Lake Simcoe Water Pollution Control Plant

2017 Annual Performance Report

The Regional Municipality of Durham

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Environmental Compliance Approval (ECA): 5292-8CYHTQ Dated June 28, 2012

Environmental Compliance Approval (Air): 8-3041-95-006 Dated February 5, 1996

The Lake Simcoe Water Pollution Control Plant (WPCP) 2017 Annual Performance Report provides staff, stakeholders and customers an overview of the performance of the Lake Simcoe WPCP in 2017. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment and Climate Change (MOECC). 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 Lake Simcoe WPCP located in the Community of Beaverton in the Township of Brock 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 MOECC Class Three wastewater treatment plant utilizes an extended aeration process with tertiary treatment and is designed to treat wastewater at a rated capacity of 4,550 cubic metres per day (m^3/d) The Lake Simcoe WPCP has a service population of 3,823 residents.

Lake Simcoe WPCP treats wastewater from the Community of Beaverton service area utilizing the following processes:

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

Raw Influent Pumping

Wastewater is collected through approximately 23.9 km of sanitary sewers in Beaverton and is conveyed to the WPCP by gravity or by two sanitary sewage pumping stations; Harbour Street and Cedar Beach located in the collection system. Flow from the two pumping stations are combined in the raw sewage inlet channel.

Preliminary Treatment

Screening: There are two screen channels in the screen 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 bar rack to provide screening on an emergency basis. Screenings are removed in this process and transported to landfill for disposal.

Grit Removal: Vortex grit removal is provided to remove sand, gravel, etc. for protection of mechanical equipment from unnecessary wear and reduce formation of heavy deposits in pipelines, channels and process tanks. The vortex grit tank 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 phosphorous removal system is intended to lower the total phosphorous 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 within the plant.

Secondary Treatment

Aeration Tanks: Preliminary effluent flow is directed to two aeration tanks. Surface mechanical aerators mix air into the wastewater to assist bacteria in removing dissolved and suspended organics and nutrients from the wastewater.

Secondary Clarifier: The effluent from the aeration tanks is directed to its associated secondary clarifier where solids settle quickly as activated sludge leaving a clear effluent. A portion of the activated sludge collected on the bottom of the clarifier is pumped back to the head of the aeration tanks and the excess activated sludge is wasted to the aerobic digester.

Tertiary Treatment

Tertiary Clarifier: The secondary effluent is directed to the tertiary clarifier. The helical flow pattern in the clarifier separates the solids from the liquid, the effluent flows over to the next process and the thickened sludge is pumped to the aerobic digester.

Tertiary Sand Filter: Effluent flow from the tertiary clarifier flows into an automatic cleaning sand filter. The automatic backwash is initiated by an increase in head pressure or a programmed timer. The backwash water is returned to the beginning of the plant 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 flow passes two banks of UV lamps connected in series before being discharged to Lake Simcoe through the 400mm diameter outfall extending 314 metres into Lake Simcoe.

Solids Treatment

Aerobic Digester: Activated sludge from the secondary clarifiers is pumped to an aerobic digester for stabilization. A mechanical mixer and a fixed header diffused aeration system provide oxygen for the microorganisms. The mixer and diffusers are turned off to allow solids to settle for removal and the supernatant to be decanted and flow by gravity to the raw equalization lagoon.

Biosolids Management: Stabilized biosolids from the digester are transported to Duffin Creek WPCP within the Region of Durham for incineration in accordance with ECA #A820250.

Environmental Compliance Approval

Under Condition 9 (5) of ECA # 5292-8CYHTQ the Region of Durham 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 outlined in Condition 5, including an overview of the success and adequacy of the works

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 conditions

in the ECA. Table 2 summarizes the raw wastewater characteristics during the reporting period.

The Lake Simcoe WPCP effluent was compliant with the approval limits during the reporting period. The plant operated at 48.7% of its rated capacity and received a maximum daily flow of 4,786 m^3/d on May 7th, 2017. Tables 3-5 provide a tabulation of effluent results.

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

No operating problems were encountered in 2017.

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 2017 included:

- Installed variable frequency drives on two of the activated sludge pumps
- Rebuilt the scum collector arm on secondary clarifier # 1
- Replaced the grit screw liner.
- The aerobic digester was cleaned. The diffusers were cleaned and repositioned.
- The aerobic digester mixer was rebuilt and installed.
- Rebuilt and installed pump # 3 at the Cedar Beach pumping station.
- Replaced the Echo auto-dialer with a Verbatim auto-dialer at Cedar Beach pumping station.
- Installed a new transfer switch at the Cedar Beach pumping station.

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 a comparable 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 effluent flow meter occurred in May and November 2017.
- Calibration of the in-house laboratory equipment was conducted in July 2017.
- Calibration of the pH meter is conducted regularly.

f) Description of efforts made and results achieved in meeting the effluent objectives of Condition 4

- The Region strives to achieve the best effluent quality at all times, remaining below the ECA compliance limits.
- The Lake Simcoe WPCP effluent met all ECA objectives except for:
  The effluent objective for total suspended solids was exceeded in five of 311 samples (1.6%).
  Results for total suspended solids were monitored and adjustments were made to the treatment process.
  The lower objective of 6.5 for pH was not met on one result of 259 samples. (0.4%)

- Best efforts and process adjustments will continue to be applied to maintain results below objectives.

g) Tabulation of Volume of Sludge Generated

The volume of sludge removed from Lake Simcoe WPCP in 2017 was 3,864m^3 .

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

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

Summary of Locations to Where Sludge was Disposed

Duffin Creek WPCP - 3,864 m^3.

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

A summary of complaints received from the public is administered through a central database. Two odour complaints were received and investigated from the same customer during the summer months. The odour was found to be coming from the aerobic digester. In order to mitigate potential odours, it was determined to increase the weekly solids haulage loads from the digester and the digester was taken off line for cleaning and maintenance. No further complaints were received.

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

Two bypass events were reported in 2017 both due to heavy rainfall. On June 29th and July 24th the tertiary sand filtration was bypassed. The partially treated effluent passed through the UV disinfection prior to discharge. The MOECC was notified of both bypass events.

j) Status Update of Initial Effluent Characterization

The initial effluent characterization report was submitted in 2015.

k) Information required by MOECC District Manager

No additional information was requested.

MOECC Inspection

This plant was last inspected by the MOECC in November 2013.

Table 1 Flows

Month	Total Plant Flow m^3 metered at the final effluent	Average Day Flow m^3/d	Maximum Day Flow m^3/d
January	82,630	2,665	3,282
February	52,166	1,863	3,087
March	78,068	2,518	3,388
April	88,755	2,959	3,636
May	115,361	3,721	4,786
June	60,379	2,013	3,306
July	71,218	2,297	4,695
August	36,159	1,166	1,921
September	27,132	904	1,296
October	33,161	1,070	1,934
November	43,382	1,446	2,604
December	34,712	1,120	1,507
Total	723,122		
Average	60,260	1,976	
Minimum	27,132		
Maximum	115,361		4,786
ECA Limit		4550*	15,110
Met Compliance		Yes	Yes

*Annual Average

Table 2 Raw Influent Analyses

Month	BOD_5 avg. conc. mg/L	BOD_5 loading kg/d	TSS avg. conc. mg/L	TSS loading kg/d	TP avg. conc. mg/L	TP loading kg/d	Alkalinity $CaCO_3$ mg/L
January	53	141	55	147	1.1	2.8	255
February	60	117	56	104	1.4	2.6	283
March	46	125	43	109	1.0	2.5	267
April	43	128	89	265	1.0	2.9	229
May	50	185	63	234	1.0	3.6	249
June	62	124	73	148	1.5	3.0	249
July	53	122	67	126	1.2	2.5	274
August	77	89	71	82	2.2	2.6	231
September	94	48	201	50	3.3	1.0	241
October	141	151	441	471	5.9	6.3	248
November	116	168	689	997	8.3	11.9	297
December	74	198	65	174	2.5	6.7	302
Average	70	137	146	289	2.3	4.6	260
Minimum	43	48	43	50	1.0	1.0	229
Maximum	141	198	689	997	8.3	11.9	302
Sampling Frequency Requirement Met	Yes		Yes		Yes		Yes

Table 2 Raw Influent Analyses continued

Month	TKN avg. conc. mg/L	TAN avg. conc. mg/L	TAN loading kg/d	pH min.	pH max.	Temp. Degrees Celsius avg.
January	11.53	7.5	20.0	7.7	8.0	8.5
February	15.03	3.8	7.1	7.6	8.0	8.5
March	8.71	2.4	6.0	7.5	8.1	7.5
April	11.08	4.6	13.6	6.9	8.3	9.8
May	10.31	6.7	24.8	7.3	7.7	12.3
June	17.45	4.1	8.3	7.0	7.6	15.4
July	16.79	7.5	17.2	7.7	8.0	17.3
August	23.46	17.7	20.6	7.0	8.0	18.2
September	28.18	7.5	6.8	7.7	8.0	18.1
October	43.65	20.3	21.7	6.8	8.0	15.2
November	51.48	14.6	21.1	6.8	8.3	12.3
December	23.30	17.0	45.3	6.9	7.8	10.2
Average	19.92	9.5	18.7			
Minimum	8.71	2.4	6.0	6.8		7.5
Maximum	51.48	20.3	45.3		8.3	18.2
Sampling Frequency Requirement Met	Yes			Yes	Yes	

Table 3 Final Effluent Analyses

Month	$CBOD_5$ avg. conc. mg/L	$CBOD_5$ loading kg/d	TSS avg. conc. mg/L	TSS loading kg/d	TP avg. conc. mg/L	TP loading kg/d	TP loading kg/month
January	0.8	2.0	1.0	3	0.02	0.1	2.0
February	0.6	1.2	0.9	2	0.03	0.0	1.3
March	0.9	2.3	1.4	4	0.03	0.1	2.2
April	1.0	3.0	2.2	6	0.03	0.1	2.5
May	1.0	3.7	3.7	14	0.03	0.1	3.7
June	1.0	2.0	2.0	4	0.04	0.1	2.3
July	1.0	2.3	1.6	4	0.03	0.1	2.4
August	1.0	1.2	0.7	1	0.03	0.0	1.0
September	1.0	0.9	0.6	1	0.03	0.0	0.7
October	1.0	1.1	1.1	1	0.04	0.0	1.2
November	1.0	1.4	3.7	5	0.10	0.1	4.4
December	1.0	2.0	0.7	3	0.04	0.1	0.8
Total							25*
Average	0.9	1.8	1.6	3	0.04	0.1	2.0
Minimum	0.6	0.9	0.6	1	0.02	0.0	0.7
Maximum	1.0	3.7	3.7	14	0.10	0.1	4.4
ECA Limit	10**		10**		0.3**		190*
ECA Objective	5		5		0.12		190
Lake Simcoe Phosphorus Reduction Strategy					0.15***		190*
Within Compliance	Yes		Yes		Yes		Yes
Sampling Frequency Requirement Met	Yes		Yes		Yes		Yes

*Total Annual Loading, kg/year
**Monthly Average Concentration
***Annual Average Concentration

Table 3 Final Effluent Analyses continued

Month	TAN Summer avg. conc. mg/L	TAN Winter avg. conc. mg/L	TAN loading kg/d	TKN avg. conc. mg/L	Un-ionized ammonia avg. conc. mg/L
January		0.05	0.1	0.49	0.0
February		0.03	0.1	0.57	0.0
March		0.04	0.1	0.55	0.0
April		0.04	0.1	0.59	0.0
May		0.06	0.2	0.74	0.0
June	0.06		0.1	0.75	0.0
July	0.09		0.2	0.56	0.0
August	0.02		0.0	0.64	0.0
September		0.02	0.0	0.59	0.0
October		0.08	0.1	0.61	0.0
November		1.38	2.0	2.24	0.0
December		0.02	0.1	0.57	0.0
Average	0.06	0.19	0.3	0.73	0.0
Minimum	0.02	0.02	0.0	0.49	0.0
Maximum	0.09	1.38	2.0	2.24	0.0
ECA Limit	5**	15**			
ECA Objective	3	10			
Within Compliance	Yes	Yes			
Sampling Frequency Requirement Met	Yes	Yes			

**Monthly Average Concentration

Table 3 Final Effluent Analyses continued

Month	pH min.	pH max.	Temp. Degrees Celsius avg.
January	7.2	7.6	8.6
February	7.4	7.5	8.1
March	7.0	7.8	8.0
April	6.9	7.7	10.4
May	6.9	7.6	13.7
June	6.8	7.5	16.0
July	6.4	7.6	17.9
August	6.8	7.6	19.2
September	6.5	7.1	18.7
October	6.7	7.2	15.9
November	6.4	7.7	11.6
December	7.2	7.6	8.7
Minimum	6.4		8.0
Maximum		7.8	19.2
ECA Objective	6.5	9.0	
Sampling Frequency Requirement Met	Yes	Yes	Yes

Table 4 Escherichia Coliform Sampling

Month	Number of Samples	Monthly Geometric Mean Density
January	4	0
February	4	0
March	5	0
April	4	2
May	5	8
June	4	2
July	4	1
August	5	0
September	4	0
October	4	0
November	5	40
December	4	0
ECA Objective		40 organisms/100ml
Sampling Frequency Requirement Met	Yes	

Table 5 Total Coliform Sampling

Month	Number of Samples	Monthly Geometric Mean Density
January	4	0
February	4	2
March	5	8
April	4	12
May	5	131
June	4	12
July	4	3
August	5	8
September	4	0
October	4	5
November	5	324
December	4	2
Sampling Frequency Requirement Met	Yes	

Table 6 Energy and Chemical Usage

Month	Alum (litres)	Hydro (kWh)	Natural Gas (cubic metres)
January	8,334	67,989	26,448
February	5,972	66,079	22,086
March	8,319	66,461	12,529
April	12,108	63,023	13,175
May	11,095	67,607	12,207
June	5,608	60,732	2,586
July	6,789	60,732	331
August	3,814	66,461	129
September	2,587	67,225	2,790
October	3,821	69,517	3,114
November	8,334	64,551	13,618
December	8,334	70,663	17,554
Total	85,116	791,039	126,567