



Harmony Creek Water Pollution Control Plant
2017 Annual Performance Report

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The Regional Municipality of Durham

Harmony Creek Water Pollution Control Plant 2017 Annual Performance Report

Environmental Compliance Approval (ECA): 3580-9PXLVG Dated December 03, 2014

Environmental Compliance Approval (ECA): 2407-AK8KJH Dated May 23, 2017

Environmental Compliance Approval (ECA): 0488-6X5PZD Dated November 16, 2007

Environmental Compliance Approval (Air): 5562-AM9RPN Dated May 18, 2017

The Harmony Creek Water Pollution Control Plant (WPCP) Performance Report provides staff, stakeholders and customers a performance overview of the Harmony Creek 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 Harmony Creek WPCP located in the City of Oshawa is owned and operated by the Regional Municipality of Durham (Region). The plant is operated according to the terms and conditions of the ECA's.

The Harmony Creek WPCP treats wastewater from the Oshawa and Courtice service areas in the Region. The Harmony Creek WPCP shares its catchment area flows with the Courtice WPCP. The Harmony Creek WPCP services approximately 37,485 residents or 21.1% of the total catchment population.

The Harmony Creek WPCP is designed to treat wastewater at an average flow rate of 34,100 cubic metres per day (m^3/d). The plant is an MOECC Class Four conventional activated sludge treatment plant that utilizes the following processes to treat wastewater:

- raw influent,
- preliminary treatment,
- primary treatment,
- secondary treatment,
- phosphorus removal,
- disinfection (chlorination/dechlorination),
- solids treatment.

Raw Influent

Wastewater is collected through approximately 679 km of sanitary sewers in Oshawa and Courtice and is conveyed to the Harmony Creek WPCP and the Harmony Creek Sanitary Sewage Pumping Station (SSPS). Approximately 78.9% of the influent flow is diverted to the Harmony Creek SSPS and conveyed to the Courtice WPCP. The remaining flow is treated at the Harmony Creek WPCP.



Preliminary Treatment

Screening: One mechanically cleaned screen removes rags and large debris that could harm pumps and process equipment. Screenings are compacted for disposal to landfill.

Grit Removal: Heavy suspended material such as sand and small stones (grit) is removed in the aerated grit tank. The velocity of the wastewater rolling in the tanks is controlled by the quantity of air added to produce conditions that allow heavy grit material to settle, while keeping the lighter organic material in suspension to proceed to the next process tank. The grit removed in this process is transported to landfill.

Primary Treatment

The primary clarifier utilizes the physical process of sedimentation which allows suspended material to settle to the bottom of the tank as sludge. This raw sludge, along with excess activated sludge from the secondary treatment process is collected by a flight and chain mechanism which pushes the sludge into hoppers. The sludge is then pumped to the anaerobic digester for further treatment. Any material floating on the surface of the clarifier (scum) is also removed to the digester. In November of 2016 the primary clarifier was taken out of service to facilitate the maintenance and construction upgrades planned for the anaerobic digester. Flows have been redirected to bypass the clarifier and go directly to the aeration tanks.

Phosphorus Removal

The phosphorous removal system is intended to lower the total phosphorous level in the final effluent by adding a chemical coagulant (ferrous chloride). Ferrous chloride is added at the primary clarifier effluent.

Secondary Treatment

Aeration: The Harmony Creek WPCP has a flexible aeration system which can operate as two individual aeration tanks or as one large aeration tank. The current configuration is as one large aeration tank. The effluent from the primary clarifier flows into the aeration tanks. Here fine bubbled air is diffused into the wastewater to assist bacteria in removing dissolved and suspended organics, and nutrients from the wastewater. Biological activity is controlled to assimilate the organic material.

Secondary Clarifier: The effluent from the aeration tank is directed to the two secondary clarifiers where the solids settle quickly to the bottom as activated sludge leaving clear supernatant. A portion of the activated sludge collected on the bottom of the clarifier is pumped back to the head of the aeration tank and the excess activated sludge is wasted to the primary clarifier.

Disinfection (chlorination/dechlorination)

Chlorine, in the form of liquid sodium hypochlorite, is metered into the secondary effluent stream for pathogen control. Adequate contact time is provided by the chlorine contact chamber. Disinfected effluent is dechlorinated with a sodium bisulphite solution before being discharged to Lake Ontario.

Solids Treatment

Anaerobic Digestion: The raw sludge that is collected from the primary clarifier is pumped into the anaerobic digester where anaerobic bacteria reduce the volume of sludge. As a result of digestion the plant produces a more stabilized sludge, water, carbon dioxide, methane, and hydrogen sulphide.



The water is returned to the head of the plant for further treatment. The methane is used for heating of the digester to offset the natural gas requirements or is flared off. In November of 2016 the anaerobic digester was taken out of service for maintenance and upgrades. The WAS flows are being sent to the head of the plant to be directed to the Courtice WPCP through the onsite pumping station.

Biosolids: All sludge produced is pumped to the biosolids holding facility. From there the treated biosolids can be utilized on approved nurseries, approved agricultural fields, or be shipped to Duffin Creek WPCP for incineration. Biosolids are transported plant to plant in accordance with ECA #A820250 and ECA #4400-4LBLXD for land application.

Environmental Compliance Approval

Under Condition 9(5) of ECA 3580-9PXLVG and Condition 11 (4) of ECA 2407-AK8KJH the Region of Durham must produce an annual report that contains 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 summarizes the raw wastewater characteristics during the reporting period.

The Harmony Creek WPCP effluent was determined to be compliant with the ECA approval limits during the reporting period. The plant operated at an average of 35.4% of its annual average rated flow capacity and received a maximum daily flow of 37,255 m³/d on May 5, 2017.

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

No major operating problems were encountered in 2017.

c) Maintenance of major equipment

Major maintenance items in 2017 included:

- Rebuilt raw pump # 150 in the west side of the pumping station wetwell.
- Construction of the proposed works as listed in the new ECA is expected to begin in 2018.

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. All results were found to be within a comparable range.

e) Summary of the calibration and maintenance carried out

- Calibration of the secondary clarifier flow meter occurred on May 9, 2017.
- Calibration of the in house laboratory equipment was conducted regularly.

f) Description of efforts made and results achieved in meeting the effluent objectives of Condition 5 of ECA 3580-9PXLVG and Condition 6 of ECA 2407-AK8KJH

The Region continually strives to achieve the best effluent quality at all times, remaining below the ECA compliance limits.

The average daily rated flow capacity of 34,100 m³/d was not exceeded.



The total suspended solids objective of 15.0 mg/L was exceeded 11 times, 10 single results between January and May 23rd and one monthly average concentration after May 23rd. Results are monitored and adjustments are made to the process.

The total phosphorus monthly average concentration objective of 0.8 mg/L was exceeded once during the reporting period. Results were monitored and adjustments were made to the process as required.

The lower objective for pH was exceeded in seven of 250 samples (2.8%). Calibration of the pH 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 Harmony Creek WPCP in 2017 was 500 m³.

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

The volume of sludge produced may be affected by the construction of the proposed works. WAS volumes may be diverted to the Harmony Creek Pumping Station based on construction requirements.

Summary of Locations to Where Sludge is Disposed:

Duffin Creek WPCP – 500 m³

Agricultural Fields – no sludge was sent for land application in 2017

Nursery – no sludge sent to nurseries in 2017

h) Summary of Complaints and Steps Taken to Address the Complaint:

There were no documented complaints in 2017.

i) Summary of By-passes and Spills

Heavy rainfall during the spring months made it necessary to bypass parts of the treatment process. On June 23rd and May 1st primary and secondary treatment were bypassed and on May 5th secondary treatment was bypassed. All three bypasses underwent disinfection prior to the effluent discharge. These events were reported to the MOECC.

There were no spills during the reporting period.

j) Schedule 'A', Section 1 Notice of Modifications and Status Update

No schedule 'A', Section 1 Notice of Modifications were submitted in 2017.

k) Schedule 'A', Section 3 Notice of Modifications

No schedule 'A', Section 3 Notice of Modifications were submitted in 2017.

l) Additional Information Required by MOECC Water Supervisor

No additional information was requested.

MOECC Inspection

An MOECC inspection occurred January 26th, 2016.



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Table 1 Raw Influent Flows

Month	Total Flow to Plant -metered at the final effluent m³	Average Day Flow m³/d	Maximum Day Flow m³/d
January	372,621	12,020	16,157
February	336,363	12,013	13,199
March	389,551	12,566	18,692
April	306,906	10,230	14,961
May	455,398	14,690	37,255
June	397,931	13,264	37,223
July	374,772	12,089	14,377
August	354,086	11,422	14,763
September	311,777	10,393	13,514
October	376,049	12,131	13,023
November	360,855	12,029	13,294
December	365,494	11,790	12,976
Total	4,401,803		
Average	366,817	12,027*	
Minimum	306,906		
Maximum	455,398		37,255
ECA Requirement		34,100	
Met Compliance		Yes	

*Annual Average Daily Flow



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Table 2 Raw Influent Analyses

Month	CBOD ₅ avg. conc. mg/L	CBOD ₅ loading kg/d	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
January	90	1,076	192	2,305	256	3,074	4.4	53
February	116	1,395	236	2,829	278	3,345	5.3	64
March	78	981	198	2,491	223	2,799	4.3	54
April	78	793	142	1,454	210	2,145	3.8	39
May	75	1,097	177	2,594	225	3,310	4.0	58
June	121	1,606	194	2,573	271	3,596	4.2	56
July	149	1,801	239	2,883	299	3,617	4.4	53
August	115	1,312	261	2,977	333	3,805	5.3	61
September	138	1,429	244	2,531	297	3,090	5.2	54
October	154	1,868	324	3,927	386	4,677	6.5	79
November	110	1,317	232	2,788	311	3,739	6.2	75
December	119	1,403	283	3,340	352	4,151	5.7	68
Average	112	1,344	227	2,726	287	3,449	5.0	60
Minimum	75	793	142	1,454	210	2,145	3.8	39
Maximum	154	1,868	324	3,927	386	4,677	6.5	79
Sampling Frequency Requirement Met			Yes		Yes		Yes	



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Table 2 Raw Influent Analyses continued

Month	COD avg. conc. mg/L	TKN avg. conc. mg/L	TAN avg. conc. mg/L	TAN loading kg/d*	Nitrate plus Nitrite mg/L	pH min.	pH max.
January	229	35.00	22.71	273	0.5	7.1	7.3
February	456	37.95	23.50	282	0.3	7.1	7.4
March	404	31.24	19.39	244	1.2	7.0	7.4
April	343	29.33	19.24	197	2.0	7.2	7.4
May	430*	27.16	16.11	237	1.1	7.1	7.3
June		31.20	18.72	248	0.5	6.9	7.3
July		35.93	21.73	263	0.4	7.1	7.2
August		40.20	23.81	272	0.4	6.7	7.1
September		45.43	24.84	258	0.5	6.5	7.5
October		50.98	25.65	311	0.4	6.9	7.7
November		45.94	24.52	295	0.4	7.0	7.6
December		48.48	23.84	281	0.6	6.4	7.5
Average	338	38.23	22.01	265	0.7		
Minimum	229	27.16	16.11	197	0.3	6.4	
Maximum	456	50.98	25.65	311	2.0		7.7
Sampling Frequency Requirement Met	Yes	Yes			Yes	Yes	Yes

*Analysis of COD is not required as of May 23, 2017 with the issue of the new ECA.



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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	TAN avg. conc. mg/L	TAN loading kg/d
January	5.9	70.3	10.9	130.5	0.36	4.4	0.58	7.0
February	10.5	126.1	8.9	107.3	0.31	3.7	0.18	2.2
March	5.0	63.3	9.4	118.6	0.32	4.0	0.29	3.6
April	4.1	42.2	8.0	82.1	0.27	2.7	0.40	4.1
May	3.8	56.4	8.6	126.4	0.33	4.8	0.52	7.6
June	3.4	45.1	10.3	136.8	0.40	5.3	0.40	5.2
July	3.1	36.9	7.4	89.8	0.53	6.4	0.16	1.9
August	2.6	30.2	6.8	77.2	0.62	7.1	0.45	5.2
September	2.2	22.9	5.0	51.6	0.69	7.2	0.14	1.5
October	2.5	30.3	5.8	70.8	0.98	11.9	0.18	2.1
November	3.1	37.0	12.2	146.1	0.47	5.7	0.18	2.2
December	5.3	62.8	11.1	130.6	0.42	5.0	0.29	3.4
Average	4.3	51.8	8.7	104.9	0.47	5.7	0.31	3.8
Minimum	2.2	22.9	5.0	51.6	0.27	2.7	0.14	1.5
Maximum	10.5	126.1	12.2	146.1	0.98	11.9	0.58	7.6
ECA Limit	25.0	852.5*	25.0	852.5*	1.0	34.1		
ECA Objective prior to May 23, 2017	15.0		15.0		1.0			
ECA as of May 23, 2017					0.8			
Within Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

*On May 23, 2017 Annual Average loading changed to Monthly Average Daily loading. The annual average loading from January 1st to May31st is

CBOD₅ 71.7kg/d

TSS 113kg/d

TP 19.6kg/d



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Table 3 Final Effluent Analyses continued

Month	Unionized NH3 avg. conc. mg/L	TKN avg. conc. mg/L	DP avg. conc. mg/L	TCR avg. conc. mg/L	Nitrate plus Nitrite mg/L	pH min.	pH max.	Temp. °C avg
January	0.0	2.08	0.11	0.00	16.0	6.9	7.3	14.2
February	0.0	2.28	0.11	0.01	17.8	7.0	7.3	12.5
March	0.0	2.16	0.09	0.00	16.8	7.0	7.4	12.2
April	0.0	2.16	0.07	0.00	17.4	7.1	7.4	13.9
May	0.0	2.14	0.13	0.00	12.9	6.8	7.3	15.4
June	0.0	2.54	0.21	0.00	12.8	6.9	7.3	18.5
July	0.0	1.50	0.36	0.00	15.6	6.9	7.1	20.1
August	0.0	1.95	0.48	0.00	14.5	6.6	7.0	21.1
September	0.0	1.47	0.56	0.00	17.2	6.5	7.1	21.3
October	0.0	1.72	0.63	0.00	17.6	6.5	7.2	19.3
November	0.0	1.73	0.31	0.00	19.1	6.4	7.5	16.8
December	0.0	2.31	0.17	0.00	19.7	6.3	7.3	14.0
Average	0.0	2.00	0.27	0.00	16.2			
Minimum	0.0	1.47	0.07	0.00	12.8	6.3		12.2
Maximum	0.0	2.54	0.63	0.01	19.1		7.5	21.3
ECA Limit as of May 23, 2017				0.02				
ECA Objective prior to May 23, 2017				0.5		6.0	9.5	
ECA Objective as of May 23, 2017				0.01				
Within Compliance				Yes				
Sampling Frequency Requirement Met	Yes	Yes		Yes	Yes	Yes	Yes	Yes



Table 4 Escherichia coliform Sampling

- The seasonal disinfection period of May 15 to October 15 changed as of May 23, 2017 to year round disinfection.

Month	Number of Samples	Geometric Mean Density
January	4	165
February	4	17
March	5	22
April	4	4
May	5	26
June	5	33
July	4	32
August	5	19
September	4	34
October	4	40
November	5	62
December	4	79
ECA Limit as of May 23, 2017		200
ECA Objective as of May 23, 2017		150
ECA Objective prior to May 23, 2017		200
Within Compliance		Yes
Sampling Frequency Requirement Met	Yes	



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Table 5 Energy and Chemical Usage

Month	Ferrous Chloride (litres)	Sodium Hypochlorite (kilograms as chlorine)	Sodium Bisulphite (litres)	Hydro (kWh)	Natural Gas (cubic metres)
January	29,711	2,112	1,099	555,913	9,111
February	20,567	704	1,152	492,380	10,576
March	21,598	889	1,567	557,684	9,282
April	19,252	678	1,633	536,417	6,409
May	22,174	1,058	1,759	554,058	4,621
June	20,799	1,026	1,066	471,051	16
July	22,635	1,125	1,489	416,041	2
August	23,254	1,219	1,050	389,908	1,898
September	23,597	968	925	373,272	1,576
October	27,964	1,081	1,183	403,862	6,515
November	27,799	1,180	1,064	463,797	7,880
December	30,237	1,481	1,107	577,498	14,824
Total	289,587	13,519	15,095	5,791,882	72,710