



Uxbridge Brook Water Pollution Control Plant 2021 Annual Performance Report





The Regional Municipality of Durham

Uxbridge Brook Water Pollution Control Plant 2021 Annual Performance Report

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) 2021 Annual Performance Report provides staff, stakeholders and customers an overview of the performance of the Uxbridge Brook WPCP in 2021. 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 Uxbridge Brook WPCP located in the Community of Uxbridge 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 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 5,221 cubic metres per day (m³/d). The Uxbridge Brook WPCP has a service population of 11,935 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 management.

Raw Influent Pumping

Wastewater is collected through approximately 50.4 kilometres of sanitary sewers in Uxbridge and is conveyed to the WPCP by gravity and the Sandy Hook sanitary sewage pumping station (SSPS).

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 raked 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: The vortex grit removal removes sand and small stones (grit) for the protection of mechanical equipment from unnecessary wear and to 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 lowers 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 throughout 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.



Sludge Management: Stabilized biosolids from the digester are transported to Duffin Creek WPCP for further treatment and incineration.

Environmental Compliance Approval (ECA)

Under Condition 9.(5) of ECA #8357-8CTQ5V 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 conditions in the ECA. Table 2 Raw Influent Analyses 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 66.3% of its rated capacity and received a maximum daily flow of 5,058 cubic metres per day (m³/d) on July 8, 2021.

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

No operating problems were encountered in 2021.

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 during the reporting period.

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 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 plant flow meter was conducted on May 17 and November 9, 2021.
- Calibration of the in-house laboratory equipment was conducted on October 20, 2021.
- Calibration of the balance scale was conducted on March 25, 2021.
- Verification 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 total suspended solids objective of 5.0 milligrams per litre (mg/L) was exceeded in 3 of 358 samples (0.8%)
 - The total phosphorus objective of 0.1 mg/L was exceeded in 16 of 360 samples (4.4%)
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- The minimum effluent pH objective of 6.5 was exceeded in 21 of 257 samples (8.2%). Calibration and cleaning of the pH electrode probe is performed regularly.

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

g) Biosolids Production;

Tabulation of Volume of Sludge Generated:

The volume of sludge removed from Uxbridge Brook WPCP in 2021 was 18,408 cubic metres (m³).

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;

The sludge produced was transported to Duffin Creek WPCP for further treatment and incineration.

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 2021.

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

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

j) Status Update of the Initial Effluent Characterization;

The initial effluent characterization report was submitted to Ministry of the Environment, Conservation and Parks (MECP) in 2016.

k) Information Required by MECP District Manager;

No additional information was requested.

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

The plant was inspected by the MECP on March 7, 2019.



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Table 1 Final Effluent Flows

Month	Total Plant Flow metered at the Final Effluent cubic metres (m ³)	Average Daily Flow In cubic metres per day (m ³ /d)	Maximum Daily Flow m ³ /d
January	102,448	3,305	3,544
February	86,865	3,102	3,615
March	115,056	3,711	4,463
April	108,746	3,625	3,918
May	113,660	3,666	4,454
June	100,528	3,351	3,750
July	110,416	3,562	5,058
August	103,523	3,339	3,747
September	105,086	3,503	5,031
October	111,657	3,602	4,042
November	95,806	3,194	3,461
December	109,033	3,517	4,104
Total	1,262,824		
Average	105,235	3,460*	
Minimum	86,865		
Maximum	115,056		5,058
ECA Limit		5,221	15,110
Met Compliance		Yes	Yes

*Annual average



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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	Dissolved Phosphorus avg. conc. mg/L
January	236	413	5.3	2.7
February	251	319	6.1	3.6
March	182	320	4.3	2.1
April	241	322	5.4	2.3
May	184	338	4.3	2.0
June	150	280	5.5	2.7
July	145	207	4.5	2.4
August	143	176	4.5	2.4
September	130	170	4.5	2.7
October	138	282	4.4	2.4
November	158	203	4.4	2.5
December	173	274	4.4	2.0
Average	178	276	4.8	2.5
Minimum	130	170	4.3	2.0
Maximum	251	413	6.1	3.6
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes



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Table 2 Raw Influent Analyses continued

Month	Total Kjeldahl Nitrogen (TKN) average (avg.) concentration (conc.) milligrams per litre (mg/L)	Total ammonia nitrogen (TAN) avg. conc. mg/L	Alkalinity Calcium Carbonate mg/L	pH minimum	pH maximum	Temp. Degree Celsius avg.
January	44.8	28.2	358	7.3	8.4	14.0
February	53.0	32.3	398	7.5	8.6	12.7
March	40.9	23.4	354	7.4	8.4	13.5
April	49.8	27.0	354	7.2	8.3	14.0
May	40.1	22.9	361	7.1	8.4	15.1
June	42.3	28.6	366	7.0	8.6	17.2
July	37.1	23.9	346	7.5	8.4	17.8
August	44.7	25.1	351	7.0	8.5	18.4
September	38.1	24.2	330	7.5	8.6	18.2
October	35.7	24.6	344	7.5	8.4	18.1
November	37.4	23.9	347	7.3	8.4	16.1
December	41.3	21.5	334	7.4	8.4	14.7
Average	42.1	25.5	354			
Minimum	35.7	21.5	330	7.0		12.7
Maximum	53.0	32.3	398		8.6	18.4
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes	Yes	Yes



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Table 3 Final Effluent Analyses

Month	Carbonaceous Biochemical Oxygen Demand (CBOD ₅) average (avg.) concentration (conc.) milligrams per litre (mg/L)	CBOD ₅ kilograms per day (kg/d) year to date avg.	Total Suspended Solids (TSS) avg. conc. mg/L	TSS kg/d year to date avg.	Total Phosphorus (TP) avg. conc. mg/L	TP kg/d monthly avg.	TP kilograms per month year to date
January	1.0	3.3	1	2.8	0.04	0.10	4
February	1.0	3.2	1	2.7	0.04	0.10	8
March	1.0	3.4	2	3.9	0.06	0.20	15
April	1.0	3.4	1	4.2	0.07	0.20	22
May	1.0	3.5	1	4.0	0.04	0.20	27
June	1.0	3.5	1	3.7	0.04	0.10	30
July	1.0	3.5	1	3.4	0.04	0.10	34
August	1.0	3.5	1	3.3	0.06	0.20	41
September	1.0	3.5	0	3.1	0.04	0.10	45
October	1.0	3.5	0	3.0	0.04	0.10	49
November	1.0	3.5	1	3.1	0.03	0.10	52
December	1.0	3.5	1	3.1	0.05	0.20	57
Total							57***
Average	1.0	3.5	1	3.1	0.05	0.16	5
Minimum	1.0	3.2	0	2.7	0.03	0.10	4
Maximum	1.0	3.5	2	4.2	0.07	0.20	57
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		

*Monthly Average Concentration

**Monthly Average Loading, kg/day

***Total Annual Average Loading, kilogram/year

****Annual Average Concentration



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Table 3 Final Effluent Analyses continued

Month	Dissolved Phosphorus average (avg.) concentration (conc.) milligrams per litre (mg/L)	Total Ammonia Nitrogen (TAN) Winter avg. conc. mg/L	TAN Winter kilograms per day (kg/d) monthly avg.	TAN Summer avg. conc. mg/L	TAN Summer kg/d monthly avg.	Unionized Ammonia Nitrogen avg. conc. mg/L
January	0.01	0	0.1			0.0
February	0.01	0	0.1			0.0
March	0.01	0	0.1			0.0
April	0.01	0	0.2			0.0
May	0.01			0	0.2	0.0
June	0.01			0	0.1	0.0
July	0.02			0	0.2	0.0
August	0.04			0	0.1	0.0
September	0.02			0	0.1	0.0
October	0.02			0	0.1	0.0
November	0.02			0	0.1	0.0
December	0.02	0	0.2			0.0
Average	0.02	0	0.1	0	0.1	0.0
Minimum	0.01	0	0.1	0	0.1	0.0
Maximum	0.04	0	0.2	0	0.2	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

*Monthly Average Concentration

**Monthly Average Loading, kg/day



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Table 3 Final Effluent Analyses continued

Month	Nitrate Nitrogen average (avg.) concentration (conc.) milligrams per litre (mg/L)	Alkalinity calcium carbonate mg/L	pH minimum.	pH maximum.	Temp. Degree Celsius avg.
January	28.6	108	6.3	7.2	12.6
February	29.9	98	6.4	7.0	10.8
March	25.8	133	6.6	7.2	12.6
April	26.6	119	6.7	7.3	13.2
May	27.7	115	6.5	7.5	15.5
June	29.0	97	6.3	7.3	18.3
July	25.0	129	6.5	7.1	19.3
August	27.5	114	6.4	7.1	19.4
September	28.8	104	6.2	7.4	19.1
October	27.9	124	6.5	7.2	18.4
November	29.4	118	6.4	7.7	15.7
December	26.6	125	6.4	7.5	13.8
Average	27.7	115			15.7
Minimum	25.0	97	6.2		10.8
Maximum	29.9	133		7.7	19.4
ECA Limit			6.0	9.5	
ECA Objective			6.5	9.0	
Within Compliance			Yes	Yes	
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes	Yes



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Table 4 *Escherichia coli* Sampling

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



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Table 5 Energy and Chemical Usage

Month	Aluminum Sulphate litres	Hydro kilowatt hours	Natural Gas cubic metres
January	18,642	138,344	3,101
February	14,894	133,481	6,755
March	16,632	140,252	1,270
April	20,208	130,784	807
May	20,141	138,524	508
June	16,418	135,077	171
July	13,839	137,152	176
August	14,452	138,135	193
September	14,738	128,271	165
October	16,565	137,772	171
November	15,513	132,315	1,906
December	18,830	140,835	2,403
Total	200,872	1,630,942	17,626