Cannington Water Pollution Control Plant

Annual Performance Report 2015

The Regional Municipality of Durham

Cannington Water Pollution Control Plant 2015 Annual Performance Report

Environmental Compliance Approval (ECA): 8730-8CYU2X Dated June 28, 2012

The Cannington Water Pollution Control Plant (WPCP) Performance Report provides staff, stakeholders and customers an overview of the performance of the Cannington WPCP in 2015. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment and Climate Change (MOECC). The performance report demonstrates the commitment of ensuring that the WPCP continues to deliver wastewater services to our customers in an environmentally responsible manner.

For a description of terms and abbreviations used in this report, refer to the glossary at the end of the report.

Water Pollution Control Plant Process Description

General

The Cannington WPCP is owned and operated by the Regional Municipality of Durham in accordance with the terms and conditions of the ECA. The plant is located in the Community of Cannington in the Township of Brock. This MOECC Class One wastewater treatment plant is designed to treat wastewater at rated capacity of 1,068 cubic metres per day (m^3/d) and utilizes two seasonal retention facultative waste stabilization lagoons. The Cannington WPCP has a service population of 2,100 residents.The treated effluent is discharged to the Beaver River in accordance with the conditions listed in the ECA.

Raw Influent

Wastewater is collected in approximately 12.6 km of sanitary sewers in the Cannington service area and is conveyed to the treatment facility by a single sanitary sewage pumping station located on Laidlaw Street. Aluminum sulphate is added at the station to enhance the settling of solids and phosphorus removal.

Lagoon Treatment

The Cannington WPCP is a seasonal wastewater stabilization lagoon facility consisting of a two cell lagoon system that is operated as a seasonal retention facultative waste stabilization pond providing a retention time of 190 days. Flow to the Cannington WPCP is distributed to each cell through an influent distribution chamber. Each cell is equipped with an outlet chamber and outfall pipe. The ECA permits for two seasonal discharge periods per year. Spring discharge is from March 1st to May 31st and fall discharge is from October 1st to December 31st. Prior to and during discharging to the Beaver River, samples are collected to verify the effluent will meet the limits established in the ECA.

Environmental Compliance Approval

Under Condition 9 (4) of ECA #8730-8CYU2X the Region of Durham must produce an annual 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 Cannington WPCP 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 Cannington WPCP effluent was determined to be compliant with the approval limits during the reporting period. The plant operated at 76.2% of its rated capacity and received a maximum daily flow of 1573 m^3/d on June 30th, 2015. An Inflow and Infiltration study is planned for 2017. The total treated effluent discharged to the Beaver River in 2015 was calculated to be 269,477 m^3. Table 4 provides a tabulation of effluent results.

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

No operating problems were encountered in 2015.

c) Maintenance of major equipment

Jetting was performed on the Laidlaw Street pumping station dry well discharge line and the first 10 feet of the forcemain toward the lagoon system.

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.

e) Summary of the calibration and maintenance carried out on all effluent monitoring equipment

- Calibration of the influent flow meter located at Laidlaw Street Pumping Station occurred in April and September, 2015.
- Temperature and pH are monitored in the field, all other routine process control tests are performed at the Lake Simcoe WPCP laboratory in Beaverton. All monitoring and laboratory equipment is calibrated and maintained according to manufacturer's specifications.

f) Estimate of sludge settling capacity of the lagoon and annual depletion

The annual depletion of the sludge settling capacity is negligible. There was no removal of biosolids during the reporting period.

g) Efforts made and results achieved in meeting the effluent objectives

- The Regional Municipality of Durham strives to achieve the best effluent quality at all times consistently remaining well below ECA limits.
- The annual average daily flow did not exceed the rated capacity of 1,068m^3/d during the reporting period.
- The objective for $CBOD_5$ was exceeded twice during spring discharge on April 7th and 8th.
- The maximum objective for pH was exceeded twice during spring discharge on April 20th and May 25th, and once during fall discharge on October 19th.
- Best efforts will continue to be applied to maintain results below objectives.

h) Complaints

A summary of complaints received from the public is administered through a central database. No complaints were received during the reporting period.

i) By-pass

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

j) Initial Effluent Characterization

The initial effluent characterization sampling was conducted in 2015 with a completion date of October 13th, 2015. A report will be submitted in April of 2016,as per Condition 8 (3) of the ECA.

k) Information required by MOECC Water Supervisor

No additional information required.

Proposed Alterations, Extensions or Replacements

No proposed alterations, extensions or replacements.

MOECC Inspection

This plant was not inspected by the MOECC in 2015.

The planned Inflow and Infiltration study for 2015 has been postponed until 2017.

Summary of Tables

Table 1 Raw Influent Flows

Month	Total Flow to Plant -metered at the Laidlaw Street Pumping Station m^3	Average Daily Flow m^3/d	Maximum Daily Flow m^3/d	Minimum Daily Flow m^3/d
January	27,370	883	1,124	733
February	19,568	699	760	653
March	29,283	945	1,321	633
April	40,027	1,334	1,529	1,067
May	28,711	926	1,094	785
June	32,212	1,074	1,573	784
July	26,678	861	1,237	656
August	20,049	847	791	486
September	16,295	543	616	300
October	16,261	525	617	450
November	19,447	648	765	494
December	22,008	710	860	607
Total	297,909			
Annual Average	24,826	814		
Minimum	16,261			300
Maximum	40,027		1,573	
ECA Requirement		1,068*		
Met Compliance		Yes		

*Annual Average

Table 2 Raw Influent Analyses

Month	$CBOD_5$ avg. conc. mg/L	$CBOD_5$ loading kg/d	BOD5 avg. conc. mg/L	BOD5 loading kg/d	TSS avg. conc. mg/L	TSS loading kg/d	TP avg. conc. mg/L	TP loading kg/d
January	109	96	148	131	200	177	5.0	4.4
February	135	94	156	109	198	138	5.0	3.5
March	125	118	155	146	209	198	4.4	4.2
April	106	141	165	220	231	308	6.0	8.0
May	94	87	111	103	148	137	3.6	3.3
June	68	73	87	93	97	104	2.9	3.1
July	84	72	116	100	177	152	3.8	3.3
August	127	108	167	141	253	214	5.9	5.0
September	211	115	379	206	530	288	8.2	4.5
October	142	75	186	98	237	124	7.7	4.0
November	178	115	265	172	348	226	7.7	5.0
December	93	66	128	91	163	116	6.2	4.4
Average	123	100	172	140	233	189	5.5	4.5
Minimum	68	66	87	91	97	104	2.9	3.1
Maximum	211	141	379	220	530	308	8.2	8.0
Sampling Frequency Requirement Met	Yes		Yes		Yes		Yes	

Table 2 Raw Influent Analyses continued

Month	DP avg. conc. mg/L	TKN avg. conc. mg/L	TKN loading kg/d	TAN avg. conc. mg/L	TAN loading kg/d	pH min.	pH max.	Temp. Degrees Celsius Min	Temp. Degrees Celsius Max
January	2.45	39.73	35	26.10	23	7.26	7.90	7.3	11.2
February	2.45	39.90	28	24.30	17	7.27	8.20	4.8	8.7
March	1.80	32.58	31	22.30	21	6.72	7.90	7.8	8.7
April	2.38	30.65	41	15.00	20	7.23	7.70	8.1	9.1
May	1.81	31.88	30	21.50	20	7.50	7.90	10.2	12.9
June	1.37	25.62	28	17.20	18	6.87	8.04	15.0	25.0
July	1.99	34.40	30	25.90	22	7.15	7.80	14.6	16.6
August	2.93	47.70	40	33.00	28	7.50	7.90	15.8	18.3
September	4.13	70.18	38	38.00	21	7.25	7.80	16.3	17.8
October	4.01	68.93	36	45.50	24	7.58	8.46	11.9	16.6
November	3.98	65.00	42	39.30	25	7.30	8.32	7.1	16.4
December	3.16	50.58	36	33.80	24	7.47	8.33	9.0	12.5
Average	2.71	44.76	36	28.49	23				
Minimum	1.37	25.62	28	15.00	17	6.72		4.8	
Maximum	4.13	70.18	42	45.50	28		8.46		25.0
Sampling Frequency Requirement Met				Yes		Yes	Yes	Yes	Yes

Table 3 Calculated Effluent Flows

Month	Calculated Effluent Flow m^3
January	
February	
March	
April	127,454
May	13,778
June	
July	
August	
September	
October	75,308
November	52,937
December	
Total	269,477
Annual Average	67,369
Minimum	13,778
Maximum	127,454

Table 4 Final Effluent Analyses

Month	$CBOD_5$ avg. conc. mg/L	$CBOD_5$ loading kg/d	BOD5 avg. conc. mg/L	BOD5 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									
February									
March									
April	11.30	77	16.80	114	7.30	49.7	0.08	0.5	10.2
May	3.90	5	4.20	6	8.90	11.8	0.17	0.2	2.3
June									
July									
August									
September									
October	1.40	6	1.60	7	3.00	0.1	0.06	0.3	4.5
November	3.60	32	3.70	33	5.10	44.9	0.15	1.3	7.9
December									
Total									24.9*
Average	5.05	26	6.58	33	6.08	30.8	0.12	0.6	3.0
Minimum	1.40	5	1.60	6	3.00	0.1	0.06	0.2	2.3
Maximum	11.30	77	16.80	114	8.90	49.7	0.17	1.3	10.2
ECA Limit	25**				30**				117*
ECA Objective	15				20		0.5		
LSPRS							0.25**		97*
Within Compliance	Yes				Yes		Yes		Yes
Sampling Frequency Requirement Met	Yes		Yes		Yes		Yes		

*Total Annual Loading, kg/year

**Annual Average Concentration

Table 4 Final Effluent Analyses continued

Month	DP avg. conc. mg/L	TKN avg. conc. mg/L	TAN avg. conc. mg/L	TAN loading kg/d	Un-ionized Ammonia avg. conc. mg/L	pH min.	pH max.	Temp. °C min.	Temp. °C max.
January									
February									
March									
April	0.012	15.33	14.34	97.5	0.00	6.8	8.2	5.6	13.9
May	0.004	9.60	8.79	11.7	0.20	7.3	8.1	16.9	22.4
June									
July									
August									
September									
October	0.011	11.63	10.64	44.4	0.10	7.0	8.1	15.7	17.1
November	0.014	12.75	10.70	94.2	0.10	7.6	7.9	1.9	4.6
December									
Average	0.010	12.33	11.12	56.4	0.10				
Minimum	0.004	9.60	8.79	11.7	0.00	6.8		1.9	
Maximum	0.014	15.33	14.34	97.5	0.20		8.2		22.4
ECA Limit						6.0	9.5		
ECA Objective						6.5	8.0		
Within Compliance						Yes	Yes		
Sampling Frequency Requirement Met			Yes			Yes	Yes	Yes	Yes

Table 5 Chemical Usage

Month	Aluminum Sulphate (litres)
January	15,134
February	9,161
March	7,067
April	22,407
May	16,914
June	3,975
July	0
August	8,538
September	5,782
October	12,432
November	8,818
December	15,496
Total	125,724

Glossary of Terms

Annual Average Concentration
An arithmetic mean of the seasonal average concentrations of a contaminant in the effluent calculated for any particular year.

Annual Average Loading
The value obtained by multiplying the seasonal average concentration of a contaminant by the Average Daily Flow over the same calendar year.

Average Daily Flow
The cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year.

BOD_5 Five Day Biochemical Oxygen Demand
(also known as total BOD_5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand.

By-pass
Any discharge from any portion of the works other than in accordance with the conditions of the ECA.

$CBOD_5$ -Five Day Carbonaceous Biochemical Oxygen Demand
Means a five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample..

Conc. Concentration
The abundance of a constituent divided by the total volume of a mixture.

Daily Concentration
Means the concentration of a contaminant in the effluent discharged over any single day, as measured by a composite or grab sample, whichever is required.

DP – Dissolved Phosphorus
This is the soluble form of phosphorus present in the wastewater.

ECA Environmental Compliance Approval
The primary regulatory instrument for each water pollution control plant.

E. coli - (Escherichia coli)
Refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius.

Final Effluent
Means sewage discharge via the water pollution control plant outfall after undergoing the full train of unit processes as listed in the Environmental Compliance Approval.

Geometric Mean Density
Is the nth root of the product of multiplication of the results of n number of samples over the period specified.

Grab Sample
A single sample taken at a specific moment in time, when tested provides a snapshot of the conditions at the time the sample was retrieved.

kg - kilogram
Basic unit of mass in the metric system

kg/d – kilogram per day

LSPRS - Lake Simcoe Phosphorus Reduction Strategy
The ECA issued on June 28, 2012 introduced additional phosphorus objectives to comply with the requirements of the Lake Simcoe Phosphorus Reduction Strategy (2010) prepared under the Lake Simcoe Protection Plan (2009).

m^3 - (Cubic Metre)
Volume measurement, $1m^3$ = 1000 litres or 220 imperial gallons.

m^3/d - (Cubic Metre Per Day)
Flow measurement, $1m^3$ = 1000 litres or 220 imperial gallons. Volume of liquid treated in a 24 hour period.

Max. - Maximum

Maximum Flow Rate
The peak or highest flow recorded during a specific time period usually in a 24 hour period.

mg./L. - (Milligram Per Litre)
This is a measure of the concentration of a parameter in water, sometimes referred to as parts per million (ppm).

Min. - Minimum

mm.-(millimetre)
Is a unit of length in the metric system, equal to one thousandth of a metre.

MOECC - (Ministry of the Environment and Climate Change)
The Provincial regulatory agency responsible for overseeing the water and wastewater industries in Ontario. Their primary functions include approval for new or expanding facilities, inspections and investigations.

Monthly Average Concentration
Means the arithmetic mean of all daily concentrations of a contaminant in the effluent sampled or measured, or both, during a calendar month.

Monthly Average Loading
Is calculated by multiplying the monthly average concentration of a contaminant in the effluent sampled or measured, or both, during a calendar month.

N/A - Not Applicable

N/D - No Discharge

Peak Flow Rate
The maximum rate of sewage flow for which the plant or process unit was designed.

pH
Index of hydrogen ion activity, pH is defined as the negative logarithm of hydrogen ion concentration in moles per litre. The pH may range from 0 – 14, where 0 is most acidic, 14 most basic and 7 neutral.

Rated Capacity
The average daily flow for which the works are approved to handle**.**

Raw Influent
Raw wastewater entering the water pollution control plant before treatment.

Seasonal Average Concentration
Means the arithmetic mean of all daily concentrations of a contaminant in the effluent sampled or measured or both during the seasonal discharge period.

Sludge
The settleable solids separated from liquids during processing.

TAN - Total Ammonia Nitrogen
Ammonia exists in two forms in the water: NH3 (this is called unionized ammonia) NH4+ (this is called ionized ammonia) Together, these two forms of ammonia are called TAN which means total ammonia nitrogen.

Temp. – Temperature

Total Annual Loading
Is calculated by summarizing the total monthly loadings within a calendar year**.**

Total Monthly Loading
Is calculated by multiplying the total monthly flow by the monthly average concentration.

TP - Total Phosphorus
A laboratory analyses to determine the total amount of non-soluble and soluble phosphorus present in the wastewater.

TSS - Total Suspended Solids
A laboratory analyses to measure particles that are larger than 2 microns found in the wastewater.

TS - Total Solids
Is a measure of the suspended and dissolved solids in the wastewater and in biosolids.

Unionized Ammonia Nitrogen
Un-ionized ammonia refers to all forms of ammonia in water with the exception of the ammonium ion (NH4 +).

WPCP - Water Pollution Control Plant
A facility composed of a variety of treatment processes that collectively treat wastewater

If this information is required in an accessible format, please contact 1-800-372-1102 extension 3488

Corbett Creek Water Pollution Control Plant

Annual Performance Report 2015

The Regional Municipality of Durham

Corbett Creek Water Pollution Control Plant 2015 Annual Performance Report

Environmental Compliance Approval (ECA): 7560-9PPRJC Dated November 12, 2014

Environmental Compliance Approval (Air): 1581-9URJFE Dated May 13, 2015

The Corbett Creek Water Pollution Control Plant (WPCP) Performance Report provides staff, stakeholders and customers a performance overview of the Corbett Creek WPCP in 2015. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment and Climate Change (MOECC). The performance report demonstrates the commitment of ensuring that the WPCP continues to deliver wastewater services to our customers in an environmentally responsible manner.

For a description of terms and abbreviations used in this report, refer to the glossary at the end of the report.

Water Pollution Control Plant Process Description

General

The Corbett Creek WPCP is owned and operated by the Regional Municipality of Durham in accordance with the terms and conditions of the ECA. The plant is located in the Town of Whitby.

Corbett Creek WPCP treats wastewater from the Whitby, Brooklin and Oshawa service areas. The Corbett Creek WPCP services approximately 147,805 residents.

The Corbett Creek WPCP is designed to treat wastewater at an average daily flow rate of 84,350 cubic metres per day (m^3/d) as noted in the ECA. The plant is an MOECC Class Four conventional activated sludge treatment plant that utilizes the following processes to treat wastewater:

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

Raw Influent Pumping

Wastewater is collected through approximately 450 km of sanitary sewers in the Town of Whitby, the Brooklin urban area, and the City of Oshawa. It is conveyed to the plant by gravity and by several sanitary sewage pumping stations located in the collection system.

Preliminary Treatment

Screening: Two automatic, mechanically cleaned screens remove paper products and large material that could harm pumps and process equipment. Screenings removed in this process are compacted for landfill disposal.

Grit Removal: Heavy suspended material such as sand and small stones (grit) is removed in the two aerated grit tanks. 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 dewatered and transported to landfill.

Primary Treatment

The four primary clarifiers utilize the physical process of sedimentation which allows suspended material to settle to the bottom of the tank as sludge. This raw sludge, along with waste activated sludge from the secondary treatment process is collected by a sweep mechanism which pushes the sludge into hoppers. The sludge is then pumped to the anaerobic digesters for further treatment. Any material floating on the surface of the clarifier (scum) is also removed to the digester.

Phosphorous Removal System

The phosphorous removal system is intended to lower the total phosphorous level in the final effluent by adding a chemical coagulant (ferrous chloride) as part of the treatment process. Ferrous chloride can be added at the primary effluent.

Secondary Treatment

Aeration: The aeration tank is where fine bubbled air is diffused into the sewage to remove organics and nutrients from the wastewater. Biological activity is controlled to assimilate the organic material.

Secondary Clarifier: The effluent from the aerators is directed to the seven secondary clarifiers where it settles quickly as an activated (living) sludge leaving a clear effluent to overflow the clarifier. The sludge collected on the bottom of the clarifier is pumped back to the head of the aeration tank. The microorganisms are returned to repeat the process. Waste activated sludge is sent to the primary clarifier to co-settle.

Disinfection (chlorination/dechlorination)

Chlorine in the form of liquid sodium hypochlorite is metered into the effluent stream for pathogen control. Adequate contact time is provided by the two chlorine contact chambers. Disinfected effluent is dechlorinated with a sodium bisulphite solution before being discharged to Lake Ontario through the 1,800 mm diameter outfall extending 409 m into Lake Ontario.

Solids Treatment

Anaerobic Digestion: The raw sludge that is collected from the primary clarifiers is pumped into the primary digester. Anaerobic bacteria reduce the volume of sludge. As a by-product the digester produces a more stabilized sludge; water which is returned to the plant for further treatment; and a combination of carbon dioxide; methane; and hydrogen sulphide.

Biosolids: All digested sludge produced is pumped to the biosolids holding facility. From there the treated biosolids can be utilized on 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 10 (6) of ECA #7560-9PPRJC 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 Corbett Creek WPCP effluent was determined to be compliant with the ECA approval limits during the reporting period. The plant operated at an average of 59% of its rated capacity and received a maximum daily flow of 114,684 m^3/d on April 9. See tables for effluent results.

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

- A high flow event caused a by-pass on June 23rd. All corrective actions were taken as per the ECA.
- High strength influent was received from a local industry causing some elevated effluent TSS. The plant process was modified biologically to adapt to the additional organic material.

c) Maintenance of major equipment

Major maintenance items in 2015 included:

- Replaced secondary clarifier bridges #5 and #6 gearboxes,
- Replaced building 'M' groundwater pumps,
- Rebuilt raw sludge pumps #2, 3, 4, and standby,
- Rebuild primary clarifier scum troughs,
- Rebuilt primary clarifier #1 and #2 scraper arms,
- Replaced primary clarifier #1 and secondary clarifier #7 gear boxes,
- Removed corner sweeps from secondary clarifier #10,
- Rebuilt corner sweeps on secondary clarifier #7,
- Installed new radar level control on primary digester #2,
- Rebuilt south plant chlorine pumps,
- Rebuilt final effluent sodium bisulphate pumps,
- Installed bisulfate exhaust and alarm in chemical containment building,
- Installed new heating unit in building 'B',
- Installed new gearbox in screenings rag packer,
- Conducted maintenance on Turblex blowers.

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

- Calibration of the effluent flow meter and the secondary clarifier flow meter occurred on May, June, and October 2015.
- Calibration of the AutoCat 9000 chlorine analyzer was conducted on July 25th 2015.

- Calibration of the in-house lab pH meter is conducted regularly.
- On-line instrumentation is verified by WPCP operators using various field or laboratory test equipment.

f) Effluent Objectives

The Regional Municipality of Durham strives to achieve the best effluent quality at all times, remaining below the ECA compliance limits.

The annual average daily flow did not exceed the rated capacity of 84,350 m^3/d.

The total suspended solids objective of 15.0 mg/L was exceeded in 33 of 413 samples (8%). These exceedances were the result of an upstream industrial discharge causing issues at the plant during the first six months of 2015.

Total phosphorus objective of 0.8 mg/L was exceeded in 33 of 303 samples (11%). This corresponded primarily with the issues causing the total suspended solids exceedances noted above.

The total ammonia nitrogen objective of 8.0 mg/L during the summer months was exceeded on six occasions out of 250 samples (2.4%). Two exceedances were the result of low dissolved oxygen events and four were the result of low biomass in two of the seven aeration tanks for a brief period.

The total chlorine residual objective of “non-detect” was exceeded in 40 of 363 samples (11%). Results were consistently low but detectable by our instrument.

Best efforts and process adjustments 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 Corbett Creek WPCP in 2015 was 85,389 m^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 is Disposed:

Duffin Creek WPCP – 46,837 m^3 or 54.8%

Agricultural Fields – 38,552 m^3 or 45.2%

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

One odour complaint was received in January from a local business owner. The concern was investigated and identified as odour from a local industry.

i) By-passes and Spills

One primary by-pass of 153 m^3 occurred on June 23rd. This event was due to extremely high flows caused by heavy rains. All sampling and testing was conducted as per the ECA. The MOECC was notified and an incident number 124312 was received.

A spill of sodium bisulphite occurred on August 5. Due to a mechanical failure of a dosing pump it was estimated that 5,465 L of the chemical was discharged from the plant. The MOECC was notified and an incident number 3527-9ZKBF was received.

j) Notice of Modifications submitted to Water Supervisor and Status Report of Limited Operational Flexibility

No modifications under “Limited Operational Flexibility” were conducted.

k) Modifications Arising under section 3 of Schedule A

No modifications under section 3 of Schedule A were conducted.

l) Information Required by MOECC Water Supervisor

No additional information required.

MOECC Inspection

No MOECC inspection occurred in 2015.

Table 1 Raw Influent Flows

Month	Total Flow to Plant -metered at the final effluent m^3	Average Daily Flow m^3/d	Maximum Daily Flow m^3/d
January	1,517,232	48,943	61,350
February	1,264,042	45,144	53,974
March	1,520,282	49,041	58,398
April	1,777,100	48,314	97,228
May	1,497,729	48,314	55,845
June	1,810,696	60,357	114,684
July	1,561,459	50,370	68,133
August	1,440,189	46,458	55,838
September	1,358,040	45,268	54,017
October	1,494,930	48,224	102,991
November	1,475,921	49,197	57,494
December	1,411,249	45,524	53,465
Average	1,510,739	49,668*	
Maximum			114,684
ECA Limit		84,350	
Met Compliance		Yes	

*Annual Average Daily Flow

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	105	5,143	144	7,066	121	5,916	4.1	201
February	123	5,553	152	6,873	112	5,035	5.3	239
March	122	5,997	145	7,113	102	5,007	4.3	212
April	94	4,526	131	6,322	107	5,150	3.6	173
May	139	6,716	178	8,600	200	9,664	4.6	221
June	96	5,787	129	7,772	166	10,014	3.0	180
July	156	7,870	181	9,117	152	7,638	3.9	198
August	131	6,074	159	7,375	185	8,577	4.4	204
September	95	4,321	121	5,462	136	6,160	3.5	158
October	65	3,145	80	3,840	95	4,588	3.4	166
November	77	3,808	102	5,030	100	4,897	4.0	196
December	89	4,071	127	5,782	131	5,978	3.6	166
Average	108	5,354	137	6,823	134	6,645	4.0	198
Minimum	65	3,145	80	3,840	95	4,588	3.0	158
Maximum	156	7,870	181	9,117	200	10,014	5.3	239
Sampling Frequency Requirement Met			Yes		Yes		Yes	

Table 2 Raw Influent Analyses continued

Month	DP avg. conc. mg/L	TKN avg. conc. mg/L	TAN avg. conc. mg/L	TAN loading kg/d	pH min.	pH max.
January	2.18	34.28	24	1,186	7.40	8.20
February	2.42	39.75	25	1,145	7.40	8.30
March	1.98	33.78	23	1,124	7.02	8.10
April	1.76	30.72	24	1,145	6.88	8.30
May	1.96	36.85	24	1,151	7.00	8.01
June	1.20	27.40	16	989	7.25	7.91
July	1.48	39.10	21	1,064	6.70	7.91
August	1.23	31.73	19	889	6.90	7.93
September	1.44	32.80	22	991	7.20	7.96
October	1.76	28.73	18	861	6.80	7.74
November	1.92	36.38	23	1,135	6.80	7.80
December	1.89	35.77	26	1,184	7.30	7.74
Average	1.77	33.94	22	1,099		
Minimum	1.20	27.40	16	861	6.70	
Maximum	2.42	39.75	26	1,186		8.30
Sampling Frequency Requirement Met		Yes	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	TAN avg. conc. mg/L summer	TAN avg. conc. mg/L winter	TAN loading kg/d
January	4.3	208	7.8	383	0.70	34.3	N/A	0.69	33.9
February	5.4	245	8.9	402	0.66	30.0	N/A	1.54	69.5
March	4.6	226	8.6	423	0.66	32.4	N/A	1.55	76.1
April	4.3	206	12.9	625	0.52	25.2	N/A	1.65	79.9
May	4.6	220	12.7	612	0.65	31.3	2.25	N/A	108.6
June	4.7	283	11.6	697	0.57	34.7	3.31	N/A	199.5
July	3.0	150	7.5	377	0.44	22.0	1.14	N/A	57.2
August	2.0	95	6.9	322	0.42	19.6	0.66	N/A	30.5
September	1.6	70	4.8	218	0.50	22.8	0.88	N/A	39.6
October	2.6	125	7.5	360	0.43	20.6	0.51	N/A	24.5
November	2.7	134	8.6	421	0.48	23.4	N/A	0.35	17.2
December	2.2	100	5.8	264	0.58	26.3	N/A	1.06	48.3
Average	3.5	173	8.6	429	0.55	27.4	1.45	1.14	65.4
Minimum	1.6	70	4.8	218	0.42	19.6	0.35	0.51	17.2
Maximum	5.4	283	12.9	697	0.70	34.7	1.65	3.31	199.5
ECA Requirement	25		25		1.0		16	24	
ECA Objective	15		15		0.8		8	18	
Within Compliance	Yes		Yes		Yes		Yes	Yes	
Sampling Frequency Requirement Met	Yes		Yes		Yes		Yes	Yes	

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	TCR loading kg/d	pH min.	pH max.	Temp. °C min.	Temp. °C max.
January	0.0	1.61	0.37	0.00	0.0	7.70	7.70	12.0	15.0
February	0.0	3.41	0.43	0.00	0.0	6.83	7.43	11.0	13.5
March	0.0	4.28	0.35	0.00	0.0	6.53	7.80	11.6	14.1
April	0.0	4.07	0.22	0.00	0.0	6.57	7.99	12.0	14.0
May	0.0	6.99	0.27	0.00	0.0	6.50	7.70	14.0	18.0
June	0.0	5.27	0.29	0.02	0.9	6.65	7.80	16.0	18.8
July	0.0	3.12	0.23	0.00	0.1	7.10	7.90	18.2	22.0
August	0.0	2.18	0.21	0.01	0.2	7.00	7.90	21.0	22.0
September	0.0	1.91	0.25	0.00	0.1	6.95	7.67	21.0	23.0
October	0.0	2.74	0.35	0.00	0.0	6.94	7.75	12.0	21.2
November	0.0	2.00	0.20	0.00	0.0	6.90	7.70	12.0	20.0
December	0.0	2.96	0.34	0.00	0.1	7.12	7.70	15.0	18.0
Average	0.0	3.38	0.29	0.00	0.1				
Minimum	0.0	1.61	0.20	0.00	0.0	6.50		11.0	
Maximum	0.0	6.99	0.43	0.02	0.9		7.99		23.0
ECA Requirement				0.02		6.0	9.0		
ECA Objective				0.0		6.5	8.5		
Within Compliance				Yes		Yes	Yes		
Sampling Frequency Requirement Met	Yes	Yes		Yes		Yes	Yes	Yes	Yes

Table 4 Escherichia Coliform Sampling

Month	Number of Samples	Geometric Mean Density
January	4	29
February	4	16
March	4	6
April	5	4
May	4	19
June	5	18
July	4	22
August	4	36
September	5	21
October	4	71
November	4	56
December	5	32
ECA Requirement		200
ECA Objective		150
Within Compliance		Yes
Sampling Frequency Requirement Met	Yes	

Table 6 Energy and Chemical Usage

Month	Total Plant Flow (cubic metres)	Ferrous Chloride (litres)	Sodium Hypochlorite (kilograms as chlorine)	Sodium Bisulphite (Litres)	Hydro (kWh)	Natural Gas (cubic metres)
January	1,517,232	180,310	8,191	26,287	773,111	66,617
February	1,264,042	179,610	7,339	23,470	741,334	48,512
March	1,520,282	201,400	7,949	30,977	778,617	56,436
April	1,777,100	183,340	9,835	22,863	733,864	51,914
May	1,497,729	167,640	8,885	12,991	728,253	39,295
June	1,810,696	167,640	14,239	10,495	706,049	30,301
July	1,561,459	182,910	12,116	8,869	763,183	29,813
August	1,440,189	193,300	12,483	18,708	730,439	23,337
September	1,358,040	181,150	12,238	15,240	703,958	23,394
October	1,494,930	196,800	10,719	14,785	721,971	28,077
November	1,475,921	177,270	8,059	14,656	676,536	37,074
December	1,411,249	174,680	6,763	14,885	687,689	38,846
Total	18,128,869	2,186,050	118,816	214,226	8,745,004	473,616

Glossary of Terms

Aeration Tank
A vessel in which a biological process is carried out which involves bacterial organisms or biochemically active substances derived from such organisms. This encompasses a combination of aerobic, and anoxic processes.

Anaerobic Digestion
Is a series of biological processes in which microorganisms break down biodegradable material in the absence of oxygen.

Average Daily Flow
The cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year.

Biosolids
Organic material recovered from wastewater sludge.

BOD_5 Five Day Biochemical Oxygen Demand
(also known as totalBOD_5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand.

By-pass
A diversion of sewage around one or more unit processes within the Sewage Treatment Plant with the diverted sewage flows being returned to the Sewage Treatment Plant treatment train upstream of the Final effluent sampling location, and discharging to the environment through the Sewage Treatment Plant outfall.

$CBOD_5$ -Five day Carbonaceous Biochemical Oxygen Demand
A five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample.

Conc. - Concentration

DP – Dissolved Phosphorus
This is the soluble form of phosphorus present in the wastewater.

ECA - Environmental Compliance Approval
The primary regulatory instrument for each WPCP.

E. coli - (Escherichia coli)
Refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius.

Final Effluent
Sewage discharge via the WPCP outfall after undergoing the full train of unit processes as listed in the Environmental Compliance Approval.

Geometric Mean Density
Is the nth root of the product of multiplication of the results of n number of samples over the period specified.

Grab Sample
A single sample taken at a specific moment in time, a snapshot of the conditions at the time the sample was retrieved.

m^3 - (Cubic Metre)
Volume measurement, $1m^3$ = 1000 litres or 220 imperial gallons.

m^3/d - (Cubic Metres Per Day)
Flow measurement, $1m^3$ = 1000 litres or 220 imperial gallons. Volume of liquid treated in a 24 hour period.

Max. – Maximum

Maximum Flow Rate
The peak or highest flow recorded during a specific time period usually in a twenty-four (24) period.

mg/L - (Milligram Per Litre)
This is a measure of the concentration of a parameter in water or wastewater, sometimes referred to as parts per million (ppm).

Min. – Minimum

mm - (millimetre)
Is a unit of length in the metric system, equal to one thousandth of a metre.

MOECC - (Ministry of the Environment and Climate Change)
The Provincial regulatory agency responsible for overseeing the water and wastewater industries in Ontario. Their primary functions include approval for new or expanding facilities, inspections and investigations.

Monthly Average Concentration
The arithmetic mean of all daily concentrations of a contaminant in the effluent sampled or measured, or both, during a calendar month.

Monthly Average Loading
Calculated by multiplying the monthly average concentration of a contaminant in the effluent sampled or measured, or both, during a calendar month.

N/A - Not Applicable

pH
Index of hydrogen ion activity, pH is defined as the negative logarithm of hydrogen ion concentration in moles per litre. The pH may range from 0 – 14, where 0 is most acidic, 14 most basic and 7 neutral.

Raw Influent
Raw wastewater entering the water pollution control plant before treatment.

Septage
Partially treated sludge from a septic tank.

Sludge
The settleable solids separated from liquids during processing.

TAN -Total Ammonia Nitrogen
Ammonia exists in two forms in the water: NH3 (this is called unionized ammonia) NH4+ (this is called ionized ammonia) Together, these two forms of ammonia are called TAN which means total ammonia nitrogen.

TCR -Total Chlorine Residual
The total amount of chlorine in water, including the combined chlorine and the free available chlorine.

Temp. – Temperature

TP -Total Phosphorus
A laboratory analyses to determine the total amount of particulate and soluble phosphorus present in the wastewater.

TSS -Total Suspended Solids
A laboratory analyses to measure particles that are larger than 2 microns found in the wastewater.

TS -Total Solids
Is a measure of the suspended and dissolved solids in the wastewater and in biosolids.

Unionized Ammonia Nitrogen
Un-ionized ammonia refers to all forms of ammonia in water with the exception of the ammonium ion (NH4 +).

WPCP - Water Pollution Control Plant
Is typically a facility composed of a variety of treatment processes that collectively treat the wastewater.

If this information is required in an accessible format, please contact 1-800-372-1102 extension 3488

Courtice Water Pollution Control Plant

Annual Performance Report 2015

The Regional Municipality of Durham

Courtice Water Pollution Control Plant 2015 Annual Performance Report

Environmental Compliance Approval (ECA): 3393-68RLD4 Dated January 28, 2005

Environmental Compliance Approval (Air): 7446-6AGNQZ Dated April 30, 2005

The Courtice Water Pollution Control Plant (WPCP) Performance Report provides staff, stakeholders and customers a performance overview of the Courtice WPCP in 2015. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment and Climate Change (MOECC). The performance report demonstrates the commitment of ensuring that the WPCP continues to deliver wastewater services to our customers in an environmentally responsible manner.

For a description of terms and abbreviations used in this report, refer to the glossary at the end of the report.

Water Pollution Control Plant Process Description

General

The Courtice WPCP is owned and operated by the Regional Municipality of Durham in accordance with the terms and conditions of the ECA. The plant is located in the Municipality of Clarington (Courtice).

The Courtice WPCP treats wastewater from the Oshawa and Courtice service areas in the Regional Municipality of Durham. The Courtice WPCP receives the majority of its flow from the Harmony Creek WPCP, receiving an average of 60% of the total collected sewage. The Courtice WPCP services 60% of the catchment population or approximately 107,703 residents.

The Courtice WPCP is designed to treat wastewater at an average daily flow rate of 68,200 cubic metres per day (m^3/d) with a peak flow rate of 180,000 m^3/d as noted in the ECA. The plant is an MOECC Class Four conventional activated sludge treatment plant that utilizes the following processes to treat wastewater:

- raw influent pumping,
- preliminary treatment,
- primary treatment,
- secondary treatment,
- phosphorus removal system,
- disinfection (chlorination/dechlorination),
- solids treatment – anaerobic digestion.

Raw Influent Pumping

Wastewater collected through approximately 656 km of sanitary sewers in Oshawa and Courtice is conveyed to the Harmony Creek sanitary sewage pumping station (SSPS) located at the Harmony Creek WPCP. A portion, approximately 60% of the influent flow is diverted to the Harmony Creek SSPS and conveyed 6.4 km in a 1050 mm diameter force main to the Courtice WPCP.

Preliminary Treatment

Screening: Two automatic, mechanically cleaned screens remove paper products and large material that could harm pumps and process equipment. Screenings removed in the process are compacted for landfill disposal.

Grit Removal: Heavy suspended material such as sand and small stones (grit) is removed in the two aerated grit tanks. 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 the process is dewatered and transported to landfill.

Primary Treatment

The two primary clarifiers utilize the physical process of sedimentation which allows the suspended material to settle to the bottom of the tank as sludge. This raw sludge, along with waste 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 digesters for further treatment. Any material floating on the surface of the clarifier (scum) is also removed to the digester.

Secondary Treatment

Aerated Bioreactor: The bioreactors are comprised of two distinct sections. The first section is an anoxic zone, where no oxygen is introduced and allows for potential denitrification. The effluent from the primary clarifiers flows into the anoxic zone first. Subsequently, the flow leaves the anoxic zone and enters the aerated zone where fine bubbled air is diffused into the sewage to remove dissolved and suspended organics and nutrients from the wastewater. Biological activity is controlled to assimilate the organic material.

Final Clarifier: The effluent from the aerators is directed to the two secondary clarifiers where it settles quickly as an activated (living) sludge leaving a clear effluent to overflow the clarifier. The sludge collected on the bottom of the clarifier is pumped back to the head of the aeration tank. The microorganisms are returned to repeat the process. Waste activated sludge is sent to the primary clarifier to co-settle.

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) as part of the treatment process. Ferrous chloride can be added at multiple locations.

Effluent Disinfection: 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 two chlorine contact chambers. Disinfected effluent is dechlorinated with a sodium bisulphite solution before being discharged through the 1,676 mm diameter outfall extending 770 meters into Lake Ontario.

Anaerobic Digestion: The raw sludge that is collected from the primary clarifiers is pumped into the primary digester followed by secondary digestion. Anaerobic bacteria reduce the volume of sludge. As a by-product these digesters produce a more stabilized sludge; water, which is returned to the plant for further treatment; and a combination of carbon dioxide; methane; and hydrogen sulphide. The methane is further used to meet the heating requirements of the digesters and for heating parts of the treatment facility.

Biosolids management: All digested sludge produced at the Courtice WPCP is pumped to the biosolids holding facility. From there the treated biosolids can be utilized on 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 10 (6) of ECA #3393-68RLD4 the Region of Durham must produce an annual report that must contain the following information:

a) Summary and interpretation of all monitoring data and a comparison to the effluent limits, including an overview of the success and adequacy of the works.

The Courtice WPCP effluent was determined to be compliant with the ECA approval limits during the reporting period. The plant operated at 69% of its rated capacity and received a maximum daily flow of 130,907 m^3/d on June 29, 2015. See tables for effluent results.

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

There were no operating issues encountered in 2015.

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 2015 included:

- Emptied and repaired both aeration tanks and both associated secondary clarifiers,
- Conducted maintenance on aeration blowers #1 and #3,
- Adjusted and calibrated final effluent flow weir,
- Repaired check valve on return activated sludge pump,
- Repaired mixer on secondary digester,
- Replaced ferrous chloride feed pump,
- Replaced variable frequency drives on Boiler #2, return activated sludge pump, and Digester pump,
- Replaced primary digester valve,
- Repaired anoxic mixer.

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. All results were found to be within 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 and the secondary clarifier flow meters occurred in May and September 2015.
- Calibration of the AutoCat 9000 chlorine analyzer was conducted July 29.
- Calibration of the in-house lab pH meter is conducted monthly.

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

The Regional Municipality of Durham continually strives to achieve the best effluent quality at all times, remaining below the ECA compliance limits.

The average daily rated flow capacity of 68,200 m^3/d was not exceeded. The rated peak flow capacity of 180,000 m^3/d was not exceeded.

One of 295(0.3%) total suspended solids samples exceeded the objective 15 mg/L. This was due to a contaminated auto sampler container. The container was subsequently scrubbed clean.

The total phosphorus objective of 0.8 mg/L was exceeded in 16 of 295 samples (5%). This was due primarily to insufficient ferrous chloride dosing. Ferrous chloride feed was increased as required.

The pH objective of <6.5 was exceeded on eight occasions. Operators monitored the results and calibrated the pH meter as required.

Six of 54 (11%) E.coli samples exceeded the objective of 200 cfu/100 ml. This occurred during a period of secondary clarifier and aeration tank maintenance resulting in higher than usual chlorine demand. Sodium hypochlorite was increased as needed and once the tanks were put back into service the E.coli concentrations were reduced.

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 Courtice WPCP in 2015 was 83,020m^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 – 49,518 m^3 or 59.6%

Agricultural Fields – 33,502 m^3 or 40.4%

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

One odour complaint was received from a neighboring industry on March 9. The concern was investigated and no odour could be identified. The MOECC was notified of the incident verbally and in writing.

i) Summary of all By-pass, spill or abnormal discharge events.

There were no by-passes during the reporting period. There are no anticipated by-passes planned during the next reporting period.

There were no spills during the reporting period.

j) Any other information the District Manager requires from time to time.

No additional information required.

MOECC Inspection

No MOECC inspection occurred in 2015.

Table 1 Raw Influent Flow

Month	Total Flow to Plant - metered at the final effluent m^3	Average Daily Flow m^3/d	Maximum Daily Flow m^3/d
January	1,493,052	48,163	66,828
February	1,222,097	43,646	46,583
March	1,494,667	48,215	56,405
April	1,901,943	63,398	110,385
May	1,321,046	42,614	52,540
June	1,700,341	56,678	130,907
July	1,364,027	44,001	68,878
August	1,276,542	41,179	50,404
September	1,238,137	41,271	61,004
October	1,395,005	45,000	92,461
November	1,485,661	49,522	63,051
December	1,257,069	40,551	52,770
Total	17,149,586		
Average	1,429,132	46,985*	
Minimum	1,222,097		
Maximum	1,901,943		130,907
ECA Requirement		68,200	180,000
Met Compliance		Yes	Yes

*Annual Average Daily Flow

Table 2 Raw Influent Analyses

Month	$CBOD_5$ avg. conc. mg/L	$CBOD_5$ avg. loading kg/d	BOD5 avg. conc. mg/L	BOD5 avg. loading kg/d	TSS avg. conc. mg/L	TSS avg. loading kg/d	TP avg. conc. mg/L	TP avg. loading kg/d
January	190	9,163	259	12,474	346	16,671	4.7	228
February	180	7,835	275	12,003	338	14,734	5.2	225
March	126	6,091	204	9,812	346	16,700	4.4	212
April	135	8,583	245	15,533	242	15,325	4.0	255
May	153	6,520	223	9,492	280	11,936	4.7	201
June	101	5,729	140	7,949	178	10,096	3.5	198
July	97	4,259	125	5,495	183	8,050	4.0	177
August	138	5,683	195	8,040	236	9,733	4.2	172
September	186	7,656	273	11,267	299	12,354	4.6	190
October	190	8,532	239	10,755	288	12,978	4.2	187
November	127	6,277	178	8,803	268	13,281	3.8	187
December	154	6,235	242	9,821	233	9,434	4.8	197
Average	148	6,954	216	10,171	270	12,678	4.3	204
Minimum	97	4,259	125	5,495	178	8,050	3.5	172
Maximum	190	9,163	275	15,533	346	16,700	5.2	255
Sampling Frequency Requirement Met			Yes		Yes		Yes	

Table 2 Raw Influent Analyses continued

Month	DP avg. conc. mg/L	TKN avg. conc. mg/L	TAN avg. conc. mg/L	TAN avg. loading kg/d	pH min.	pH max.	Temp. min.	Temp. max.	Alkalinity avg. conc. mg/L
January	2.45	42.50	26.04	1,254	6.88	7.65	6.6	16.2	264
February	2.59	44.35	24.62	1,075	6.75	7.66	8.1	15.1	293
March	2.33	37.98	26.18	1,262	6.76	7.75	8.5	18.9	257
April	1.93	33.62	19.08	1,210	6.83	7.61	12.8	18.3	269
May	2.80	41.60	26.66	1,136	6.50	7.35	15.4	19.7	284
June	1.94	31.58	20.49	1,162	6.99	7.40	11.5	21.8	282
July	2.20	33.84	24.99	1,100	7.06	7.53	18.8	24.1	291
August	2.32	37.95	27.93	1,150	7.07	7.67	18.9	25.2	329
September	2.53	45.18	27.45	1,133	6.86	7.59	18.2	23.1	235
October	2.48	44.94	27.31	1,229	7.05	7.81	12.2	20.2	296
November	2.10	37.20	25.27	1,252	7.01	7.99	11.3	18.8	260
December	2.45	41.32	29.29	1,188	6.86	7.97	9.3	18.3	262
Average	2.34	39.34	25.44	1,195					277
Minimum	1.93	31.58	19.08	1,075	6.50		6.6		235
Maximum	2.80	45.18	29.29	1,262		7.99		25.2	329
Sampling Frequency Requirement Met	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes

Table 3 Final Effluent Analyses

Summary of the final effluent sample analyses

Month	$CBOD_5$ avg. conc. mg/L	$CBOD_5$ avg. loading kg/d	TSS avg. conc. mg/L	TSS avg. loading kg/d	TP avg. conc. mg/L	TP avg. loading kg/d	TAN avg. conc. mg/L winter	TAN avg. conc. mg/L summer	TAN avg. loading kg/d
January	2.2	105	3.3	161	0.45	21.8	0.09	N/A	4.3
February	1.5	67	2.7	118	0.55	23.9	0.13	N/A	5.8
March	2.6	127	6.2	300	0.52	25.0	0.23	N/A	10.9
April	1.4	91	3.5	219	0.52	33.0	0.26	N/A	16.4
May	2.5	105	4.1	176	0.63	26.9	N/A	0.27	11.5
June	1.2	69	2.6	146	0.47	26.7	N/A	0.10	5.4
July	1.3	58	2.5	109	0.64	28.0	N/A	0.06	2.8
August	1.2	48	3.2	133	0.49	20.4	N/A	0.32	13.1
September	1.4	57	3.8	158	0.56	23.0	N/A	1.51	62.4
October	1.7	75	3.6	162	0.69	31.3	N/A	0.47	21.1
November	1.1	56	2.0	98	0.70	34.7	0.06	N/A	2.9
December	1.8	74	2.6	105	0.59	24.1	0.17	N/A	7.0
Average	1.7	78	3.3	157	0.57	26.7	0.16	0.45	13.6
Minimum	1.1	48	2.0	98	0.45	20.4	0.06	0.06	2.8
Maximum	2.6	127	6.2	300	0.70	34.7	0.26	1.51	62.4
ECA Requirement	25		25		1.0		24	15	
ECA Objective	15		15		0.8		12	8	
Within Compliance	Yes		Yes		Yes		Yes	Yes	
Sampling Frequency Requirement Met	Yes		Yes		Yes		Yes	Yes	

Table 3 Final Effluent Analyses continued

Month	Unionized NH3 avg. conc. mg/L	TKN avg. conc. mg/L	DP avg. conc. mg/L	Nitrate avg. conc. mg/L	Alkalinity avg. conc. mg/L
January	0.0	1.14	0.38	20.11	85
February	0.0	1.53	0.49	19.53	82
March	0.0	1.07	0.69	20.19	113
April	0.0	1.64	0.42	19.96	128
May	0.0	2.18	0.56	21.64	91
June	0.0	1.48	0.45	18.44	117
July	0.0	1.04	0.55	20.26	103
August	0.0	1.25	0.46	20.19	108
September	0.0	2.15	0.49	19.83	69
October	0.0	1.91	0.65	19.83	102
November	0.0	1.63	0.65	15.87	101
December	0.0	1.48	0.63	24.54	69
Average	0.0	1.54	0.54	20.03	97
Minimum	0.0	1.04	0.38	15.87	69
Maximum	0.0	2.18	0.69	24.54	128
ECA Requirement	0.2				
ECA Objective	0.1				
Within Compliance	Yes				
Sampling Frequency Requirement Met	Yes		Yes	Yes	Yes

Table 3 Final Effluent Analyses continued

Month	TCR avg. conc. mg/L	TCR avg. loading kg/d	pH min.	pH max.	Temp. °C min.	Temp. °C max.
January	0.01	0.3	6.25	7.90	11.1	15.1
February	0.00	0.0	6.41	6.92	9.3	14.1
March	0.01	0.3	6.55	7.51	10.5	15.4
April	0.01	0.7	6.83	7.33	12.7	15.4
May	0.00	0.1	6.73	7.50	14.9	17.8
June	0.00	0.1	6.78	7.69	16.8	19.4
July	0.00	0.1	6.87	7.57	17.6	21.2
August	0.00	0.1	6.63	7.62	18.9	25.5
September	0.00	0.1	6.25	7.73	20.2	22.9
October	0.00	0.1	6.64	7.71	16.9	20.3
November	0.01	0.4	6.98	7.49	16.1	18.5
December	0.00	0.1	6.87	7.22	14.8	17.2
Average	0.00	0.2				
Minimum	0.00	0.0	6.25		9.3	
Maximum	0.01	0.7		7.90		25.5
ECA Requirement			6.0	9.5		
ECA Objective			6.5	9.0		
Within Compliance			Yes	Yes		
Sampling Frequency Requirement Met	Yes		Yes	Yes	Yes	Yes

Table 4 Escherichia Coliform Sampling

Month	Number of Samples	Geometric Mean Density
January	4	24
February	4	15
March	6	35
April	5	89
May	4	61
June	4	11
July	4	90
August	4	330
September	5	14
October	5	61
November	4	20
December	5	10
ECA Requirement		N/A
ECA Objective		200
Within Compliance		Yes
Sampling Frequency Requirement Met	Yes	

Table 5 Energy and Chemical Usage

Month	Total Plant Flow (cubic metres)	Ferrous Chloride (litres)	Sodium Hypochlorite (kilograms as chlorine)	Sodium Bisulphite (Litres)	Hydro (kWh)	Natural Gas (cubic metres)
January	1,493,052	82,320	2,999	13,837	634,522	10,868
February	1,222,097	92,680	2,293	14,168	640,741	18,626
March	1,494,667	84,420	2,720	20,939	648,004	4,329
April	1,901,943	105,140	2,999	15,640	717,108	3,078
May	1,321,046	121,940	2,646	11,224	661,348	2,456
June	1,700,341	120,820	3,557	12,291	703,079	1,485
July	1,364,027	124,740	2,661	8,280	550,714	1,623
August	1,276,542	121,982	2,675	7,544	596,258	1,103
September	1,238,137	114,100	3,219	7,544	671,823	3,070
October	1,395,005	111,300	3,822	8,170	659,305	2,803
November	1,485,661	72,380	4,880	9,126	619,502	2,676
December	1,257,069	107,380	3,660	7,581	1,399,279	6,634
Total	17,149,586	1,259,202	38,132	136,344	8,501,683	58,751

Glossary of Terms

Anaerobic Digestion
A series of biological processes in which microorganisms break down biodegradable material in the absence of oxygen.

Average Daily Flow
The cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year.

Biosolids
Organic material recovered from wastewater sludge.

Bioreactor
A bioreactor is a vessel in which a biological process is carried out which involves bacterial organisms or biochemically active substances derived from such organisms. This encompasses a combination of aerobic, and anoxic processes.

BOD_5 Five Day Biochemical Oxygen Demand
(also known as totalBOD_5) Five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand.

By-pass
Any discharge from the Works that does not undergo any treatment or only undergoes partial treatment before it is discharged to the environment.

$CBOD_5$ -Five day Carbonaceous Biochemical Oxygen Demand
A five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample.

Conc. Concentration

District Manager
The District Manager of the York-Durham District Office of the Ministry.

DP – Dissolved Phosphorus
The soluble form of phosphorus present in the wastewater.

ECA - Environmental Compliance Approval
The primary regulatory instrument for each WPCP.

E. coli - (Escherichia coli)
Refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius.

Final Effluent
Sewage discharge via the Sewage Treatment Plant outfall after undergoing the full train of unit processes as listed in the Environmental Compliance Approval.

Geometric Mean Density
Is the nth root of the product of multiplication of the results of n number of samples over the period specified.

Grab Sample
A single sample taken at a specific moment in time, a snapshot of the conditions at the time the sample was retrieved.

m^3 - (Cubic Metre)
Volume measurement, $1m^3$ = 1000 litres or 220 imperial gallons.

m^3/d - (Cubic Metres Per Day)
Flow measurement, $1m^3$ = 1000 litres or 220 imperial gallons. Volume of liquid treated in a 24 hour period.

Max. – Maximum

Maximum Flow Rate
The peak or highest flow recorded during a specific time period usually in a twenty-four (24) period.

mg/L - (Milligram Per Litre)
This is a measure of the concentration of a parameter in wastewater, sometimes referred to as parts per million (ppm).

Min. – Minimum

mm - (millimetre)
Is a unit of length in the metric system, equal to one thousandth of a metre.

MOECC - (Ministry of the Environment and Climate Change)
The Provincial regulatory agency responsible for overseeing the water and wastewater industries in Ontario. Their primary functions include approval for new or expanding facilities, inspections and investigations.

Monthly average concentration
The arithmetic mean of all daily concentrations of a contaminant in the effluent sampled or measured, or both, during a calendar month.

Monthly average loading is calculated by multiplying the monthly average concentration of a contaminant in the effluent sampled or measured, or both, during a calendar month.

N/A - Not Applicable

pH
Index of hydrogen ion activity, pH is defined as the negative logarithm of hydrogen ion concentration in moles per litre. The pH may range from 0 – 14, where 0 is most acidic, 14 most basic and 7 neutral.

Rated Capacity
The average daily flow for which the works are approved to handle.

Raw Influent
Raw wastewater entering the water pollution control plant before treatment.

Septage
Partially treated sludge from a septic tank.

Sludge

The settleable solids separated from liquids during processing.

Substantial completion – has the same meaning as "substantial performance" in the Construction Lien Act.

TAN -Total Ammonia Nitrogen
Ammonia exists in two forms in the water: NH3 (this is called unionized ammonia) NH4+ (this is called ionized ammonia) Together, these two forms of ammonia are called TAN which means total ammonia nitrogen.

TCR -Total Chlorine Residual
The total amount of chlorine in water, including the combined chlorine and the free available chlorine.

Temp. – Temperature

TP -Total Phosphorus
A laboratory analyses to determine the total amount of particulate and soluble phosphorus present in the wastewater.

TSS -Total Suspended Solids
A laboratory analyses to measure particles that are larger than 2 microns found in the wastewater.

TS -Total Solids
Is a measure of the suspended and dissolved solids in the wastewater and in biosolids.

Unionized Ammonia Nitrogen
Un-ionized ammonia refers to all forms of ammonia in water with the exception of the ammonium ion (NH4 +).

Works –The sewage works described in the owner's application, and the ECA, and includes both proposed works and previous works.

WPCP - Water Pollution Control Plant
Is typically a facility composed of a variety of treatment processes that collectively treat the wastewater.

If this information is required in an accessible format, please contact 1-800-372-1102 extension 3488

Duffin Creek Water Pollution Control Plant
Annual Performance Report 2015

Duffin Creek Water Pollution Control Plant 2015 Annual Performance Report

Environmental Compliance Approval (ECA): 5531-9FJJT5 Dated March 3, 2014

Environmental Compliance Approval (Air): 1110-9AJP5C Dated September 13, 2013

International Organization for Standardization (ISO) 14001 Certification: CA05/3563/E

The Duffin Creek Water Pollution Control Plant (WPCP) Annual Performance Report provides staff, stakeholders and customers an overview of the performance of the Duffin Creek WPCP in 2015. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment and Climate Change (MOECC). The performance 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 Duffin Creek WPCP is jointly owned by the Regional Municipality of Durham and the Regional Municipality of York and operated in accordance with the terms and conditions of the ECA noted above. The plant is located in the City of Pickering, and operated by the Regional Municipality of Durham. This MOECC Class Four conventional activated sludge treatment plant is designed to treat wastewater at an average daily flow rate of 630,000 cubic metres per day (m^3/d) with a limit of 520,000 m^3/d as noted in the outfall capacity limitations in the ECA.

Duffin Creek WPCP treats wastewater from the Town of Ajax and the City of Pickering service areas in the Regional Municipality of Durham as well as the following service areas in the Regional Municipality of York: Vaughan, King, Newmarket, Whitchurch-Stouffville, Aurora, East Gwillimbury, Richmond Hill, and Markham.

The Duffin Creek WPCP is ISO 14001 Certified and an MOECC Class Four conventional activated sludge treatment plant that utilizes the following processes to treat wastewater:

- raw influent pumping,
- preliminary treatment,
- primary treatment,
- phosphorous removal system,
- secondary treatment,
- disinfection (chlorination/dechlorination)
- sludge management,
- dewatering of sludge,
- incineration.

Raw Influent Pumping

Wastewater collected through approximately 655 km of sanitary sewers in Ajax and Pickering is conveyed to the treatment plant by gravity and by the following sanitary sewage pumping stations located in the collection system: Bayly St, Jodrel Rd., Toy Ave., Liverpool/Finch and Liverpool. Wastewater collected from the Corporation of the Regional Municipality of York is conveyed to the WPCP via the York Durham Sewage System (YDSS) which accounted for 81.9% of the wastewater

treated in 2015. The remaining 18.1% was generated by the Town of Ajax and the City of Pickering. The combined flows enter a diversion chamber which then splits the flow between Stages 1 & 2 and Stage 3.

Stages 1 & 2:

Preliminary Treatment

Screening: Twelve automatic, mechanically cleaned bar screens remove paper products and large material that could harm pumps and process equipment. The bar screens discharge the screenings onto a series of conveyers which in turn discharge into bins for landfill disposal.

Grit Removal: The eight grit tanks are sized such that the flow-through velocity will allow the grit material such as sand and small stones to settle to the bottom of the tanks. The grit collecting mechanism, which has rotating arms with blades, scrapes the grit into a collection pit where a rake deposits the grit onto a series of conveyers and into bins for landfill disposal.

Primary Treatment

Eight primary clarifiers each equipped with a travelling bridge system utilize the physical process of sedimentation which causes heavy particles to settle to the bottom of the tank as raw sludge and lighter particles to float to the surface as scum. The sludge, along with return activated sludge from the secondary treatment process is collected by scraper blades which push the sludge into hoppers. The sludge is then pumped to the digester tanks or to the dewatering building. The scum is collected by the travelling bridge and sent to the digester.

Phosphorous Removal System

The phosphorous removal system is intended to lower the total phosphorous level in the final effluent by adding chemicals (ferrous chloride) as part of the treatment process. It also improves the settling of solids which reduces the total solids concentration in the final effluent. Ferrous chloride can be added at multiple locations throughout the WPCP.

Secondary Treatment

Aeration: Effluent from the primary clarifiers is treated with ferrous chloride in order to aid in phosphorus removal. There are eight aeration tanks each containing anoxic and aerobic zones. The first part of the tank is a selector where there is no oxygen introduced, this is for denitrification. The second part of the tank is where fine bubbled air is diffused into the sewage to remove 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 tanks is directed to the 16 secondary clarifiers where it settles quickly as an activated (living) sludge leaving a clear effluent to overflow the clarifier. The sludge collected on the bottom of the clarifier is pumped back to the head of the aeration tank. The microorganisms are returned to repeat the process. Waste activated sludge is sent to the primary clarifier to co-settle.

Disinfection (chlorination/dechlorination)

Chlorine in the form of liquid sodium hypochlorite is metered into the effluent stream for pathogen control. Adequate contact time is provided by the chlorine contact chambers. Disinfected effluent is

dechlorinated with a sodium bisulphite solution before being discharged to Lake Ontario through a 3.05 m diameter outfall tunnel, approximately 1,100 m long with a 183 m long diffuser pipe.

Stage 3:

Preliminary Treatment

Screening: Six automatic, mechanically cleaned screens remove paper products and large material that could harm pumps and process equipment. Screenings are compacted for disposal to landfill.

Grit Removal: There are four grit tanks equipped with coarse bubble diffusers to provide aeration in the grit removal process. Heavy suspended material such as sand and small stones (grit) is settled to the bottom of the tanks while lighter organic particles are kept in suspension and passed through the tanks for further treatment. The grit removed is dewatered for landfill disposal.

Primary Treatment

Six primary clarifiers each equipped with a travelling bridge system utilize the physical process of sedimentation which causes heavy particles to settle to the bottom of the tank as raw sludge and lighter particles to float to the surface as scum. The sludge, along with return activated sludge from the secondary treatment process is collected by scraper blades which push the sludge into hoppers. The sludge is then pumped to the digester tanks or to the dewatering building. The scum is collected by the travelling bridge and sent to the digester.

Phosphorous Removal System

The phosphorous removal system is intended to lower the total phosphorous level in the final effluent by adding chemical (ferrous chloride) as part of the treatment process. It also improves the settling of solids which reduces the total solids concentration in the final effluent. Ferrous chloride can be added at multiple locations throughout the WPCP.

Secondary Treatment

Aeration: Effluent from the primary clarifiers is treated with ferrous chloride in order to aid in phosphorus removal. There are six aeration tanks each containing anoxic and aerobic zones. The first part of the tank is a selector where there is no oxygen introduced, this is for denitrification. The second part of the tank is where fine bubbled air is diffused into the sewage to remove dissolved and suspended organics and nutrients from the wastewater. Biological activity is controlled to assimilate the organic material.

Secondary Clarifier: The effluent from the aerators is directed to the six secondary clarifiers where it settles quickly as an activated (living) sludge leaving a clear effluent to overflow the clarifier. The sludge collected on the bottom of the clarifier is pumped back to the head of the aeration tank. The microorganisms are returned to repeat the process. Waste activated sludge is sent to the primary clarifier to co-settle.

Disinfection (chlorination/dechlorination)

Chlorine in the form of liquid sodium hypochlorite is metered into the effluent stream for pathogen control. Adequate contact time is provided by the chlorine contact chambers. Disinfected effluent is dechlorinated with a sodium bisulphite solution before being discharged to Lake Ontario through a 3.05 m diameter outfall tunnel, approximately 1,100 m long with a 183 m long diffuser pipe.

Sludge Management

The sludges that are collected from the primary clarifiers are pumped into one of the four primary digesters followed by two secondary digesters. There are four blending tanks where raw sludges are blended with digested sludges before they are pumped to be dewatered. All sludges produced are dewatered and incinerated on site.

Imported Sludge

Durham's Regional Biosolids Management Program (ECA #H120110009-03) imports sludges from facilities in the Regional of Municipality of York and the Regional Municipality of Durham with the exception of the Newcastle WPCP and the facultative lagoons. Durham's sludges are transported by Terratec Environmental Ltd. under C of A # A820250 and York's sludges are transported by GFL Environmental Corp. under C of A # A841293.

Dewatering of Sludge

Duffin Creek WPCP utilizes eight dewatering solid bowl centrifuges in order to separate the heavier material and the liquid waste. All dewatered sludges (sludge cake) are sent to incineration.

Incineration

There are four fluidized bed process trains which through the combustion process burns the organic substances contained in the sludge cake and converts the waste into ash, flue gas. Steam boilers are utilized for waste heat recovery. All sludges at Duffin Creek WPCP were incinerated during the reporting period.

The incinerated ash is sent to St. Mary's Cement in Bowmanville, Ontario for reuse. No land application or landfill of biosolids occurred in 2015. Ash disposal was hauled to St. Mary's Cement by BFI Canada Inc. under ECA #A840506.

Environmental Compliance Approval

Under Condition 10 (6) of ECA # 5531-9FJJT5 the Region of Durham must produce an annual performance report that contains the following information:

a) Summary and interpretation of all monitoring data and a comparison to the effluent limits

- The Duffin Creek WPCP effluent was determined to be compliant with the ECA approval limits during the reporting period.
- The plant operated at 61.5% of its approved capacity for this reporting period. The plant received a maximum daily flow of 623,810 m^3 on June 28, 2015. See tables for effluent flow and sampling results.

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

- Challenges arose when accommodating ongoing construction with processes being offline, electrical interruptions, flow diversions etc. These challenges were overcome with careful planning and communication.
- Primary Digesters 1 & 4 shut down for clean out which reduced solids holding capacity.

- New disinfection building brought online in March, 2015, therefore all chemical pumps, regulators and analyzers had to be commissioned and verified. Temporary storage tanker and gravity feed lines were removed.

c) Maintenance of major equipment

Major maintenance items in 2015 included:

Operations

- Stage 1&2 and 3 Substations – servicing of all 4,160V and certain 600V switches, breakers, transformers/protection relays etc.
- Blowers 1-9 schedule 1 or 2 tear down and rebuild/cleaning of all internal blowers.
- Generators 1100, 1200, 1300, 1400, 5401, 5501,5601 – regular monthly runs as well as all oils and filters changed, fuel system checks.
- Program modifications to generators 1100-1400 to allow generators to run independently.
- Digester preventative maintenance, Waste Gas Burners – servicing of all gas protection, including; pressure relief valves, gas valves, flame arrestors, roof pressure tests etc.
- Stage 3 headworks – all screenings and grit screw liners refurbished.
- Primary tanks # 11 and # 12 – cross collectors rebuilt.
- Secondary tanks # 17-22, chain adjustments and skimmer, complete rebuilds # 19 and # 21, inlet baffle replaced on # 21.
- Stage 3 Influent pumping station – all eight pumps lifted and inspected.

Dewatering

- Plug valve replacement in the basement of the south Dewatering building.
- Filtrate station overhaul (rebuilt pumps, new piping, new platform, new guide rails and new check valves).
- Cleaned tank, repaired gates, replaced ladders, rebuilt mixers in # 3 and # 4 sludge holding tanks.
- Repair two centrifuge screw conveyors.

Incineration

- Purchased two excess steam condensers, one installed, one remaining.
- Replaced # 2 coil on auxiliary boiler.
- Rebuilt venture dampers on incinerators # 1 and # 2.
- Installed new bearings, shaft sleeves and carbon rings on # 2 turbine.
- Replaced # 2 speed reducer on turbine / Fluidizing Air Blower (FAB)
- Installed # 3 feedwater pump at new incineration.
- Completed FAB cross-over duct from incinerators # 3 and # 4.
- Stack inspections and repairs completed.
- Replaced part of old incineration roof.
- Exterior cleaning of concrete façade on old incineration building.

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.
- 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;

Plant flows are measured at the influent of this plant.

- All influent flow meters were calibrated in February and March.
- All monitoring and laboratory equipment is calibrated and maintained according to manufacturer's specifications.

f) Effluent Objectives

The objective for pH was exceeded in the months of October, November and December. New instrumentation was purchased and installed. The total chlorine residual was detectable in the months of March and October.

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

g) Biosolids Production

A summary of plant biosolids production and disposal is included in Table 7. There is no increase of sludge volume expected in the next reporting period.

h) Complaints

Odour complaint – received August 31, 2015. Email was sent to staff regarding odour in the Ajax Waterfront Park area. Staff investigated odours at the plant and sanitary sewage pumping stations. No odours were detected, however, an algae mat was covering the shoreline area. The algae was found to be producing an odour when staff were investigating.

Odour complaint – received September 15, 2015. E-mail was sent to staff regarding perceived odours in the Ajax Waterfront Park area. Staff investigated odours at the plant. No odours were detected. There were no abnormal maintenance activities or operational events taking place at the time of the reported incident.

The MOECC was notified verbally on September 15, 2015 and by letter dated Sept. 24, 2015.

i) By-passes, Spills or abnormal discharge events

There is no mechanism for by-passing untreated wastewater at this facility. There are no anticipated by-passes planned for the next reporting period.

Spills

On June 4, 2015 a sludge sample sink in the dewatering complex plugged and resulted in a sludge overflow. The overflow reached two stormwater catch basins. Proper clean up and notification procedures were followed. Modifications to the sink and to sampling procedures have been put in place to prevent a re-occurrence.

The MOECC Spills Action Center (SAC) was notified verbally on June 4, 2015 and by written report dated June 12, 2015.

Environment Canada was notified by email on June 16, 2015.

j) Notice of modifications and any implementation of Limited Operational Flexibility

No notice of modifications were submitted in 2015.

k) Extra Information

The fixed bed carbon adsorption units in the incineration complex was by-passed. The MOECC was notified on October 13, 2015.

Proposed Alterations, Extensions or Replacements

- Replacement of existing Stage 1 and 2 disinfection facility Contract T-12-92 (complete, in service).
- Replacement of the Stage 1 and 2 Headworks and influent pumping station Contract T-13-50 (in progress, estimated completion date March, 2017).
- Improvements to Stage 1 and 2 Contract T-13-86 (Stage 2 complete and returned to service, Stage 1 off-line, estimated completion date December, 2016).
- Odour control duct modifications in dewatering building (in progress, estimated completion date August, 2016).
- Capital restoration plan for damaged sludge blending tank and biofilter works (design commenced).
- Stage 1 and 2 incineration hot water heating upgrades (complete and in service).
- Installation of 3rd waste heat boiler feedwater pump and fluidized air crossover in Stage 3 and incineration facility (complete and in service).
- Standby power closed transition modifications to Stage 3 electrical substation (in progress, estimated completion date September, 2016).
- Stage 1 and 2 digester mixing improvements and motor control center replacements (conceptual design to commence April, 2016).
- Conceptual planning has commenced for replacement of incineration facility reactor 1 and/or 2.

MOECC Inspection

This plant was inspected by the MOECC on February 12, 2015. No action items were identified in the report.

Table 1 Raw Influent Flows

Month	York Region Plant Flow m^3	Durham Region Plant Flow m^3	Total Flow to Plant metered at the raw influent m^3	Average Daily Flow m^3/d	Maximum Daily Flow m^3/d	Minimum Daily Flow m^3/d
January	8,068,674	1,783,187	9,851,860	317,802	392,100	289,316
February	6,824,837	1,508,297	8,333,134	297,612	310,333	287,536
March	8,230,271	1,818,900	10,049,171	324,167	373,945	290,433
April	8,958,274	1,979,789	10,938,063	364,602	507,985	313,558
May	8,324,068	1,839,629	10,163,697	327,861	404,981	307,080
June	9,372,389	2,071,309	11,443,699	381,457	623,810	327,251
July	8,249,652	1,823,183	10,072,835	324,930	379,239	304,708
August	7,687,017	1,698,840	9,385,857	302,770	349,990	283,887
September	7,197,657	1,590,691	8,788,348	292,945	339,303	250,898
October	7,781,522	1,719,726	9,501,248	306,492	440,953	278,608
November	7,521,458	1,662,251	9,183,709	306,124	350,763	280,576
December	7,427,870	1,641,568	9,069,438	292,563	355,808	273,812
Total (percentage (%)) *	95,643,688 (81.9%)	21,137,372 (18.1%)	116,781,059 (100%)			
Average *	7,970,307	1,761,448	9,731,755	319,944		
Minimum	6,824,837	1,508,297	8,333,134			250,898
Maximum	9,372,389	2,071,309	11,443,699		623,810	
ECA Requirement				520,000		
ECA Objective						
Met Compliance				Yes		

*Note – total and average reflect rounding of decimal places

Table 2 Raw Influent Analyses

Month	BOD_5 average conc. mg/L	BOD_5 average loading kg/d	TSS average conc. mg/L	TSS average loading kg/d	TP average conc. mg/L	TP average loading kg/d	DP average conc. mg/L	TKN average conc. mg/L
January	204	64,832	279	88,667	5.6	1,780	2.9	48.66
February	210	62,499	293	87,200	5.1	1,518	2.7	46.23
March	195	63,213	307	99,519	5.7	1,848	2.9	43.92
April	185	67,451	252	91,880	5.2	1,896	2.8	44.33
May	225	73,769	304	99,670	6.4	2,098	3.2	53.49
June	197	75,147	337	128,551	5.1	1,945	2.5	43.67
July	228	74,084	346	112,426	6.2	2,015	3.5	50.23
August	292	88,409	396	119,897	6.4	1,938	3.6	57.71
September	270	79,095	394	115,420	6.6	1,933	3.0	53.27
October	182	55,782	336	102,981	6.4	1,962	3.2	52.52
November	220	67,347	314	96,123	6.6	2,020	3.2	56.63
December	261	76,359	312	91,280	7.0	2,048	3.7	57.84
Average	222	71,162	323	103,183	6.0	1,928	3.1	50.71
Minimum	182	55,782	252	87,200	5.1	1,518	2.5	43.67
Maximum	292	88,409	396	128,551	7.0	2,098	3.7	57.84
Sampling Frequency Requirement Met	Yes		Yes		Yes			Yes

Table 2 Raw Influent Analyses continued

Month	TAN average conc. mg/L	TAN average loading kg/d	pH min.	pH max.	Temperature min. °C	Temperature max. °C
January	33.5	10,646	6.90	8.40	5.9	14.5
February	30.4	9,047	7.40	8.30	7.5	13.8
March	29.5	9,563	7.30	8.10	8.2	13.6
April	30.1	10,975	7.00	7.78	11.3	16.1
May	37.0	12,131	6.95	7.50	10.9	18.6
June	28.4	10,833	6.80	7.46	14.9	20.3
July	32.2	10,463	6.40	7.60	17.3	23.7
August	35.7	10,809	6.70	7.52	18.2	21.9
September	34.2	10,019	6.70	7.60	19.0	23.1
October	31.6	9,685	6.70	7.50	15.4	21.8
November	37.2	11,388	6.90	7.61	14.2	20.3
December	43.5	12,726	6.83	7.67	6.8	19.1
Average	33.6	10,753				
Minimum	28.4	9,047	6.4		5.9	
Maximum	43.5	12,726		8.4		23.7

Table 3 Final Effluent Analyses

Month	$CBOD_5$ average conc. mg/L	$CBOD_5$ average loading kg/d	TSS average conc. mg/L	TSS average loading kg/d	TP average conc. mg/L	TP average loading kg/d	TAN average conc. mg/L summer	TAN average conc. mg/L winter	TAN average loading kg/d
January	3.7	1,176	6.7	2,129	0.54	172		0.56	178
February	4.3	1,280	7.7	2,292	0.58	173		1.05	312
March	4.0	1,297	9.1	2,950	0.49	159		2.09	312
April	2.8	1,021	6.9	2,516	0.43	157		0.75	678
May	2.6	852	6.0	1,967	0.58	190	0.51		167
June	2.4	915	6.3	2,403	0.37	141	1.74		664
July	2.6	845	6.8	2,210	0.52	169	0.97		315
August	3.4	1,029	10.5	3,179	0.52	157	1.15		348
September	3.1	908	12.4	3,633	0.49	144	1.91		560
October	3.4	1,042	10.5	3,218	0.55	169	1.49		457
November	2.6	796	8.2	2,510	0.51	156		0.49	150
December	3.1	907	9.0	2,633	0.51	149		1.52	445
Average	3.2	1,013	8.3	2,669	0.51	162	1.30	1.08	379
Minimum	2.4	796	6.0	1,967	0.37	141	0.51	0.49	150
Maximum	4.3	1,297	12.4	3,633	0.58	190	1.91	2.09	678
ECA Requirement	25.0		25.0		0.8	311	6.0	10.0	
ECA Objective	15.0		15.0		0.6		5.0	5.0	
Within Compliance	Yes		Yes		Yes	Yes	Yes	Yes	
Sampling Requirement Frequency Met	Yes		Yes		Yes		Yes	Yes	

Table 3 Final Effluent Analyses continued

Month	Unionized Ammonia Nitrogen average conc. mg/L	TKN average conc. mg/L	DP average conc. mg/L	TCR average conc. mg/L	TCR average loading kg/d	pH min.	pH max.	Temp. °C min.	Temp. °C max.
January	0.0	1.62	0.48	0.00	0.00	6.6	7.7	6.9	16.7
February	0.0	2.65	0.40	0.00	0.00	6.6	7.9	3.1	12.7
March	0.0	2.91	0.29	0.01	0.00	6.5	7.7	8.0	16.0
April	0.0	1.71	0.27	0.00	0.00	7.1	7.8	10.3	17.4
May	0.0	1.64	0.45	0.00	0.00	7.1	7.5	14.3	20.0
June	0.0	2.96	0.23	0.00	0.00	6.9	7.8	16.0	22.4
July	0.0	1.95	0.38	0.00	0.00	6.7	7.6	18.6	23.5
August	0.0	2.65	0.32	0.00	0.00	6.8	7.5	19.8	24.0
September	0.0	3.38	0.27	0.00	0.00	6.7	7.4	16.1	23.6
October	0.0	2.87	0.32	0.01	0.00	6.3	7.3	14.3	21.7
November	0.0	1.80	0.33	0.00	0.00	6.4	7.2	12.2	20.7
December	0.0	2.99	0.30	0.00	0.00	6.0	6.9	12.7	20.0
Average	0.0	2.43	0.34	0.00	0.00				
Minimum	0.0	1.62	0.23	0.00	0.00	6.0		3.1	
Maximum	0.0	3.38	0.48	0.01	0.00		7.9		26.6
ECA Requirement	0.2			0.02		6.0	9.5		
ECA Objective	0.1			Non-detectable		6.5	8.5		
Within Compliance	Yes			Yes		Yes	Yes		
Sampling Frequency Requirement Met	Yes			Yes		Yes	Yes	Yes	Yes

Table 4 Escherichia Coliform Sampling

Month	Number of Samples	Geometric Mean Density
January	21	31
February	21	34
March	22	7
April	20	29
May	20	19
June	23	19
July	22	34
August	20	90
September	18	45
October	19	54
November	19	76
December	20	41
ECA Requirement	52	200
ECA Objective		100
Within Compliance		Yes
Sampling Frequency Requirement Met	Yes	

Table 5 Imported Wastewater Analyses

Month	BOD_5 average conc. mg/L	TSS average conc. mg/L	TP average conc. mg/L	TKN average conc. mg/L
January	4,158	10,865	180.0	1,159.00
February	8,831	15,334	206.0	1,771.00
March	7,715	18,380	136.0	1,374.00
April	10,025	21,173	419.0	1,903.00
May	7,312	13,743	192.0	1,403.00
June	3,253	7,397	178.0	1,267.00
July	4,242	15,191	279.0	1,344.00
August	4,094	10,485	244.0	1,189.00
September	6,653	11,555	216.0	1,283.00
October	7,231	19,960	215.0	1,313.00
November	27,524	10,079	173.0	589.00
December	6,116	21,295	366.0	1,717.00
Average	8,096	14,621	233.7	1,359.33
Minimum	3,253	7,397	136.0	589.00
Maximum	27,524	21,295	419.0	1,903.00
Sampling Requirement Frequency Met	Yes	Yes	Yes	Yes

Table 6 Energy and Chemical Usage

Month	Plant Flow m^3	Ferrous Chloride L	Sodium Hypochlorite L	Sodium Bisulphite L	Hydro kWh	Natural Gas m^3
January	9,851,860	864,594	187,557	32,675	5,568,466	190,659
February	8,333,134	928,007	168,369	28,396	5,082,577	331,487
March	10,049,171	1,004,221	211,325	30,718	6,073,485	270,141*
April	10,938,063	919,023	221,072	30,606	5,457,569	162,657*
May	10,163,697	1,041,291	199,504	29,078	5,493,756	124,592*
June	11,443,699	984,556	197,869	29,756	5,286,169	32,888*
July	10,072,835	771,765	163,506	24,845	5,192,318	30,038*
August	9,385,857	911,987	167,463	26,300	4,992,880	36,058*
September	8,788,348	1,169,735	165,136	23,007	4,709,764	62,477*
October	9,501,248	1,281,045	184,665	28,211	5,065,226	234,063
November	9,183,709	847,245	236,105	27,653	4,956,388	167,673
December	9,069,438	892,717	186,265	29,567	4,935,736	259,090
Total	116,781,059	11,616,185	2,231,474	340,812	62,814,334	1,901,823*

*Note- The natural gas flowmeter was deemed inaccurate by Enbridge from March 23 to September 18, 2015. The flowmeter is owned and maintained by Enbridge.

Table 7 Summary of sludge produced and imported

Month	York Influent Solids (dry tonnes)	Durham Influent Solids (dry tonnes)	Total Influent Solids (dry tonnes)	York Imported Solids (dry tonnes)	Durham Imported Solids (dry tonnes)	Total Imported Solids (dry tonnes)
January	2,251	498	2,749	101	515	616
February	2,000	442	2,442	93	391	484
March	2,527	558	3,085	107	461	568
April	2,257	499	2,756	116	422	538
May	2,531	559	3,090	118	99	217
June	3,158	698	3,857	122	370	492
July	2,854	631	3,485	112	341	453
August	3,044	673	3,717	51	100	151
September	2,836	627	3,463	85	87	172
October	2,615	578	3,192	98	83	181
November	2,362	522	2,884	95	218	313
December	2,317	512	3,164	40	486	526
Total	30,752	6,796	37,883	1,138	3,573	4,711

Table 8 Summary Hauled Septage

Month	York Septage Solids (dry tonnes)	Durham Septage Solids (dry tonnes)	Total Septage Solids (dry tonnes)	Dewatered Sludge Incinerated (dry tonnes)	Ash Produced (tonnes)
January	1.4	3.6	5.0	2,037	867
February	0.8	2.3	3.1	2,097	788
March	0.6	3.7	4.4	2,274	773
April	7.0	23.6	30.5	2,522	909
May	3.0	13.9	16.9	2,527	933
June	7.8	40.3	48.1	2,403	1,015
July	2.5	13.5	16.0	2,204	961
August	3.4	10.3	13.7	1,851	768
September	0.9	3.5	4.4	1,398	651
October	6.9	18.6	25.5	2,055	934
November	4.5	25.5	30.0	2,070	852
December	3.1	12.6	15.7	2,347	1,252
Total	41.9	171.5	213.4	25,785	10,703

Table 9 Dewatering Summary

Month	Average Feed Solids % TS	Average Sludge Cake % TS	Average Polymer Dosage kg/tonne	Total Sludge Output dry tonnes
January	2.7	26.1	9.6	2,433
February	2.5	25.7	9.0	2,400
March	3.1	26.3	9.2	2,535
April	3.3	27.3	9.0	2,796
May	2.8	27.0	7.6	3,186
June	3.1	27.0	8.2	3,012
July	2.7	26.7	8.7	2,648
August	2.6	26.6	9.0	2,198
September	2.4	25.5	8.5	1,695
October	2.4	25.2	8.5	2,532
November	2.6	26.1	7.9	2,561
December	3.3	27.3	5.5	3,955
Total				31,951
Average	2.8	26.39	8.4	2,663
Min	2.4	25.20	5.5	1,695
Max	3.3	27.28	9.6	3,955

Glossary of Terms

Aeration Tank
A vessel in which a biological process is carried out which involves bacterial organisms or biochemically active substances derived from such organisms. This encompasses a combination of aerobic, anoxic, and anaerobic processes.

Anaerobic Digestion
Is a series of biological processes in which microorganisms break down biodegradable material in the absence of oxygen.

Annual Average Concentration
An arithmetic mean of the monthly average concentrations of a contaminant in the effluent calculated for any particular year.

Annual Average Loading
The value obtained by multiplying the Annual Average Concentration of a contaminant by the Average Daily Flow over the same calendar year.

Average Daily Flow
The cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year.

Biosolids
Organic material recovered from wastewater sludge.

BOD_5 Five Day Biochemical Oxygen Demand
(also known as totalBOD_5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand.

By-pass
Means a diversion of sewage around one or more unit processes within the Sewage Treatment Plant with the diverted sewage flows being returned to the Sewage Treatment Plant treatment train upstream of the Final effluent sampling location, and discharging to the environment through the Sewage Treatment Plant outfall.

$CBOD_5$ -Five day Carbonaceous Biochemical Oxygen Demand
Means a five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample.

conc. - Concentration

DP - Dissolved Phosphorus
This is the soluble form of phosphorus present in the wastewater.

ECA - Environmental Compliance Approval
The primary regulatory instrument for each WPCP.

E. coli - (Escherichia coli)
Refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius.

Final Effluent
Sewage discharge via the WPCP outfall after undergoing the full train of unit processes as listed in the Environmental Compliance Approval.

Geometric Mean Density
Is the nth root of the product of multiplication of the results of n number of samples over the period specified.

Grab Sample
A single sample taken at a specific moment in time, a snapshot of the conditions at the time the sample was retrieved.

m^3 - (Cubic Metre)

Volume measurement, $1m^3$ = 1000 litres or 220 imperial gallons.

m^3/d - (Cubic Metres Per Day)

Flow measurement, $1m^3$ = 1000 litres or 220 imperial gallons. Volume of liquid treated in a 24 hour period.

Max. – Maximum

Maximum Flow Rate

The peak or highest flow recorded during a specific time period usually in a twenty-four (24) period.

mg/L - (Milligram Per Litre)

This is a measure of the concentration of a parameter in water or wastewater, sometimes referred to as parts per million (ppm).

Min. – Minimum

mm - (millimetre)

Is a unit of length in the metric system, equal to one thousandth of a metre.

MOECC - (Ministry of the Environment and Climate Change)

The Provincial regulatory agency responsible for overseeing the water and wastewater facilities in Ontario. Their primary functions include approval for new or expanding facilities, inspections and investigations.

Monthly Average Concentration

The arithmetic mean of all daily concentrations of a contaminant in the effluent sampled or measured, or both, during a calendar month.

Monthly Average Loading

Calculated by multiplying the monthly average concentration of a contaminant in the effluent sampled or measured, or both, during a calendar month.

N/A - Not Applicable

pH

Index of hydrogen ion activity, pH is defined as the negative logarithm of hydrogen ion concentration in moles per litre. The pH may range from 0 – 14, where 0 is most acidic, 14 most basic and 7 neutral.

Raw Influent

Raw wastewater entering the water pollution control plant before treatment.

Septage

Partially treated sludge from a septic tank.

Sludge

The settleable solids separated from liquids during processing.

TAN -Total Ammonia Nitrogen

Ammonia exists in two forms in the water: NH3 (this is called unionized ammonia) NH4+ (this is called ionized ammonia) Together, these two forms of ammonia are called TAN which means total ammonia nitrogen.

TCR -Total Chlorine Residual

The total amount of chlorine in water, including the combined chlorine and the free available chlorine.

Temp. – Temperature

TP -Total Phosphorus

A laboratory analyses to determine the total amount of particulate and soluble phosphorus present in the wastewater.

TSS -Total Suspended Solids

A laboratory analyses to measure particles that are larger than 2 microns found in the wastewater.

TS -Total Solids

Is a measure of the suspended and dissolved solids in the wastewater and in biosolids.

Unionized Ammonia Nitrogen

Un-ionized ammonia refers to all forms of ammonia in water with the exception of the ammonium ion (NH_4^+).

WPCP - Water Pollution Control Plant

Is typically a facility composed of a variety of treatment processes that collectively treat the wastewater.

If this information is required in an accessible format, please contact 1-800-372-1102 extension 3488

Harmony Creek Water Pollution Control Plant

Annual Performance Report 2015

The Regional Municipality of Durham

Harmony Creek Water Pollution Control Plant 2015 Annual Performance Report

Environmental Compliance Approval (ECA): 3580-9PXLVG Dated December 3, 2014

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

The Harmony Creek Water Pollution Control Plant (WPCP) Performance Report provides staff, stakeholders and customers a performance overview of the Harmony Creek WPCP in 2015. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment and Climate Change (MOECC). The performance report demonstrates the commitment of ensuring that the WPCP continues to deliver wastewater services to our customers in an environmentally responsible manner.

For a description of terms and abbreviations used in this report, refer to the glossary at the end of the report.

Water Pollution Control Plant Process Description

General

The Harmony Creek WPCP is owned and operated by the Regional Municipality of Durham and in accordance with the terms and conditions of the ECA. The plant is located in the City of Oshawa.

Harmony Creek WPCP treats wastewater from the Oshawa and Courtice service areas in the Regional Municipality of Durham. A portion of the flow received at the Harmony Creek WPCP is pumped to the Courtice WPCP by the on-site Harmony Creek Sanitary Sewage Pumping Station (SSPS). The Harmony Creek WPCP services 40% of the catchment population or approximately 74,564 residents.

The Harmony Creek WPCP is designed to treat wastewater at an average flow rate of 34,100 cubic metres per day (m^3/d) as noted in the ECA. 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 system,
- disinfection (chlorination/dechlorination),
- solids treatment – anaerobic digestion..

Raw Influent

Wastewater is collected through approximately 655 km of sanitary sewers in Oshawa and Courtice and is conveyed to the Harmony Creek WPCP and Harmony Creek sanitary sewage pumping station (SSPS). Approximately 60% 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

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.

Screening: One automatic, mechanically cleaned screen removes paper products and large material that could harm pumps and process equipment. Screenings are removed in this process and transported to landfill for disposal.

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.

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 sewage to remove 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 it settles quickly as an activated (living) sludge leaving a clear effluent to overflow the clarifier. The sludge collected on the bottom of the clarifier is pumped back to the head of the aeration tank. The microorganisms are returned to repeat the process. Waste activated sludge is sent to the primary clarifier.

Phosphorous Removal System

The phosphorous removal system is intended to lower the total phosphorous level in the final effluent by adding a chemical coagulant (ferrous chloride) as part of the treatment process. Ferrous chloride can be added at the primary effluent.

Disinfection (chlorination/dechlorination)

Chlorine in the form of liquid sodium hypochlorite is metered into the effluent stream for pathogen control. Disinfected effluent is discharged to Lake Ontario.

Sludge Management

Anaerobic Digestion: The raw sludge collected from the primary clarifiers is pumped into the primary digester. Anaerobic bacteria reduce the volume of sludge. As a by-product the digester produces a more stabilized sludge; water, which is returned to the plant for further treatment; and a combination of carbon dioxide, methane, and hydrogen sulphide. The methane is used to offset the heating requirements of the digesters.

Biosolids: All sludge produced is pumped to the biosolids holding facility. From there the treated biosolids can be utilized on approved nurseries 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 the ECA #3580-9PXLVG 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 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 62% of its rated capacity and received a maximum daily flow of 42,178 m^3/d on June 29, 2015. Table 3 provides a descriptive tabulation of effluent results.

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

No major operating problems were encountered other than the high flow events described in the bypass section. No corrective actions could be taken for these events.
Ongoing construction upgrades were taking place in 2015.

c) Maintenance of major equipment

Major maintenance items in 2015 included:

- Repairs to secondary clarifier flight & chain system.
- Plant #2 main bar screen maintenance.
- Rebuild return activated sludge pump.
- Rebuild waste activated sludge pump.
- Effluent water pump rebuild.
- Digester mixer refurbishment.
- Repaired leaking pipes in digester heat exchanger.

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 effluent flow meter and the secondary clarifier flow meter occurred in May and October 2015.
- Calibration of the in-house lab pH meter is conducted regularly.

f) Effluent Objectives

The Regional Municipality of Durham 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 m^3/d was not exceeded.

The total suspended solids objective of 15 mg/L was exceeded in 6 of 282 samples (2%). This was the result of additional loading to the plant while receiving sludge from the Port Darlington WPCP which was undergoing construction. Samples were monitored, no process changes were made.

The total phosphorus objective of 1 mg/L was exceeded in 14 of 291 (5%) samples. This is likely also attributed to the additional sludge loading to the plant. Samples were monitored and ferrous chloride was increased as required.

The E.coli monthly average objective of 200 cfu/100 ml was exceeded on six occasions. These results occurred during the non-disinfection period of January 1 to May 15 and October 16 to December 31.

The total chlorine residual objective was exceeded 175 times during the disinfection period attempting to meet the E.coli objective. Dechlorination facilities were under construction in 2015. Best efforts and process adjustments 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 Harmony Creek WPCP in 2015 was 11,600 $m^{3.}$

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 is Disposed:

Duffin Creek WPCP - 100%

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

There were no documented complaints in 2015.

i) By-passes and Spills

Construction was underway during 2015 in order to upgrade processes at the Harmony Creek WPCP.

A planned by-pass was approved by the MOECC in September of 2014 allowing the influent raw flow to be diverted around the primary clarifier so that raw sewage could go directly to the aeration tank. This was done so that the primary clarifier could undergo approved essential maintenance. The influent sewage was fully treated through the preliminary and secondary processes and sampling was conducted to ensure compliance with the ECA. Approval for the by-pass expired April 3, 2015. The MOECC granted an extension to complete the work by July 31, 2015. The primary clarifier was put back into service July 7 of 2015.

Two unplanned by-pass events occurred in 2015:

A primary by-pass occurred on June 23rd. The event lasted three hours and fifteen minutes and discharged approximately 4,200 m^3 without treatment. Exceptionally high flows caused this event. The MOECC was notified and the Region received notification number 124313.

A secondary by-pass occurred on October 28th, due to very high flows during a heavy rainfall event. 113 m^3 bypassed secondary treatment with the event lasting eight hours and twenty three minutes. The MOECC was notified and the Region received notification number 127115.

Both bypasses were chlorinated and sampled as required.

There were no spills during the reporting period.

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

As per the letter submitted to the MOECC dated August 24, 2012, as part of the previous Comprehensive Certificate of Approval (CCofA), the aeration system has been converted to fine bubble aeration, and the chlorine contact tank and disinfection building construction have been completed.

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

No schedule 'A', Section 3 Notice of Modifications were submitted in 2015.

l) Additional Information Required by MOECC Water Supervisor

No additional information required.

MOECC Inspection

No MOECC inspection occurred in 2015.

Table 1 Raw Influent Flows

Month	Total Flow to Plant -metered at the final effluent m^3	Average Day Flow m^3/d	Maximum Day Flow m^3/d
January	621,941	20,063	28,462
February	553,440	19,766	21,064
March	618,708	19,958	21,736
April	616,189	20,540	36,754
May	639,117	20,617	28,747
June	681,482	22,716	42,178
July	654,972	21,128	29,649
August	660,095	21,293	21,905
September	635,327	21,178	24,875
October	648,017	20,904	40,518
November	747,626	24,921	27,330
December	664,418	21,433	29,142
Total	7,741,332		
Average	645,111	21,209*	
Minimum	553,440		
Maximum	747,626		42,178
ECA Requirement		34,100	
Met Compliance		Yes	

*Annual Average Daily Flow

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	104	2,077	175	3,516	194	3,902	4.3	85
February	74	1,462	167	3,291	169	3,335	4.8	96
March	75	1,501	138	2,763	151	3,013	4.2	83
April	183	3,756	161	3,300	144	2,960	3.5	72
May	70	1,439	170	3,495	183	3,767	4.4	91
June	56	1,261	112	2,555	121	2,757	3.6	83
July	230	4,859	185	3,904	341	7,210	5.1	108
August	385	8,187	510	10,849	571	12,164	9.5	203
September	380	8,047	500	10,585	594	12,582	11.2	237
October	260	5,425	449	9,375	646	13,514	10.6	222
November	270	6,729	450	11,208	511	12,734	10.3	258
December	209	4,469	297	6,366	557	11,943	7.5	161
Average	191	4,053	276	5,854	349	7,394	6.6	140
Minimum	56	1,261	112	2,555	121	2,757	3.5	72
Maximum	385	8,187	510	11,208	646	13,514	11.2	258
Sampling Frequency Requirement Met			Yes		Yes		Yes	

Table 2 Raw Influent Analyses continued

Month	DP avg. conc. mg/L	COD avg. conc. mg/L	TKN avg. conc. mg/L	TAN avg. conc. mg/L	TAN loading* kg/d	pH min.	pH max.
January	1.82	267	39.58	27.02	542	6.75	7.27
February	1.93	451	42.65	29.36	580	6.87	7.20
March	2.25	391	39.15	30.72	613	6.58	7.54
April	1.76	351	36.60	21.82	448	7.00	8.11
May	1.76	394	38.23	27.05	558	7.29	7.77
June	1.54	265	31.52	18.68	424	6.91	7.78
July	1.13	812	40.83	27.49	581	6.70	7.54
August	1.67	1017	59.63	28.96	617	6.40	7.32
September	1.40	985	67.96	26.84	568	6.59	7.33
October	1.57	609	69.03	26.27	549	6.68	7.80
November	1.65	865	64.58	27.46	684	7.07	7.52
December	1.81	550	49.50	26.38	565	6.47	7.63
Average	1.69	580	48.27	26.50	562		
Minimum	1.13	265	31.52	18.68	424	6.40	
Maximum	2.25	1017	69.03	30.72	684		8.11
Sampling Frequency Requirement Met		Yes	Yes	Yes		Yes	Yes

*Annual Average loading

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	3.8	76.2	8.4	167.6	0.32	6.4	0.39	7.9
February	3.0	59.8	8.7	171.9	0.45	8.9	0.56	11.1
March	2.9	57.4	6.3	126.4	0.33	6.7	0.24	4.9
April	1.9	39.8	6.3	129.4	0.24	4.9	0.30	6.1
May	1.7	34.0	3.8	77.5	0.19	3.9	0.17	3.5
June	3.0	67.7	5.6	127.5	0.41	9.2	0.17	3.9
July	2.5	52.3	7.1	149.6	0.51	10.9	0.20	4.2
August	2.2	45.8	4.9	103.6	0.42	9.0	0.27	5.7
September	2.0	42.4	6.6	140.3	0.60	12.8	0.39	8.3
October	1.7	34.5	5.5	116.0	0.41	8.5	0.11	2.3
November	1.7	42.4	4.1	102.8	0.60	15.0	0.19	4.6
December	2.3	48.2	4.6	98.5	0.50	10.8	0.21	4.5
Average	2.4	50.4	6.0	127.1	0.42	8.8	0.27	5.7
Minimum	1.7	34.0	3.8	77.5	0.19	3.9	0.11	2.3
Maximum	3.8	76.2	8.7	171.9	0.60	15.0	0.56	11.1
ECA Requirement	25.0	852.5*	25.0	852.5*	1.0	34.1		
ECA Objective	15.0		15.0		1.0			
Within Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Sampling Frequency Requirement Met	Yes		Yes		Yes		Yes	

*Annual Average loading

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	TCR loading kg/d	pH min.	pH max.	Temp. °C min.	Temp. °C max.
January	0.00	1.65	0.10	N/A	N/A	6.70	7.04	6.6	11.4
February	0.00	1.80	0.06	N/A	N/A	6.73	7.18	7.6	11.1
March	0.00	1.75	0.06	N/A	N/A	6.54	7.37	9.7	13.8
April	0.00	1.67	0.05	N/A	N/A	6.83	7.49	9.4	14.0
May	0.00	1.30	0.06	0.57	11.7	7.04	7.50	14.0	18.9
June	0.00	1.92	0.24	0.52	11.8	6.86	7.20	16.4	20.1
July	0.00	1.73	0.33	0.56	11.8	6.79	7.55	17.9	24.3
August	0.00	1.92	0.29	0.56	12.0	6.92	7.14	20.0	22.5
September	0.00	1.80	0.44	0.53	11.2	6.63	7.13	18.5	23.9
October	0.00	1.56	0.30	0.53	11.0	6.59	7.42	14.9	19.6
November	0.00	1.79	0.39	N/A	N/A	7.15	7.64	13.0	17.9
December	0.00	1.70	0.30	N/A	N/A	6.99	7.62	13.6	18.6
Average	0.00	1.72	0.22	0.54	11.6				
Minimum	0.00	1.30	0.05	0.52	11.1	6.54		6.6	
Maximum	0.00	1.92	0.44	0.57	12.0		7.64		24.3
ECA Requirement									
ECA Objective				0.5		6.0	9.5		
Within Compliance									
Sampling Frequency Requirement Met	Yes	Yes		Yes		Yes	Yes	Yes	Yes

Table 4 Escherichia coliform Sampling

- Seasonal disinfection period is from May 15 to October 15.

Month	Number of Samples	Geometric Mean Density
January	4	4,628
February	4	2,592
March	5	7,266
April	4	4,246
May	4	179
June	5	73
July	4	22
August	4	6
September	5	10
October	4	19
November	4	3,016
December	5	683
ECA Requirement (Seasonal)		N/A
ECA Objective (Seasonal)		200
Within Compliance		N/A
Sampling Frequency Requirement Met	Yes	

Table 5 Energy and Chemical Usage

Month	Total Plant Flow (cubic metres)	Ferrous Chloride (litres)	Sodium Hypochlorite (kilograms as chlorine)	Hydro (kWh)	Natural Gas (cubic metres)
January	621,941	10,963	0	513,476	14,989
February	553,440	11,089	0	456,228	17,997
March	618,708	13,299	0	496,760	13,823
April	616,189	13,140	0	554,337	9,668
May	639,117	15,326	182	451,563	3,377
June	681,482	15,052	327	621,950	2,517
July	654,972	13,853	362	468,051	4,424
August	660,095	12,633	355	406,755	1,822
September	635,327	13,685	371	405,634	12,745
October	648,017	13,778	183	463,124	7,584
November	747,626	13,155	0	479,631	25,344
December	664,418	16,007	0	524,110	11,770
Total	7,741,332	161,980	1,780	5,841,619	126,060

Glossary of Terms

Aeration Tank
Is a vessel in which a biological process is carried out which involves bacterial organisms or biochemically active substances derived from such organisms. This encompasses a combination of aerobic, anoxic processes.

Anaerobic Digestion
Is a series of biological processes in which microorganisms break down biodegradable material in the absence of oxygen.

Annual Average Concentration
An arithmetic mean of the monthly average concentrations of a contaminant in the effluent calculated for any particular year.

Annual Average Loading
The value obtained by multiplying the Annual Average Concentration of a contaminant by the Average Daily Flow over the same calendar year.

Average Daily Flow
The cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year.

Biosolids
Organic material recovered from wastewater sludge.

BOD_5 Five Day Biochemical Oxygen Demand
(also known as totalBOD_5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand.

By-pass
A diversion of sewage around one or more unit processes within the Sewage Treatment Plant with the diverted sewage flows being returned to the Sewage Treatment Plant treatment train upstream of the Final effluent sampling location, and discharging to the environment through the Sewage Treatment Plant outfall.

$CBOD_5$ -Five day Carbonaceous Biochemical Oxygen Demand
A five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample.

Conc. Concentration
The abundance of a constituent divided by the total volume of a mixture.

DP – Dissolved Phosphorus
This is the soluble form of phosphorus present in the wastewater.

ECA - Environmental Compliance Approval
The primary regulatory instrument for each WPCP.

E. coli - (Escherichia coli)
Refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius. Calculated using a monthly geometric mean density.

Final Effluent

Sewage discharge via the WPCP outfall after undergoing the full train of unit processes as listed in the Environmental Compliance Approval.

Geometric Mean Density

Is the nth root of the product of multiplication of the results of n number of samples over the period specified.

Grab Sample

A single sample taken at a specific moment in time, a snapshot of the conditions at the time the sample was retrieved.

m^3 - (Cubic Metre)

Volume measurement, 1 m^3 = 1000 litres or 220 imperial gallons.

m^3/d - (Cubic Metres Per Day)

Flow measurement, 1 m^3 = 1000 litres or 220 imperial gallons. Volume of liquid treated in a 24 hour period.

Max. – Maximum

Maximum Flow Rate

The peak or highest flow recorded during a specific time period usually in a twenty-four (24) period.

mg/L - (Milligram Per Litre)

This is a measure of the concentration of a parameter in wastewater, sometimes referred to as parts per million (ppm).

Min. – Minimum

mm - (millimetre)

Is a unit of length in the metric system, equal to one thousandth of a metre.

MOECC - (Ministry of the Environment and Climate Change)

The Provincial regulatory agency responsible for overseeing the water and wastewater industries in Ontario. Their primary functions include approval for new or expanding facilities, inspections and investigations.

Monthly Average Concentration

The arithmetic mean of all daily concentrations of a contaminant in the effluent sampled or measured, or both, during a calendar month.

Monthly Average Daily Flow

The cumulative total sewage flow to the sewage works during a calendar month divided by the number of days during which sewage was flowing to the sewage works that month.

Monthly Average Loading

Calculated by multiplying the monthly average concentration of a contaminant in the effluent sampled or measured, or both, during a calendar month by the monthly average daily flow.

N/A - Not Applicable

pH

Index of hydrogen ion activity, pH is defined as the negative logarithm of hydrogen ion concentration in moles per litre. The pH may range from 0 – 14, where 0 is most acidic, 14 most basic and 7 neutral.

Rated Capacity

The Average Daily Flow for which the works are approved to handle.

Raw Influent

Raw wastewater entering the water pollution control plant before treatment.

Septage

Partially treated sludge from a septic tank.

Sludge

The settleable solids separated from liquids during processing.

TAN -Total Ammonia Nitrogen

Ammonia exists in two forms in the water: NH3 (this is called unionized ammonia) NH4+ (this is called ionized ammonia) Together, these two forms of ammonia are called TAN which means total ammonia nitrogen.

TCR -Total Chlorine Residual

The total amount of chlorine in water, including the combined chlorine and the free available chlorine.

Temp. – Temperature

TP -Total Phosphorus

A laboratory analyses to determine the total amount of particulate and soluble phosphorus present in the wastewater.

TSS -Total Suspended Solids

A laboratory analyses to measure particles that are larger than 2 microns found in the wastewater.

TS -Total Solids

Is a measure of the suspended and dissolved solids in the wastewater and in biosolids.

Unionized Ammonia Nitrogen

Un-ionized ammonia refers to all forms of ammonia in water with the exception of the ammonium ion (NH4 +). Calculated using the methodology specified in the MOECC's Guideline and Policies document titled "Provincial Water Quality Objectives" (July 1994).

WPCP - Water Pollution Control Plant

Is typically a facility composed of a variety of treatment processes that collectively treat the wastewater.

If this information is required in an accessible format, please contact 1-800-372-1102 extension 3488

Lake Simcoe Water Pollution Control Plant

Annual Performance Report 2015

The Regional Municipality of Durham

Lake Simcoe Water Pollution Control Plant 2015 Annual Performance Report

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) Performance Report provides staff, stakeholders and customers an overview of the performance of the Lake Simcoe WPCP in 2015. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment and Climate Change (MOECC). The performance report demonstrates the commitment of ensuring that the WPCP continues to deliver wastewater services to our customers in an environmentally responsible manner.

For a description of terms and abbreviations used in this report, refer to the glossary at the end of the report.

Water Pollution Control Plant Process Description

General

The Lake Simcoe WPCP is owned and operated by the Regional Municipality of Durham in accordance with the terms and conditions of the ECA. The plant is located in the Community of Beaverton in the Township of Brock. 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 3,788 residents.

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

- raw influent pumping,
- preliminary treatment,
- secondary treatment,
- tertiary treatment,
- disinfection,
- aerobic digestion.

Raw Influent Pumping

Wastewater is collected through approximately 23.5 km of sanitary sewers in Beaverton and is conveyed to the WPCP by gravity or by two sanitary sewage pumping stations Harbor Street and Cedar Beach located in the collection system. The two flows 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 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.

Secondary Treatment

Aeration Tanks: Preliminary effluent flow is directed to two aeration tanks. Aluminum sulphate is added to the aeration tanks to react with and remove phosphorus. Surface mechanical aerators mix air into the sewage to remove dissolved and suspended solids and nutrients from the wastewater. Biological activity is controlled to assimilate the organic material.

Secondary Clarifier: The effluent from the aeration tanks is directed to its associated secondary clarifier where it settles quickly as an activated (living) sludge leaving a clear effluent to overflow the tank. The activated sludge collected on the bottom of the clarifier is pumped back to the head of the aeration tanks. The microorganisms are returned to repeat the process. Any 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 digestor.

Tertiary Sand Filter: Effluent flow from the tertiary clarifier flows into an automatic self- cleaning sand filter. The automatic backwash may be set to backwash 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 the effluent outfall channel and final discharge to Lake Simcoe.

Sludge Treatment

Aerobic Digester: Activated sludge from the secondary clarifiers is pumped to an aerobic digestor for stabilization. Two mechanical mixers and a fixed header diffused aeration system provide oxygen for the microorganisms. The 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 for further treatment.

Biosolids: Stabilized biosolids from the digester are transported plant to plant within the Region of Durham for further treatment, stabilization or 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 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 31.2% of its rated capacity and received a maximum daily flow of 3,749m^3/d on April 26th, 2015. 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 2015.

c) Maintenance of major equipment

Major maintenance items in 2015 included:

- Upgrades were made to the mechanical barscreen.
- The overhead fill station for the biosolids removal has been removed and replaced with a hose at ground level as it was causing problems in cold weather and created a safety concern when lifting the filler pipe.

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 effluent flow meter occurred in May and September 2015.
- All monitoring and laboratory equipment is calibrated and maintained according to manufacturer's specifications.

f) Efforts made and results achieved in meeting the effluent objectives

- The Regional Municipality of Durham strives to achieve the best effluent quality at all times, remaining below the ECA compliance limits.
- The annual average daily flow did not exceed the rated capacity of 4,550m^3/d during the reporting period. The preliminary peak flow rate of 22,750m^3/d was not exceeded.
- The effluent objective for $CBOD_5$ was exceeded once on February 25th.
- The effluent objective for total suspended solids was exceeded nine times of 257 samples (3.5%).
- The effluent objective for total phosphorus was exceeded 18 times of 308 samples (5.8%). Aluminum sulphate dosage was increased.
- The minimum objective for pH was exceeded six times of 282 samples (2%). The bench top pH meter probe was replaced.

- The effluent objective for total ammonia nitrogen was exceeded seven times of 267 samples (2.6%).
- Extreme cold temperatures in February caused operational difficulties. Both secondary clarifiers had frozen over causing higher levels of suspended solids and total phosphorus. Aluminum sulphate dosing was increased to accommodate plant process conditions.
- On July 28th the microbial life was lost in the activated sludge process due to an overdose of aluminum sulphate. Secondary flows were diverted to the secondary equalization lagoon for stabilization. High levels of total ammonia nitrogen were experienced when microbial life was being restored to the activated sludge process.
- Best efforts and process adjustments will continue to be applied to maintain results below objectives.

g) Sludge generated

A summary of the sludge volume generated in the reporting period is included in Table 5.There is no increase of sludge volume expected in the next reporting period

h) Complaints

A summary of complaints received from the public is administered through a central database. There were no complaints received during the reporting period.

i) By-passes

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

j) Initial Effluent Characterization

The initial effluent characterization sampling was conducted in 2014. A report was submitted to the MOECC in April of 2015.

k) Information required by MOECC Water Supervisor

No additional information required.

Proposed Alterations, Extensions or Replacements

There are no proposed alterations for 2016**.**

MOECC Inspection

This plant was not inspected by the MOECC in 2015.

Summary of Tables

Table 1 Flows

Month	Total Plant Flow	Average Day Flow m^3/d	Maximum Day Flow m^3/d
January	40,557	1,308	1,772
February	25,861	924	1,067
March	51,000	1,645	2,678
April	83,411	2,780	3,749
May	49,508	1,597	2,425
June	50,022	1,667	3,227
July	48,472	1,564	3,106
August	40,900	1,319	2,820
September	29,968	999	1,389
October	39,063	1,260	2,117
November	30,768	1,026	1,454
December	37,896	1,222	1,650
Total	527,426		
Average	43,952	1,445*	
Minimum	25,861		
Maximum	83,411		3,749
ECA Requirement		4,550	
Met Compliance		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	Alkal-inity $CaCO_3$ mg/L
January	86	112	80	105	2.1	2.7	1.12	300
February	105	97	84	78	3.0	2.8	1.47	267
March	77	127	107	176	2.1	3.5	1.03	237
April	50	139	66	183	1.0	2.8	0.34	269
May	66	105	107	171	1.9	3.0	0.64	270
June	61	102	82	137	1.9	3.2	0.73	278
July	86	135	110	172	2.1	3.3	0.7	258
August	107	141	113	149	2.4	3.2	0.95	255
September	93	93	102	102	2.4	2.4	0.89	224
October	83	105	96	121	2.4	3.0	0.88	219
November	95	97	96	98	2.6	2.7	1.02	262
December	73	89	84	103	2.3	2.8	1.46	280
Average	82	118	94	136	2.2	3.2	0.94	260
Minimum	50	89	66	78	1.0	2.4	0.34	219
Maximum	107	141	113	183	3.0	3.5	1.47	300
Sampling Frequency Requirement Met	Yes		Yes		Yes			Yes

Table 2 Raw Influent Analyses continued

Month	TKN avg. conc. mg/L	TKN loading kg/d	TAN avg. conc. mg/L	TAN loading kg/d	pH min.	pH max.	Temp. Degrees Celsius min.	Temp. Degrees Celsius max.
January	21.03	28	14.30	18.7	7.31	7.80	3.6	11.7
February	27.30	25	19.50	18.0	7.11	7.45	2.3	10.7
March	19.15	32	12.90	21.2	6.98	7.64	1.3	16.2
April	10.32	29	6.50	18.1	7.23	7.70	6.3	14.9
May	15.83	25	12.30	19.6	7.33	7.67	9.3	18.6
June	16.08	27	12.60	21.0	7.20	7.69	12.3	21.6
July	21.90	34	13.40	21.0	7.06	8.00	11.4	23.0
August	21.80	29	15.40	20.3	7.00	7.90	16.7	19.0
September	24.14	24	17.20	17.2	6.78	7.38	16.3	20.1
October	24.45	31	18.30	23.1	6.62	7.49	12.4	17.3
November	25.88	27	18.80	19.3	6.35	7.60	11.7	15.9
December	22.68	28	18.80	23.0	6.21	7.39	10.6	17.3
Average	20.88	30	15.00	21.7				
Minimum	10.32	24	6.50	17.2	6.21		1.3	
Maximum	27.30	34	19.50	23.1		8.00		23.0
Sampling Frequency Requirement Met	Yes		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	0.7	0.9	0.8	1	0.03	0.0	1.2
February	3.0	2.8	3.0	3	0.10	0.1	2.6
March	1.9	3.1	3.3	5	0.10	0.2	5.1
April	0.9	2.5	1.2	3	0.02	0.1	1.7
May	0.8	1.3	1.2	2	0.03	0.0	1.5
June	0.6	1.0	0.5	1	0.03	0.1	1.5
July	1.1	1.7	1.7	3	0.04	0.1	1.9
August	0.8	1.1	1.1	1	0.05	0.1	2.0
September	0.5	0.5	0.8	1	0.08	0.1	2.4
October	0.7	0.9	0.8	1	0.04	0.1	1.6
November	0.6	0.6	0.8	1	0.03	0.0	0.9
December	0.5	0.6	0.9	1	0.02	0.0	0.8
Total							23*
Average	1.0	1.5	1.3	2	0.05	0.1	2
Minimum	0.5	0.5	0.5	1	0.02	0.0	1
Maximum	3.0	3.1	3.3	5	0.10	0.2	5
ECA Limit	10**		10**		0.3**		190*
ECA Objective	5		5		0.12		190
LSPRS					0.15***		190*
Within Compliance	Yes		Yes		Yes		Yes
Sampling Frequency Requirement Met	Yes		Yes		Yes		

*Total Annual Loading, kg/year

**Monthly Average Concentration

***Annual Average Concentration

Table 3 Final Effluent Analyses continued

Month	DP avg. conc. mg/L	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	0.005		0.02	0.0	0.56	0.0
February	0.019		3.73	3.4	4.44	0.0
March	0.017		1.79	2.9	2.41	0.0
April	0.003		0.04	0.1	0.62	0.0
May	0.012		0.03	0.0	0.65	0.0
June	0.014	0.03		0.1	0.82	0.0
July	0.017	1.46		2.3	3.38	0.0
August	0.016	1.81		2.4	1.26	0.0
September	0.039		0.05	0.0	0.62	0.0
October	0.016		0.03	0.0	0.81	0.0
November	0.019		0.34	0.3	1.02	0.0
December	0.011		0.02	0.0	0.61	0.0
Average	0.016	1.10	0.67	1.1	1.43	0.0
Minimum	0.003	0.03	0.02	0.0	0.56	0.0
Maximum	0.039	1.81	3.73	3.4	4.44	0.0
ECA Limit		5**	15**			
ECA Objective			10			
Within Compliance		Yes	Yes			
Sampling Frequency Requirement Met	Yes	Yes	Yes			

Table 3 Final Effluent Analyses continued

Month	pH min.	pH max.	Temp. Degrees Celsius min.	Temp. Degrees Celsius max.
January	7.01	7.90	5.0	11.6
February	6.62	7.70	2.6	9.5
March	6.46	7.21	4.6	16.1
April	6.75	7.51	4.8	14.8
May	7.02	7.62	4.8	16.6
June	7.02	7.70	5.6	20.5
July	4.40	7.79	6.5	21.4
August	6.74	7.64	6.7	21.2
September	6.78	7.38	16.3	20.1
October	6.48	7.37	17.2	21.2
November	6.46	7.79	10.8	16.8
December	7.11	7.37	9.1	13.6
Minimum	4.40		2.6	
Maximum		7.9		21.4
ECA Objective	6.5	9.0		
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes

Table 4 Escherichia Coliform Sampling

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

Table 5 Total Coliform Sampling

Month	Number of Samples	Geometric Mean Density
January	4	0
February	4	17
March	4	4
April	5	0
May	4	2
June	5	0
July	4	5
August	4	4
September	5	2
October	4	9
November	4	5
December	5	1
Sampling Frequency Requirement Met	Yes	

Table 6 Energy and Chemical Usage

Month	Total Plant Flow (cubic metres)	Alum (litres)	Hydro (kWh)	Natural Gas (cubic metres)
January	40,557	4,287	99,310	18,818
February	25,861	4,079	69,135	22,191
March	51,000	8,022	71,427	30,100
April	83,411	10,446	67,225	17,754
May	49,508	4,502	75,246	1,954
June	50,022	4,925	69,517	2,897
July	48,472	4,775	56,912	2,797
August	40,900	2,243	70,663	0
September	29,968	3,051	66,843	0
October	39,063	3,822	67,989	3,944
November	30,768	3,155	65,315	8,887
December	37,896	4,751	75,246	11,848
Total	527,426	58,058	854,828	121,190

Table 7 Summary of the Solids Produced

Month	Total Hauled (cubic metres)	Total Solids %	Hauled to Duffin Creek WPCP
January	320	1.51	320
February	320	1.28	320
March	360	1.29	360
April	360	1.44	360
May	320	1.49	320
June	200	1.45	200
July	320	1.23	320
August	200	1.40	200
September	160	1.39	160
October	200	1.52	200
November	800	1.20	800
December	80	0.94	80
Total	3,640		3640

Glossary of Terms

Annual Average Concentration
An arithmetic mean of the monthly average concentrations of a contaminant in the effluent calculated for any particular year.

Annual Average Loading
The value obtained by multiplying the annual average concentration of a contaminant by the average daily flow over the same calendar year.

Average Daily Flow
The cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year.

Avg – Average
An arithemetic mean of the average concentrations and loadings.

Biosolids
Organic material recovered from wastewater sludge.

Bioreactor
A bioreactor is a vessel in which a biological process is carried out which involves bacterial organisms or biochemically active substances derived from such organisms.

BOD_5 Five Day Biochemical Oxygen Demand
(also known as total BOD_5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand.

By-pass
Any discharge from the works that does not undergo any treatment or only receives partial treatment before it is discharged to the environment.

$cBOD_5$ -Five Day Carbonaceous Biochemical Oxygen Demand
Means a five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample..

Conc. - Concentration
The abundance of a constituent divided by the total volume of a mixture.

Daily Concentration
The concentration of a contaminant in the effluent discharged over any single day, as measured by a composite or grab sample, whichever is required.

DP - Dissolved Phosphorus
This is the soluble form of phosphorus present in the wastewater.

ECA - Environmental Compliance Approval
The primary regulatory instrument for each water pollution control plant.

E. - coli - (Escherichia coli)
Refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius.

Final Effluent
Sewage discharge through the water pollution control plant outfall after undergoing the full train of unit processes as listed in the Environmental Compliance Approval.

Geometric Mean Density
Is the nth root of the product of multiplication of the results of n number of samples over the period specified.

Grab Sample
A single sample taken at a specific moment in time, when tested provides a snapshot of the conditions at the time the sample was retrieved.

kg - kilogram
Basic unit of mass in the metric system

kg/d – kilogram per day

LSPRS - Lake Simcoe Phosphorus Reduction Strategy
The ECA issued on June 28, 2012 introduced additional phosphorus objectives to comply with the requirements of the Lake Simcoe Phosphorus Reduction Strategy (2010) prepared under the Lake Simcoe Protection Plan (2009).

m^3 - (Cubic Metre)
Volume measurement, $1m^3$ = 1000 litres or 220 imperial gallons.

m^3/d - (Cubic Metre Per Day)
Flow measurement, $1m^3$ = 1000litres or 220 imperial gallons. Volume of liquid treated in a 24 hour period.

Max. - Maximum

Maximum Flow Rate
The peak or highest flow recorded during a specific time period usually in a 24 hour period.

mg/L - (Milligram Per Litre)
This is a measure of the concentration of a parameter in water, sometimes referred to as parts per million (ppm).

Min. - Minimum

mm.-(millimetre)
Is a unit of length in the metric system, equal to one thousandth of a metre.

MOECC - (Ministry of the Environment and Climate Change)
The Provincial regulatory agency responsible for overseeing the water and wastewater industries in Ontario. Their primary functions include approval for new or expanding facilities, inspections and investigations.

Monthly Average Concentration
The arithmetic mean of all daily concentrations of a contaminant in the effluent sampled or measured, or both, during a calendar month.

Monthly Average Loading
Is calculated by multiplying the monthly average concentration of a contaminant by the monthly average daily flow over the same calendar month.

N/A - Not Applicable

Peak Flow Rate
The maximum rate of sewage flow for which the plant or process unit was designed.

pH
Index of hydrogen ion activity, pH is defined as the negative logarithm of hydrogen ion concentration in moles per litre. The pH may range from 0 – 14, where 0 is most acidic, 14 most basic and 7 neutral.

Rated Capacity
The average daily flow for which the works are approved to handle**.**

Raw Influent
Raw wastewater entering the water pollution control plant before treatment.

Septage
Partially treated sludge from a septic tank.

Sludge
The settleable solids separated from liquids during processing.

TAN - Total Ammonia Nitrogen

Ammonia exists in two forms in the water: NH3 (this is called unionized ammonia) NH4+ (this is called ionized ammonia) Together, these two forms of ammonia are called TAN which means total ammonia nitrogen.

Temp. – Temperature

Total Annual Loading

Is calculated by adding the calculated total monthly load discharged for each calendar year.

Total Monthly Loading

Is calculated by multiplying the total monthly flow by the monthly average concentration.

TP - Total Phosphorus

A laboratory analyses to determine the total amount of non-soluble and soluble phosphorus present in the wastewater.

TSS - Total Suspended Solids

A laboratory analyses to measure particles that are larger than 2 microns found in the wastewater.

TS - Total Solids

Is a measure of the suspended and dissolved solids in the wastewater and in biosolids.

Unionized Ammonia Nitrogen

Un-ionized ammonia refers to all forms of ammonia in water with the exception of the ammonium ion (NH4 +).

WPCP - Water Pollution Control Plant

A facility composed of a variety of treatment processes that collectively treat wastewater

If this information is required in an accessible format, please contact 1-800-372-1102 extension 3488

Newcastle Water Pollution Control Plant

Annual Performance Report 2015

The Regional Municipality of Durham

Newcastle Water Pollution Control Plant 2015 Annual Performance Report

Environmental Compliance Approval (ECA): 3-2189-87-946 Dated July 26, 1994
Amendments: Dated June 21, 2006
May 10, 1998
June 11, 1996

Environmental Compliance Approval (Air): 8-3083-93-006 Dated March 22, 1993

The Newcastle Water Pollution Control Plant (WPCP) Performance Report provides staff, stakeholders and customers a performance overview of the Newcastle WPCP in 2015. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment and Climate Change (MOECC). The performance report demonstrates the commitment of ensuring that the WPCP continues to deliver wastewater services to our customers in an environmentally responsible manner.

For a description of terms and abbreviations used in this report, refer to the glossary at the end of the report.

Water Pollution Control Plant Process Description

General

The Newcastle WPCP is owned and operated by the Regional Municipality of Durham in accordance with the terms and conditions of the ECA. The plant is located in the Municipality of Clarington (Newcastle) and treats wastewater from the Newcastle service area in the Regional Municipality of Durham.

The Newcastle WPCP is designed to treat wastewater at an average flow rate of 4,086 cubic metres per day (m^3/d) with a peak flow rate of 12,300 m^3/d as noted in the ECA. The plant is an MOECC Class Three conventional activated sludge treatment plant that utilizes the following processes to treat wastewater:

- raw influent pumping,
- preliminary treatment,
- primary treatment,
- secondary treatment,
- phosphorus removal system,
- disinfection (chlorination/dechlorination),
- solids treatment – sludge holding.

Raw Influent Pumping

Wastewater collected through approximately 38 km of sanitary sewers in Newcastle is conveyed to the Newcastle WPCP by gravity and by two sanitary sewage pumping stations located in the collection system.

Preliminary Treatment

Screening: One automatic, mechanically cleaned screen removes paper products and large material that could harm pumps and process equipment. Screenings removed in this process are transported 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 dewatered and 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 waste activated sludge from the secondary treatment process is collected by a sweep arm mechanism which pushes the sludge into a hopper. The sludge is then pumped to the sludge holding tank for transportation to Courtice WPCP. Any material floating on the surface of the clarifier (scum) is also removed to the holding tank.

Secondary Treatment

Aeration Tanks: The aeration tank is comprised of two distinct sections. The first part of the tank is a selector where there is no oxygen introduced, this is for denitrification. The second part of the tank is where fine bubbled air is diffused into the sewage to remove 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 secondary clarifier where it settles quickly as an activated (living) sludge leaving a clear effluent to overflow the clarifier. The sludge collected on the bottom of the clarifier is pumped back to the head of the aeration tank. The microorganisms are returned to repeat the process. Waste activated sludge is sent to the primary clarifier to co-settle.

Phosphorus Removal System

The phosphorous removal system is intended to lower the total phosphorous level in the final effluent by adding a chemical coagulant (aluminum chloride) as part of the treatment process. Aluminum chloride can be added at multiple locations throughout the WPCP

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 single chlorine contact chamber. Disinfected effluent is dechlorinated with a sodium bisulphite solution before being discharged through a 900 mm diameter outfall extending 130 m to a 600 mm pipe extending 800 m into Lake Ontario.

Solids Treatment – Sludge Holding

All sludge produced at the Newcastle WPCP is stored in a sludge holding tank. From there the sludge is shipped to Courtice WPCP for anaerobic digestion. Sludge is transported plant to plant in accordance with ECA #A820250.

Environmental Compliance Approval

Under Condition 17 (1) of ECA #3-2189-87-946 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 Newcastle WPCP effluent was determined to be compliant with the ECA approval limits during the reporting period. The plant operated at an average of 68% of its rated capacity and received a maximum daily flow of 8,282 m^3/d on October 29, 2015. See tables for effluent results.

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

No operating problems were encountered at the Newcastle WPCP in 2015.

c) Maintenance of major equipment

Major maintenance items in 2015 included:

- Major clean out of wet well,
- Replacement of clutch on primary clarifier sludge collector drive,
- Installation of winterized chemical lines for year round chlorination/dechlorination.

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.
- Online instrumentation is verified by WPCP operators using field or laboratory test equipment.

e) Summary of the calibration and maintenance carried out

- Calibration of the effluent flow meter and the secondary clarifier flow meter occurred in June and September 2015. Verification showed that meters were operating as required.
- Calibration of the AutoCat 9000 chlorine analyzer was conducted on July 29, 2015.
- Calibration of the in-house lab pH meter is conducted monthly.
- On-line instrumentation is verified by WPCP operators using various field or laboratory test equipment.

f) Effluent Objectives

The Regional Municipality of Durham continually strives to achieve the best effluent quality at all times, remaining below the ECA compliance limits.

The average daily rated flow capacity of 4,086m^3/d was not exceeded. The maximum rated flow rate of 12,300 m^3/d was not exceeded.

The effluent objective for E. coli was exceeded on eight occasions during the non-disinfection seasons of January 1 to May 15 and October 16 to December 31. This is due to no chlorine addition during these periods.

The total chlorine residual objective was exceeded on seven occasions. The ECA requests an objective concentration of 0 mg/L, however the instrumentation used has a detection limit of

0.0012 mg/L so it is typical to have results above 0 mg/L. Sodium bisulphite dosing is monitored to ensure low total chlorine residuals.

Chlorination and dechlorination chemical dosing became a year round practice as of December 2015.

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

g) Sludge Production:

Tabulation of Volume of Sludge Generated:

The volume of sludge removed from Newcastle WPCP in 2015 was 7,132 m^3 at an average concentration of 3.19% total solids. See table 5 for a tabulation of hauled sludge.

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 is Disposed:

Courtice WPCP -100%

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

There were no documented complaints received.

i) By-passes and Spills

There were no by-passes during the reporting period. There are no anticipated by-passes planned during the next reporting period.

There were no spills during the reporting period.

j) Proposed Alterations, Extensions or Replacements

A plant-wide SCADA system upgrade is expected to begin in 2016.

k) Information Required by MOECC Water Supervisor

Table 7 provides a Bacterial analysis of the Newcastle Water Supply Plant raw water for 2015.

MOECC Inspection

No MOECC inspection occurred in 2015.

Table 1 Raw Influent Flows

Month	Total Flow to Plant -metered at the raw influent m^3	Average Day Flow m^3/d	Maximum Day Flow m^3/d
January	80,835	2,608	3,995
February	61,733	2,205	2,645
March	81,746	2,637	3,399
April	115,529	3,851	6,877
May	89,832	2,898	3,651
June	103,080	3,436	5,868
July	85,190	2,748	4,740
August	73,966	2,386	2,842
September	71,606	2,387	3,198
October	89,650	2,892	8,282
November	82,168	2,739	4,120
December	75,074	2,422	3,121
Total	1,010,409		
Average	84,201	2,768*	
Minimum	61,733		
Maximum	115,529		8,282
ECA Requirement		4,086	
Met Compliance		Yes	

*Annual Average Daily Flow

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	132	345	319	832	290	757	7.5	20
February	132	291	358	790	309	681	7.9	17
March	136	359	383	1,010	353	931	8.2	21
April	117	449	293	1,128	322	1,241	6.3	24
May	155	448	412	1,195	293	848	7.1	21
June	109	375	260	893	258	886	5.7	20
July	212	581	406	1,115	320	879	7.2	20
August	165	394	366	874	272	648	7.2	17
September	129	307	245	584	213	508	6.4	15
October	128	369	162	469	227	655	5.1	15
November	88	242	144	394	175	478	4.3	12
December	94	227	151	365	227	550	4.6	11
Average	133	368	292	807	271	751	6.5	18
Minimum	88	227	144	365	175	478	4.3	11
Maximum	212	581	412	1,195	353	1,241	8.2	24
Sampling Frequency Requirement Met			Yes		Yes		Yes	

Table 2 Raw Influent Analyses continued

Month	DP avg. conc. mg/L	TKN avg. conc. mg/L	TKN loading kg/d	TAN avg. conc. mg/L	TAN loading kg/d	pH min.	pH max.
January	2.52	46.95	122	32.85	86	7.06	8.85
February	2.96	52.90	117	36.81	81	6.89	8.85
March	2.88	49.96	132	31.55	83	7.47	8.30
April	2.08	36.15	139	21.85	84	7.11	8.69
May	2.86	49.35	143	31.01	90	6.91	8.60
June	2.16	36.96	127	24.49	84	6.82	8.00
July	3.20	50.40	139	29.79	82	6.68	7.38
August	3.58	50.45	120	32.73	78	6.80	7.62
September	2.13	42.36	101	29.52	70	6.80	7.28
October	2.08	42.55	123	27.59	80	7.02	7.50
November	1.86	35.53	97	25.84	71	6.90	7.38
December	2.22	38.32	93	28.09	68	7.00	7.71
Average	2.54	44.32	123	29.34	81		
Minimum	1.86	35.53	93	21.85	68	6.68	
Maximum	3.58	52.90	143	36.81	90		8.85
Sampling Frequency Requirement Met		Yes		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	TAN avg. conc. mg/L summer	TAN avg. conc. mg/L winter	TAN loading kg/d
January	1.5	4	5.3	14	0.40	1.0	N/A	0.08	0.2
February	2.3	5	5.6	12	0.38	0.8	N/A	0.44	1.0
March	1.9	5	5.3	14	0.42	1.1	N/A	3.68	9.7
April	1.6	6	4.7	18	0.52	2.0	0.32	N/A	1.2
May	2.3	7	7.4	22	0.75	2.2	0.57	N/A	1.6
June	1.3	4	6.0	21	0.54	1.8	0.77	N/A	2.6
July	1.8	5	5.4	15	0.46	1.3	0.05	N/A	0.1
August	1.2	3	3.7	9	0.32	0.8	0.08	N/A	0.2
September	1.2	3	5.2	12	0.48	1.1	0.10	N/A	0.2
October	1.9	6	6.2	18	0.68	2.0	0.51	N/A	1.5
November	1.6	4	6.3	17	0.30	0.8	1.07	N/A	2.9
December	2.0	5	5.4	13	0.39	0.9	N/A	0.08	0.2
Average	1.7	5	5.5	15	0.47	1.3	0.43	1.07	1.8
Minimum	1.2	3	3.7	9	0.30	0.8	0.05	0.08	0.1
Maximum	2.3	7	7.4	22	0.75	2.2	1.07	3.68	9.7
ECA Requirement	25.0	102	25.0	102			15	20	
ECA Objective	15.0	61.29	15.0	61.29	1.0	4.1	10	15	
Within Compliance	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Sampling Frequency Requirement Met	Yes		Yes		Yes		Yes	Yes	

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	TCR loading kg/d	pH min.	pH max.	Temp. °C min.	Temp. °C max.
January	0.00	1.26	0.18	0.00	0.00	6.50	7.60	5.6	14.7
February	0.00	1.85	0.16	0.00	0.00	6.60	7.50	8.2	10.9
March	0.01	4.34	0.25	0.00	0.00	6.83	7.48	9.5	12.0
April	0.00	1.52	0.36	0.00	0.00	7.20	7.65	10.6	21.1
May	0.00	1.79	0.44	0.01	0.02	6.45	7.50	12.1	22.1
June	0.00	2.24	0.29	0.01	0.03	6.49	7.28	14.5	17.0
July	0.00	1.08	0.18	0.01	0.02	6.41	7.25	16.2	19.5
August	0.00	1.16	0.13	0.00	0.01	6.40	6.97	18.3	28.6
September	0.00	1.21	0.27	0.01	0.01	6.20	6.95	18.9	21.7
October	0.00	1.40	0.70	0.01	0.03	6.34	7.19	13.3	19.6
November	0.00	2.47	0.08	0.00	0.00	6.69	7.27	14.8	17.7
December	0.00	1.27	0.09	0.00	0.00	6.40	7.10	12.5	18.1
Average	0.00	1.80	0.26	0.00	0.03				
Minimum	0.00	1.08	0.08	0.00	0.00	6.20		5.6	
Maximum	0.01	4.34	0.70	0.01	0.10		7.65		28.6
ECA Requirement				0.04					
ECA Objective				0					
Within Compliance				Yes					
Sampling Frequency Requirement Met		Yes		Yes		Yes	Yes	Yes	Yes

Table 4 Summary of the E. coliform sampling

- Seasonal disinfection period is from May 15 and from October 15

Month	Number of Samples	Geometric Mean Density
January	4	4,628
February	4	2,592
March	5	7,266
April	4	4,246
May	4	546
June	5	73
July	4	22
August	4	6
September	5	10
October	4	412
November	4	3,016
December	5	683
ECA Requirement (Seasonal)		N/A
ECA Objective (Seasonal)		200
Within Compliance		N/A
Sampling Frequency Requirement Met	Yes	

Table 4(a) Summary of the Faecal Streptococcus sampling

Month	Number of Samples	Geometric Mean Density
January	2	4,979
February	2	1,129
March	2	4,822
April	2	3,262
May	2	3376
June	2	767
July	2	9
August	2	31
September	2	439
October	2	1627
November	2	2,191
December	2	2,750
ECA Requirement		N/A
ECA Objective		N/A
Within Compliance		N/A
Sampling Frequency Requirement Met	Yes	

Table 4(b) Summary of the Total Coliform sampling

Month	Number of Samples	Geometric Mean Density
January	2	55,498
February	2	25,923
March	2	30,984
April	2	28,142
May	2	34,957
June	2	13,248
July	2	438
August	2	219
September	2	684
October	2	48,990
November	2	29,665
December	2	31,623
ECA Requirement		N/A
ECA Objective		N/A
Within Compliance		N/A
Sampling Frequency Requirement Met	Yes	

Table 5 Sludge Quality and Disposal

Month	Avg. Sludge TS (%)	Total Volume Removed (m^3)	Total Volume Hauled to Courtice WPCP (m^3)	Total Volume Hauled to Duffin Creek WPCP (m^3)
January	3.31	608	608	0
February	3.04	532	532	0
March	2.79	570	570	0
April	5.53	608	608	0
May	3.16	608	608	0
June	3.02	646	646	0
July	3.90	646	646	0
August	2.56	558	558	0
September	15.98	570	570	0
October	1.28	608	608	0
November	2.27	570	570	0
December	4.60	608	608	0
Total	N/A	7,132	7,132	0
Average	4.29	594	594	0

Table 6 Energy and Chemical Usage

Month	Total Plant Flow (cubic metres)	Alum (litres)	Sodium Hypochlorite (kilograms as chlorine)	Sodium Bisulphite (Litres)	Hydro (kWh)	Natural Gas (cubic metres)
January	80,835	7,287	N/A	N/A	95,235	17,763
February	61,733	6,599	N/A	N/A	90,143	18,284
March	81,746	5,890	N/A	N/A	92,689	21,410
April	115,529	5,611	N/A	N/A	97,782	13,222
May	89,832	5,708	269	3,398	102,875	2,955
June	103,080	6,141	366	5,890	99,819	3,508
July	85,190	6,125	577	5,657	88,105	2,449
August	73,966	6,126	591	4,250	97,782	461
September	71,606	5,559	434	3,677	93,198	436
October	89,650	4,979	266	1,962	103,384	5,760
November	82,168	7,332	N/A	N/A	79,448	11,733
December	75,074	7,565	133	833	115,607	16,832
Total	1,010,409	34,638	2,503	24,833	1,156,067	114,813

Table 7 Newcastle WSP Bacteriological Sampling

Month	E.coli cfu/100ml (min-max result)	E.coli (number of samples)	Total Coliform cfu/100ml (min-max result)	Total Coliform (number of samples)
January	ND-2	16	ND-33	16
February	ND-1	15	ND-3	15
March	ND-<1	18	ND-52	18
April	ND-2	17	ND-200	17
May	ND-<1	15	ND-200	15
June	ND-3	18	ND-88	18
July	ND-1	17	ND-12	17
August	ND-1	16	ND-1300	16
September	ND-3	17	3-900	17
October	ND-3	16	ND-47	16
November	ND-3	16	ND-61	16
December	ND-4	16	ND-12	16

Glossary of Terms

Aeration tank
An aeration tank is a vessel in which a biological process is carried out which involves bacterial organisms or biochemically active substances derived from such organisms. This encompasses a combination of aerobic and anoxic processes.

Anaerobic digestion
Is a series of biological processes in which microorganisms break down biodegradable material in the absence of oxygen.

Average Concentration
The arithmetic mean concentration of a parameter within a specified period of operation.

Average Daily Flow
The total volume of sewage flow to the plant over twelve consecutive calendar months divided by the number of days over the same period of time.

BOD_5 - Five day Biochemical Oxygen Demand
(also known as total BOD_5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand.

By-pass
A diversion of sewage around one or more unit processes within the Sewage Treatment Plant with the diverted sewage flows being returned to the Sewage Treatment Plant treatment train upstream of the Final effluent sampling location, and discharging to the environment through the Sewage Treatment Plant outfall.

$CBOD_5$ -Five day Carbonaceous Biochemical Oxygen Demand
A five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample.

Conc. - Concentration

DP – Dissolved Phosphorus
This is the soluble form of phosphorus present in the wastewater.

ECA
Environmental Compliance Approval. The primary governing document for each WPCP.

E. coli - (Escherichia coli)
Refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius. Calculated using a monthly geometric mean density.

Final Effluent
sewage discharge via the Sewage Treatment Plant outfall after undergoing the full train of unit processes as listed in the Environmental Compliance Approval.

Geometric mean density
Is the nth root of the product of multiplication of the results of n number of samples over the period specified.

Grab Sample
A single sample taken at a specific moment in time, a snapshot of the conditions at the time the sample was retrieved.

Loading
Volume of a parameter that is present in a given volume of wastewater, is calculated by multiplying the annual average concentration by the average daily flow as kg/day.

m^3 - (Cubic Metre)
Volume measurement, $1m^3$ = 1000 litres or 220 imperial gallons.

m^3/d - (Cubic Metre Per Day)
Flow measurement, $1m^3$ = 1000 litres or 220 imperial gallons. Volume of liquid treated in a 24 hour period.

Max. - Maximum
Maximum Flow Rate
The peak or highest flow recorded during a specific time period usually in a twenty-four (24) period.

Mg/L - (Milligram Per Litre)
This is a measure of the concentration of a parameter in water, sometimes referred to as parts per million (ppm).

Min. - Minimum
mm.- (millimetre)
Is a unit of length in the metric system, equal to one thousandth of a metre.

MOECC - (Ministry of the Environment and Climate Change)
The Provincial regulatory agency responsible for overseeing the water and wastewater industries in Ontario. Their primary functions include approval for new or expanding facilities, inspections and investigations.

Monthly average concentration
Calculated as an arithmetic mean of all daily concentrations analyzed for the month.

Monthly average loading
Calculated by multiplying the monthly average concentration by the monthly average daily flow.

N/A - Not applicable
NH3 – Unionized Ammonia
Is a compound of nitrogen and hydrogen with the formula NH3. It is a colourless gas with a characteristic pungent smell

pH
Index of hydrogen ion activity, pH is defined as the negative logarithm of hydrogen ion concentration in moles per litre. A solution of pH from 0-7 is acidic, 7 is neutral, and 7-14 is alkaline.

Raw Influent
Raw wastewater entering the water pollution control plant before treatment.

Rated Capacity
The average daily flow for which the works is approved to handle.

Septage
Partially treated sludge from a septic tank.

Sludge
A Semi-solid material that is produced as a by-product during sewage treatment. Similar to biosolids.

TAN -Total Ammonia Nitrogen
Ammonia exists in two forms in the water: NH3 (this is called unionized ammonia) NH4+ (this is called ionized ammonia) Together, these two forms of ammonia are called TAN which means total ammonia nitrogen.

TCR -Total Chlorine Residual
The sum of the free and combined chlorine residual

Temp. - Temperature

Total loading
Calculated by multiplying the average concentration by the average flow.

TP -Total Phosphorus
A laboratory analyses to determine the total amount of particulate and soluble phosphorus present in the wastewater.

TSS -Total Suspended Solids
A laboratory analyses to measure particles that are larger than 2 microns found in the wastewater.

TS -Total Solids
Is a measure of the suspended and dissolved solids in the wastewater and in biosolids.

Un-ionized Ammonia nitrogen
Calculated using the methodology specified in the MOECC's Guideline and Policies document titled "Provincial Water Quality Objectives" (July 1994).

WPCP - Water Pollution Control Plant
Is typically a facility composed of a variety of treatment processes that collectively treat the wastewater.

If this information is required in an accessible format, please contact 1-800-372-1102 extension 3488

Nonquon Water Pollution Control Plant

Annual Performance Report 2015

The Regional Municipality of Durham

Nonquon Water Pollution Control Plant 2015 Annual Performance Report

Environmental Compliance Approval (ECA): 2207-9LKHLM Dated July 17, 2014

4143-7NCKSG Dated June 18, 2009

The Nonquon Water Pollution Control Plant (WPCP) Performance Report provides staff, stakeholders and customers an overview of the performance of the Nonquon WPCP in 2015. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment and Climate Change (MOECC). The performance report demonstrates the commitment of ensuring that the WPCP continues to deliver wastewater services to our customers in an environmentally responsible manner.

For a description of terms and abbreviations used in this report, refer to the glossary at the end of the report.

Water Pollution Control Plant Process Description

General

The Nonquon WPCP is owned and operated by the Regional Municipality of Durham in accordance with the terms and conditions of the ECA.The plant is located in the Community of Port Perry in the Township of Scugog. This MOECC Class Two wastewater treatment plant is designed to treat wastewater at an average flow rate of 3,870 cubic metres per day (m^3/d) utilizing two aerated lagoon cells and six seasonal facultative retention ponds. The Nonquon WPCP has a service population of 8,154 residents. The treated effluent is discharged to the Nonquon River in accordance with the conditions listed in the ECA.

Raw Influent

Wastewater is collected through approximately 48.5 km of sanitary sewers in the Port Perry service area and is conveyed to the Nonquon WPCP by three sanitary sewage pumping stations: Water Street, Reach Street and Canterbury Common. Additional flow is added to the forcemain by two private pumping systems: a recreational complex and a small lakefront community of 16 individual homes. Aluminum sulphate is added at the Water Street Pumping Station to enhance the settling of solids and phosphorus removal.

Lagoon Treatment

Aerated Cells

Influent wastewater enters the Nonquon WPCP through the aerated cell inlet chamber where the flow is split and directed into two aerated cells. These cells are aerated by mechanical surface aerators to mix the contents and provide oxygen to maintain biological activity.

Seasonal Retention Ponds

Partially treated wastewater from the aerated cells flows by gravity to cell number six for solids settling. The flow from cell number six is transferred through a distribution chamber to one of the five retention stabilization lagoons. The wastewater remains in the retention ponds until the effluent

quality meets the ECA requirements. Prior to discharging to the Nonquon River samples are collected from individual lagoon cells to verify the effluent will meet the limits established in the ECA.

Environmental Compliance Approval

Under Condition 10 (6) of ECA #2207-9LKHLM the Region of Durham must produce an annual 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 plant's ECA. Table 2 summarizes the raw wastewater characteristics during the reporting year.

The Nonquon WPCP effluent was determined to be compliant with the approval limits during the reporting period. The plant operated at 64.7% of its rated capacity and received a maximum daily flow of 5,237 m^3/d on April 20th, 2015. The total treated effluent discharged to the Nonquon River in 2015 was 931,156 m^3. Tables 3-5 provide a tabulation of effluent result.

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

No operating problems were encountered in 2015.

c) Maintenance of major equipment

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 a comparable range.

e) Summary of the calibration and maintenance carried out on all effluent monitoring equipment

- Calibration of the influent flow meter occurred in April and September, 2015.
- Temperature and pH are monitored in the field, all other routine process control tests are performed at the Uxbridge Brook WPCP laboratory in Uxbridge. All monitoring and laboratory equipment is calibrated and maintained according to manufacturer's specifications.

f) Efforts made and results achieved in meeting the effluent objectives

- The Regional Municipality of Durham strives to achieve the best effluent quality at all times, remaining below the ECA compliance limits.
- The annual average daily flow did not exceed the rated capacity of 3,870 m3/d during the reporting period.
- The effluent objective for $CBOD_5$ was exceeded in four of 38 samples (10.5%).
- The effluent objective for total phosphorus was exceeded in six of 135 samples (4.4%).
- The effluent objective for total suspended solids was exceeded in 13 of 135 samples (9.6%).
- The effluent objective for total ammonia nitrogen was exceeded in 75 of 135 samples (55.6%).

- The objective for total ammonia nitrogen was exceeded due to ice cover on the lagoons during the winter and early spring. Limited storage made it necessary to discharge with continuous monitoring of the effluent.
- To assist in total suspended solids and total phosphorus removal, the aluminum sulphate dosage at the Water Street sanitary sewage pumping station was increased and additional aluminum sulphate was added by boat to the lagoons.
- All effluent flows met the flow objectives set by ECA #4143-7NCKSG dated June 18, 2009 with the exception of June where an emergency discharge request to increase effluent flows was approved by the MOECC. Table 5 summarizes discharge flows to the Nonquon River.
- Best efforts will continue to be applied to maintain results below objectives.

g) Sludge Generated

The annual depletion of the sludge settling capacity is negligible. There was no removal of biosolids during the reporting period.

h) Complaints

A summary of complaints received from the public is administered through a central database. On July 24th a noise complaint was received due to early morning construction. It was requested to have construction comply with the Township of Scugog noise by-law of 7:00am.to 7:00pm. Contractors were asked to comply with the by-law.

i) By-passes

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

Additional Discharge

Extreme cold temperatures in February and ice cover on the lagoons in the spring resulted in limited discharge during the winter months causing accumulation of effluent. The Region of Durham requested an emergency discharge to increase the treated effluent discharge rate to 8,200m^3/day during the month of June. The MOECC approved an increased discharge rate in a letter dated May 29, 2015.

j) Copy of all Notice of modifications and any implementation of Limited Operational Flexibility(schedule B)

No notice of modifications were submitted in 2015.

k) Report Summarizing Modifications(Schedule B)

There were no modifications to the plant during the reporting period..

l) Information Required by MOECC Water Supervisor

No additional information required.

Proposed Alterations, Extensions or Replacements

The recommendation of the Class Environmental Assessment was to design and construct a WPCP which includes an activated sludge process and tertiary treatment. The construction of the new Nonquon WPCP began in spring of 2015 and completion is anticipated by the end of 2016 subject to weather and working conditions.

MOECC Inspection

This plant was not inspected by the MOECC in 2015.

Table 1 Raw Influent Flows

Month	Total Flow to Plant -metered at lagoon inlet m^3	Average Daily Flow m^3/d	Maximum Daily Flow m^3/d
January	78,616	2,536	3,503
February	58,569	2,092	2,288
March	72,765	2,347	2,852
April	98,236	3,275	5,237
May	80,977	2,612	2,904
June	90,168	3,006	5,053
July	79,773	2,573	3,431
August	67,007	2,182	2,313
September	66,539	2,218	2,911
October	72,387	2,335	3,747
November	75,679	2,523	2,955
December	72,703	2,345	2,493
Total	913,419		
Average	76,118	2,503*	
Minimum	58,569		
Maximum	98,236		5,237
ECA Requirement		3870*	
Met Compliance		Yes	

*Annual Average

Table 2 Raw Influent Analyses

Month	BOD5 avg. conc. mg/L	BOD5 loading kg/d	TSS avg conc. mg/L	TSS loading kg/d	TP avg conc. mg/L	TP loading kg/d
January	216	548	302	766	4.5	11
February	268	561	318	665	5.8	12
March	195	458	243	570	4.4	10
April	169	553	267	874	3.1	10
May	280	731	405	1058	4.9	13
June	150	451	223	670	2.7	8
July	158	407	230	592	3.3	8
August	287	626	411	897	6.1	13
September	222	492	234	519	4.6	10
October	220	514	217	507	4.4	10
November	176	444	211	532	3.1	8
December	200	469	220	516	4.0	9
Average	212	530	273	684	4.2	11
Minimum	150	407	211	507	2.7	8
Maximum	287	731	411	1058	6.1	13
Sampling Frequency Requirement Met	Yes		Yes		Yes	

Table 2 Raw Influent Analyses continued

Month	DP avg. conc. mg/L	TKN avg. conc. mg/L	TKN loading kg/d
January	0.49	40.25	102
February	1.57	49.48	104
March	1.09	39.44	93
April	0.93	29.65	97
May	0.86	41.85	109
June	0.21	33.36	100
July	0.5	34.20	88
August	1.23	47.05	103
September	0.52	45.06	100
October	0.91	44.38	104
November	0.65	40.15	101
December	0.86	41.76	98
Average	0.82	40.55	101
Minimum	0.21	29.65	88
Maximum	1.57	49.48	109
Sampling Frequency Requirement Met		Yes	

Table 3 Final Effluent Analyses

Month	$CBOD_5$ avg. conc. mg/L	$CBOD_5$ loading avg. kg/d	TSS avg. conc. mg/L	TSS loading avg. kg/d	TP avg. conc. mg/L	TP loading avg. kg/d	DP avg. conc. mg/L
January	10.9	31.1	15.6	44.4	0.06	0.171	0.004
February	6.3	19.6	6.5	20.2	0.10	0.311	0.005
March	8.5	28.5	7.2	24.1	0.18	0.603	0.039
April	5.1	15.0	11.6	34.1	0.11	0.323	0.005
May	4.2	4.2	4.2	4.2	0.06	0.061	0.003
June	2.2	14.6	2.5	16.6	0.04	0.266	0.003
July							
August							
September	1.3	2.8	2.7	5.9	0.04	0.087	0.004
October	1.7	7.7	3.3	14.9	0.06	0.272	0.011
November	3.0	18.5	5.0	30.9	0.06	0.371	0.01
December	4.0	17.8	7.2	32.1	0.10	0.446	0.007
Average	4.7	11.8	6.6	16.5	0.08	0.202	0.091
Minimum	1.3	2.8	2.5	4.2	0.04	0.061	0.003
Maximum	10.9	31.1	15.6	44.4	0.18	0.603	0.039
ECA Limit	10*	37.1**	12.0*	44.5**	0.3***	1.1**	
ECA Objective	8.0		11.0		0.21		
Within Compliance	Yes	Yes	Yes	Yes	Yes	Yes	
Sampling Frequency Requirement Met	Yes		Yes		Yes	Yes	

*Annual Average Concentration

**Annual Average Loading, kg/day

***Monthly Average Concentration

Table 3 Final Effluent Analyses continued

Month	TAN avg. conc. mg/L	TAN loading ave kg/d	TKN avg. conc. mg/L	Un-ionized ammonia avg. conc. mg/L	pH min.	pH max.	Temp. °C min.	Temp. °C max.
January	16.85	48.0	19.40	0.1	6.79	7.90	3.9	5.9
February	22.25	69.1	24.90	0.1	6.87	7.79	0.4	6.9
March	19.84	66.4	21.68	0.0	6.75	7.50	1.2	5.5
April	11.63	34.2	12.75	0.3	7.90	8.35	6.6	12.0
May	11.70	11.8	12.83	0.2	6.54	8.10	15.2	21.6
June	1.72	11.4	2.65	0.1	6.94	8.36	17.1	22.9
July								
August								
September	2.45	5.4	3.44	0.1	6.77	8.21	16.8	25.3
October	2.12	9.6	8.75	0.1	6.62	8.52	8.1	15.0
November	3.56	22.0	5.79	0.1	6.73	8.60	3.7	14.3
December	6.01	26.8	8.03	0.1	7.10	8.28	2.7	9.0
Average	9.81	38.2	12.02	0.12				
Minimum	1.72	5.4	2.65	0.00	6.54		0.4	
Maximum	22.25	69.1	24.90	0.30		8.60		25.3
ECA Limit					6.0	9.5		
ECA Objective	Refer to Table 4	Refer to Table 4			6.0	9.5		
Within Compliance					Yes	Yes		
Sampling Frequency Requirement Met	Yes	Yes			Yes	Yes	Yes	Yes

Table 4 Effluent Objectives for Total Ammonia Nitrogen

Month	TAN Effluent Objective conc. mg/L
January	8.4
February	8.6
March	8.6
April	7.8
May	2.4
June	2.1
July	0
August	0
September	2.3
October	3.4
November	5.7
December	7.9

Table 5 Effluent Discharge Flows

Month	Total Flow Discharged metered at outlet m^3	Monthly Max Objective m^3	Daily Average Discharge m^3	Maximum Daily Flow Objective m^3/d
January	31,337	130,000	2,849	4,600
February	62,096	100,000	3,105	3,900
March	93,747	130,000	3,348	4,600
April	32,321	150,000	2,938	5,500
May	27,297	40,000	1,011	1,400
June	199,438*	70,000	6,648*	2,600
July	0	0	0	0
August	0	0	0	0
September	65,562	70,000	2,185	2,600
October	140,271	145,000	4,525	5,100
November	185,486	290,000	6,183	10,700
December	93,601	230,000	4,457	8,200
Total	913,419	1,355,000		

*Additional Discharge Approved

Table 6 Energy and Chemical Usage

Month	Total Plant Inlet Flow (cubic metres)	Aluminum Sulphate (litres)	Hydro kWh
January	78,616	22.8	29,666
February	58,569	16.0	38,196
March	72,765	19.6	29,666
April	98,236	24.7	31,321
May	80,977	19.0	33,485
June	90,168	26.0	31,830
July	79,773	22.5	33,994
August	67,007	13.8	33,485
September	66,539	13.7	28,774
October	72,387	14.3	22,154
November	75,679	15.6	32,212
December	72,703	15.0	33,231
Total	931,156	223.0	378,014

Glossary of Terms

Annual Average Concentration
An arithmetic mean of the monthly average concentrations of a contaminant in the effluent calculated for any particular year.

Annual Average Loading
The value obtained by multiplying the annual average concentration of a contaminant by the Average Daily Flow over the same calendar year.

Average Daily Flow
The cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year.

Biosolids
Organic material recovered from wastewater sludge.

BOD_5 Five Day Biochemical Oxygen Demand
(also known as total BOD_5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand.

By-pass
A diversion of sewage around one or more unit processes within the water pollution control plant with the diverted sewage flows being returned to the water pollution control plant treatment train upstream of the final effluent sampling location, and discharging to the environment through the water pollution control plant outfall.

$CBOD_5$ -Five Day Carbonaceous Biochemical Oxygen Demand
Means a five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample..

Conc. Concentration
The abundance of a constituent divided by the total volume of a mixture.

Daily Concentration
The concentration of a contaminant in the effluent discharged over any single day, as measured by a composite or grab sample, whichever is required.

DP – Dissolved Phosphorus
This is the soluble form of phosphorus present in the wastewater.

ECA Environmental Compliance Approval
The primary regulatory instrument for each water pollution control plant.

Final Effluent
Sewage discharge via the water pollution control plant outfall after undergoing the full train of unit processes as listed in the Environmental Compliance Approval.

Geometric Mean Density
Is the nth root of the product of multiplication of the results of n number of samples over the period specified.

Grab Sample
A single sample taken at a specific moment in time, when tested provides a snapshot of the conditions at the time the sample was retrieved.

kg - kilogram
Basic unit of mass in the metric system

kg/d – kilogram per day

m^3 - (Cubic Metre)
Volume measurement, $1m^3$ = 1000 litres or 220 imperial gallons.

m^3/d - (Cubic Metre Per Day)
Flow measurement, $1m^3$ = 1000litres or 220 imperial gallons. Volume of liquid treated in a 24 hour period.

Max. - Maximum

Maximum Flow Rate
The peak or highest flow recorded during a specific time period usually in a 24 hour period.

mg./L. - (Milligram Per Litre)
This is a measure of the concentration of a parameter in water, sometimes referred to as parts per million (ppm).

Min. - Minimum

mm.-(millimetre)
Is a unit of length in the metric system, equal to one thousandth of a metre.

MOECC - (Ministry of the Environment and Climate Change)
The Provincial regulatory agency responsible for overseeing the water and wastewater industries in Ontario. Their primary functions include approval for new or expanding facilities, inspections and investigations.

Monthly Average Concentration
The arithmetic mean of all daily concentrations of a contaminant in the effluent sampled or measured, or both, during a calendar month.

Monthly Average Loading
Is calculated by multiplying the monthly average concentration of a contaminant in the effluent sampled or measured, or both, during a calendar month.

N/A - Not Applicable

N/D - No Discharge

Peak Flow Rate
The maximum rate of sewage flow for which the plant or process unit was designed.

pH
Index of hydrogen ion activity, pH is defined as the negative logarithm of hydrogen ion concentration in moles per litre. The pH may range from 0 – 14, where 0 is most acidic, 14 most basic and 7 neutral.

Rated Capacity
The average daily flow for which the works are approved to handle**.**

Raw Influent
Raw wastewater entering the water pollution control plant before treatment.

Seasonal Average Concentration
The arithmetic mean of all daily concentrations of a contaminant in the effluent sampled or measured or both during the seasonal discharge period.

Sludge
The settleable solids separated from liquids during processing.

TAN - Total Ammonia Nitrogen
Ammonia exists in two forms in the water: NH3 (this is called unionized ammonia) NH4+ (this is called ionized ammonia) Together, these two forms of ammonia are called TAN which means total ammonia nitrogen.

Temp. – Temperature

Total Annual Loading
Is calculated by summarizing the total monthly loadings within a calendar year**.**

Total Monthly Loading
Is calculated by multiplying the total monthly flow by the monthly average concentration.

TP - Total Phosphorus
A laboratory analyses to determine the total amount of non-soluble and soluble phosphorus present in the wastewater.

TSS - Total Suspended Solids
A laboratory analyses to measure particles that are larger than 2 microns found in the wastewater.

TS - Total Solids
Is a measure of the suspended and dissolved solids in the wastewater and in biosolids.

Unionized Ammonia Nitrogen
Un-ionized ammonia refers to all forms of ammonia in water with the exception of the ammonium ion (NH4 +).

WPCP - Water Pollution Control Plant
A facility composed of a variety of treatment processes that collectively treat wastewater

Port Darlington Water Pollution Control Plant

Annual Performance Report 2015

The Regional Municipality of Durham

Port Darlington Water Pollution Control Plant 2015 Annual Performance Report

Environmental Compliance Approval (ECA): 0114-8S8RTA Dated April 24, 2012

Environmental Compliance Approval (Air): 2242-8TFNN3 Dated June 19, 2012

The Port Darlington Water Pollution Control Plant (WPCP) Performance Report provides staff, stakeholders and customers a performance overview of the Port Darlington WPCP in 2015. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment and Climate Change (MOECC). The performance report demonstrates the commitment of ensuring that the WPCP continues to deliver wastewater services to our customers in an environmentally responsible manner.

For a description of terms and abbreviations used in this report, refer to the glossary at the end of the report.

Water Pollution Control Plant Process Description

General

The Port Darlington WPCP is owned and operated by the Regional Municipality of Durham in accordance with the terms and conditions of the ECA. The plant is located in the Municipality of Clarington (Bowmanville).

Port Darlington WPCP treats wastewater from the Bowmanville service area in the Regional Municipality of Durham. The Port Darlington WPCP has been undergoing an expansion since 2012. Two new trains have been added as of November 2015 and are treating all incoming sewage. The four existing trains were removed from service for refurbishment before substantial completion can be granted. The Port Darlington WPCP services 39,520 residents.

The Port Darlington WPCP is designed to treat wastewater at an average daily flow rate of 13,638 cubic metres per day (m^3/d) with an increased rating of 27,276 m^3/d once the plant expansion is completed and substantial completion is recognized as noted in the ECA. The plant is an MOECC Class Three conventional activated sludge treatment plant that utilizes the following processes to treat wastewater:

- raw influent pumping,
- preliminary treatment,
- primary treatment,
- secondary treatment,
- phosphorus removal system,
- disinfection (chlorination/dechlorination),
- solids treatment – anaerobic digestion.

Raw Influent Pumping

Wastewater is collected through approximately 135 km of sanitary sewers in Bowmanville and is conveyed to the Port Darlington WPCP by gravity to a sanitary sewage pumping station located at the WPCP.

Preliminary Treatment

Screening: Two automatic, mechanically cleaned screens remove paper products and large material that could harm pumps and process equipment. Screenings removed in this process are compacted for landfill disposal.

Grit Removal: Heavy suspended material such as sand and small stones (grit) is removed in the two vortex grit tanks. The velocity of the wastewater swirling in the tanks is controlled by the velocity of influent flow to 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 dewatered and transported to landfill.

Primary Treatment

The two primary clarifiers utilize the physical process of sedimentation which allows suspended material to settle to the bottom of the tank as sludge. This raw sludge, along with waste 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 digesters for further treatment. Any material floating on the surface of the clarifier (scum) is also removed to the digester.

Secondary Treatment

Aeration Tanks: The aerations tanks are comprised of two distinct sections. The first section is an anoxic zone, where there is no oxygen introduced, to allow for denitrification. The second part of the tank is where fine bubbled air is diffused into the sewage to remove organics and nutrients from the wastewater. Biological activity is controlled to assimilate the organic material.

Secondary Clarifier: The effluent from the aeration tanks is directed to the secondary clarifiers where it settles quickly as an activated (living) sludge leaving a clear supernatant to overflow the tank. The activated sludge collected on the bottom of the clarifier is pumped back to the head of the aeration tank. Waste activated sludge is sent to the primary clarifier where it blends with the settled sludge and is removed to the anaerobic digester.

Phosphorus Removal System

The phosphorous removal system is intended to lower the total phosphorous level in the final effluent by adding a chemical coagulant (ferrous chloride) as part of the treatment process. Ferrous chloride can be added at multiple locations throughout the WPCP.

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 single chlorine contact chamber. Disinfected effluent is dechlorinated with a sodium bisulphite solution before being discharged through the 1,350 mm diameter outfall extending 1,100 meters into Lake Ontario.

Solids Treatment - Anaerobic Digestion

The raw sludge that is collected from the primary clarifiers is pumped into the primary digester. Anaerobic digestion reduces the volume of sludge by bacteria consuming the organic material. As these digesters are currently under construction, they are being used as sludge storage tanks only. All sludge produced at the Port Darlington WPCP is hauled to Harmony Creek WPCP or to Duffin

Creek WPCP for further processing. Sludges are transported plant to plant in accordance with ECA #A820250.

Environmental Compliance Approval

Under Condition 10 (6) of ECA #0114-8S8RTA 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, including an overview of the success and adequacy of the Works;

- The Port Darlington WPCP effluent was determined to be compliant with the ECA approval limits during the reporting period. The plant operated at an average of 93% of its rated capacity and received a maximum daily flow of 38,720 m^3/d on October 29, 2015. See tables for effluent results.

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

There were no operating problems encountered in 2015.

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

- Due to the construction, no major maintenance was done outside of the expansion scope of work.

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. All results were found to be within 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 and the secondary clarifier flow meter occurred on June and December 2015.
- Calibration of the in-house lab pH meter is conducted regularly.

f) A description of efforts made and results achieved in meeting the Effluent Objectives;

The Regional Municipality of Durham continually strives to achieve the best effluent quality at all times, remaining below the ECA compliance limits.

The annual average daily flow did not exceed the rated capacity of 13,638 m^3/d during the reporting period.

An effluent objective for total ammonia nitrogen was exceeded on one occasion – the newly constructed treatment trains have alleviated this issue.

The total chlorine residual objective was exceeded in 25 of 44 samples (57%). The newly constructed dechlorination system is intended to correct this.

The pH objective of 6.5 was exceeded in 55 of 279 samples (20%). The pH meter was calibrated as required and ultimately in December a replacement meter was purchased.

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

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 Port Darlington WPCP in 2015 was 47,671 m^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 – 13,040 m^3 or 27%
Harmony Creek WPCP – 34,631 m^3 or 73%

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

There were no documented complaints received about the Port Darlington WPCP in 2015.

i) A summary of all By-pass, Spills or abnormal discharge events;

There were no by-passes during the reporting period. There are no anticipated by-passes planned during the next reporting period.

There were no spills during the reporting period.

MOECC Inspection

No MOECC inspection occurred in 2015.

Table 1 Influent Flows

Month	Total Flow to Plant -metered at the final effluent m^3	Average Daily Flow m^3/d	Maximum Daily Flow m^3/d
January	386,390	12,464	18,600
February	303,690	10,846	13,110
March	390,250	12,589	14,820
April	517,570	17,252	32,660
May	390,160	12,586	14,670
June	473,680	15,789	31,170
July	395,270	12,751	19,080
August	364,220	11,749	16,550
September	346,160	11,539	17,020
October	417,410	13,465	38,720
November	349,597	11,653	18,210
December	307,177	9,909	12,366
Total	4,641,574		
Average	386,798	12,717*	
Minimum	303,690		
Maximum	517,570		38,720
ECA Requirement		13,638	
Met Compliance		Yes	

*Annual Average Daily Flow

Table 2 Raw Influent Analyses

Month	$CBOD_5$ avg. conc. mg/L	$CBOD_5$ avg. loading kg/d	BOD_5 avg. conc. mg/L	BOD_5 avg. loading kg/d	TSS avg. conc. mg/L	TSS avg. loading kg/d	TP avg. conc. mg/L	TP avg. loading kg/d
January	102	1,267	166	2,072	280	3,484	5.5	69
February	224	2,427	445	4,827	297	3,222	5.8	63
March	134	1,684	193	2,427	271	3,412	4.6	58
April	82	1,419	129	2,227	204	3,513	3.2	55
May	121	1,523	171	2,146	244	3,069	4.8	60
June	102	1,610	137	2,165	313	4,940	6.1	96
July	129	1,645	194	2,474	232	2,963	5.6	71
August	133	1,563	164	1,927	233	2,739	5.1	60
September	141	1,629	178	2,056	225	2,597	4.8	55
October	146	1,966	191	2,575	230	3,102	4.7	63
November	111	1,293	170	1,981	244	2,847	6.3	73
December	143	1,412	189	1,872	292	2,893	4.8	48
Average	131	1,661	194	2,466	255	3,248	5.1	65
Minimum	82	1,267	129	1,872	204	2,597	3.2	48
Maximum	224	2,427	445	4,827	313	4,940	6.3	96
Sampling Frequency Requirement Met			Yes		Yes		Yes	

Table 2 Raw Influent Analyses continued

Month	DP avg. conc. mg/L	TKN avg. conc. mg/L	TAN avg. conc. mg/L	TAN avg. loading kg/d	pH min.	pH max.
January	2.92	47.05	26.8	334	6.60	8.00
February	5.83	46.73	28.7	312	6.37	7.90
March	2.11	39.56	27.7	349	5.83	7.40
April	1.24	27.45	17.7	305	6.40	7.40
May	2.03	37.53	24.9	313	6.62	7.40
June	1.41	28.78	22.2	350	6.45	7.20
July	2.04	40.35	27.1	346	6.20	7.04
August	2.10	37.85	27.3	321	6.60	7.20
September	2.14	40.54	27.0	312	6.60	7.40
October	1.73	38.80	23.8	320	6.60	7.50
November	2.85	52.15	34.1	398	6.67	7.90
December	2.03	42.18	29.1	288	6.70	8.00
Average	2.37	39.91	26.4	335		
Minimum	1.24	27.45	17.7	288	5.83	
Maximum	5.83	52.15	34.1	398		8.00
Sampling Frequency Requirement Met		Yes	Yes		Yes	Yes

Table 3 Final Effluent Analyses

Month	$CBOD_5$ avg. conc. mg/L	$CBOD_5$ avg. loading kg/d	TSS avg. conc. mg/L	TSS avg. loading kg/d	TP avg. conc. mg/L	TP avg. loading kg/d	TAN avg. conc. mg/L winter	TAN avg. loading kg/d
January	4.3	53.0	12.0	149.7	0.39	4.85	10.35	129.05
February	3.8	40.9	11.5	125.0	0.43	4.64	10.86	117.76
March	3.8	47.6	10.6	133.2	0.36	4.51	15.29	192.50
April	4.1	69.9	10.4	180.1	0.42	7.24	10.72	184.98
May	2.9	36.2	12.4	155.6	0.39	4.93	12.31	154.92
June	2.1	33.8	10.0	157.1	0.45	7.07	10.22	161.29
July	5.2	66.3	6.7	85.1	0.34	4.34	8.85	112.80
August	1.8	21.1	6.8	79.8	0.29	3.37	12.12	142.45
September	2.3	26.1	9.3	107.6	0.49	5.62	15.27	176.14
October	4.3	57.6	10.7	143.8	0.44	5.95	13.61	183.29
November	4.9	56.8	8.3	96.8	0.69	8.01	9.71	113.11
December	6.6	65.8	12.8	126.8	0.66	6.55	0.58	5.74
Average	3.8	47.9	10.1	128.7	0.44	5.66	10.82	137.64
Minimum	1.8	21.1	6.7	79.8	0.29	3.37	0.58	5.74
Maximum	6.6	69.9	12.8	180.1	0.69	8.01	15.29	192.50
ECA Requirement	25.0		25.0		1			
ECA Objective	15.0		15.0		1		14	
Within Compliance	Yes		Yes		Yes			
Sampling Frequency Requirement Met	Yes		Yes		Yes		Yes	

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	TCR avg. loading kg/d	pH min.	pH max.	Temp. °C min.	Temp. °C max.
January	0.01	12.98	0.08	N/A	N/A	6.10	6.80	11.3	13.4
February	0.01	17.63	0.08	N/A	N/A	6.10	6.90	9.5	13.8
March	0.02	17.24	0.09	N/A	N/A	6.30	7.00	10.2	11.9
April	0.01	11.80	0.11	N/A	N/A	6.40	7.00	10.6	13.2
May	0.03	14.43	0.16	0.44	5.52	6.15	7.20	13.2	16.2
June	0.01	11.54	0.17	0.74	11.62	6.16	7.10	15.4	21.4
July	0.02	10.53	0.10	0.76	9.74	5.62	6.89	16.8	22.1
August	0.02	13.88	0.12	0.78	9.11	6.40	6.85	19.0	21.2
September	0.04	17.92	0.18	0.77	8.86	6.40	7.20	19.7	22.0
October	0.03	18.58	0.13	0.56	7.47	6.50	7.20	11.1	18.6
November	0.02	12.28	0.45	N/A	N/A	6.53	7.40	7.7	17.8
December	0.00	7.26	0.21	0.41	4.04	6.30	7.50	10.2	15.3
Average	0.02	13.84	0.16	0.63	8.07				
Minimum	0.00	7.26	0.08	0.41	4.04	5.62		7.7	
Maximum	0.04	18.58	0.45	0.78	11.62		7.50		22.1
ECA Requirement						5.5	9.5		
ECA Objective				0.5		6.5	9.0		
Within Compliance				Yes		Yes	Yes		
Sampling Frequency Requirement Met	Yes			Yes		Yes	Yes	Yes	Yes

Table 4 Escherichia Coliform Sampling

Month	Number of Samples	Geometric Mean Density
January	4	12,848
February	4	10,150
March	5	4,978
April	4	18,951
May	4	1,313
June	5	434
July	5	18
August	4	454
September	5	104
October	4	1,514
November	4	13,902
December	5	661
ECA Requirement		200*
ECA Objective		N/A
Within Compliance		N/A
Sampling Frequency Requirement Met	Yes	

NOTE: *ECA limit of 200 organisms per 100 ml is not required until disinfection system upgrade completed

Table 5 Energy and Chemical Usage

Month	Total Plant Flow (cubic metres)	Alum (litres)	Ferrous Chloride (litres)	Sodium Hypochlorite (kilograms as chlorine)	Sodium Bisulphite (Litres)	Hydro (kWh)	Natural Gas (cubic metres)
January	386,390	50,341	0	0	0	131,286	12,572
February	303,690	42,185	0	0	0	116,586	7,941
March	390,250	49,080	0	0	0	129,408	8,032
April	517,570	50,507	0	0	0	147,466	4,237
May	390,160	50,301	0	571	0	164,682	5,002
June	473,680	50,217	0	1,128	0	136,338	497
July	395,270	48,800	0	1,161	0	135,132	393
August	364,220	47,999	0	1,090	0	146,870	3,115
September	346,160	45,857	0	1,318	0	146,013	3,063
October	417,410	48,822	0	550	0	251,245	5,489
November	349,597	21,920	6,165	0	0	237,753	12,546
December	307,177	0	24,795	161	451	256,082	23,143
Total	4,641,574	506,029	30,960	5,978	451	1,998,861	86,030

Table 6 Summary of Raw Water Bacteriological Analyses at the Bowmanville Water Supply Plant

Month	E.coli cfu/100ml (min-max result)	E.coli (number of samples)	Total Coliform cfu/100ml (min-max result)	Total Coliform (number of samples)
January	<1	16	<1-3	16
February	<1	15	<1	15
March	<1	18	<1-12	18
April	<1-1	17	<1-34	17
May	<1-1	15	<1-2	15
June	<1-1	18	<1-10	18
July	<1-1	17	<1-6	17
August	<1-2	16	<1-240	16
September	<1-1	17	<1-180	17
October	<1-7	16	<1-90	16
November	<1-15	16	<1-73	16
December	<1-1	16	<1-3	16

Glossary of Terms

Aeration Tank
A vessel in which a biological process is carried out which involves bacterial organisms or biochemically active substances derived from such organisms. This encompasses a combination of aerobic, anoxic, and anaerobic processes.

Anaerobic Digestion
Is a series of biological processes in which microorganisms break down biodegradable material in the absence of oxygen.

Annual Average Concentration
An arithmetic mean of the monthly average concentrations of a contaminant in the effluent calculated for any particular year.

Annual Average Loading
The value obtained by multiplying the Annual Average Concentration of a contaminant by the Average Daily Flow over the same calendar year.

Average Daily Flow
The cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year.

Biosolids
Organic material recovered from wastewater sludge.

BOD_5 Five Day Biochemical Oxygen Demand
(also known as totalBOD_5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand.

By-pass
A diversion of sewage around one or more unit processes within the Sewage Treatment Plant with the diverted sewage flows being returned to the Sewage Treatment Plant treatment train upstream of the Final effluent sampling location, and discharging to the environment through the Sewage Treatment Plant outfall.

$CBOD_5$ -Five day Carbonaceous Biochemical Oxygen Demand
A five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample.

conc. - Concentration

DP – Dissolved Phosphorus
The soluble form of phosphorus present in the wastewater.

ECA - Environmental Compliance Approval
The primary regulatory instrument for each WPCP.

E. coli - (Escherichia coli)
Refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius.

Final Effluent
Sewage discharge via the Sewage Treatment Plant outfall after undergoing the full train of unit processes as listed in the Environmental Compliance Approval.

Geometric Mean Density
Is the nth root of the product of multiplication of the results of n number of samples over the period specified.

Grab Sample
A single sample taken at a specific moment in time, a snapshot of the conditions at the time the sample was retrieved.

m^3 - (Cubic Metre)
Volume measurement, $1m^3$ = 1000 litres or 220 imperial gallons.

m^3/d - (Cubic Metres Per Day)
Flow measurement, $1m^3$ = 1000 litres or 220 imperial gallons. Volume of liquid treated in a 24 hour period.

Max. – Maximum

Maximum Flow Rate
The peak or highest flow recorded during a specific time period usually in a twenty-four (24) period.

mg/L - (Milligram Per Litre)
This is a measure of the concentration of a parameter in water or wastewater, sometimes referred to as parts per million (ppm).

Min. – Minimum

mm - (millimetre)
A unit of length in the metric system, equal to one thousandth of a metre.

MOECC - (Ministry of the Environment and Climate Change)
The Provincial regulatory agency responsible for overseeing the water and wastewater industries in Ontario. Their primary functions include approval for new or expanding facilities, inspections and investigations.

Monthly average concentration
The arithmetic mean of all daily concentrations of a contaminant in the effluent sampled or measured, or both, during a calendar month.

Monthly average loading
Is calculated by multiplying the monthly average concentration of a contaminant in the effluent sampled or measured, or both, during a calendar month.

N/A - Not Applicable

pH
Index of hydrogen ion activity, pH is defined as the negative logarithm of hydrogen ion concentration in moles per litre. The pH may range from 0 – 14, where 0 is most acidic, 14 most basic and 7 neutral.

Rated Capacity
The average daily flow for which the works are approved to handle.

Raw Influent
Raw wastewater entering the water pollution control plant before treatment.

Septage
Partially treated sludge from a septic tank.

Sludge
The settleable solids separated from liquids during processing.

Substantial completion
Has the same meaning as “substantial performance” in the Construction Lien Act.

TAN -Total Ammonia Nitrogen
Ammonia exists in two forms in the water: NH3 (this is called unionized ammonia) NH4+ (this is called ionized ammonia) Together, these two forms of ammonia are called TAN which means total ammonia nitrogen.

TCR -Total Chlorine Residual
The total amount of chlorine in water, including the combined chlorine and the free available chlorine.

Temp. – Temperature

TP -Total Phosphorus
A laboratory analyses to determine the total amount of particulate and soluble phosphorus present in the wastewater.

TSS -Total Suspended Solids
A laboratory analyses to measure particles that are larger than 2 microns found in the wastewater.

TS -Total Solids
Is a measure of the suspended and dissolved solids in the wastewater and in biosolids.

Unionized Ammonia Nitrogen
Un-ionized ammonia refers to all forms of ammonia in water with the exception of the ammonium ion (NH4 +).

Works
The sewage works described in the owner’s application, and the ECA, and includes both proposed works and previous works.

WPCP - Water Pollution Control Plant
Is typically a facility composed of a variety of treatment processes that collectively treat the wastewater.

If this information is required in an accessible format, please contact 1-800-372-1102 extension 3488

Sunderland Water Pollution Control Plant

Annual Performance Report 2015

The Regional Municipality of Durham

Sunderland Water Pollution Control Plant 2015 Annual Performance Report

Environmental Compliance Approval (ECA): 9252-8CUNBZ Dated June 28, 2012

The Sunderland Water Pollution Control Plant (WPCP) Performance Report provides staff, stakeholders and customers an overview of the performance of the Sunderland WPCP in 2015. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment and Climate Change (MOECC). The performance report demonstrates the commitment of ensuring that the WPCP continues to deliver wastewater services to our customers in an environmentally responsible manner.

For a description of terms and abbreviations used in this report, refer to the glossary at the end of the report.

General

The Sunderland WPCP is owned and operated by the Regional Municipality of Durham in accordance with the terms and conditions of the ECA. The plant is located in the Community of Sunderland in the Township of Brock. This MOECC Class One wastewater treatment plant is designed to treat wastewater at a rated capacity of 632 cubic metres per day (m^3/d) and utilizes a seasonal retention wastewater stabilization lagoon system. The Sunderland WPCP has a service population of 1,183 residents.

Raw Influent

Wastewater is collected through 7.7 km of sanitary sewers in the Sunderland service area and is conveyed to the treatment facility by a single pumping station located on River Street.

Lagoon Treatment

The Sunderland WPCP is a two cell lagoon system where the influent raw sewage enters a retention stabilization lagoon and overflows into an exfiltration cell giving a combined retention time of 182.5 days. The ECA permits two seasonal discharges per year. Spring discharge is for 20 days in May and fall discharge is for 20 days in November. Prior to and during discharge to the Beaver River, samples are collected to verify the effluent will meet the limits established in the ECA.

Environmental Compliance Approval

Under Condition 9 (4) of ECA #9252-8CUNBZ the Region of Durham must produce an annual 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 Sunderland WPCP effluent was determined to be compliant with the approval limits during the reporting period. In early fall of 2015, the River Street Sanitary Sewage Pumping Station flow meter was found to be inaccurate. Based on a historical five year trend the utilization is estimated to be approximately 70%. Replacement of the flowmeter was completed in February 2016. The total treated effluent discharged to the Beaver River in 2015 was calculated to be 102,118 m^3. Table 4 provides a tabulation of effluent results.

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

The River Street Sanitary Sewage Pumping Station flow meter was found to be inaccurate. The wet well and discharge chamber were inspected and cleaned. Replacement of the flow meter was completed in February 2016.

c) Maintenance of major equipment

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 within a comparable range.

e) Summary of the calibration and maintenance carried out on all effluent monitoring equipment

- The influent flow meter located at River Street pumping station was calibrated in April and August, 2015.
- Temperature and pH are monitored in the field, all other routine process control tests are performed at the Lake Simcoe WPCP laboratory in Beaverton. All monitoring and laboratory equipment is calibrated and maintained according to manufacturer's specifications.

f) Estimate of sludge settling capacity of the lagoon and annual depletion

The annual depletion of the sludge settling capacity is negligible. There was no removal of solids from the lagoons in 2015. Due to additional funding required the design and construction of a maintenance lagoon was not completed in 2015 and is scheduled for 2016.

g) Efforts made and results achieved in meeting the effluent objectives of Condition 4

- The Regional Municipality of Durham strives to achieve the best effluent quality at all times consistently remaining well below ECA limits.
- The annual average daily flow did not exceed the rated capacity of 632 m^3/d during the reporting period. The peak flow rate of 727 m^3/d was not exceeded.
- The maximum objective for pH was exceeded once on November 2nd during the fall discharge.
- The total phosphorus objective was exceeded once on November 12th during the fall discharge, as a result the discharge was stopped.
- Best efforts will continue to be applied to maintain results below objectives.

h) Complaints

A summary of complaints received from the public is administered through a central database.

No complaints were received during the reporting period regarding this plant.

i) By-passes

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

j) Initial Effluent Characterization

The initial effluent characterization sampling was conducted during 2015 with a completion date of November 2nd, 2015. A report will be submitted in April of 2016, as per Condition 8 (3) of the ECA.

k) Information Required by MOECC Water Supervisor

No additional information required.

Proposed Alterations, Extensions or Replacements

Design and construction of a maintenance lagoon to allow for storage during cleaning is scheduled to be completed in 2016.

MOECC Inspection

This plant was inspected by the MOECC on January 12, 2015.

Summary of Tables

Table 1 Raw Influent Flows

Month	Total Flow to Plant - metered at the River Street Pumping Station m^3	Average Daily Flow m^3/d	Maximum Daily Flow m^3/d	Minimum Daily Flow m^3/d
January	8,125	262	219	221
February	6,103	218	270	149
March	7,418	239	277	190
April	8,504	283	316	232
May	7,298	235	255	212
June	8,135	271	392	200
July	8,314	268	333	217
August	6,187	200	228	164
September	5,676	189	246	167
October	5,263	170	206	149
November	5,743	191	211	165
December	5,863	189	208	151
Total	82,629			
Average	6,886	226*		
Minimum	5,263	170		149
Maximum	8,504	283	392	
ECA Requirement		632*		
Met Compliance		Yes		

*Annual average daily flow

Flowmeter was found to be inaccurate, replaced February 2016

Table 2 Raw Influent Analyses

Month	$CBOD_5$ avg. conc. mg/L	$CBOD_5$ loading kg/d	BOD5 avg. conc. mg/L	BOD5 loading kg/d	TSS avg conc. mg/L	TSS loading kg/d	TP avg conc. mg/L	TP loading kg/d
January	175	46	263	69	426	112	6.1	1.6
February	126	27	188	41	243	53	6.4	1.4
March	129	31	166	40	220	53	5.8	1.4
April	74	21	122	35	160	45	3.9	1.1
May	111	26	145	34	190	45	4.1	1.0
June	102	28	135	37	223	60	3.9	1.1
July	159	43	167	45	307	82	4.3	1.2
August	106	21	138	28	296	59	4.8	1.0
September	166	31	212	40	360	68	5.6	1.1
October	256	44	325	55	388	66	7.4	1.3
November	126	24	174	33	229	44	5.3	1.0
December	130	25	176	33	226	43	5.7	1.1
Average	138	31	184	42	272	62	5.3	1.2
Minimum	74	21	122	28	160	43	3.9	1.0
Maximum	256	46	325	69	426	112	7.4	1.6
Sampling Frequency Requirement Met	Yes		Yes		Yes		Yes	

Table 2 Raw Influent Analyses continued

Month	DP avg. conc. mg/L	TKN avg. conc. mg/L	TKN loading kg/d	TAN avg. conc. mg/L	TAN loading kg/d	pH min.	pH max.	Temp. Degrees Celsius min.	Temp. Degrees Celsius max.
January	2.28	44.90	12	24.8	6.5	7.4	7.8	7.3	12.6
February	3.01	52.60	11	30.5	6.6	7.6	8.5	3.9	10.2
March	3.11	49.72	12	33.7	8.1	7.5	8.4	8.2	9.2
April	1.91	33.73	10	21.8	6.2	7.4	7.7	8.8	9.6
May	1.99	36.50	9	24.8	5.8	7.6	7.9	10.4	13.2
June	1.68	30.80	8	20.1	5.4	7.0	8.4	13.7	25.0
July	1.79	35.28	9	23.8	6.4	7.0	7.8	15.3	16.4
August	2.38	40.30	8	27.1	5.4	7.5	8.0	16.4	17.1
September	2.38	48.55	9	36.4	6.9	7.1	7.7	16.8	17.4
October	3.65	71.88	12	40.0	6.8	7.3	8.4	10.2	17.0
November	2.53	46.68	9	28.5	5.4	7.6	8.4	9.8	16.7
December	3.10	51.95	10	31.3	5.9	7.6	8.3	10.4	13.4
Average	2.48	45.24	10	28.6	6.5				
Minimum	1.68	30.80	8	20.1	5.4	7.0		3.9	
Maximum	3.65	71.88	12	40.0	8.1		8.5		25.0
Sampling Frequency Requirement Met				Yes		Yes	Yes	Yes	Yes

Table 3 Calculated Effluent Flows

Month	Calculated Effluent Flow m^3
January	
February	
March	
April	
May	59,616
June	
July	
August	
September	
October	
November	42,502
December	
Total	102,118
Annual Average	51,059
Minimum	42,502
Maximum	59,616

Table 4 Final Effluent Analyses

Month	$CBOD_5$ avg. conc. mg/L	$CBOD_5$ loading kg/d	BOD5 avg. conc. mg/L	BOD5 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									
February									
March									
April									
May	4.1	22	5.7	31	4.6	25	0.05	0.3	3.0
June									
July									
August									
September									
October									
November	1.9	8	3.3	6	5.8	25	0.12	0.5	5.1
December									
Total									8.1*
Average	3.0	15	4.5	22	5.2	25	0.09	0.4	2.0
Minimum	1.9	8	3.3	6	4.6	25	0.05	0.3	3.0
Maximum	4.1	22	5.7	31	5.8	25	0.12	0.5	5.1
ECA Limit	10**				15**		0.3**		69*
ECA Objective	10				15		0.5		
LSPRS							0.25**		58*
Within Compliance	Yes				Yes		Yes		Yes
Sampling Frequency Requirement Met	Yes		Yes		Yes		Yes		

*Total Annual Loading , kg/year

**Annual Average Concentration

Table 4 Final Effluent Analyses continued

Month	DP avg. conc. mg/L	TAN avg. conc. mg/L	TAN loading kg/d	TKN avg. conc. mg/L	Un-ionized ammonia avg. conc. mg/L	pH min.	pH max.	Temp. °C min.	Temp. °C max.
January									
February									
March									
April									
May	0.003	6.18	4.93	26.7	0.10	7.6	7.9	14.7	20.5
June									
July									
August									
September									
October									
November	0.007	1.95	1.67	7.2	0.00	6.6	8.2	9.9	15.7
December									
Average	0.005	4.07	3.30	16.1	0.05				
Minimum	0.003	1.95	1.67	7.2	0.00	6.6		9.9	
Maximum	0.007	6.18	4.93	26.7	0.10		8.2		20.5
ECA Limit						6.0	9.5		
ECA Objective						6.5	8.0		
Within Compliance						Yes	Yes		
Sampling Frequency Requirement Met		Yes				Yes	Yes	Yes	Yes

Glossary of Terms

Annual Average Concentration
An arithmetic mean of the seasonal average concentrations of a contaminant in the effluent calculated for any particular year.

Annual Average Loading
The value obtained by multiplying the seasonal average concentration of a contaminant by the Average Daily Flow over the same calendar year.

Average Daily Flow
The cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year.

Avg – Average
An arithemetic mean of the average concentrations and loadings.

BOD_5 Five Day Biochemical Oxygen Demand
(also known as total BOD_5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand.

By-pass
Any discharge from any portion of the works other than in accordance with the conditions of the ECA.

$CBOD_5$ -Five Day Carbonaceous Biochemical Oxygen Demand
A five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample..

Conc. Concentration
The abundance of a constituent divided by the total volume of a mixture.

Daily Concentration
Means the concentration of a contaminant in the effluent discharged over any single day, as measured by a composite or grab sample, whichever is required.

DP – Dissolved Phosphorus
This is the soluble form of phosphorus present in the wastewater.

ECA Environmental Compliance Approval
The primary regulatory instrument for each water pollution control plant.

E. coli - (Escherichia coli)
Refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius.

Final Effluent
Sewage discharge through the water pollution control plant outfall after undergoing the full train of unit processes as listed in the Environmental Compliance Approval.

Geometric Mean Density
Is the nth root of the product of multiplication of the results of n number of samples over the period specified.

Grab Sample
A single sample taken at a specific moment in time, when tested provides a snapshot of the conditions at the time the sample was retrieved.

kg - kilogram
Basic unit of mass in the metric system

kg/d – kilogram per day

LSPRS - Lake Simcoe Phosphorus Reduction Strategy

The ECA issued on June 28, 2012 introduced additional phosphorus objectives to comply with the requirements of the Lake Simcoe Phosphorus Reduction Strategy (2010) prepared under the Lake Simcoe Protection Plan (2009).

m^3 - (Cubic Metre)

Volume measurement, $1m^3$ = 1000 litres or 220 imperial gallons.

m^3/d - (Cubic Metre Per Day)

Flow measurement, $1m^3$ = 1000 litres or 220 imperial gallons. Volume of liquid treated in a 24 hour period.

Max. - Maximum

Maximum Flow Rate

The peak or highest flow recorded during a specific time period usually in a 24 hour period.

mg./L. - (Milligram Per Litre)

This is a measure of the concentration of a parameter in water, sometimes referred to as parts per million (ppm).

Min. - Minimum

mm.-(millimetre)

Is a unit of length in the metric system, equal to one thousandth of a metre.

MOECC - (Ministry of the Environment and Climate Change)

The Provincial regulatory agency responsible for overseeing the water and wastewater industries in Ontario. Their primary functions include approval for new or expanding facilities, inspections and investigations.

Monthly Average Concentration

The arithmetic mean of all daily concentrations of a contaminant in the effluent sampled or measured, or both, during a calendar month.

Monthly Average Loading

Is calculated by multiplying the monthly average concentration of a contaminant in the effluent sampled or measured, or both, during a calendar month.

N/A - Not Applicable

N/D - No Discharge

Peak Flow Rate

The maximum rate of sewage flow for which the plant or process unit was designed.

pH

Index of hydrogen ion activity, pH is defined as the negative logarithm of hydrogen ion concentration in moles per litre. The pH may range from 0 – 14, where 0 is most acidic, 14 most basic and 7 neutral.

Rated Capacity

The average daily flow for which the works are approved to handle**.**

Raw Influent

Raw wastewater entering the water pollution control plant before treatment.

Seasonal Average Concentration

The arithmetic mean of all daily concentrations of a contaminant in the effluent sampled or measured or both during the seasonal discharge period.

Sludge

The settleable solids separated from liquids during processing.

TAN - Total Ammonia Nitrogen

Ammonia exists in two forms in the water: NH3 (this is called unionized ammonia) NH4+ (this is called ionized ammonia) Together, these two forms of ammonia are called TAN which means total ammonia nitrogen.

Temp. – Temperature

Total Annual Loading

Is calculated by adding the calculated total monthly load discharged each month during each seasonal dischargeperiod for each calendar year.

Total Monthly Loading

Is calculated by multiplying the total monthly flow by the monthly average concentration.

TP - Total Phosphorus

A laboratory analyses to determine the total amount of non-soluble and soluble phosphorus present in the wastewater.

TSS - Total Suspended Solids

A laboratory analyses to measure particles that are larger than 2 microns found in the wastewater.

TS - Total Solids

Is a measure of the suspended and dissolved solids in the wastewater and in biosolids.

WPCP - Water Pollution Control Plant

A facility composed of a variety of treatment processes that collectively treat wastewater

If this information is required in an accessible format, please contact 1-800-372-1102 extension 3488

Uxbridge Brook Water Pollution Control Plant

Annual Performance Report 2015

The Regional Municipality of Durham

Uxbridge Brook Water Pollution Control Plant 2015 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) Performance Report provides staff, stakeholders and customers an overview of the performance of the Uxbridge Brook WPCP in 2015. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment and Climate Change (MOECC). The performance report demonstrates the commitment of ensuring that the WPCP continues to deliver wastewater services to our customers in an environmentally responsible manner.

For a description of terms and abbreviations used in this report, refer to the glossary at the end of the report.

Water Pollution Control Plant Process Description

General

The Uxbridge Brook WPCP is owned and operated by the Regional Municipality of Durham in accordance with the terms and conditions of the ECA. The plant is located in the Township of Uxbridge. 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 11,055 residents.

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

- preliminary treatment,
- secondary treatment,
- tertiary filtration,
- disinfection,
- aerobic digestion.

Raw Influent

Wastewater is collected through approximately 50 km of sanitary sewers in Uxbridge and is conveyed to the WPCP by gravity and one sanitary sewage pumping station (Sandy Hook).

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 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 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.

Secondary Treatment

Aeration Tanks: Preliminary effluent flow is directed to two aeration tanks. Aluminum sulphate is added to the aeration tanks to react with and remove phosphorus. Fine bubbled air is diffused into the sewage to remove dissolved and suspended solids and nutrients from the wastewater. Biological activity is controlled to assimilate the organic material.

Secondary Clarifiers: The effluent from the aeration tank is directed to three secondary clarifiers where it settles quickly as an activated (living) sludge leaving a clear effluent to overflow the clarifier. The activated sludge collected on the bottom of the clarifier is pumped back to the head of the aeration tanks. The microorganisms are returned to repeat the process. Any excess activated sludge is ‘wasted’ 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 triggered by an increase in head pressure or on a programmed timer. The backwash water is returned to the head of the plant for further treatment.

Disinfection

Ultra Violet (UV) Irradiation: The effluent flow from the sand filter is then directed to the UV system channel for disinfection. The effluent passes two banks of UV lamps connected in series. The treated effluent is discharged to the Uxbridge Brook.

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

Biosolids: Stabilized biosolids from the digester are transported plant to plant within the Region of Durham for further treatment, stabilization or incineration in accordance with ECA #A820250.

Environmental Compliance Approval

Under Condition 9 (5) of ECA #8357-8CTQ5V the Region of Durham must produce an annual 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 77.7% of its rated capacity and received a maximum daily flow of 5,923 m^3/d on June 28th, 2015. Tables 3 and 4 provide a tabulation of effluent results.

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

No operating problems were encountered in 2015

c) Maintenance of major equipment

No major maintenance items occurred in 2015.

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 meters occurred in June and October 2015.
- All monitoring and laboratory equipment is calibrated and maintained according to manufacturer's specifications.

f) Efforts made and results achieved in meeting the effluent objectives

- The Regional Municipality of Durham strives to achieve the best effluent quality at all times, remaining below the ECA compliance limits.
- The annual average daily flow did not exceed the rated capacity of 5,221m^3/d during the reporting period . The peak flow rate of 15,110 m^3/d was never exceeded.
- The effluent objective for total suspended solids was exceeded once on January 14th .
- The effluent objective for total ammonia nitrogen was exceeded twice, May 14th and 15th.
- The effluent objective for total phosphorus was exceeded 28 times of 312 samples (9%). Aluminum sulphate dosage was increased to accommodate.
- The minimum effluent objective for pH was exceeded 41 times of 265 samples (15.5%). 24 of the exceedances occurred during the months of January and February. The techniques for calibration and measurement were reviewed at this time. Regular maintenance and cleaning of the probe electrode was performed with continuous monitoring for the remainder of the year.
- Best efforts and process adjustments will continue to be applied to maintain results below objectives.

g) Sludge Generated

A summary of the sludge volume generated in the reporting period is included in Table 5. There is no increase of sludge volume expected in the next reporting period.

h) Complaints

A summary of complaints received from the public is administered through a central database. There were no complaints received during the reporting period.

i) By-passes

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

j) Initial Effluent Characterization

The initial effluent characterization sampling was conducted during 2015 with a completion date of October 13th, 2015. A report will be submitted in April, 2016 as per Condition 8 (3) of the ECA.

k) Information Required by MOECC Water Supervisor

No additional information required.

Proposed Alterations, Extensions or Replacements

No proposed alterations, extensions or replacements.

MOECC Inspection

This plant was not inspected by the MOECC in 2015.

Summary of Tables

Table 1 Flows

Month	Plant Flow m3	Average Daily Flow m^3/d	Maximum Daily Flow m^3/d
January	117,224	3,781	4,775
February	99,648	3,559	3,774
March	122,500	3,952	4,533
April	134,318	4,477	5,060
May	131,303	4,236	5,697
June	140,206	4,539	5,923
July	136,912	4,417	5,171
August	123,240	3,975	4,319
September	116,024	3,867	4,547
October	122,300	3,945	4,823
November	127,244	4,241	4,621
December	110,555	3,566	3,855
Total	1,481,474		
Average	123,456	4,059*	
Minimum	99,648		
Maximum	140,206		5,923
ECA Requirement		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	225	851	219	828	4.9	19	2.0
February	219	779	232	826	6.2	22	2.6
March	188	743	240	948	4.4	17	1.9
April	159	712	206	922	3.9	17	1.7
May	147	623	233	987	4.0	17	1.7
June	202	917	243	1,103	4.5	20	1.9
July	194	857	223	985	4.5	20	1.8
August	188	747	225	894	4.0	16	2.0
September	198	766	228	882	4.6	18	1.9
October	156	615	155	611	3.9	15	1.9
November	115	488	162	687	3.8	16	2.4
December	143	510	119	424	4.0	14	2.3
Average	178	722	207	841	4.4	18	2.0
Minimum	115	488	119	424	3.8	14	1.7
Maximum	225	917	243	1,103	6.2	22	2.6
Sampling Frequency Requirement Met	Yes		Yes		Yes		Yes

Table 2 Raw Influent Analyses continued

Month	TKN avg. conc. mg/L	TKN loading kg/d	TAN avg. conc. mg/L	TAN loading kg/d	Alkal-inity $CaCO_3$ mg/L	pH min.	pH max.	Temp. Degrees Celsius min.	Temp. Degrees Celsius max.
January	37.03	140	25.0	94.5	352	7.1	8.5	11.2	13.8
February	45.98	164	29.5	105.0	338	7.2	7.5	5.6	10.6
March	25.32	100	23.0	90.9	309	7.8	8.3	10.4	15.2
April	33.42	150	21.7	97.2	327	7.6	8.4	11.5	14.4
May	31.40	133	22.0	93.2	324	7.3	8.3	13.9	16.9
June	36.50	166	22.8	103.5	330	7.3	8.4	14.8	19.7
July	38.05	168	24.4	107.8	337	7.4	8.2	15.5	20.4
August	34.98	139	23.4	93.0	327	7.5	8.3	17.8	20.4
September	36.26	140	24.3	94.0	327	7.0	8.4	17.9	21.0
October	35.38	140	23.8	93.9	334	6.7	8.4	16.1	18.2
November	33.23	141	24.0	101.8	330	7.6	8.6	13.8	18.7
December	35.50	127	25.2	89.9	337	7.0	8.5	12.8	17.5
Average	35.25	143	24.1	97.8	331				
Minimum	25.32	100	21.7	89.9	309	6.7		5.6	
Maximum	45.98	168	29.5	107.8	352		8.6		21.0
Sampling Frequency Requirement Met	Yes		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	0.7	2.6	2.2	8.3	0.03	0.11	4
February	0.8	2.8	2.6	9.3	0.08	0.28	8
March	1.4	5.5	1.7	6.7	0.10	0.40	12
April	1.3	5.8	2.0	9.0	0.10	0.45	13
May	0.7	3.0	1.8	7.6	0.06	0.25	8
June	0.6	2.8	1.3	5.9	0.03	0.14	4
July	0.5	2.2	0.8	3.5	0.03	0.13	4
August	0.7	2.8	1.0	4.0	0.03	0.12	4
September	0.5	1.9	1.5	5.8	0.03	0.12	3
October	0.7	2.8	1.2	4.7	0.03	0.12	4
November	0.8	3.4	1.4	5.9	0.05	0.21	6
December	0.7	2.5	1.4	5.0	0.04	0.14	4
Total							75*
Average	0.8	3.2	1.6	6.4	0.05	0.21	6
Minimum	0.5	1.9	0.8	3.5	0.03	0.11	3
Maximum	1.4	5.8	2.6	9.3	0.10	0.45	13
ECA Limit	8.5**	30.9****	10**	36.3****	0.15**	0.78****	286*
ECA Objective	5		5		0.1		
LSPRS					0.15***		286*
Within Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sampling Frequency Requirement Met	Yes		Yes		Yes	Yes	

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

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	0.02	0.08			0.67	0.0
February	0.04	0.03	0.11			0.86	0.0
March	0.04	0.04	0.16			0.79	0.0
April	0.03	0.08	0.36			0.87	0.0
May	0.01			0.80	3.39	1.12	0.0
June	0.01			0.03	0.14	0.62	0.0
July	0.01			0.02	0.09	0.55	0.0
August	0.01			0.05	0.20	0.61	0.0
September	0.01			0.06	0.23	0.91	0.0
October	0.02			0.03	0.12	0.63	0.0
November	0.02			0.14	0.59	1.04	0.0
December	0.18	0.04	0.14			0.80	0.0
Average	0.03	0.04	0.17	0.16	0.68	0.79	0.0
Minimum	0.01	0.02	0.08	0.02	0.09	0.55	0.0
Maximum	0.18	0.08	0.36	0.80	3.39	1.12	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

Table 3 Final Effluent Analyses continued

Month	Nitrate Nitrogen avg. conc. mg/L	Alkal-inity $CaCO^3$. mg/L	pH min.	pH max.	Temp. Degrees Celsius min.	Temp. Degrees Celsius max.
January	27.3	93	6.22	7.10	8.9	12.5
February	28.5	99	6.36	7.47	5.6	10.6
March	27.4	89	6.45	7.51	8.9	12.7
April	25.3	97	6.47	7.44	10.8	18.9
May	26.5	88	6.55	7.40	13.5	17.4
June	26.0	102	6.32	7.26	15.1	18.9
July	25.2	93	6.28	7.20	16.3	19.8
August	24.2	100	6.55	7.09	18.1	20.2
September	27.4	87	6.39	7.22	17.5	20.6
October	29.0	88	6.33	7.13	14.5	17.8
November	27.6	100	6.34	7.36	13.4	17.3
December	28.8	96	6.56	7.83	12.5	15.3
Average	26.9	94				
Minimum	24.2	87	6.2		5.6	
Maximum	29.0	102		7.8		20.6
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	Yes

Table 4 Escherichia Coliform Sampling

Month	Number of Samples	Geometric Mean Density
January	4	0
February	5	0
March	4	0
April	5	0
May	5	0
June	5	0
July	4	0
August	5	0
September	5	0
October	4	0
November	5	0
December	5	0
ECA Objective		200
Sampling Frequency Requirement Met	Yes	

Table 5 Energy and Chemical Usage

Month	Aluminum Sulphate (litres)	Hydro (kWh)	Natural Gas (cubic metres)
January	23,954	138,866	2,512
February	14,160	129,054	2,145
March	22,302	99,244	2,536
April	27,140	106,696	1,366
May	26,609	107,373	1,225
June	23,730	102,017	527
July	25,099	102,630	121
August	20,975	93,800	101
September	20,178	95,955	314
October	18,750	104,061	39
November	29,294	101,168	788
December	19,134	105,885	775
Total	271,325	1,286,749	12,449

Table 6 Summary of the Solids Produced

Month	Total Hauled (cubic metres)	Total Solids %	Hauled to Duffin Creek WPCP
January	1,200	1.65	1,200
February	960	1.76	960
March	1,160	1.48	1,160
April	1,240	1.49	1,240
May	1,360	1.22	1,360
June	1,680	1.10	1,680
July	1,360	1.50	1,360
August	920	1.55	920
September	1,160	1.76	1,160
October	1,160	1.08	1,160
November	1,160	0.94	1,160
December	1,240	1.21	1,240
Total	14,760		14,760

Glossary of Terms

Annual Average Concentration
An arithmetic mean of the monthly average concentrations of a contaminant in the effluent calculated for any particular year.

Annual Average Loading
The value obtained by multiplying the annual average concentration of a contaminant by the average daily flow over the same calendar year.

Average Daily Flow
The cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year.

Avg – Average
An arithemetic mean of the average concentrations and loadings.

Biosolids
Organic material recovered from wastewater sludge.

Bioreactor
A bioreactor is a vessel in which a biological process is carried out which involves bacterial organisms or biochemically active substances derived from such organisms.

BOD_5 Five Day Biochemical Oxygen Demand
(also known as total BOD_5) a five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand.

By-pass
Any discharge from the works that does not undergo any treatment or only undergoes partial treatment before it is discharged to the environment.

$CBOD_5$ -Five Day Carbonaceous Biochemical Oxygen Demand
A five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample..

Conc. - Concentration
The abundance of a constituent divided by the total volume of a mixture.

Daily Concentration
The concentration of a contaminant in the effluent discharged over any single day, as measured by a composite or grab sample, whichever is required.

DP - Dissolved Phosphorus
This is the soluble form of phosphorus present in the wastewater.

ECA - Environmental Compliance Approval
The primary regulatory instrument for each water pollution control plant.

E. - coli - (Escherichia coli)
Refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius.

Final Effluent
Sewage discharge through the water pollution control plant outfall after undergoing the full train of unit processes as listed in the Environmental Compliance Approval.

Geometric Mean Density
Is the nth root of the product of multiplication of the results of n number of samples over the period specified.

Grab Sample

A single sample taken at a specific moment in time, when tested provides a snapshot of the conditions at the time the sample was retrieved.

kg - kilogram

Basic unit of mass in the metric system

kg/d – kilogram per day

LSPRS - Lake Simcoe Phosphorus Reduction Strategy

The ECA issued on June 28, 2012 introduced additional phosphorus objectives to comply with the requirements of the Lake Simcoe Phosphorus Reduction Strategy (2010) prepared under the Lake Simcoe Protection Plan (2009).

m^3 - (Cubic Metre)

Volume measurement, $1m^3$ = 1000 litres or 220 imperial gallons.

m^3/d - (Cubic Metre Per Day)

Flow measurement, $1m^3$ = 1000litres or 220 imperial gallons. Volume of liquid treated in a 24 hour period.

Max. - Maximum

Maximum Flow Rate

The peak or highest flow recorded during a specific time period usually in a 24 hour period.

mg/L - (Milligram Per Litre)

This is a measure of the concentration of a parameter in water, sometimes referred to as parts per million (ppm).

Min. - Minimum

mm.-(millimetre)

Is a unit of length in the metric system, equal to one thousandth of a metre.

MOECC - (Ministry of the Environment and Climate Change)

The Provincial regulatory agency responsible for overseeing the water and wastewater industries in Ontario. Their primary functions include approval for new or expanding facilities, inspections and investigations.

Monthly average concentration

The arithmetic mean of all daily concentrations of a contaminant in the effluent sampled or measured, or both, during a calendar month.

Monthly average loading

Is calculated by multiplying the monthly average concentration of a contaminant by the monthly average daily flow over the same calendar month.

Nitrate Nitrogen

Is a salt or ester of nitric acid, containing the NO_3 ion. Nitrates are the most water soluble of salts, and play a major part in the nitrogen cycle and nitrate pollution.

N/A - Not Applicable

Peak Flow Rate

The maximum rate of sewage flow for which the plant or process unit was designed.

pH

Index of hydrogen ion activity, pH is defined as the negative logarithm of hydrogen ion concentration in moles per litre. The pH may range from 0 – 14, where 0 is most acidic, 14 most basic and 7 neutral.

Rated Capacity
The average daily flow for which the works are approved to handle**.**

Raw Influent
Raw wastewater entering the water pollution control plant before treatment.

Septage
Partially treated sludge from a septic tank.

Sludge
The settleable solids separated from liquids during processing.

TAN - Total Ammonia Nitrogen
Ammonia exists in two forms in the water: NH3 (this is called unionized ammonia) NH4+ (this is called ionized ammonia) Together, these two forms of ammonia are called TAN which means total ammonia nitrogen.

Temp. – Temperature

Total Annual Loading
Is calculated by adding the calculated total monthly load discharged for each calendar year.

Total Monthly Loading
Is calculated by multiplying the total monthly flow by the monthly average concentration.

TP - Total Phosphorus
A laboratory analyses to determine the total amount of non-soluble and soluble phosphorus present in the wastewater.

TSS - Total Suspended Solids
A laboratory analyses to measure particles that are larger than 2 microns found in the wastewater.

TS - Total Solids
Is a measure of the suspended and dissolved solids in the wastewater and in biosolids.

Unionized Ammonia Nitrogen
Un-ionized ammonia refers to all forms of ammonia in water with the exception of the ammonium ion (NH4 +).

WPCP - Water Pollution Control Plant
A facility composed of a variety of treatment processes that collectively treat wastewater