Uxbridge Brook Water Pollution Control Plant

2017 Annual Performance Report

The Regional Municipality of Durham

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Environmental Compliance Approval (ECA): 8357-8CTQ5V Dated June 28, 2012

Environmental Compliance Approval (Air): 6581-67GRPR Dated December 10, 2004

The Uxbridge Brook Water Pollution Control Plant (WPCP) 2017 Annual Performance Report provides staff, stakeholders and customers an overview of the performance of the Uxbridge Brook 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 Uxbridge Brook WPCP located in the Township of Uxbridge 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 5,221 cubic metres per day (m^3/d). The Uxbridge Brook WPCP has a service population of 11,521 residents.

Uxbridge Brook WPCP treats wastewater from the Uxbridge service area utilizing the following processes:

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

Raw Influent Pumping

Wastewater is collected through approximately 50.4 km of sanitary sewers in Uxbridge and is conveyed to the WPCP by gravity and the Sandy Hook Sanitary Sewage Pumping Station.

Preliminary Treatment

Screening: There are two 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. Screenings are removed in this process and transported to landfill for disposal.

Grit Removal: Vortex grit removal is provided to remove sand and small stones (grit) for 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 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. Fine bubbled air is diffused into the wastewater to assist bacteria in removing dissolved and suspended organics and nutrients.

Secondary Clarifiers: The effluent from the aeration tanks is directed to three secondary clarifiers where solids settle quickly as activated sludge leaving a clear effluent. A portion of the activated sludge collected on the bottom of the clarifiers is pumped back to the front of the aeration tanks and any excess activated sludge is sent to the aerobic digester.

Tertiary Treatment

Tertiary Sand Filter: Effluent from the secondary clarifiers is filtered through two automatic self-cleaning sand filters. The automatic backwash is initiated by an increase in head pressure or on a programmed timer. The backwash water is returned to the front 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 effluent passes two banks of UV lamps connected in series. The treated final effluent is discharged to the Uxbridge Brook.

Solids Treatment

Aerobic Digester: Waste activated sludge from the secondary clarifiers is pumped to a two stage aerobic digester for stabilization. A coarse bubble diffuser provides oxygen for the microorganisms. The diffusers are turned off to allow solids to settle for removal and the supernatant is returned to the front of the plant for further treatment.

Biosolids Management: Stabilized biosolids from the digester is transported to Duffin Creek WPCP for incineration.

Environmental Compliance Approval

Under Condition 9 (5) of ECA #8357-8CTQ5V 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 Uxbridge Brook WPCP effluent was compliant with the approval limits during the reporting period. The plant operated at 65.2% of its rated capacity and received a maximum daily flow of 7,070 m^3/d on May 6th, 2017.

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

The plant experienced a foaming issue deemed to be caused by filamentous bacteria in the aeration tanks, secondary clarifier #3 was taken out of service in October to help manage the sludge age within the plant.

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

No maintenance was performed on major equipment in 2017.

d) Summary of any effluent quality assurance or control measures

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 plant flow meter was conducted 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

- The Region strives to achieve the best effluent quality at all times, remaining below the ECA compliance limits.
- The Uxbridge Brook WPCP effluent met all ECA objectives except for:
  The effluent objective for total suspended solids was exceeded in one of 309 samples (0.3%)
  The effluent objective for total phosphorus was exceeded in six of 309 samples (1.9%).
  Results were monitored and adjustments were made to the treatment process.
  The minimum effluent objective for pH was exceeded in 14 of 257 samples (5.4%).
  Calibration, maintenance and cleaning of the pH electrode probe is performed regularly.
- 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 Uxbridge Brook WPCP in 2017 was 15,400m^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 - 15,400 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. Several noise complaints were received from the same resident between February 17th, 2017and the end of May 2017. Regional staff conducted an investigation and a noise study on February 22nd, 2017.It was determined that the blower providing dissolved oxygen to the aerated portions of the treatment process may be contributing to the noise. Several attempts were made to resolve the issue including: inspection of the insulation around the pipes, switching blowers during the overnight hours of operation and the installation of a noise dampening unit. No further complaints were received for the remainder of the year

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

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

i) Status Update of the Initial Effluent Characterization

The initial effluent characterization report was submitted in 2016.

j) 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	Plant Flow m3	Average Daily Flow m^3/d	Maximum Daily Flow m^3/d
January	98,771	3,186	4,057
February	87,760	3,134	4,294
March	106,655	3,440	4,132
April	127,103	4,237	5,302
May	141,231	4,556	6,791
June	116,941	3,898	5,474
July	102,084	3,293	4,131
August	92,581	2,986	3,323
September	87,400	2,913	3,589
October	94,717	3,055	3,504
November	95,441	3,181	3,536
December	95,772	3,089	3,332
Total	1,246,458		
Average	103,871	3,406	
Minimum	87,400		
Maximum	141,231		6,791
ECA Limit		5,221	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	DP avg. conc. mg/L
January	253	806	358	1141	4.1	13	2.6
February	185	580	204	639	4.3	13	2.4
March	175	602	133	459	3.7	13	2.4
April	112	475	121	512	3.4	14	1.8
May	103	469	129	586	3.5	16	2.9
June	158	616	155	603	4.0	16	2.6
July	149	490	422	1388	2.9	10	1.7
August	118	351	92	274	3.7	11	2.4
September	143	417	132	385	3.9	11	2.1
October	148	452	109	334	3.7	11	2.2
November	116	368	127	405	3.8	12	2.5
December	197	607	193	598	4.9	15	3.2
Average	155	527	181	617	3.8	13	2.4
Minimum	103	351	92	274	2.9	10	1.7
Maximum	253	806	422	1388	4.9	16	3.2
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	Alkalinity $CaCO_3$ mg/L	pH min.	pH max.	Temp. Degrees Celsius avg.
January	34.65	24.0	76.4	332	7.8	8.3	13.8
February	32.90	23.3	73.2	332	7.5	8.5	13.0
March	30.68	20.2	69.6	360	7.6	8.2	11.8
April	25.83	21.1	89.5	383	7.1	8.2	13.6
May	29.84	19.6	89.2	350	7.5	8.3	15.2
June	40.18	23.3	90.9	322	7.6	8.4	17.1
July	26.70	20.4	67.2	398	7.6	8.5	17.0
August	32.90	23.9	71.2	347	7.1	8.5	17.8
September	31.83	22.8	66.5	334	6.8	8.5	17.9
October	34.73	27.5	84.0	351	7.1	8.7	17.6
November	32.76	24.6	78.2	326	7.2	8.5	15.9
December	49.40	29.6	91.4	342	7.3	8.6	14.1
Average	33.53	23.4	79.6	348			
Minimum	25.83	19.6	66.5	322	6.8		11.8
Maximum	49.40	29.6	91.4	398		8.7	17.9
Sampling Frequency Requirement Met	Yes	Yes		Yes	Yes	Yes	Yes

Table 3 Final Effluent Analyses

Month	$CBOD_5$ avg. conc. mg/L	$CBOD_5$ loading monthly avg. kg/d	TSS avg. conc. mg/L	TSS loading monthly avg. kg/d	TP avg. conc. mg/L	TP loading avg. kg/d	TP loading kg/month
January	0.9	2.9	1.9	6.2	0.03	0.10	3
February	1.0	3.0	2.2	6.8	0.07	0.22	6
March	0.9	3.2	1.8	6.2	0.04	0.15	5
April	1.0	4.2	1.4	5.8	0.06	0.23	7
May	1.0	4.6	1.4	6.4	0.03	0.14	4
June	1.0	3.9	1.0	3.7	0.03	0.12	4
July	1.0	3.3	1.1	3.8	0.03	0.11	3
August	1.2	3.6	0.7	2.0	0.03	0.08	3
September	1.0	2.9	0.6	1.7	0.03	0.08	2
October	1.0	3.1	1.1	3.5	0.03	0.10	3
November	1.2	3.8	1.5	4.7	0.04	0.12	4
December	1.0	3.1	0.9	2.8	0.03	0.08	2
Total							47***
Average	1.0	3.5	1.3	4.4	0.04	0.13	4
Minimum	0.9	2.9	0.6	1.7	0.03	0.08	2
Maximum	1.2	4.6	2.2	6.8	0.07	0.23	7
ECA Limit	8.5*	30.9**	10*	36.3**	0.15*	0.78**	286***
ECA Objective	5		5		0.1		
Lake Simcoe Phosphorus Reduction Strategy					0.15****		286***
Within Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes	Yes	Yes	Yes

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

Table 3 Final Effluent Analyses continued

Month	DP avg. conc. mg/L	TAN Winter avg. conc. mg/L	TAN Winter loading monthly avg. kg/d	TAN Summer avg. conc. mg/L	TAN Summer loading monthly avg. kg/d	TKN avg. conc. mg/L	Un-ionized Ammonia Nitrogen avg. conc. mg/L
January	0.01	0.06	0.19			0.74	0.0
February	0.02	0.06	0.18			1.45	0.0
March	0.02	0.07	0.23			0.67	0.0
April	0.03	0.09	0.39			0.63	0.0
May	0.00			0.04	0.2	0.62	0.0
June	0.01			0.04	0.1	0.61	0.0
July	0.01			0.01	0.0	0.58	0.0
August	0.01			0.02	0.1	0.55	0.0
September	0.01			0.03	0.1	0.52	0.0
October	0.02			0.02	0.1	0.64	0.0
November	0.01			0.02	0.1	0.60	0.0
December	0.01	0.02	0.06			0.60	0.0
Average	0.01	0.06	0.21	0.03	0.09	0.68	0.0
Minimum	0.00	0.02	0.06	0.01	0.04	1.45	0.0
Maximum	0.03	0.09	0.39	0.04	0.19	0.52	0.0
ECA Limit		6*	21.8**	3*	10.9**		0.1*
ECA Objective		5		2			
Within Compliance		Yes	Yes	Yes	Yes		Yes
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes	Yes		Yes

*Monthly Average Concentration
**Monthly Average Loading, kg/day

Table 3 Final Effluent Analyses continued

Month	Nitrate Nitrogen avg. conc. mg/L	Alkalinity $CaCO^3$. mg/L	pH min.	pH max.	Temp. Degrees Celsius avg.
January	26.7	92	6.4	7.0	11.9
February	25.1	109	6.5	7.4	11.4
March	21.8	131	6.5	7.2	10.6
April	18.8	139	6.5	7.2	12.7
May	19.5	141	6.5	7.3	14.9
June	23.1	153	6.6	7.5	17.1
July	26.0	143	6.6	7.5	17.8
August	26.3	110	6.3	7.5	18.0
September	26.9	91	6.2	7.3	17.9
October	27.9	119	6.5	7.2	17.4
November	27.4	112	6.4	7.5	14.8
December	27.7	108	6.3	7.3	12.2
Average	24.8	121			
Minimum	18.8	91	6.2		10.6
Maximum	27.9	167		7.5	18.0
ECA Limit			6.0	9.5	
ECA Objective			6.5	9.0	
Within Compliance			Yes	Yes	
Sampling Frequency Requirement	Yes	Yes	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	0
May	5	0
June	4	0
July	4	0
August	5	0
September	4	0
October	4	0
November	5	0
December	4	0
ECA Objective		200 organisms/100ml
Sampling Frequency Requirement Met	Yes	

Table 5 Energy and Chemical Usage

Month	Aluminum Sulphate (litres)	Hydro (kWh)	Natural Gas (cubic metres)
January	24,461	111,079	1,668
February	35,872	97,134	3,819
March	24,279	109,271	2,196
April	30,273	97,243	1,451
May	26,255	118,791	7,14
June	22,479	126,831	270
July	23,305	130,523	134
August	22,892	128,873	64
September	21,555	123,655	227
October	14,868	121,969	90
November	15,753	132,566	813
December	17,405	154,884	3,447
Total	279,396	1,452,818	14,893