



# **Uxbridge Brook Water Pollution Control Plant 2023 Annual Performance Report**





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### The Regional Municipality of Durham

### Uxbridge Brook Water Pollution Control Plant 2023 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) 2023 Annual Performance Report provides staff, stakeholders and customers an overview of the performance of the Uxbridge Brook WPCP in 2023. 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 (m<sup>3</sup>/d). The Uxbridge Brook WPCP has a service population of 12,231 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 50.9 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

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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 Filtration**

**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 Management**

**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.



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**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 73% of its rated capacity and received a maximum daily flow of 6,003 cubic metres per day (m<sup>3</sup>/d) on April 1, 2023.

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

No operating problems were encountered in 2023.

**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 2023 included:

- Replaced aeration blower 3,
- Replaced final effluent composite sampler pump,
- Performed diesel generator fuel and exhaust upgrades.

**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. 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 two aeration tank flow meters and final effluent flow meter were conducted on June 28 and November 29, 2023.

Calibration of the in-house laboratory scale was conducted on October 13, 2023.

Calibration of the Hach equipment was conducted on November 6, 2023

Calibration and verification of the pH meter is conducted regularly.



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### **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 16 of 360 samples (4.4%). Total suspended solids results are monitored daily, and adjustments are made to the process as required
- The total phosphorus objective of 0.1 mg/L was exceeded in 16 of 360 samples (4.4%). Total phosphorus results are monitored daily and adjustments are made to the process as required,
- The minimum effluent pH objective of 6.5 was exceeded in 22 of 260 samples (8.5%). Alkalinity is monitored twice per week to ensure there is enough buffering capacity to maintain pH compliance

### **g) A tabulation of the volume of sludge generated in the reporting period, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed**

The volume of sludge removed from Uxbridge Brook WPCP in 2023 was 17,440 cubic metres (m<sup>3</sup>).

Even with the increase in population on a year-to-year basis, no significant changes to flows or processing are anticipated. Therefore, no significant changes in sludge generation are expected for the next year.

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 2023.

### **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* cubic metre (m <sup>3</sup> )	Average Daily Flow In cubic metre per day (m <sup>3</sup> /d)	Maximum Daily Flow m <sup>3</sup> /d
January	113,630	3,665	4,557
February	111,862	3,995	4,682
March	136,154	4,392	5,806
April	141,368	4,712	6,003
May	140,408	4,529	5,378
June	121,011	4,034	5,578
July	113,029	3,646	4,512
August	109,597	3,535	3,963
September	97,186	3,240	3,573
October	97,713	3,152	3,429
November	96,532	3,218	3,582
December	104,214	3,362	4,189
Total	1,382,704		
Average	115,225	3,788**	
Minimum	96,532		
Maximum	141,368		6,003
ECA Limit		5,221	15,110
Met Compliance		Yes	Yes

\*Metered at the Final Effluent

\*\*Annual average



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**Table 2 Raw Influent Analyses**

Month	Biochemical Oxygen Demand (BOD <sub>5</sub> ) 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	123	229	4.29	1.91
February	76	167	3.46	1.61
March	129	237	4.05	1.40
April	89	154	2.79	1.00
May	104	232	2.80	1.05
June	122	196	3.67	1.76
July	147	167	4.34	1.63
August	134	256	3.84	1.74
September	172	320	4.29	2.29
October	166	256	4.76	2.15
November	175	263	4.98	2.02
December	159	203	4.09	1.66
Average	133	221	3.95	1.68
Minimum	76	154	2.79	1.00
Maximum	175	320	4.98	2.29
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	Temperature Degree Celsius avg.
January	41.42	25.0	387	7.3	8.5	13.6
February	29.33	21.4	350	6.8	8.3	12.8
March	32.90	20.0	340	7.4	8.2	13.1
April	24.71	16.5	316	7.0	8.2	13.6
May	27.02	17.8	320	7.0	8.7	14.5
June	34.21	23.6	329	7.3	8.6	16.5
July	33.99	21.1	331	7.3	8.3	17.8
August	33.61	23.3	348	6.5	8.3	18.6
September	37.16	24.5	322	6.8	8.5	18.5
October	39.70	23.2	352	6.8	8.3	18.5
November	39.31	24.8	363	7.3	8.4	17.1
December	38.91	23.5	340	7.0	8.4	14.9
Average	34.36	22.1	341			
Minimum	24.71	16.5	316	6.5		12.8
Maximum	41.42	25.0	387		8.7	18.6
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 <sub>5</sub> ) average (avg.) concentration (conc.) milligrams per litre (mg/L)	CBOD <sub>5</sub> 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	3.7	1	4.6
February	1.0	3.8	2	7.0
March	1.0	4.0	2	7.1
April	1.0	4.2	2	8.0
May	1.0	4.3	2	8.1
June	1.0	4.2	2	8.1
July	1.0	4.1	1	7.6
August	1.0	4.1	1	7.1
September	1.0	4.0	1	6.4
October	1.0	3.9	2	6.3
November	1.0	3.8	1	5.9
December	1.0	3.8	1	6.3
Annual Loading		3.8**		6.3**
Average	1.0		2	
Minimum	1.0		1	
Maximum	1.0		3	
ECA Limit	8.5*	30.9**	10*	36.3**
ECA Objective	5		5	
Within Compliance	Yes	Yes	Yes	Yes
Sampling Frequency Requirement Met	Yes		Yes	

\*Monthly Average Concentration

\*\*Annual Average Loading



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**Table 3 Final Effluent Analyses continued**

Month	Total Phosphorus (TP) average (avg.) concentration (conc.) milligrams per litre (mg/L)*	TP kilograms per day (kg/d) monthly avg.**	TP kilograms per year (kg/yr) year to date avg.
January	0.06	0.22	7
February	0.07	0.28	15
March	0.05	0.22	22
April	0.05	0.24	29
May	0.04	0.18	35
June	0.06	0.24	42
July	0.05	0.18	48
August	0.03	0.11	51
September	0.03	0.10	54
October	0.04	0.13	58
November	0.04	0.13	62
December	0.07	0.24	69
Annual Loading			69***
Average	0.05****	0.19	
Minimum	0.03	0.10**	
Maximum	0.07	0.28**	
ECA Limit	0.15*	0.78**	286***
ECA Objective	0.1		
Lake Simcoe Phosphorus Reduction Strategy	0.15****		286***
Within Compliance	Yes	Yes	Yes
Sampling Frequency Requirement Met	Yes		

\*Monthly Average Concentration  
 \*\*Monthly Average Loading  
 \*\*\*Total Annual Average Loading  
 \*\*\*\*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	0.02	0	0.2			0.0
February	0.01	0	0.2			0.0
March	0.01	0	0.1			0.0
April	0.00	0	0.2			0.0
May	0.00			0	0.1	0.0
June	0.01			0	0.1	0.0
July	0.01			0	0.1	0.0
August	0.01			0	0.1	0.0
September	0.01			0	0.1	0.0
October	0.01			0	0.1	0.0
November	0.01			0	0.1	0.0
December	0.01	2	1.5			0.0
Average	0.01	0	0.5	0	0.1	0.0
Minimum	0.00	0	0.1	0	0.1	0.0
Maximum	0.02	2	1.5	0	0.1	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



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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	26.1	142	6.4	7.4	12.7
February	24.3	139	6.4	7.3	12.0
March	21.7	139	6.7	7.4	12.3
April	20.8	158	6.2	7.2	13.5
May	22.0	142	6.3	7.0	14.7
June	26.1	118	6.3	7.2	17.4
July	25.4	121	6.9	7.2	19.0
August	26.3	114	6.6	7.4	19.5
September	29.0	101	6.4	7.7	19.2
October	30.8	98	6.4	6.7	18.1
November	29.4	97	6.3	7.6	15.6
December	26.6	118	6.5	6.8	14.0
Average	25.7	124			15.7
Minimum	20.8	97	6.2		12.0
Maximum	30.8	158		7.7	19.5
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	9	1
February	8	1
March	9	1
April	8	1
May	10	1
June	8	2
July	8	1
August	9	1
September	7	1
October	9	1
November	9	1
December	7	1
ECA Objective		200 organisms/100mL
Sampling Frequency Requirement Met	Yes	



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**Table 5 Chemical and Energy Usage**

<b>Month</b>	<b>Aluminum Sulphate litres</b>	<b>Hydro kilowatt hours</b>	<b>Natural Gas cubic metres</b>
January	16,194	163,073	3,950
February	15,292	148,710	3,755
March	22,020	143,438	6,100
April	24,375	135,950	6,177
May	24,046	137,687	2,566
June	18,816	127,890	74
July	18,415	134,808	76
August	18,474	134,223	189
September	16,208	124,476	79
October	16,218	129,023	926
November	17,106	135,959	1,544
December	19,479	146,542	3,745
<b>Total</b>	<b>226,643</b>	<b>1,661,779</b>	<b>29,181</b>