and Monitoring 10
Review of Final Effluent Sampling and Monitoring Activities 12
Effluent Quality Assurance Measurements and Control Measures 18
Deviations from Scheduled Sampling Days 19
NF-T-3 Description of Operating Problems Encountered and Corrective Actions Taken 19
CBOD and TSS Monthly Compliance Limit Exceedances – 2023 19
NF-T-4 Summary of Major Maintenance Activities and Capital Works 21
Summary of Maintenance Carried out on Major Equipment 21
Planned Capital Upgrades 22
Summary and Update of Notice of Modifications Completed 22
Proposed Works – Status Update 22
NF-T-5 Summary Calibration Activities 23
Flow Meter Calibration – Influent, Effluent and Imported Sewage 23
Effluent Monitoring Equipment Calibration/Verification 23
NF-T-6 Solids Handling 24
Process Organics Received 24
Volumes Sludge Generated and Removed From Site 24
Sludge Quality Monitoring 25
NF-T-7 Complaints 27
NF-T-8 Bypasses, Overflows, other situations outside Normal Operating, Spills and Abnormal Discharge Events 27
Bypasses and Overflows 27
Situations Outside of Normal Operating Conditions 32
Spills 32
Abnormal Discharges 32
NF-T-9 Summary of Efforts to Achieve Conformance with F-5-1 and/or F-5-5 33
Summary of Efforts – Procedure F-5-1 – Secondary Treatment Equivalent 33
Summary of Efforts – Procedure F-5-1 and F-5-5 – Bypassing from Combined Sewer Systems 33
Excess Primary Treatment Capacity 34
Industrial Waste 34

List of Tables:

Table NF-T-1: Table of Niagara Falls WWTP 2023 Treated and Imported Sewage Flows 7
Table NF-T-2: Table of Imported Sewage monthly average analysis results..... 11
Table NF-T-3: Evaluation of Final Effluent sample results to ECA objectives and compliance limits 14
Table NF-T-4: Annual Summary of Niagara Falls Plant and Imported Sewage Flows, Influent and Effluent Sampling and Monitoring Results 15
Table NF-T-5: Summary of Daphnia Magna and Rainbow Trout Acute Lethality Results 17
Table NF-T-6: Summary of landfill leachate testing required by Niagara Falls WWTP ECA .. 18
Table NF-T-7: Table of 2023 sampling schedule deviations..... 19
Table NF-T-8: Average Number of RBCs In Service for reporting period 2023..... 20
Table NF-T-9: Summary of Flow Meter Calibration 23
Table NF-T-10: Summary of Calibration/Verification of Effluent Monitoring Equipment 23
Table NF-T-11: Summary of Niagara Falls 2023 Sludge Production and Handling..... 25
Table NF-T-12: Summary of Monthly Average Sludge Results 26
Table NF-T-13: Summary of Secondary and Plant Overflow Events by Month 27
Table NF-T-14: Niagara Falls WWTP Secondary Overflow Sampling Results..... 29
Table NF-T-15: 2023 Niagara Falls WWTP Plant Overflow Sampling Results..... 31
Table NF-T-16: Summary of spills occurring at the Niagara Falls WWTP during the reporting year 32

List of Figures:

Figure NF-T-1: Graph displaying the Monthly Average Daily Flow Rate in MLD 8
Figure NF-T-2: Figure of monthly plant loadings to the Niagara Falls 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..... 10

Niagara Falls Wastewater Collection System Annual Performance Report (NF-C)

List of Tables 4
NF-C-1 Overview of the Niagara Falls WWTP Collection System 35
NF-C-2 Summary and Interpretation of Collection System Monitoring Data 37
Monitoring of Pump Station Operations 37
Sanitary Sewer Closed-Circuit Television Inspection Program 37
Flow Monitoring 38
NF-C-3 Summary of Operating Issues Encountered and Corrective Actions Taken 38
Pump Stations and Forcemains 38
Gravity Trunk Sewers 39
NF-C-4 Summary of Major Maintenance, Capital Projects and Pre-Authorized Alterations 39
Summary of Maintenance Carried out on Major Equipment 39
Planned Capital Upgrades 40
Summary of Pre-Authorized Alterations Undertaken 40
NF-C-5 Summary of Calibration Activities 40
NF-C-6 Summary of Complaints 41
NF-C-7 Summary of Collection System Overflows and Spills 41
Collection System Overflows 41
Collection System Spills 45
NF-C-8 Summary of Efforts to Reduce WWTP Bypasses/Overflows and Collection System Overflows 46
Projects Undertaken to Reduce Bypasses or Overflows 46
Public Reporting of Bypasses and Overflows 47

List of Tables

Table NF-C-1- CCTV Program Summary 38
Table NF-C-2 - Summary of Calibration Activities Undertaken in the Niagara Falls Collection System 40
Table NF-C-3: Summary of Collection System Overflow Events 42
Table NF-C-4: Summary of Spills Occurring in the Niagara Falls Collection System 45

List of Figures

Figure NF-C-1: Map of Niagara Falls WWTP Collection System 36

NF-T-1 Wastewater Treatment Process Description

The Niagara Falls Wastewater Treatment Plant (WWTP) is located at 3450 Stanley Avenue in the City of Niagara Falls and provides wastewater treatment to the City of Niagara Falls and portions of the Town of Niagara-on-the-Lake (NOTL). The Niagara Falls WWTP is a class IV treatment facility and has been designed to treat an average daily flow (ADF) of 68,300 cubic meters per day (m^3/d). This facility can fully treat all flows up to 136,400 m^3/d and provides primary treatment for wet weather flows greater than 136,400 m^3/d up to a maximum flow rate of 205,000 m^3/d.

The Niagara Falls WWTP operates under the following Ministry of Environment, Conservation and Parks (MECP) Environmental Compliance Approvals (ECA):

Environmental Compliance Approval (Sewage):

- A-500-5110411564 Revision 1, issued August 22, 2021

Environmental Compliance Approval (Air):

- 6480-7ZUMEH, issued January 19, 2010

The Niagara Falls WWTP uses the following processes to treat wastewater:

- Imported Sewage Receiving
- Screening
- Raw Influent Pumping
- Grit Removal
- Flocculation
- Phosphorus Removal
- Primary Treatment
- Secondary Treatment (Rotating Biological Contactors and Settling)
- Disinfection (Chlorination and Dechlorination)
- Solids Handling – sludge digestion, dewatering and transportation

Imported Sewage Receiving Station: To provide service to Niagara Region residents outside the wastewater servicing area, the Niagara Falls WWTP accepts Hauled Sewage from commercial haulers and recreational vehicle holding tanks. Receiving stations are situated to ensure all hauled 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.

Raw Influent Pumping: Screened wastewater enters a wet well, equipped with raw sewage pumps. The wet well provides a low point for the collection system to discharge. 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.

The Niagara Falls WWTP is equipped to pump all wastewater received up to 205,000 m^3/d. During wet weather events, high flows above 205,000 m^3/d will back up in the incoming sewer and discharge directly to the Queenston-Chippawa Power Canal. This is called a Plant Overflow.

Grit Removal: Grit tanks equipped with coarse bubble diffusers are used to remove grit from wastewater. Heavy suspended material in the wastewater such as sand and small stones (grit) is settled to the bottom of the tanks while lighter organic particles are kept in suspension and passed through the tanks for further treatment. The grit removed is dewatered for landfill disposal.

Flocculation: Polymer and coagulant is added to the wastewater and mixed in flocculation tanks. Flocculation brings small solids together into larger bunches. The larger bunches of solids are heavier and improve settling in the downstream primary clarifiers.

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 less than 136,400 m^3/day, the effluent from the primary clarifiers flows to the secondary treatment process for full treatment, disinfection and dechlorination. Flows greater then 136,400 m^3/d will bypass the secondary treatment system and disinfection/dechlorination system and flow to the OPG canal. This is called a secondary overflow.

Secondary Treatment:

Rotating Biological Contactors (RBCs): A shaft with multiple large round discs stacked close together are slowly rotated into a shallow tank of wastewater. Microorganisms (or “bugs”) grow on the discs and remove dissolved and suspended organics and nutrients when in contact with the wastewater. While the portions of the disc are exposed to the air, the microorganisms get the oxygen they need to remain healthy.

Coagulation and Phosphorus Removal: A polymer and metal salt solution, ferric chloride, is added to assist with phosphorus removal and solids settling in the secondary clarifiers.

Secondary Clarifiers: Secondary clarifiers receive effluent from the RBCs which separates the remaining solids. Solids settle as waste sludge on the bottom of the clarifier while a clean effluent overflows from the clarifiers to be disinfected and discharged to the environment. The waste sludge collected on the bottom of the clarifier is pumped to the solids handling process for anaerobic digestion.

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 Queenston-Chippawa Power Canal.

Solids Handling:

Anaerobic Digestion: Sludge from the primary and secondary clarifiers is directed to primary anaerobic digesters, which overflow into a secondary digester for thickening. Anaerobic digestion allows a further breakdown of pollutants and pathogens in the collected sludge. The digested sludge is stored for further dewatering.

Dewatering: Digested sludge is mixed with a polymer and processed through a centrifuge. A centrifuge spins the sludge at a high rate of speed to separate the solids from the liquid portion. Centrifuging produces a dewatered cake material which is transported from site for further processing into a pelletized fertilizer. The liquid portion, or centrate, is normally returned to the liquid treatment process for full treatment and discharge to the environment.

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

Review of 2023 Plant Flows

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

Table NF-T-1: Table of Niagara Falls WWTP Treated and Imported Sewage Flows

Flow Statistic	Value
Design Average Daily Flow (ML/d)	68.300
Design Peak Flow Rate - Dry Weather (ML/d)	136.400
Design Peak Flow Rate - Wet Weather (ML/d)	205.000
Total Volume Processed (ML)	15,659.076
Annual Average Daily Flow (MLD)	42.902
% Annual Average Daily Flow Utilization	63%
% Increase/Decrease over prior year	8%
Volume Imported Sewage Received (ML)	0.383
% Increase/Decrease Imported Sewage over prior year	62%

Flow Statistic	Value
Imported Sewage as % of Flow	0.00%

Reviewing the treated flows in 2023, it was observed that, on average, the plant is utilizing 63% of its design Average Daily Flow. This indicates that the facility has hydraulic capacity to meet the needs of the collection system with room for additional future flows that may be added from development. Where the average becomes greater than 80%, plant expansion should be considered.

Daily flows to the plant were reviewed. In 2023, there were 28 instances where the flow to the plant was greater than the design Average Daily Flow, amounting to approximately 8% of the year. These instances occurred during times of wet weather or heavy snow melt. The Niagara Falls 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 completed. This can be observed below in Figure NF-T-1 below. No trends were observed indicating that the average flow at the plant is increasing or decreasing. Spikes during typical wet weather seasons, spring and fall, demonstrate impacts of wet weather on the Niagara Falls collection system and wastewater treatment plant. Lower flows were observed during 2020 and 2021, which can be attributed to COVID-19 pandemic restrictions and its impact on tourism.

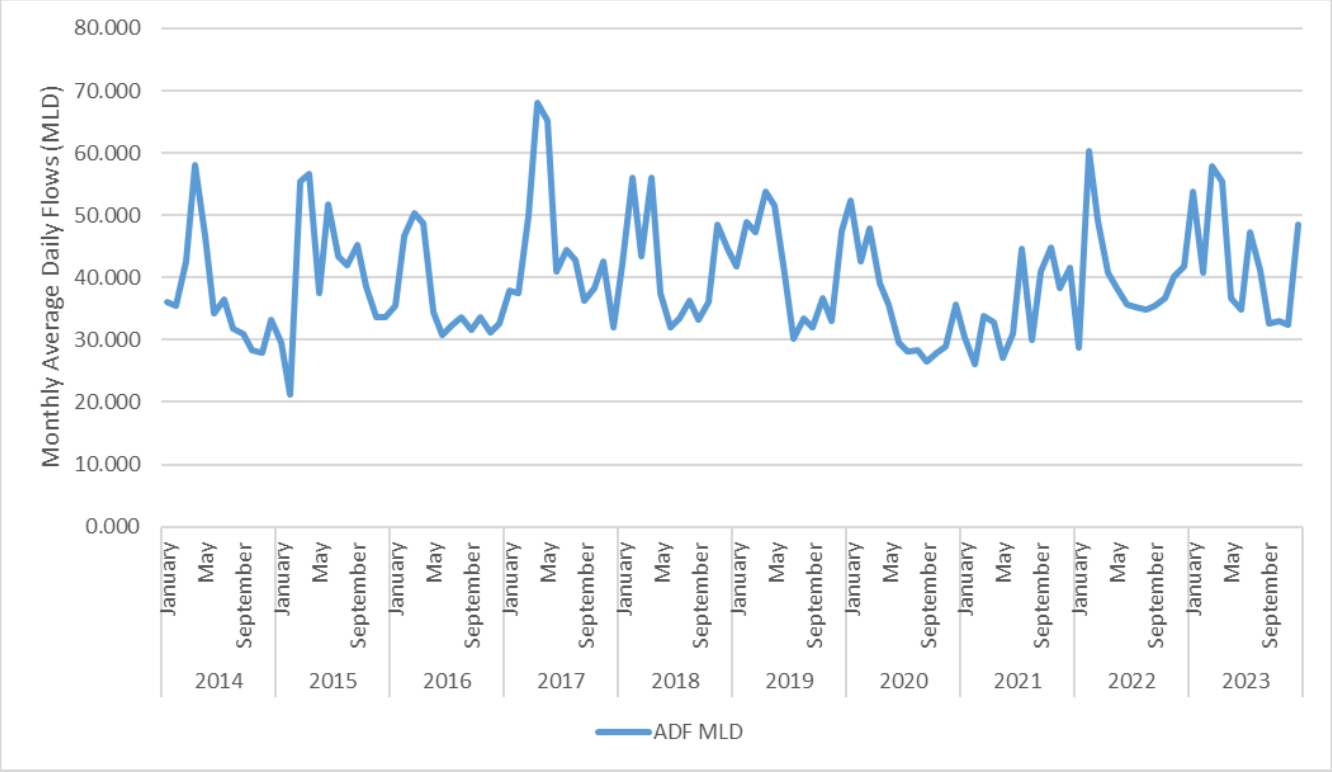

Figure NF-T-1: Graph displaying the Monthly Average Daily Flow Rate in MLD

The volume of imported sewage received at this facility increased by 62% compared to the prior year. Due to final effluent quality issues and ongoing non-compliance with ECA limits, the imported sewage receiving station was closed to all imported sewage as of September 2021. One imported sewage generator (domestic source) was exempted for receipt at Niagara Falls WWTP in 2022. This exemption ended November of 2022. In May 2023, a plan was developed for receipt of domestic imported sewage and shared with the MECP for acceptance. The plan included the following restrictions for imported sewage:

- Limited to domestic wastewater from within the City of Niagara Falls boundaries only
- daily received volume limit of 100 m^3
- Daily sewage disposals would be stored in the hauled sewage holding tank to be released slowly into the influent stream over time
- Plant will receive imported sewage Monday, Tuesday, and Wednesday or at the discretion of the Plant Operations Manager

These restrictions were put in place to ensure no adverse impacts to the plant occurred from the receipt of imported sewage.

As of July 17, 2023, Niagara Falls WWTP began to accept imported wastewater according to the accepted plan. No instances of exceedance of the daily volume limit occurred with the maximum daily total of 27.3 m^3 occurring on October 10, 2023.

Two occurrences of non-domestic imported sewage disposals occurred. Enforcement staff followed up with the hauler in each instance to prevent reoccurrence.

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 NF-T-4: Annual Summary of Niagara Falls Plant and Imported Sewage Flows, Influent and Effluent Sampling and Monitoring Results.

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 shows 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 NF-T-2, is a graph depicting four commonly monitored pollutant loadings to the plant for the period of 2021-2023.

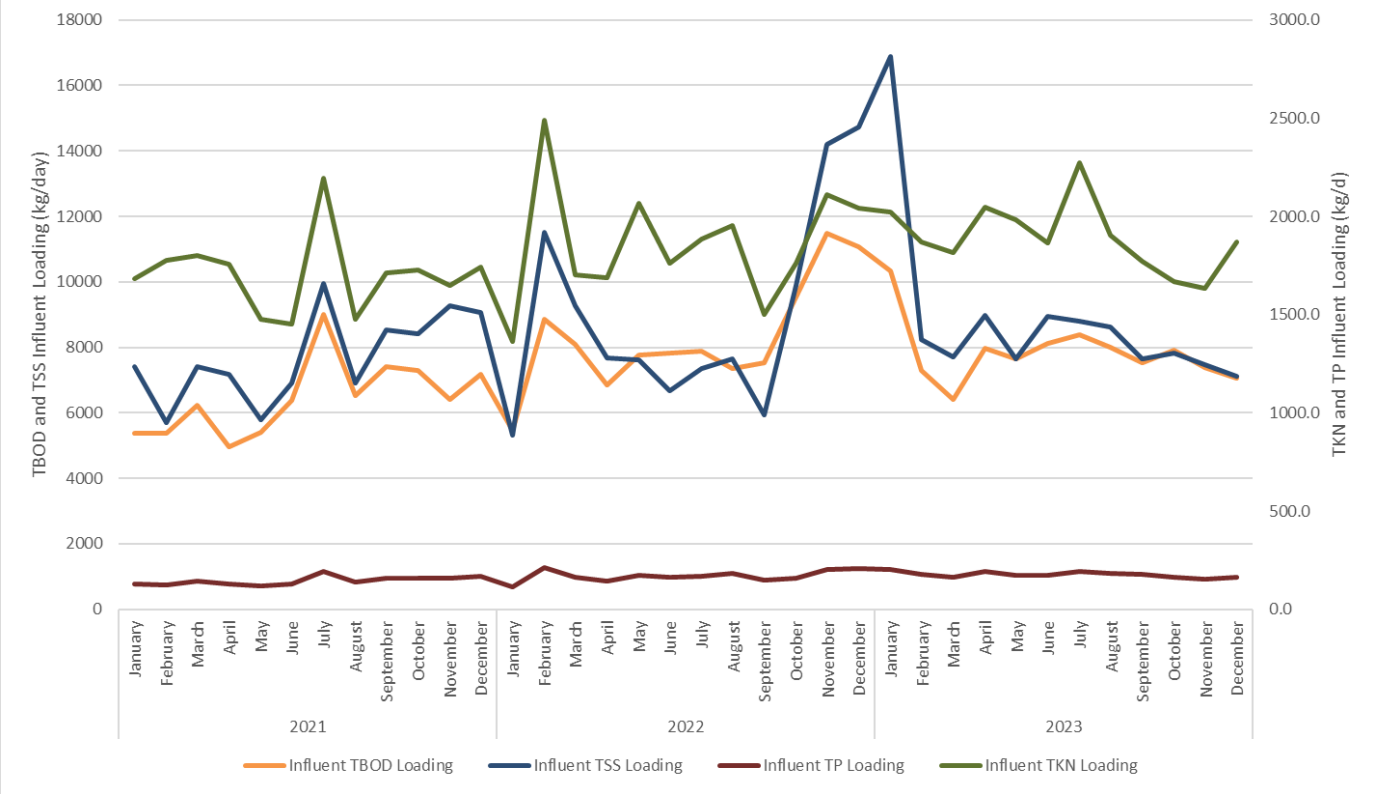

Figure NF-T-2: Figure of monthly plant loadings to the Niagara Falls WWTP for Total Biochemical Oxygen Demand (TBOD), Total Suspended Solids (TSS), Total Kjeldahl Nitrogen (TKN) and Total Phosphorus (TP), in kg/d, for the period 2021 to 2023.

Reviewing the calculated loadings for TBOD, TSS, TKN and TP for the past 3 years shows a slight increase in influent loading. A more in-depth review of 10 years of loading was conducted and 2020 and 2021 years appear to be lower than average likely due to COVID-19 pandemic restrictions and impacts to tourism. This trend may stabilize when the pandemic related years are not included in the three-year trend.

Review of Imported Sewage Sampling and Monitoring

Imported sewage is sampled 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, 23 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 SUBL. Where exceedances of the by-law were noted, the source of the imported sewage is investigated. Exceedances of treatable parameters (TBOD, TSS, TP, pH) are allowable under the SUBL.

Table NF-T-2: Table of Imported Sewage monthly average analysis results. Imported Sewage was not received at the site from January to June 2023.

Analyte	Units	SUBL Limit	January	February	March	April	May	June	July	August	September	October	November	December
Total Solids	mg/L	-	-	-	-	-	-	-	1,760	3,137	1,933	1,290	13,058	6,277
Phosphorus	mg/L	10	-	-	-	-	-	-	16.82	19.24	25.42	9.74	59.53	35.77
Arsenic	mg/L	1	-	-	-	-	-	-	0.02	0.01	0.02	0.04	0.06	0.07
Cadmium	mg/L	0.7	-	-	-	-	-	-	0.01	0.00	0.01	0.01	0.02	0.02
Chromium	mg/L	3	-	-	-	-	-	-	0.07	0.01	0.03	0.04	0.23	0.07
Cobalt	mg/L	5	-	-	-	-	-	-	0.01	0.00	0.01	0.01	0.03	0.02
Copper	mg/L	3	-	-	-	-	-	-	0.22	0.17	0.53	0.39	7.67	1.66
Lead	mg/L	1	-	-	-	-	-	-	0.03	0.01	0.03	0.04	1.25	0.18
Mercury	ug/L	10	-	-	-	-	-	-	0.17	0.20	0.13	0.15	13.55	1.36
Molybdenum	mg/L	5	-	-	-	-	-	-	0.01	0.01	0.01	0.01	0.05	0.04
Nickel	mg/L	2	-	-	-	-	-	-	0.03	0.01	0.02	0.02	0.19	0.08
Selenium	mg/L	1	-	-	-	-	-	-	0.02	0.01	0.02	0.04	0.06	0.07
Zinc	mg/L	3	-	-	-	-	-	-	0.60	0.49	1.38	0.65	8.87	4.63
Aluminum	mg/L	-	-	-	-	-	-	-	1.98	1.42	3.88	2.79	33.90	11.37
Antimony	mg/L	5	-	-	-	-	-	-	0.03	0.03	0.04	0.07	0.11	0.13
Barium	mg/L	-	-	-	-	-	-	-	0.07	0.04	0.27	0.11	1.47	0.45
Beryllium	mg/L	-	-	-	-	-	-	-	0.02	0.01	0.02	0.04	0.06	0.07
Boron	mg/L	-	-	-	-	-	-	-	0.33	0.27	0.40	0.70	1.13	1.33
T BOD	mg/L	300	-	-	-	-	-	-	570	1,437	618	418	2,516	1,690
COD	mg/L	-	-	-	-	-	-	-	1,833	4,030	2,273	1,511	11,046	5,513
Conductivity	mg/L	-	-	-	-	-	-	-	2,076	1,860	2,302	1,731	1,592	1,593
Iron	mg/L	-	-	-	-	-	-	-	4.64	1.87	5.36	2.86	56.64	22.25
Manganese	mg/L	-	-	-	-	-	-	-	0.11	0.09	0.19	0.12	1.59	0.77
pH		6-11	-	-	-	-	-	-	8.00	7.37	7.80	7.60	7.10	7.23
Silver	mg/L	5	-	-	-	-	-	-	0.02	0.01	0.02	0.04	0.06	0.07
Tin	mg/L	5	-	-	-	-	-	-	0.03	0.03	0.05	0.07	0.33	0.13
Total Volatile Solids	mg/L	-	-	-	-	-	-	-	980	2,423	1,185	733	9,718	4,903
Vanadium	mg/L	-	-	-	-	-	-	-	0.01	0.01	0.01	0.02	0.10	0.06
Total Kjeldahl Nitrogen	mg/L	100	-	-	-	-	-	-	179	303	245	136	301	244
Total Suspended Solids	mg/L	350	-	-	-	-	-	-	699	2,458	1,118	609	9,356	4,040

Review of Final Effluent Sampling and Monitoring Activities

In 2023, 104 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 NF-T-3 below summarizes the number of monthly objective and compliance limit exceedances at the Niagara Falls WWTP in the reporting year.

Niagara Falls exceeded the ECA compliance limit for CBOD and TSS six months in 2023. The ECA objectives for CBOD were not achieved 11 months and the TSS objectives were not achieved 12 months of 2023.

The ECA objective for TP was not achieved 10 months of 2023. TP objective exceedances are related to the TSS exceedances noted above as solids that carryover into the final effluent contain phosphorus. The ECA annual average loading limit for TP of 68.3 kg/d was achieved in 2023.

The ECA compliance limit and objective for E.Coli was exceeded in August of 2023. This exceedance was attributed to a single high sample that was collected during this period. Excluding this sample, the monthly geometric mean density met ECA compliance limits and objectives. Operations logs indicate the final effluent did have a residual chlorine on the day of the high sample. It is thought that the sample may have been contaminated. Operators were instructed to take extra care when collecting E.Coli samples to prevent contamination.

The Niagara Falls WWTP final effluent quality is impacted by deficiencies in the secondary treatment process. A new secondary treatment process is currently under construction to replace the current aging infrastructure. This will greatly enhance the facility's ability to effectively treat wastewater and meet and achieve ECA requirements in the future. A status update regarding the ongoing construction is included in section NF-T-4 Proposed Works – Status Update below. A full review and discussion of ECA compliance and objective exceedances is included in section NF-T-3 below.

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

- Carbonaceous Biochemical Oxygen Demand (CBOD) – 82%
- Total Suspended Solids (TSS) – 90%
- Total Phosphorus (TP) – 80%
- E.Coli – 29%
- pH – 2%

Niagara Falls WWTP exceeded ECA objectives greater than 50% of the year for the parameters CBOD, TSS and TP. The facility struggled to maintain a compliant effluent in 2023. Factors attributing to the objective and limit exceedances are covered in further detail in section NF-T-3 below. An annual summary of monthly average final effluent sample results can be observed in Table NF-T-4 below.

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

Parameter	ECA Monthly Concentration Objective	ECA Monthly Concentration Limit	Monthly Loading Limit (kg/d)	Number of Monthly Objective Concentration Exceedances	Number of Monthly Limit Concentration Exceedances	Number of Monthly Loading Limits Exceeded
pH[1]	6.5-8.5	6.0-9.5	-	1	0	-
CBOD5	15 mg/L	25 mg/L	-	11	6	-
Total Suspended Solids	15 mg/L	25 mg/L	-	12	6	-
Total Phosphorus	0.5 mg/L	1.0 mg/L	68.3 kg/d	10	0	0
Total Residual Chlorine[2]	non-detect	0.02 mg/L	-	0	0	-
E-Coli (geomean) [2]	200 CFU/100 mL	200 CFU/100 mL	-	1	1	-

[1] pH must meet objectives/limits at all times (inclusive)
[2] TRC/E.Coli monitoring only required April 01 to October 31 inclusive

Table NF-T-4: Annual Summary of Niagara Falls 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	Samples Tested
Influent - Monthly Average TSS (mg/L)	314	202	133	162	209	246	186	210	234	238	231	147	209	
Number of Influent TSS Samples	9	8	9	9	9	8	9	9	8	10	8	8		104
Influent - Monthly Average TBOD5 (mg/L)	192	179	111	144	209	221	177	195	230	240	228	146	189	
Number of Influent TBOD5 Samples	9	8	9	9	9	8	9	9	8	10	8	8		104
Influent - Monthly Average TP (mg/L)	3.8	4.3	2.8	3.5	4.7	4.8	4.1	4.5	5.4	4.9	4.8	3.4	4.3	
Number of Influent TP Samples	9	8	9	9	9	8	9	9	8	10	8	8		104
Influent - Monthly Average TKN (mg/L)	37.60	45.83	31.42	36.93	54.12	53.28	47.97	46.40	54.26	50.64	50.40	38.59	45.62	
Number of Influent TKN Samples	9	8	9	9	9	8	9	9	8	10	8	8		104
Total Plant Flows (ML)	1667.264	1142.608	1793.537	1660.659	1135.096	1045.052	1467.756	1273.503	980.323	1020.992	971.595	1500.691	15659.076	
Average Daily Flow (MLD)	53.783	40.807	57.856	55.355	36.616	34.835	47.347	41.081	32.677	32.935	32.387	48.409	42.902	
Maximum Daily Flow (MLD)	97.283	96.630	147.563	144.502	56.606	71.275	114.079	58.660	67.643	61.385	60.951	120.237	**MAX**	147.563
Minimum Daily Flow (MLD)	34.491	31.450	18.089	33.487	28.922	29.407	31.047	33.151	28.251	25.070	26.234	32.251	**MIN**	18.089
Volume Imported Sewage Received (ML)	0.000	0.000	0.000	0.000	0.000	0.000	0.041	0.048	0.091	0.098	0.052	0.054	0.383	
Final Effluent - Monthly Average TSS (mg/L)	15.8	16.8	18.7	30.6	29.9	24.5	23.7	23.9	32.6	36.5	40.1	32.5	27.1	
Final Effluent - Average Daily TSS Loading (kg/d)	850	686	1082	1694	1095	853	1122	982	1065	1202	1299	1573	1164	
Number of Final Effluent TSS Samples	9	8	9	9	9	8	9	9	8	10	8	8		104
Final Effluent - Monthly Average CBOD5 (mg/L)	12.7	17.9	18.2	31.7	38.3	20.6	21.8	19.2	29.5	37.2	39.0	28.3	26.2	
Final Effluent - Average Daily CBOD5 Loading (kg/d)	683	730	1053	1755	1402	718	1032	789	964	1225	1263	1370	1124	
Number of Final Effluent CBOD5 Samples	9	8	9	9	9	8	9	9	8	10	8	8		104
Final Effluent - Monthly Average TP (mg/L)	0.42	0.52	0.49	0.86	0.98	0.65	0.70	0.71	0.92	0.95	0.95	0.78	0.74	
Final Effluent - Average Daily TP Loading (kg/d)	22.59	21.22	28.35	47.61	35.88	22.64	33.14	29.17	30.06	31.29	30.77	37.76	31.93	
Number of Final Effluent TP Samples	9	8	9	9	9	8	9	9	8	10	8	8		104
Final Effluent - Monthly Average TKN (mg/L)	22.21	31.35	22.21	27.50	38.80	36.69	35.74	32.08	38.35	34.95	35.36	25.99	31.77	
Number of Final Effluent TKN Samples	9	8	9	9	9	8	9	9	8	10	8	8		104
Final Effluent - Monthly Average NH3 (mg/L)	17.93	25.39	19.13	22.71	32.93	28.49	28.94	31.91	37.38	30.50	31.21	24.14	27.56	
Number of Final Effluent NH3 Samples	9	8	9	9	9	8	9	9	8	10	8	8		104
Final Effluent - Monthly Average NO3 (mg/L)	1.90	1.43	0.37	0.30	0.34	1.91	0.46	0.68	0.36	0.25	0.20	0.40	0.72	
Number of Final Effluent NO3 Samples	9	8	9	9	9	8	9	9	8	10	8	8		104
Final Effluent - Monthly Average NO2 (mg/L)	0.38	0.40	0.17	0.12	0.37	0.51	0.14	0.61	0.31	0.26	0.13	0.16	0.30	
Number of Final Effluent NO2 Samples	9	8	9	9	9	8	9	9	8	10	8	8		104
Final Effluent - Monthly Geomean E.Coli (cfu/100mL)				169	55	37	57	225	65	25			69	
Number of Final Effluent E.Coli Samples				8	10	8	8	10	9	9				62
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	29	31	31	30	31				213

Measured Parameter	January	February	March	April	May	June	July	August	September	October	November	December	Total / Average	Samples Tested
Final Effluent - Monthly Average Temperature (°C)	12.46	12.55	11.83	14.97	15.62	18.85	21.14	21.59	21.28	19.25	15.25	14.45	16.60	
Number of Final Effluent Temperature Samples	9	8	9	9	9	8	9	9	8	10	8	8		104
Final Effluent - Monthly Average pH	7.69	7.74	7.56	7.13	7.30	7.26	7.21	7.13	7.05	7.10	7.43	7.50	7.34	
Number of Final Effluent pH Samples	9	8	9	9	9	8	9	9	8	10	8	8		104

Quarterly sampling and testing of Final Effluent for Acute Lethality to Daphnia Magna[3] and Rainbow Trout[4] is a requirement of the ECA at the Niagara Falls WWTP. This testing includes introducing Daphnia or Rainbow Trout to a sample of Final Effluent. The sample is aerated and observed for multiple days.

- For the Daphnia Magna, the number of test subjects that die during the 48-hour testing period are counted. If more then 50% of the total Daphnia die, the sample fails.
- For Rainbow Trout, 10 trout are tested in the effluent for 96 hours. If more than five trout die during the testing period, the sample fails.
    - Typically during the 96 hour testing period for Rainbow Trout, the action of aerating the effluent will cause the pH of the sample to rise due to the evolution of carbon dioxide. The increase in pH causes ammonium and ammonia concentrations present in the sample to shift resulting in a higher amount of un-ionized ammonia that can be toxic to fish. This is a result of the testing conditions and is not a true representation of the toxicity of the effluent.
    - As the pH shifted sample is not reflective of the actual effluent pH, the Rainbow Trout test can also be conducted using pH stabilization. This means the pH is measured at the beginning and during the test. If it begins to change, the pH is adjusted back to the originally measured value at the beginning of the test.
    - Both the standard Rainbow Trout test as well as the pH stabilized version are run at the same time as a precaution and means to determine if final effluent toxicity is occurring due to the pH shift that can occur during testing

Test results for 2023 can be observed in Table NF-T-5 below.

Table NF-T-5: Summary of Daphnia Magna and Rainbow Trout Acute Lethality Results

Sample Date	Acute Lethality to Daphnia Magna Pass/Fail	Acute Lethality to Rainbow Trout Pass/Fail	Acute Lethality to Rainbow Trout - pH Stabilized Pass/Fail
2023-03-13	Pass	Fail	Pass
2023-05-30	Pass	Fail	Pass
2023-08-08	Pass	Fail	Pass
2023-11-06	Pass	Fail	Pass

Niagara Falls WWTP passed all Acute Lethality to Daphnia Magna tests in 2023. All four Acute Lethality to Rainbow Trout without pH stabilization tests failed. This is due to the concentration

[3] Acute Lethality to Daphnia Magna is carried out as per Environment Canada Publication EPS 1/RM/14
[4] Acute Lethality to Rainbow Trout is carried out as per Environment and Climate Change Canada publication EPS 1/RM/13 and EPS 1/RM/50 for pH Stabilization

of ammonia in the Final Effluent and the shift in pH that occurs during the test that was described above. All four pH stabilized tests passed confirming that the failures are a result of the pH shift that occurs during testing. Toxicity test reports are available upon request.

Niagara Falls WWTP receives landfill leachate from the collection system for treatment and discharge. To monitor impacts of landfill leachate on the Final Effluent, the ECA requires quarterly testing for landfill leachate related parameters. Table NF-T-6 below summarizes landfill leachate testing results for reporting year 2023. Insufficient sample volume was available during the May 9 sampling event for Bis(2-ethylhexyl) Phthalate. Resampling occurred on May 29 to fulfill this sampling requirement.

Table NF-T-6: Summary of landfill leachate testing required by Niagara Falls WWTP ECA

Analyte	Units	2023/02/15	2023/05/09	2023/05/29	2023/08/01	2023/11/07
Arsenic	mg/L	<0.01	<0.01		<0.01	<0.01
Bis(2-ethylhexyl) Phthalate	ug/L	<4		2	<1	<1
Boron	mg/L	<0.2	<0.2		<0.2	<0.2
Cobalt	mg/L	<0.003	<0.003		<0.003	<0.003
Magnesium	mg/L	24.4	21.7		20.4	15.5
Manganese	mg/L	0.14	0.11		0.14	0.17
Potassium	mg/L	12.0	14.0		12.2	13.9
Strontium	mg/L	0.56	0.48		0.57	0.38

Effluent Quality Assurance Measurements and Control Measures

To ensure Niagara Falls 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 Niagara Falls 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, seven deviations from the scheduled sampling days occurred. Table NF-T-7 below provides the instances where a deviation occurred and a reason for the deviation.

The 2024 sampling schedule is available upon request.

Table NF-T-7: Table of 2023 sampling schedule deviations

Sampling Date Deviation	Sample Type(s)	Reason
2023-10-10	Final Effluent	Final effluent E.Coli sample was submitted the following day.
2023-10-16	Primary Effluent	Primary effluent sampler malfunction. Sample was submitted following day.
2023-08-10 2023-09-26 2023-11-01 2023-12-05 2023-12-28	Imported Sewage	Imported Sewage was not received at the site until July 2023. After this date, weekly sampling was required. Samples were sometimes not available on the scheduled day as no disposals were made.

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

CBOD and TSS Monthly Compliance Limit Exceedances – 2023

The Niagara Falls WWTP did not achieve ECA objectives for CBOD, TSS and TP in 2023. Additionally, the plant did not meet compliance limits for CBOD and TSS for six months in 2023. Significant capital upgrades are required at the facility to replace the aging rotating biological contactors (RBCs) with a more robust secondary treatment system to better treat fluctuating wastewater loads to the facility. A new moving bed biofilm reactor (MBBR) process has been designed, approved by MECP and currently under construction. The new secondary treatment system has an anticipated completion date of 2025.

The monthly objective for CBOD was not achieved 11 months in 2023 as well as six CBOD ECA limit exceedances. Several breakdowns of RBC units occurred over the reporting year. Table NF-T-8 below outlines the average number of RBC units in service during 2023. Daily COD monitoring of the influent has also shown higher than average COD loading to the

Niagara Falls WWTP. The RBC treatment process is not robust enough to adapt quickly to changes in plant loading. The new MBBR technology will provide a better treatment solution for the variable loadings observed at the Niagara Falls WWTP.

Table NF-T-8: Average Number of RBCs In Service for reporting period 2023

Month Name	Average Number of RBC Units in Service
January	25.5
February	25.0
March	23.7
April	24.0
May	23.9
June	27.9
July	26.9
August	26.3
September	22.6
October	22.5
November	23.0
December	24.0

Currently, 9 of 35 RBC units are out of service (26%). Due to the age of the equipment, many replacement parts need to be fabricated causing long lead time for repairs. Current supply chain issues has exacerbated the sourcing and procurement of parts and materials. Starting in April 2021, an RBC maintenance and repair strategy was implemented, however, as RBCs are repaired and brought back online for service, other RBCs continue to fail due to the age and condition of the equipment.

To address final effluent CBOD quality, the following measures have been taken:

- All centrate generated by the onsite centrifuge is being removed by truck and discharged to the other Niagara Region wastewater treatment plants for further treatment to reduce BOD loading to the Niagara Falls plant. Centrate has high amounts of soluble organics that the RBC units are not able to effectively remove. This has been ongoing since February 2021.
    - In 2023, over 2,000 loads of centrate were removed from site
- Daily COD influent, primary effluent, RBC effluent and final effluent sampling to monitor performance of the RBC units, plant loadings and process change impacts more closely.
- Restrictions are in place for the receipt of imported sewage.

- Sludge from Queenston WWTP has been diverted from Niagara Falls WWTP.

Final Effluent TSS and TP monthly results were also over ECA objectives during 2023 with six TSS non-compliances 2023. Solids handling is still limited at the plant while primary digester #2 is out of service. TP exceedances are tied to solids carryover.

To improve solids handling at the Niagara Falls plant, the following actions continued or were taken in 2023:

- Operations staff continue with process optimization efforts that have been ongoing at the facility since 2019.
- Dosing of polymer to the RBC effluent to improve settling in the final clarifiers is still occurring. Polymer system optimization was undertaken with the supplier to ensure that the polymer in use and the dosage applied is still the best option available.
- New ferric chloride dosing pumps have been installed to address issues with the current ferric chloride system. Flow meter installation and pacing of the system to flow was completed in 2023.
- Flushing of the ferric chloride lines is completed on a weekly basis.
- Niagara Falls Water Treatment Plant has been redirecting the discharge of residuals away from the sanitary sewer. Sludge from the Queenston WWTP was redirected to Port Weller WWTP.
- Sampling of discharges to the collection system from industries has been increased to determine additional loadings to the plant.

All incidents of non-compliance were reported as required to the MECP and Environment and Climate Change Canada.

NF-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 Niagara Falls WWTP:

- On going maintenance and repairs to RBC units including gearbox rebuilds, bearing replacements and rotating assembly rebuilds
- Rebuild of Raw Sewage Pumps #1 and #2

- Chlorine contact tank cleaning
- Clean out of primary digester #1

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 Niagara Falls WWTP:

- Niagara Falls WWTP phase one secondary treatment upgrades – in construction
- Niagara Falls phase two solids handling upgrade – in design

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 A-500-5110411564 version 1.0 includes the following Proposed Works:

- Upgrades to grit treatment system
- Installation of new Moving Bed Biological Reactor (MBBR) secondary treatment system to replace failing RBC units
- Decommissioning of RBC units
- Improvements to secondary clarifiers
- Influent flow measurement
- Improvements to coagulation and flocculation processes
- Construction of new chlorine contact tank
- New Final Effluent flow measurement

Construction of phase one secondary treatment upgrades is and has been ongoing following the necessary Asbestos Containing Material (ACM) abatement.

The project has experienced delays related mainly to site conditions. Project substantial completion is now anticipated to be July 23, 2025.

Process upgrades to the grit treatment system are in progress and partially complete. Significant structural (foundation and concrete) work has been completed and is in progress for the new moving bed biological reactor (MBBR) secondary treatment system, new chlorine contact tank (CCT), and new blower and water meter buildings. Improvements to two of four secondary clarifiers are nearing completion, with functional testing and deficiency corrections remaining.

NF-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 NF-T-9 provides a summary of flow meter calibration.

Table NF-T-9: Summary of Flow Meter Calibration

Meter Name	Date Calibrated	Comments
Niagara Falls Final Effluent Meter	2023-04-11	Passed
Niagara Falls Secondary Overflow Meter	2023-04-11	Passed
Niagara Falls Plant Overflow Meter	2023-06-07	Passed
Niagara Falls Final Effluent Meter	2023-11-07	Passed
Niagara Falls Secondary Overflow Meter	2023-11-07	Passed

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, calibration or verification on all effluent monitoring equipment is completed. A summary of annual calibration/verification activities are available in Table NF-T-10 below.

Table NF-T-10: Summary of Calibration/Verification of Effluent Monitoring Equipment

Equipment Description	Date Calibrated	Comments
pH Meter	2023-08-09	Passed

Equipment Description	Date Calibrated	Comments
COD Reactor	2023-08-09	Passed
Spectrophotometer (DR1900)	2023-08-29	Passed
Dissolved Oxygen Meter	2023-08-09	Passed
Turbidimeter (TU5200)	2023-08-09	Passed
Turbidimeter (2100Q)	2023-08-09	Passed
Chlorine Pocket Colorimeter II	2023-08-09	Passed
Balance	2023-09-11	Passed

Calibration certificates are available upon request.

NF-T-6 Solids Handling

Processed Organics Received

No processed organics were received at the Niagara Falls WWTP in 2023. Sludge from Queenston WWTP is usually accepted at this site but this has been redirected to other wastewater treatment plants to limit loading to the facility.

Volumes Sludge Generated and Removed From Site

Solids removed from the treatment process are stored and centrifuged on site to produce a thickened product called dewatered cake. Dewatered cake is transported from site for further processing and conversion to a pelletized fertilizer. Additional sludge unable to be dewatered on site is transported 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 NF-T-11 provides a summary of 2022 and 2023 sludge volumes removed from site.

Table NF-T-11: Summary of Niagara Falls 2023 Sludge Production and Handling

Month	2023 Volume Sludge Dewatered On Site (ML)	2023 Dewatered Cake Yield (Dry tons)	2023 Volume Digested Sludge Hauled to Garner Road Biosolids Facility (ML)	2023 Volume Raw Sludge Hauled Off Site (ML)	Prior Year Total Sludge Produced (ML)
January	8.309	160.42	0.911	0.000	6.136
February	8.328	139.06	0.434	0.000	6.092
March	4.389	143.17	3.816	0.000	5.664
April	1.185	174.22	6.417	0.000	7.845
May	8.871	169.97	0.000	0.000	7.454
June	10.311	172.24	0.000	0.000	6.876
July	7.513	109.79	0.000	0.000	6.814
August	7.977	239.32	0.000	0.000	8.407
September	7.378	198.86	0.130	0.000	7.514
October	7.101	157.61	0.000	0.000	7.659
November	9.653	212.48	0.000	0.000	10.071
December	5.064	192.87	1.734	0.000	9.616
TOTAL	**86.079**	**2070.01**	**13.442**	**0.000**	**90.149**

A 10% increase in sludge removed from site in 2023 versus reporting year 2022 was observed. Increased flows to the plant were experienced in 2023.

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

Sludge Quality Monitoring

Digested sludge is sampled and analyzed bi-weekly to meet regulatory requirements of the Garner Road Biosolids Facility and Niagara Falls WWTP ECA and maintain our ability to beneficially re-use biosolids. Results are trended and compared to Nutrient Management Act 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 Niagara Falls WWTP is included in Table NF-T-12.

Table NF-T-12: Summary of Monthly Average Sludge Results

Analyte	Units	NMA Limits	January	February	March	April	May	June	August	September	October	November	December
Total Solids	%	-	2.90	2.85	3.30	3.50	3.25	3.90	4.27	4.10	3.15	2.15	2.05
Ammonia as N	mg/Kg	-	300	330	330	425	270	410	397	895	980	735	870
Nitrate+Nitrite	mg/Kg	-	0.99	1.00	0.99	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00
Phosphorus	mg/Kg	-	9662	16,400	14,400	16,450	14,450	15,050	16,700	20,350	25,650	22,400	24,200
Arsenic	mg/Kg	170	2.27	2.01	3.34	1.85	1.50	2.00	2.14	3.22	2.82	1.77	3.76
Cadmium	mg/Kg	34	0.34	0.50	0.40	0.50	0.50	0.50	0.50	0.50	0.50	0.70	0.50
Chromium	mg/Kg	2,800	33.48	55.20	47.60	53.15	50.35	66.80	63.87	70.65	84.35	90.70	96.90
Cobalt	mg/Kg	340	0.84	1.90	1.80	1.50	1.55	2.75	2.43	1.90	2.55	2.15	3.60
Copper	mg/Kg	1,700	218	306	288	299	278	294	290	398	505	577	496
Lead	mg/Kg	1,100	12.05	15.50	16.00	12.00	11.50	13.00	15.67	296.00	247.50	88.50	146.00
Mercury	mg/Kg	11	0.08	0.08	0.04	0.07	0.07	0.06	0.11	0.21	0.11	0.21	0.14
Molybdenum	mg/Kg	94	4.70	8.00	5.00	5.50	7.50	7.50	8.00	8.50	13.00	14.50	15.50
Nickel	mg/Kg	420	16.61	19.20	11.90	11.80	12.20	5.90	13.23	11.40	4.80	48.85	12.05
Potassium	mg/Kg	-	1730	3,025	2,430	2,450	2,800	2,465	1,970	2,540	3,170	4,160	4,145
Selenium	mg/Kg	34	1.06	1.00	0.45	1.15	1.65	0.75	1.18	1.41	1.47	1.20	0.79
Zinc	mg/Kg	4,200	254	359	362	373	364	387	406	549	639	637	587

NF-T-7 Complaints

Three (3) odour complaints were received regarding the operation of the Niagara Falls WWTP When a complaint is received, operations staff attend the site to verify the complaint. Corrective actions are taken if required based on the site verification. All complaints and corrective actions are logged in a complaint tracking system. Six (6) complaints were received regarding operation of the collection system and are included in section below.

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

Bypasses and Overflows

There were 25 secondary overflows events at the Niagara Falls WWTP in 2023. Secondary overflows from this facility receive primary treatment prior to discharge to the environment including screening, grit removal, phosphorus removal and settling (solids removal). The facility also had 17 plant overflows. Plant overflows occur when flows to the plant increase above the raw sewage pumping capabilities of 205,000 m^3/d. Plant overflows receive no treatment prior to discharge to the environment. Table NF-T-13 provides a monthly breakdown of overflow events occurring at the Niagara Falls WWTP during the reporting period.

Table NF-T-13: Summary of Secondary and Plant Overflow Events by Month

Month	Number of Secondary Overflow Events	Total Secondary Overflow Volume (ML)	Number of Plant Overflow Events	Total Plant Overflow Volume (ML)
January	2	12.302	1	7.850
February	1	9.160	1	0.710
March	4	37.894	2	1.302
April	3	47.862	3	7.878
May	0	0.000	0	0.000
June	1	1.109	0	0.000
July	5	23.221	5	29.657
August	3	1.505	2	0.245
September	1	0.025	0	0.000
October	1	0.007	0	0.000
November	1	0.967	1	0.175
December	3	19.992	2	12.029

Month	Number of Secondary Overflow Events	Total Secondary Overflow Volume (ML)	Number of Plant Overflow Events	Total Plant Overflow Volume (ML)
Total	**25**	**154.044**	**17**	**59.846**

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 secondary overflow event samples collected in 2023 are shown in Table NF-T-14 below. Results for plant overflow event samples collected in 2023 are shown in Table NF-T-15 below.

Table NF-T-14: Niagara Falls WWTP Secondary Overflow Sampling Results

Date/Time	TBOD (mg/L)	TSS (mg/L)	TP (mg/L)	TKN (mg/L)	Ammonia as N (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	E.Coli[5] (cfu/100mL)
2023-01-04/ Event Start	90	85	3.28	29.50	19.30	0.20	0.10	N/A
2023-01-05/ 8 Hour Sample	60	118	1.41	11.60	5.62	1.50	0.10	N/A
2023-01-20/ Event Start	70	40	1.70	22.00	15.20	0.20	0.10	N/A
2023-02-09/ Event Start	121	146	3.70	40.70	22.10	0.40	0.20	N/A
2023-02-09/ 8 Hour Sample	66	67	1.70	17.30	10.60	0.20	0.10	N/A
2023-03-03/ Event Start	106	74	2.30	28.80	16.70	0.20	0.10	N/A
2023-03-04/ 8 Hour Sample	48	62	1.10	16.80	9.20	0.60	0.10	N/A
2023-03-04/ 16 Hour Sample	107	91	2.10	28.50	18.60	0.20	0.10	N/A
2023-03-04/ 24 Hour Sample	126	98	1.80	26.10	18.80	0.40	0.20	N/A
2023-03-05/ Event Start	59	58	2.40	25.40	17.20	0.70	0.20	N/A
2023-03-05/ 8 Hour Sample	45	59	1.30	14.00	8.60	0.80	0.10	N/A
2023-03-17/ Event Start	62	64	1.60	14.80	8.30	0.20	0.10	N/A
2023-03-17/ 8 Hour Sample	40	34	1.10	10.50	7.30	0.20	0.10	N/A
2023-03-25/ Event Start	48	29	1.80	32.70	23.70	0.20	0.10	N/A
2023-03-25/ 8 Hour Sample	46	31	1.70	34.40	25.20	0.20	0.10	N/A
2023-04-01/ Event Start	75	60	2.60	24.80	16.70	0.20	0.10	1,920,000
2023-04-01/ 8 Hour Sample	75	56	2.30	25.10	16.10	0.20	0.10	1,930,000
2023-04-01/ 16 Hour Sample	71	62	2.30	23.70	18.20	0.20	0.10	2,280,000
2023-04-05/ Event Start	140	110	2.20	20.90	13.00	0.50	0.20	2,000,000
2023-04-06/ 8 Hour Sample	27	27	0.90	8.40	5.80	1.40	0.10	400,000
2023-06-12/ Event Start	114	84	2.80	35.00	20.30	0.20	0.10	4,570,000

[5] Sampling of E.Coli is completed April 01 to October 31 annually

Date/Time	TBOD (mg/L)	TSS (mg/L)	TP (mg/L)	TKN (mg/L)	Ammonia as N (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	E.Coli[5] (cfu/100mL)
2023-07-03/ Event Start	58	59	2.10	35.20	20.30	0.20	0.10	9,210,000
2023-07-20/ Event Start	174	43	3.30	54.90	39.00	0.20	0.10	17,930,000
2023-07-24/ Event Start	88	57	3.10	40.60	27.00	0.20	0.10	7,270,000
2023-07-27/ Event Start	34	132	0.20	10.80	4.70	0.20	0.10	1,660,000
2023-07-27/ 8 Hour Sample	27	44	0.20	12.70	7.20	1.00	0.10	1,930,000
2023-07-29/ Event Start	46	52	1.60	19.80	12.10	0.20	0.10	3,280,000
2023-07-29/ 8 Hour Sample	44	39	1.00	15.40	9.70	0.70	0.30	2,380,000
2023-08-15/ Event Start	230	319	6.10	48.20	22.40	0.20	0.10	10,500,000
2023-08-18/ Event Start	160	38	2.50	42.90	32.70	0.20	0.10	14,100,000
2023-08-25/ Event Start	140	108	3.00	28.20	19.00	0.20	0.10	4,350,000
2023-09-07/ Event Start	125	235	3.80	23.30	11.30	0.20	0.10	6,490,000
2023-10-06/ Event Start	106	91	2.50	25.10	14.50	0.20	0.10	9,600,000
2023-11-09/ Event Start	110	67	1.70	29.00	23.10	0.20	0.10	N/A
2023-12-09/ Event Start	172	218	4.80	45.50	28.70	0.20	0.10	N/A
2023-12-17/ Event Start	87	45	3.80	61.00	58.50	0.20	0.10	N/A
2023-12-27/ Event Start	66	110	2.00	21.10	8.60	0.60	0.10	N/A
2023-12-27/ 8 Hour Sample	69	106	1.80	20.10	7.70	0.70	0.20	N/A

Table NF-T-15: 2023 Niagara Falls WWTP Plant Overflow Sampling Results

Date/Time	TBOD (mg/L)	TSS (mg/L)	TP (mg/L)	TKN (mg/L)	Ammonia as N (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	E.Coli[6] (cfu/100mL)
2023-01-04/ Event Start	128	193	3.14	22.70	9.20	0.20	0.10	N/A
2023-02-09/ Event Start	210	617	5.90	41.40	15.50	0.20	0.10	N/A
2023-03-03/ Event Start	173	265	3.20	31.30	14.80	0.20	0.10	N/A
2023-03-17/ Event Start	107	200	2.70	19.90	8.30	0.20	0.10	
2023-04-01/ Event Start	78	183	2.10	16.50	6.50	0.20	0.10	1,250,000
2023-04-01/ 8 Hour Sample	148	385	3.00	23.10	9.40	0.20	0.10	1,660,000
2023-04-04/ Event Start	72	118	1.70	19.60	11.00	0.50	0.10	1,170,000
2023-04-05/ 8 Hour Sample	95	161	2.00	17.10	10.20	0.50	0.10	2,000,000
2023-07-03/ Event Start	119	709	2.70	15.20	5.90	0.20	0.10	4,110,000
2023-07-20/ Event Start	260	195	4.60	57.10	31.50	0.20	0.10	26,130,000
2023-07-24/ Event Start	71	386	3.10	21.40	6.60	0.30	0.10	5,790,000
2023-07-27/ Event Start	53	141	0.20	14.90	7.90	0.20	0.10	1,850,000
2023-07-27/ 8 Hour Sample	52	108	0.70	18.70	9.30	1.80	0.10	2,990,000
2023-07-29/ Event Start	88	139	2.50	29.60	20.00	0.20	0.10	4,110,000
2023-08-15/ Event Start	170	227	4.60	30.20	11.00	0.20	0.10	6,130,000
2023-08-25/ Event Start	230	226	4.30	42.80	25.40	0.20	0.10	8,160,000
2023-11-09/ Event Start	121	262	2.70	25.90	17.00	0.30	0.10	N/A
2023-12-09/ Event Start	200	464	4.40	27.40	10.50	0.20	0.10	N/A
2023-12-27 Event Start	96	186	2.60	32.80	15.20	0.20	0.10	N/A
2023-12-27/ 8 Hour Sample	160	305	3.60	34.90	15.90	0.20	0.10	N/A

[6] Sampling of E.Coli is completed April 01 to October 31 annually

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, spills can also be a necessity to complete required maintenance to critical equipment in a safe way. These are “Planned Spills” and approval is obtained prior to the spill from the MECP.

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 NF-T-16 summarizes spills that occurred at the Niagara Falls WWTP in 2023.

Table NF-T-16: Summary of spills occurring at the Niagara Falls WWTP during the reporting year

Spill Date	MECP Incident Number	Description of Spill
No spills in reporting year 2023		

Abnormal Discharges

An abnormal discharge is a discharge to the environment that is abnormal in quality or quantity. There were no instances of abnormal discharge to the environment in 2023.

NF-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 described above in section NF-T-1 and Table NF-T-4, Niagara Falls struggles to achieve effluent quality that meets design objectives and secondary treatment equivalence as defined by procedure F-5-1. The plant is currently under construction to replace the failing RBC secondary treatment process with MBBR technology. Many optimization efforts have been and continue to be implemented at the facility in an effort to improve effluent quality. This was described above in section NF-T-3 above.

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

The Niagara Falls WWTP receives sewage from portions of the City of Niagara Falls 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 Niagara Falls and the Town of Niagara-on-the-Lake to reduce overflows 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 inflow and infiltration 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. One project was approved for cost sharing in the Town of Niagara-on-the-Lake with Niagara Region contributing $60,000 to support post repair flow monitoring activities. Four projects were approved for cost sharing with the City of Niagara Falls totaling $1,363,830 supporting sewer separation and rehabilitation work.

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 Niagara Falls WWTP services a collection system that is impacted by wet weather flow, fully treating the combined sewage and stormwater is not feasible. Niagara Falls is equipped with primary treatment capacity for flows greater than 136,400 m^3/d, up to a maximum flow of 205,000 m^3/d. Chemically enhanced primary treatment is available to provide enhanced solids and phosphorus removal before being discharged to the Queenston-Chippawa Power Canal. This additional primary treatment capacity treats flows up to five times greater than what is handled on an average day at the Niagara Falls WWTP.

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.

NF-C-1 Overview of the Niagara Falls WWTP Collection System

The Niagara Falls WWTP collection system is a class IV system that collects wastewater from domestic, commercial and industrial sources from the City of Niagara Falls and the Village of St. David's in the Town of Niagara-on-the-Lake (NOTL). The collection system consists of the following:

- Local sanitary sewers
- 20.9 kilometres of regional gravity mains
- 25.8 kilometres of regional force mains
- 21 pumping stations:
    - Bender Hill Sewage Pumping Station
    - Calaguiro Estates Sewage Pumping Station
    - Central Sewage Pumping Station (Niagara Region) and High Rate Treatment Facility (City of Niagara Falls)
    - Dorchester Road Sewage Pumping Station
    - Drummond Road Sewage Pumping Station
    - Garner Southwest Sewage Pumping Station
    - Grassy Brook Sewage Pumping Station
    - Kalar Road Sewage Pumping Station
    - Lundy's Lane Sewage Pumping Station
    - Meadowvale Sewage Pumping Station
    - Mewburn Sewage Pumping Station
    - Muddy Run Sewage Pumping Station
    - Neighbourhood of St. David's Sewage Pumping Station
    - Oakwood Sewage Pumping Station
    - Rolling Acres Sewage Pumping Station
    - Royal Manor Sewage Pumping Station
    - Seneca Street Sewage Pumping Station
    - South Side Low Lift Sewage Pumping Station (Niagara Region) and Detention Tank (City of Niagara Falls)
    - South Side High Lift Sewage Pumping Station
    - St. David's #1 Sewage Pumping Station
    - St. David's #2 Sewage Pumping Station
- Eight Combined Sewer Overflows (CSOs) at sewage pumping stations
- Two Sanitary Sewer Overflows (SSOs) at sewage pumping stations

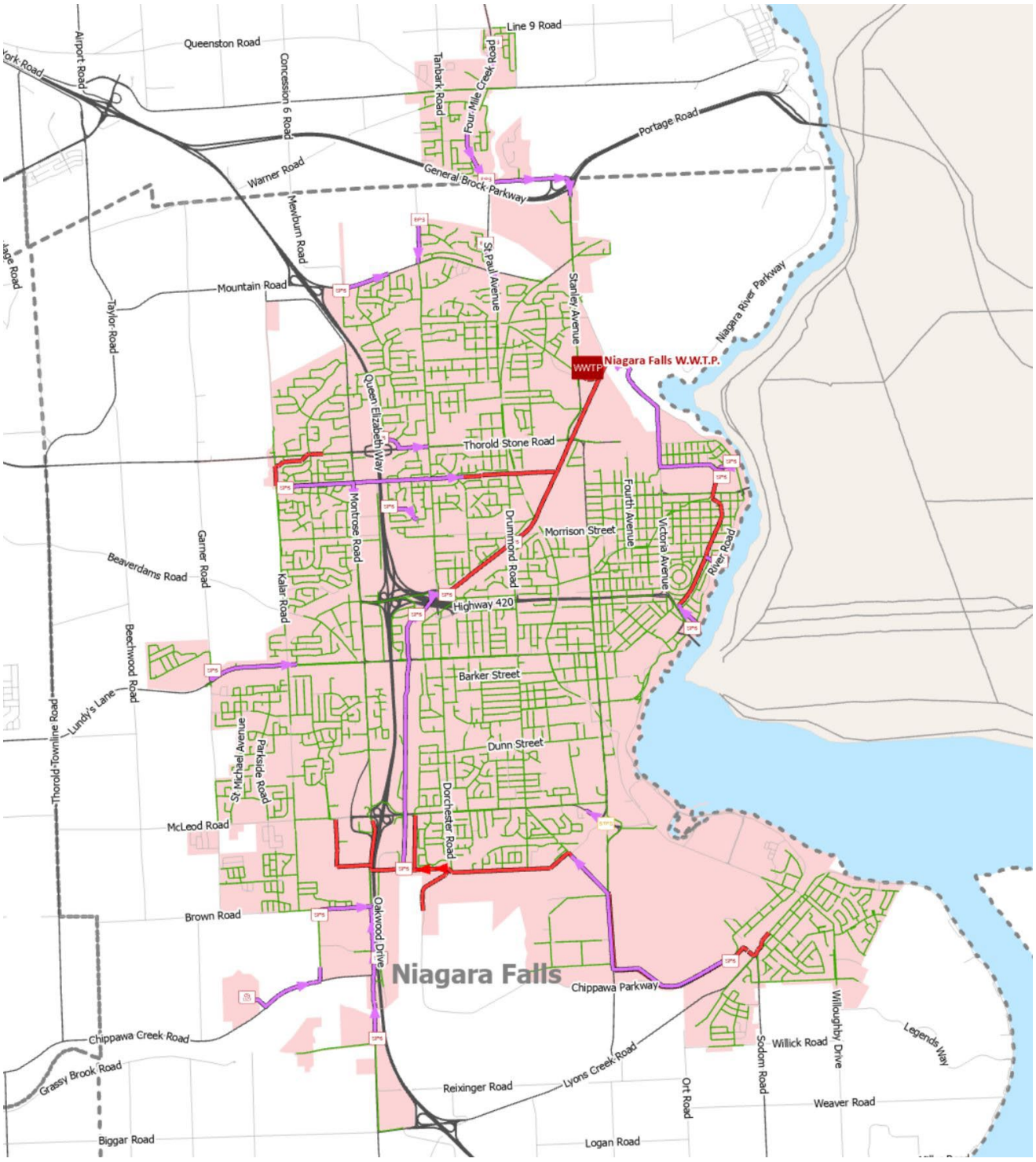

Figure NF-C-1: Map of Niagara Falls WWTP Collection System

The collection system is operated under a two-tier system, where the area municipalities own and operate local gravity sanitary sewers and some sewage detention facilities. Niagara Region owns and operates sewage pumping stations, forcemains and larger gravity sanitary sewers or trunk sewers. It is classified as a combined sewer system. This means there are

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 during wet weather from deficiencies 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:

- Niagara Falls Wastewater Catchment System, 007-W603, issue number 2

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

NF-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 Niagara Falls 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 NF-C-1 details the total length of sewers inspected over the past four years.

Table NF-C-1- CCTV Program Summary

Measurement in Kilometers (km)	2020	2021[7]	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.

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

Pump Stations and Forcemains

South Side Low Lift SPS – Pump Issues

In 2022, operations staff experienced operational issues at the South Side Low Lift (SSLL) SPS. On November 30, 2022, issues were encountered with three of four pumps at the SSLL SPS. All three pumps were faulting out with an over temperature / leak alarm. All station pumps were replaced in 2018 and have been rebuilt twice since install. Pump #1 has been replaced.

An investigation was conducted. It was noted that operations staff had observed pump vibration and signs of cavitation occurring. The pump programming was set such that the pumps were running at a lower frequency causing the pumps to run for extended periods of time leading to overheating. To address station deficiencies, the following actions were taken:

- SCADA programming was updated to prevent pumps running at lower frequencies for long periods of time to prevent overheating and failure of pumps #2, #3 and #4
- Review of pump selection during station upgrade is ongoing

[7] 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.

Operating issues at the South Side Low Lift station continued into 2023 while maintenance staff are working to purchase and install new station pumps.

Muddy Run SPS – Capacity Issues

Operating issues were also encountered at Muddy Run SPS in 2023. One of the two station pumps failed due to mechanical issues in February 2023. The failed pump was removed and sent away for repairs. During this time, a single pump was available to pump station flows. A contingency plan was in place to use a portable pump in the event the remaining pump should also fail.

During a wet weather event on March 3, 2023, the Muddy Run SPS as experiencing high flows to the station. This was originally reported as a wet weather overflow but upon further investigation of station trends it was observed that the station was not pumping to the rated station capacity. This spill is covered in full details in section NF-C-7 below. Maintenance staff were dispatched to site to implement the contingency plan and use a portable pump to pump sewage to the station forcemain.

Repairs to the pump were completed and it was re-installed in May 2023, returning the station to normal operation.

Gravity Trunk Sewers

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

NF-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 Niagara Falls Collection System:

- South Side Low Lift SPS – purchasing of new pumps
- South Side High Lift SPS – rebuild of pump #4
- Lundy’s Lane SPS – repairs to wet well concrete
- Central SPS – replacement of discharge piping on all five pumps
- Central SPS – replacement of pump #2 check valve
- Central SPS – repair of electrical failure of pump #1

- St Davids #2 SPS – pump discharge piping replacement
- St Davids #2 SPS – Replacement of pump #1

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 Niagara Falls Collection System:

- Bender Hill SPS Upgrades – currently in design
- Mewburn SPS – currently in design
- Rolling Acres SPS – currently in design
- Thundering Waters trunk sewer rehabilitation – construction anticipated for 2024

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.

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

Table NF-C-2 - Summary of Calibration Activities Undertaken in the Niagara Falls Collection System

Equipment Description	Date Calibrated	Comments
South Side High Lift SPS Overflow Meter	2023-06-16	Passed
St. David’s #2 SPS Station Discharge Flow Meter	2023-04-14	Passed
St. David’s #2 SPS Station Discharge Flow Meter	2023-11-29	Passed
Central SPS Station Effluent Flow Meter	2023-06-06	Passed
Central SPS Station Overflow Meter	2023-06-06	Passed

Equipment Description	Date Calibrated	Comments
Dorchester Road SPS Station Overflow Meter	2023-06-05	Passed
Drummond Road SPS Station Overflow Meter	2023-06-05	Passed

Calibration certificates are available upon request.

NF-C-6 Summary of Complaints

Six (6) odour complaints were received in 2023 from operation of the Niagara Falls 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.

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

Collection System Overflows

The Niagara Falls 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 NF-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 NF-C-3: Summary of Collection System Overflow Events

Overflow Location	Overflow Date	Overflow Volume (ML)	Overflow Duration (hhh:mm)	BOD Loading (kg)	TSS Loading (kg)	TP Loading (kg)	TKN Loading (kg)	E.Coli[8] (cfu/100 mL)	Was the Overflow Disinfected (Yes/No)	Were Any Adverse Impacts Observed (Yes/No)	Corrective Actions Taken
Bender Hill	2023-01-04	8.373	10:19	761.9	3,005.9	22.6	159.9		No	No	Awaited End of Event
Bender Hill	2023-07-24	3.289	4:04	180.9	588.7	10.2	71.7	2,850,000	No	No	Awaited End of Event
Bender Hill	2023-07-27	7.181	2:52	323.1	1,235.1	1.4	99.8	3,130,000	No	No	Awaited End of Event
Bender Hill	2023-07-29	10.487	3:50	702.6	650.2	16.8	292.6	4,610,000	No	No	Awaited End of Event
Central SPS	2023-07-02	3.650	0.57	730.0	1,460.0	20.8	207.3	7,700,000	No	No	Awaited End of Event
Central SPS	2023-07-03	8.352	8.53	1,027.3	1,545.1	24.2	322.4	6,870,000	No	No	Awaited End of Event
Central SPS	2023-07-15	9.430	7.06	1,697.4	5,959.8	50.0	402.7	11,200,000	No	No	Awaited End of Event
Central SPS	2023-07-18	0.798	0.02	175.6	323.2	5.3	55.9	14,100,000	No	No	Awaited End of Event
Central SPS	2023-07-20	6.189	2.32	1,423.5	1,169.7	29.7	355.2	20,460,000	No	No	Awaited End of Event
Central SPS	2023-07-24	6.517	2.34	404.1	1,824.8	18.9	121.9	5,790,000	No	No	Awaited End of Event
Central SPS	2023-07-27	3.823	5.50	179.7	550.5	0.8	56.6	2,760,000	No	No	Awaited End of Event
Central SPS	2023-07-29	18.365	5.27	936.6	1,763.0	44.1	521.6	5,790,000	No	No	Awaited End of Event
Central SPS	2023-08-15	1.440	0.54	180.0	322.6	6.6	45.5	7,700,000	No	No	Awaited End of Event
Central SPS	2023-08-25	0.214	2.40	42.8	46.4	0.8	8.6	7,700,000	No	No	Awaited End of Event
Central SPS	2023-10-06	2.011	0.56	301.7	541.0	4.2	37.2	18,300,000	No	No	Awaited End of Event
Central SPS	2023-11-09	0.591	1.50	82.7	212.2	1.8	15.0	2,280,000	No	No	Awaited End of Event
Central SPS	2023-12-09	4.331	2.28	623.7	1,801.7	15.6	113.9	3,260,000	No	No	Awaited End of Event
Central SPS	2023-12-27	3.020	8.02	262.7	770.1	8.2	88.2	3,450,000	No	No	Awaited End of Event
Dorchester SPS	2023-01-04	3.830	4.46	406.0	785.2	10.5	102.6	N/A	No	No	Awaited End of Event
Dorchester SPS	2023-02-09	0.310	7.59	62.0	146.9	1.9	13.3	N/A	No	No	Awaited End of Event
Dorchester SPS	2023-03-17	0.597	4.04	5.1	58.5	121.2	1.4	N/A	No	No	Awaited End of Event
Dorchester SPS	2023-04-01	2.520	3.48	171.4	378.0	4.8	32.3	1,380,000	No	No	Awaited End of Event
Dorchester SPS	2023-04-04	0.448	5.54	22.0	54.2	0.7	7.4	1,080,000	No	No	Awaited End of Event
Dorchester SPS	2023-04-05	1.298	5.32	106.4	203.8	3.8	25.8	1,900,000	No	No	Awaited End of Event
Dorchester SPS	2023-06-12	0.023	0.41	2.8	11.0	0.1	1.0	3,650,000	No	No	Awaited End of Event
Dorchester SPS	2023-07-03	1.261	5.36	176.5	385.9	4.3	58.0	5,170,000	No	No	Awaited End of Event
Dorchester SPS	2023-07-20	0.200	2.12	50.0	38.6	0.9	11.5	24,950,000	No	No	Awaited End of Event
Dorchester SPS	2023-07-24	1.961	1.41	121.6	315.7	6.5	44.3	3,870,000	No	No	Awaited End of Event
Dorchester SPS	2023-07-27	3.672	5.14	146.9	613.2	0.7	54.3	2,910,000	No	No	Awaited End of Event
Dorchester SPS	2023-07-29	5.125	6.33	425.4	430.5	13.8	168.1	7,270,000	No	No	Awaited End of Event

[8] E.Coli sampling and analysis is required April 01 to October 31 annually.

Overflow Location	Overflow Date	Overflow Volume (ML)	Overflow Duration (hhh:mm)	BOD Loading (kg)	TSS Loading (kg)	TP Loading (kg)	TKN Loading (kg)	E.Coli[8] (cfu/100 mL)	Was the Overflow Disinfected (Yes/No)	Were Any Adverse Impacts Observed (Yes/No)	Corrective Actions Taken
Drummond SPS	2023-01-04	0.049	0.35	4.8	22.5	0.1	0.9	N/A	No	No	Awaited End of Event
Drummond SPS	2023-07-15	0.000	0.06	-	-	-	-	7,270,000	No	No	Awaited End of Event
Drummond SPS	2023-07-20	0.001	0.57	0.3	0.2	0.0	0.1	19,350,000	No	No	Awaited End of Event
Drummond SPS	2023-07-24	0.002	0.26	0.2	1.0	0.0	0.0	4,790,000	No	No	Awaited End of Event
Drummond SPS	2023-07-27	0.004	0.51	0.2	0.6	0.0	0.1	2,990,000	No	No	Awaited End of Event
Drummond SPS	2023-10-06	0.001	0.04	0.2	0.4	0.0	0.0	10,900,000	No	No	Awaited End of Event
Muddy Run SPS	2023-01-04	0.099	1.47	11.4	43.3	0.3	2.1	N/A	No	No	Awaited End of Event
Muddy Run SPS	2023-03-03	0.331	15.43	28.3	55.3	0.8	9.9	N/A	No	No	Awaited End of Event
Muddy Run SPS	2023-04-01	0.282	19.45	24.0	109.8	0.9	5.6	1,630,153	No	No	Awaited End of Event
Muddy Run SPS	2023-04-05	0.018	0.28	1.6	3.4	0.0	0.3	24,00,000	No	No	Awaited End of Event
Muddy Run SPS	2023-06-12	0.002	0.14	0.2	0.6	0.0	0.1	5,170,000	No	No	Awaited End of Event
Muddy Run SPS	2023-07-02	0.048	0.30	11.0	30.7	0.3	2.8	10,500,000	No	No	Awaited End of Event
Muddy Run SPS	2023-07-15	0.049	0.29	7.8	33.4	0.3	2.3	6,870,000	No	No	Awaited End of Event
Muddy Run SPS	2023-07-24	0.003	0.11	0.4	1.9	0.0	0.1	3,970,000	No	No	Awaited End of Event
Muddy Run SPS	2023-07-27	0.146	1.20	7.6	23.4	0.1	2.1	3,080,000	No	No	Awaited End of Event
Muddy Run SPS	2023-07-29	0.144	1.29	8.9	9.8	0.4	4.5	6,130,000	No	No	Awaited End of Event
Royal Manor SPS	2023-07-03	2.224	2.07	209.1	720.6	4.7	44.7	3,650,000	No	No	Awaited End of Event
Royal Manor SPS	2023-07-27	1.069	0.36	46.0	124.0	1.9	20.5	4,350,000	No	No	Awaited End of Event
Seneca St SPS	2023-04-01	0.640	1.21	67.8	261.8	2.1	14.1	1,660,000	No	No	Awaited End of Event
Seneca St SPS	2023-06-27	0.031	0.09	6.2	8.3	0.2	1.7	10,500,000	No	No	Awaited End of Event
Seneca St SPS	2023-07-02	0.122	0.23	28.1	41.5	0.7	6.9	10,500,000	No	No	Awaited End of Event
Seneca St SPS	2023-07-15	0.150	0.24	27.0	122.1	1.1	7.8	8,660,000	No	No	Awaited End of Event
Seneca St SPS	2023-07-29	1.554	3.25	113.4	369.9	4.0	47.1	4,610,000	No	No	Awaited End of Event
Seneca St SPS	2023-09-07	0.069	0.16	18.6	19.0	0.4	3.5	6,870,000	No	No	Awaited End of Event
Seneca St SPS	2023-09-18	0.012	0.04	2.4	2.1	0.1	0.7	12,514,950	No	No	Awaited End of Event
Seneca St SPS	2023-10-06	0.075	0.18	13.5	32.2	0.2	1.6	11,000,000	No	No	Awaited End of Event
South Side high Lift SPS	2023-01-04	0.980	7.05	137.2	456.7	3.1	19.0	N/A	No	No	Awaited End of Event
South Side high Lift SPS	2023-02-09	1.360	5.21	217.6	505.9	4.9	32.4	N/A	No	No	Awaited End of Event
South Side high Lift SPS	2023-03-03	3.843	24.10	459.9	1,060.7	11.7	121.7	N/A	No	No	Awaited End of Event
South Side high Lift SPS	2023-03-05	0.002	7.20	0.1	0.1	0.0	0.0	N/A	No	No	Awaited End of Event
South Side high Lift SPS	2023-03-17	1.987	10.55	76.6	207.3	153.2	20.5	N/A	No	No	Awaited End of Event
South Side high Lift SPS	2023-04-01	4.599	21.46	292.0	655.4	9.2	82.3	1,597,811	No	No	Awaited End of Event
South Side high Lift SPS	2023-04-04	0.813	6.10	39.8	111.4	1.1	14.0	1,370,000	No	No	Awaited End of Event

Overflow Location	Overflow Date	Overflow Volume (ML)	Overflow Duration (hhh:mm)	BOD Loading (kg)	TSS Loading (kg)	TP Loading (kg)	TKN Loading (kg)	E.Coli[8] (cfu/100 mL)	Was the Overflow Disinfected (Yes/No)	Were Any Adverse Impacts Observed (Yes/No)	Corrective Actions Taken
South Side high Lift SPS	2023-04-05	4.085	8.32	314.5	678.1	7.8	71.9	2,700,000	No	No	Awaited End of Event
South Side high Lift SPS	2023-07-27	3.386	9.00	250.6	1,591.4	9.8	68.7	5,480,000	No	No	Awaited End of Event
South Side high Lift SPS	2023-07-29	5.493	11.04	387.3	508.1	11.0	128.3	2,966,614	No	No	Awaited End of Event
South Side high Lift SPS	2023-12-09	0.003	4.03	0.5	1.8	0.0	0.1	N/A	No	No	Awaited End of Event
South Side high Lift SPS	2023-12-27	5.326	13.06	367.5	798.9	14.9	164.0	N/A	No	No	Awaited End of Event

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. Spills can also be a necessity to complete required maintenance to critical equipment in a safe way. 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 verbally to the MECP Spills Action Centre upon discovery and written reports are submitted as required to regulatory authorities. Below in Table NF-C-4 summarizes spills that occurred in the Niagara Falls collection system in 2023.

Table NF-C-4: Summary of Spills Occurring in the Niagara Falls Collection System

Spill Date	MECP Incident Number	Description of Spill
2023-03-06	230303-000009	**Unplanned Spill – Muddy Run SPS Reduced Station Capacity** On March 3, 2023, heavy rainfall and snow melt was occurring causing high flows to the Muddy Run SPS. A station overflow occurred and was reported as a wet weather overflow to the MECP. Upon further review of station trends, it was noticed by Operations that the station was not pumping to its design capacity during the event. Since the station was not pumping what it is required to pump, the event details were updated with the MECP to a spill. Once the reduced flow was identified, maintenance staff were dispatched to the station with a portable pump to pump from the station wet well to the collection system. The maintenance staff removed the existing pump and removed debris causing the reduced pumping capacity at the station. The pump was re-installed and put back in service returning station to design rated capacity.

Spill Date	MECP Incident Number	Description of Spill
2023-05-10	1-3GDLST	**Unplanned Spill – St. David's No. 2 SPS Dry Weather Spill** A programmable logic controller (PLC) was being replaced at the St. David's No. 2 SPS on May 10, 2023. During the replacement the pump station was being operated under manual control by staff on site. Unknown to staff, the wet well level rose more quickly than normal inflow causing approximately 0.25 m3 of sewage to spill from a maintenance access hole to the roadway. Upon noticing the spill, staff immediately started the station pump to lower the wet well and stop the spill. A vacuum truck was dispatched to site to perform site clean up and remediation of the roadway and ditch. Moving forward, during PLC replacements, control instruments will be powered externally to maintain normal operation of the pumps and level sensors. Additionally, visual observation of the wet well by staff will be put into practice.

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

Projects Undertaken to Reduce Bypasses or Overflows

The Niagara Falls WWTP is impacted by wet weather causing overflow in the system and at the wastewater treatment plant. Being a two-tier system, Niagara Region works closely with the City of Niagara Falls and Town of Niagara-on-the-Lake to reduce overflows. 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 Town of Niagara-on-the-Lake with Niagara Region contributing $60,000 for post repair flow monitoring activities. Four projects were approved for cost sharing with the City of Niagara Falls totaling $1,363,830 supporting sewer separation and rehabilitation work.

The Niagara Region portion of the Niagara Falls collection system had 68 overflows from eight overflow locations in 2023. In addition to work being completed by City of Niagara Falls and Town of NOTL, the Niagara Region is undertaking projects to support the reduction of overflows at the WWTP and in the collection system. The proposed South Niagara Wastewater Solution study is anticipated to provide broad benefits to multiple municipalities across Niagara Region including optimization of wet weather and minimizing overflows and flooding events across the study area. More information regarding this project can be found on the Niagara Region website. (https://www.niagararegion.ca/projects/south-niagara-falls-treatment-plant/default.aspx)k8

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.