Nonquon Water Pollution Control Plant

2022 Annual Performance Report

The Regional Municipality of Durham
Nonquon Water Pollution Control Plant 2022 Annual Performance Report

Environmental Compliance Approval (ECA): 2207-9LKHLM Dated July 17, 2014

The Nonquon Water Pollution Control Plant (WPCP) 2022 Annual Performance Report provides staff, stakeholders and customers an overview of the performance of the Nonquon WPCP in 2022. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of Environment, Conservation and Parks (MECP). This report demonstrates the commitment of ensuring that the WPCP continues to deliver wastewater services to our customers in an environmentally responsible manner.

Water Pollution Control Plant Process Description

General

The Nonquon WPCP located in the Community of Port Perry in the Township of Scugog is owned and operated by the Regional Municipality of Durham (Region). The plant is operated according to the terms and conditions of the ECA. This MECP Class 3 wastewater treatment plant utilizes an extended aeration process with tertiary treatment and is designed to treat wastewater at a rated capacity of 5,900 cubic metres per day (m^3/d). The Nonquon WPCP has a service population of 9,174 residents.

Nonquon WPCP treats wastewater from the Port Perry service area utilizing the following processes;

- raw influent pumping,
- preliminary treatment,
- phosphorus removal,
- secondary treatment,
- tertiary treatment,
- disinfection, and
- solids management.

Raw Influent Pumping

Wastewater is collected through approximately 51.3 kilometres of sanitary sewers in the Port Perry service area and is conveyed to the Nonquon WPCP by three sanitary sewage pumping stations (SSPS): Water Street, Reach Street and Canterbury Common SSPS.

The influent pumping station at the Nonquon WPCP allows raw wastewater flow in excess of the design flow of 5,900 m^3/d to passively overflow to the inlet chamber and be directed to one of the five equalization lagoons for storage. A gravity sanitary sewer pipe allows for lagoon effluent to be returned to the influent pumping station during periods of low flows, for full treatment.

Preliminary Treatment

Screening: There are two bar screens in the screening room for the removal of paper products and large material that could harm pumps and process equipment. One channel contains an automatic, mechanically cleaned bar screen and the other is equipped with a manually raked bar screen to provide screening on an emergency basis. A screenings washer/compacter utilizes plant effluent water to wash and compact the screenings. Screenings are removed in this process and transported to landfill for disposal.
Grit Removal: The vortex grit removal removes sand and small stones (grit) for the protection of mechanical equipment from unnecessary wear and reduce formation of heavy deposits in pipelines, channels and process tanks. The vortex grit removal chamber uses centrifugal force to separate the grit from the wastewater. Grit is collected in the lower portion of the grit tank and is pumped to a grit classifier for dewatering. The dewatered grit is conveyed to the grit/screenings bin for landfill disposal.

Phosphorus Removal

The phosphorus removal system lowers the total phosphorus level in the final effluent by adding a chemical coagulant, aluminum sulphate, as part of the treatment process. Aluminum sulphate can be added at multiple locations throughout the plant.

Secondary Treatment

Aeration Tanks: Preliminary effluent flow is directed to two aeration tanks comprised of two distinct zones. The first is a swing zone equipped with fine bubble diffusers. This zone is capable of being operated as an anoxic zone where no oxygen is introduced and allows for potential denitrification or an aerated zone where fine bubbled air is diffused into the wastewater. It is typically operated as an anoxic zone. The flow leaves the swing zone and enters the aerated zone where fine bubbled air is diffused into the wastewater to assist bacteria in removing dissolved and suspended organics and nutrients. Prior to entering the secondary clarifiers, the two aeration tanks are equipped with a rotating slotted pipe for removal of any excess activated sludge, the waste activated sludge (WAS) is decanted manually to the WAS chamber and pumped to a storage lagoon.
Secondary Clarifiers: The effluent from the aeration tank is directed to the two secondary clarifiers where solids settle quickly as activated sludge leaving a clear effluent. The activated sludge collected on the bottom of the clarifiers is pumped back to the front of the aeration tanks. The clear effluent continues to tertiary treatment.

Tertiary Treatment

Tertiary Sand Filter: Effluent from the secondary clarifiers is filtered through four upflow filter cells operated in parallel. The tertiary influent flow is directed to the bottom of the cells and upward through the sand media. The automatic backwash is initiated by an increase in head pressure or on a

programmed timer. The backwash water is returned to the influent pumping station for further treatment.

Disinfection

Ultra Violet (UV) Irradiation: The effluent flow from the sand filter is then directed to the UV channel for disinfection. The effluent passes through two banks of UV lamps connected in series. The treated final effluent is discharged to the Nonquon River.

Solids Management

Equalization Storage Lagoons: During high flow conditions excess flow from the influent pumping station is diverted to the aerated cell inlet chamber, from here it is directed to one of the five storage lagoons. During low flow conditions the lagoon effluent can be returned to the influent pumping station for treatment.

Solids Treatment: Waste activated sludge (WAS) is pumped from the WAS chamber to lagoon number six for storage and settling, the solid levels are monitored and removed for disposal as needed.

Environmental Compliance Approval (ECA)

Under Condition 10.(6) of ECA #2207-9LKHLM the Region must produce an annual performance report that must contain the following information:

a) Summary and interpretation of all monitoring data and a comparison to the effluent limits;

The raw wastewater flowing into the plant is analyzed for its chemical and physical composition. Monitoring of the raw wastewater is performed in accordance with the plant's ECA. Table 2 Raw Influent Analyses summarizes the raw wastewater characteristics during the reporting period.

The Nonquon WPCP effluent was determined to be compliant with the approval limits during the reporting period. The plant operated at 50.6% of its rated capacity and received a maximum daily flow of 6,099 cubic metres per day (m^3/d) on March 20, 2022.

b) Description of any operating problems encountered and corrective actions taken;

Higher than normal final effluent carbonaceous biochemical oxygen demand (cBOD) results were obtained between July and September. Replacing the final effluent sampler hose resolved the issue.

In early 2022, foaming issues occurred at Reach Street sanitary sewage pumping station (SSPS) and in the plant at the inlet to the sand filters. Durham Region's Sewer Use By-Law Office traced the issue to a local industry that has since modified their sanitation procedure to reduce foaming when discharging to the collection system.

The balance scale was not calibrated in 2022. Staff will ensure calibration is conducted annually together with the other plants.

c) Summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works;

Major maintenance items in 2022 included:

- Installed new final effluent composite sampler,
- Performed diesel generator fuel and exhaust upgrades at Reach Street sanitary sewer pumping station (SSPS),
- Replaced pump 1 at Canterbury SSPS.

d) Summary of any effluent quality assurance or control measures undertaken in the reporting period;

In-house lab test results are compared to the results of the Regional Environmental Laboratory on comparable samples to determine the in-house accuracy. Results were found to be in an acceptable range. On-line instrumentation is verified by WPCP operators using various field or laboratory test equipment.

e) Summary of the calibration and maintenance carried out on all effluent monitoring equipment;

Calibration of the flow meter was conducted on June 15 and November 23, 2022.
Calibration of the in-house laboratory equipment was conducted on October 18, 2022.
Calibration of the pH meter is conducted regularly.

f) Description of efforts made and results achieved in meeting the effluent objectives;

The Region continually strives to achieve the best effluent quality at all times and remain below the objectives specified in the ECA.

The Nonquon WPCP effluent objectives were met in 2022 except for:

- The monthly total phosphorus objective of 0.08 milligrams per litre (mg/L) was exceeded in May.

Best efforts will continue to be applied to maintain results below objectives.

g) Biosolids Production;

Tabulation of Volume of Sludge Generated;

There was no sludge generated for the reporting period**.**

Outline of Anticipated Volumes to be Generated in the Next Reporting Period;

There is no increase of sludge volume generated expected in the next reporting period.

Summary of Locations to Where Sludge was Disposed;

Waste activated sludge is pumped to lagoon number six for storage and settling, the solid levels are monitored and will be removed for disposal when needed.

h) Summary of any complaints received during the reporting period and any steps taken to address the complaints;

All complaints received from the public are administered and tracked through a central database. No complaints were received in 2022.

i) Summary of all By-pass, Spill or Abnormal Discharge;

No by-passes or spills occurred during the reporting period.

j) Copy of all Notice of Modifications and any implementation of Limited Operational Flexibility (Schedule B);

No notice of modifications was submitted in 2022.

k) Report summarizing modifications (Schedule B Section 3);

There were no modifications to the plant during the reporting period.

l) Information required by Ministry of the Environment, Conservation and Parks Water Supervisor;

No additional information was requested.

Ministry of the Environment, Conservation and Parks (MECP) Inspection

The plant was inspected by the MECP on March 5, 2019.

Table 1 Final Effluent Flows

Month	Total Plant Flow* cubic metre (m^3)	Average Daily Flow cubic metre per day (m^3/d)	Maximum Daily Flow m^3/d
January	85,565	2,760	3,135
February	82,734	2,955	5,268
March	126,631	4,085	6,099
April	108,976	3,633	4,833
May	91,198	2,942	3,850
June	100,119	3,337	4,303
July	89,912	2,900	3,173
August	85,350	2,753	3,058
September	76,260	2,542	2,870
October	76,238	2,459	2,962
November	76,335	2,545	3,316
December	89,445	2,885	5,328
Total	1,088,763		
Annual Average	90,730	2,983	
Minimum	76,238		
Maximum	126,631		6,099
ECA Limit		5,900**	
Met Compliance		Yes	

*Metered at the Final Effluent

**Annual Average

Table 2 Raw Influent Analyses

Month	Biochemical Oxygen Demand (BOD_5) average (avg.) concentration (conc.) milligrams per litre (mg/L)	Total Suspended Solids (TSS) avg conc. mg/L	Total Phosphorus (TP) avg conc. mg/L	Total Kjeldahl Nitrogen avg. conc. mg/L
January	150	199	4.0	33.28
February	169	245	3.8	34.83
March	124	174	2.7	26.70
April	108	173	3.3	30.28
May	160	200	3.6	35.38
June	122	163	3.2	30.45
July	112	176	3.0	28.43
August	107	179	3.1	26.76
September	130	185	3.8	31.10
October	156	214	4.5	31.30
November	148	224	4.5	36.90
December	204	212	4.4	39.85
Average	141	195	3.7	32.11
Minimum	107	163	2.7	26.70
Maximum	204	245	4.5	39.85
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes

Table 3 Final Effluent Analyses

Month	Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) average (avg.) concentration (conc.) milligrams per litre (mg/L)	$CBOD_5$ loading kilograms per day (kg/d) year to date avg.	Total Suspended Solids (TSS) avg. conc. mg/L	TSS kg/d year to date avg.
January	1.0	2.8	6.6	18.2
February	1.0	2.9	6.8	19.1
March	1.0	3.3	7.5	22.8
April	1.0	3.4	8.2	24.5
May	1.0	3.3	8.1	24.4
June	1.8	3.7	4.5	22.9
July	5.0	5.4	4.7	21.4
August	9.1	8.3	3.4	19.7
September	2.6	8.1	2.1	17.9
October	1.3	7.5	2.1	16.4
November	1.9	7.3	3.3	15.6
December	1.0	6.9	3.7	15.2
Annual Loading		6.9**		15.2**
Average	2.3		5.1	
Minimum	1.0	2.8	2.1	15.2
Maximum	9.1	8.3	8.2	24.5
ECA Limit	5.0*	29.5**	10.0*	59.0**
ECA Objective	4.0		8.0	
Within Compliance	Yes	Yes	Yes	Yes
Sampling Frequency Requirement Met	Yes		Yes	

*Annual Average Concentration

**Annual Average Loading

Table 3 Final Effluent Analyses continued

Month	Total Phosphorus (TP) average (avg.) concentration (conc.) milligrams per litre (mg/L)	TP kilograms per month (kg/m) monthly avg.	TP kilograms per year (kg/year) to date avg.
January	0.05	4.3	4
February	0.04	3.7	8
March	0.06	7.0	15
April	0.07	8.2	22
May	0.11	9.7	33
June	0.06	5.8	39
July	0.05	4.8	43
August	0.03	2.4	45
September	0.03	2.4	47
October	0.03	2.2	49
November	0.04	2.7	52
December	0.03	2.9	54
Annual Loading			54**
Average	0.05	4.5	
Minimum	0.03	2.2	4
Maximum	0.11	9.7	54
ECA Limit		14.2* May to October	170**
ECA Objective	0.08		
Within Compliance		Yes	Yes
Sampling Frequency Requirement Met	Yes	Yes	Yes

*Monthly Average Loading

**Annual Average Loading

Table 3 Final Effluent Analyses continued

Month	pH minimum	pH maximum	Temperature Degree Celsius average (avg.)
January	6.9	7.2	11.2
February	6.8	7.1	10.9
March	6.9	7.3	11.2
April	7.0	7.3	12.6
May	7.0	7.2	15.3
June	7.0	7.2	18.3
July	6.9	7.2	20.6
August	6.9	7.3	21.1
September	7.1	7.4	19.5
October	7.1	7.4	16.6
November	7.0	7.4	14.8
December	6.9	7.3	12.3
Average			15.4
Minimum	6.8		10.9
Maximum		7.4	21.1
ECA Limit	6.0	9.5	
Within Compliance	Yes	Yes	
Sampling Frequency Requirement Met	Yes	Yes	Yes

Table 3 Final Effluent Analyses continued

Month	Total Ammonia Nitrogen (TAN) average (avg.) concentration (conc.) milligrams per litre (mg/L)	TAN Effluent Objective conc. mg/L	TAN Effluent Limit Monthly avg. conc. mg/L
January	0.0	4.0	5.0
February	0.3	4.0	5.0
March	0.3	4.0	5.0
April	0.0	4.0	5.0
May	0.1	2.4	3.0
June	0.0	1.2	1.5
July	0.0	1.2	1.5
August	0.0	1.2	1.5
September	0.0	1.2	1.5
October	0.0	2.4	3.0
November	0.0	4.0	5.0
December	0.0	4.0	5.0
Average	0.1		
Minimum	0.0		
Maximum	0.3		
Within Compliance	Yes		

Table 5 *Escherichia coli* Sampling

Month	Number of Samples	Monthly Geometric Mean Density
January	9	3
February	8	5
March	9	8
April	8	1
May	9	1
June	9	1
July	8	2
August	10	4
September	8	10
October	9	2
November	9	1
December	8	1
ECA Objective		100 organisms/100ml
ECA Limit		200 organisms/100ml
Within Compliance		Yes
Sampling Frequency Requirement Met	Yes	

Table 6 Energy and Chemical Usage

Month	Aluminum Sulphate litres	Hydro kilowatt hours
January	22,238	111,543
February	19,208	109,059
March	22,241	92,083
April	20,319	91,868
May	24,063	80,041
June	19,871	85,134
July	17,708	81,499
August	18,627	82,904
September	16,980	77,974
October	17,823	92,189
November	17,285	95,267
December	19,654	121,217
Total	236,017	1,120,780