Renfrew Wastewater Treatment System

2016 Annual Report

January 1, 2016 – December 31, 2016

Prepared By

Ontario Clean Water Agency
Agence Ontarienne Des Eaux

This report has been prepared to meet the requirements set out in the facility Environmental Compliance Certificate #4237-ACPJ6Y issued October 13, 2016.

Contents

Appendix

Compliance Report Card

Compliance Event	# of Events	Details
Ministry of Environment Inspections	0	
Ministry of Labour Inspections	0	
Effluent Parameter Exceedances	0	
Bypass/Overflows	4	See summary of Bypass/Overflows
Community Complaints	0	
Spills	0	

System/Process Description

Wastewater enters the WPCP through two influent channels, one equipped with a mechanical screen and one with a manual bar screen for maintenance and emergency bypass. The screening system is equipped with one screenings washer/compactor. Influent then enters two aerated grit tanks where blowers, provide aeration. Two grit slurry pumps, two grit cyclones, and one grit classifier/dewatering unit transport and process particulate material.

Biological treatment is provided using two three-pass aeration tanks with fine bubble aeration systems and one anoxic intake zone. Flow is then directed to two, two-pass secondary clarifiers equipped with sludge and scum removal mechanisms. The phosphorus removal system uses ferric chloride. It is injected into the influent of the aeration process.

Disinfection of final effluent is achieved via ultraviolet (UV) light disinfection. The UV bulbs are cleaned via automated wipers.

Sludge digestion occurs via aerobic digester. Digested sludge is dewatered via one centrifuge and back-up system dewatering press. Polymers are added to aid in dewatering. Also present is a conveyer and loading facility for dewatered biosolids cake. There are no sludge storage facilities onsite at Renfrew WPCP.

The facility is equipped with back-up power.

An on-site tank and chopper pump are available for receiving imported wastewaters.

Effluent Quality Assurance or Control Measures

The Town of Renfrew facilities are part of OCWA's operational Mississippi Cluster. The facilities are supported by regional and corporate resources. Operational Services are delivered by OCWA staff that live and work in the community.

OCWA operates facilities in compliance with applicable regulations. The facility has comprehensive manuals detailing operations, maintenance, instrumentation, and emergency procedures. All procedures are treated as active documents, with annual reviews.

OCWA has additional "Value Added" and operational support services that the Town of Renfrew benefits from including:

- Access to a network of operational compliance and support experts at the regional and corporate level, as well as affiliated programs that include the following:
    - Quality & Environmental Management System, Occupational Health & Safety System and an internal compliance audit system.
    - Process Data Management (PDM) facility operating information repository, which consolidates field data, online instrumentation, and electronic receipt of lab test results for reporting, tracking and analysis.

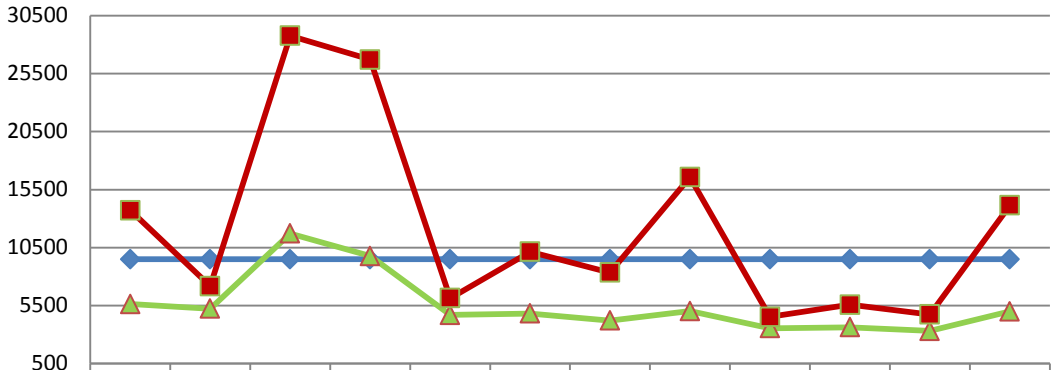
  - Work Management System (WMS) that tracks and reports maintenance activity, and creates predictive and preventative reports.
  - Outpost 5 wide-area SCADA system allows for process optimization and data logging, process trending, remote alarming and optimization of staff time.
- Client reporting which includes operational data, equipment inventory, financial statements, maintenance work orders, and capital status reports
- Site-Specific Contingency Plans and Standard Operating Procedures
- Use of accredited laboratories
- Additional support in response to unusual circumstances, and extra support in an emergency.
- Use of sampling schedules for external laboratory sampling

Treatment Flows

Raw Flow (m3/d)

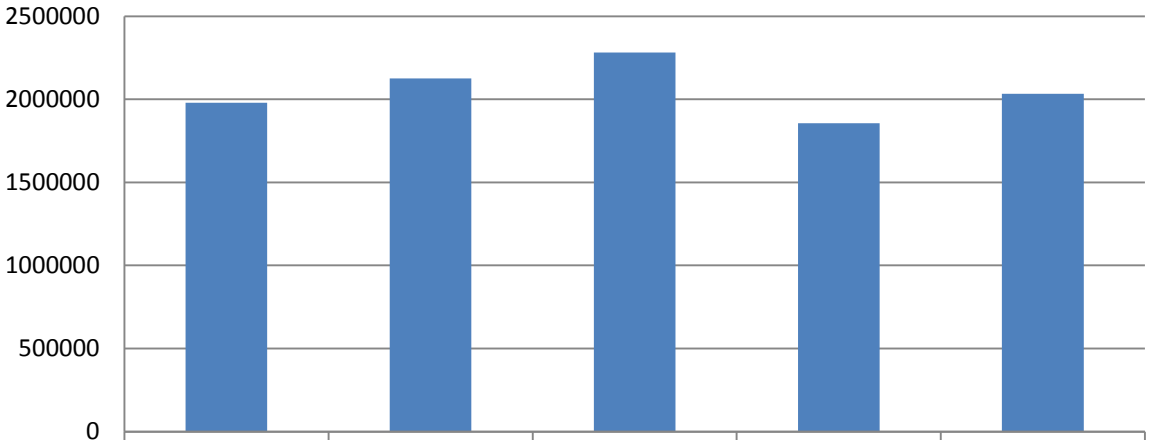
Compliance is based on an annual average flow. For 2016 the average daily flow was 5552.4 m3/d.

Note: Elevated flows above the rated capacity are directly related to snow melt and wet weather events.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rated Capacity	9500	9500	9500	9500	9500	9500	9500	9500	9500	9500	9500	9500
Avg Daily Flow (m3/d)	5627	5239	11715	9768	4700	4824	4210	5026	3553	3641	3323	5003
Max Daily Flow (m3/d)	13712	7178	28759	26707	6140	10138	8352	16575	4525	5573	4733	14149

Annual Comparison (m3)



	2012	2013	2014	2015	2016
Total Annual Flow	1978580	2126111	2281121	1855735	2033547

Imported Wastewater Quality Volumes

Average daily flow for 2016 = 0 m3/d

Total Flow for 2016 = 0 m3

Raw Sewage Quality

Results of raw sewage concentrations are available in the Facility Performance Assessment Report in Appendix A. A monthly loading summary is available in Appendix B.

Loadings Objectives

Parameter	Annual Average (kg/d)	Objective (kg/d)
BOD5	579.3	712
Total Suspended Solids	824.9	801
Total Phosphorus	3.1	22
Total Kjeldahl Nitrogen (TKN)	22.6	125

Effluent Quality

The limits are based on current requirements in the facilities Environmental Compliance Approval. Laboratory samples are submitted to an accredited laboratory for regulatory analysis.

The Federal Government also regulates certain sewage effluent parameter under the Federal Fisheries Act. The results are submitted to Environment Canada on a quarterly basis.

Effluent Exceedance Summary

Limit

Sample	Date	Parameter	Exceedance of	Limit	Value	Corrective Action
There were no limit exceedances in 2016						

Objective

Sample	Date	Parameter	Objective	Value	Corrective Action
Final Effluent	October 2016	Total Ammonia	5.0	6.2	Blower failure reduced aeration DO.
Final Effluent	December 2016	Total Suspended Solids	10	11.5	Problems with algae in the composite sampler. Cleaned sampler and increased purge time.

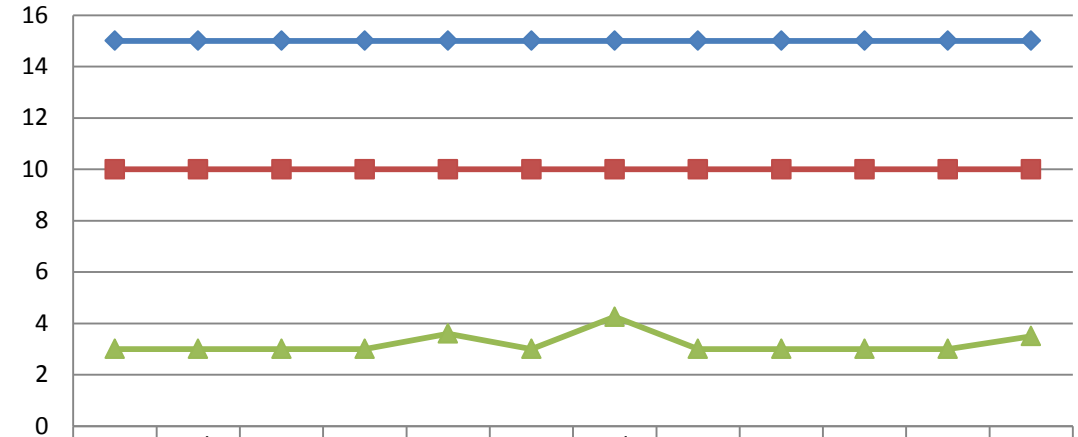
Other Effluent Issues

Sample	Legislation	Date	Details	Response
There were no other operational issues affecting effluent quality				

Effluent Parameter Summary

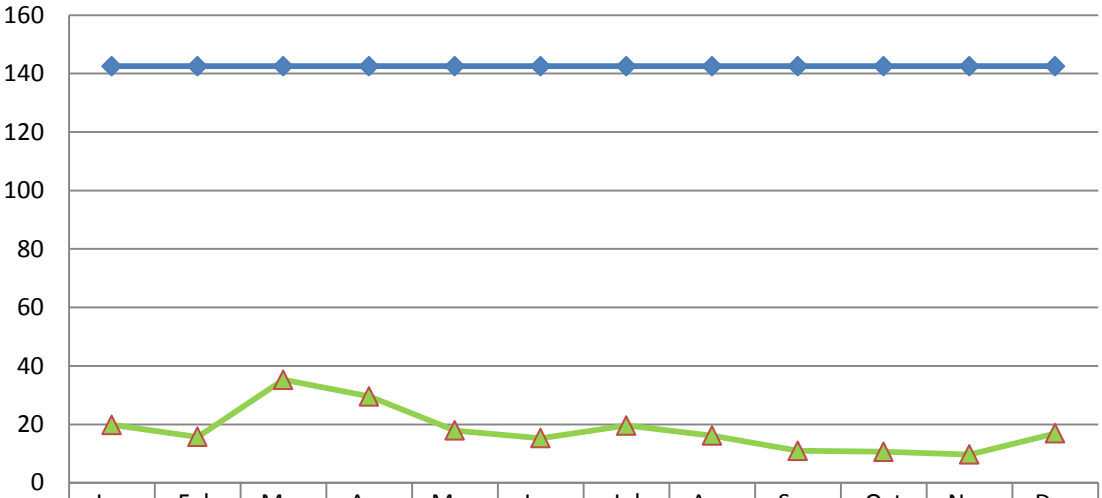
Carbonaceous Biological Oxygen Demand (CBOD5)

Concentration (mg/L)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Limit	15	15	15	15	15	15	15	15	15	15	15	15
Objective	10	10	10	10	10	10	10	10	10	10	10	10
Average	3	3	3	3	4	3	4	3	3	3	3	4

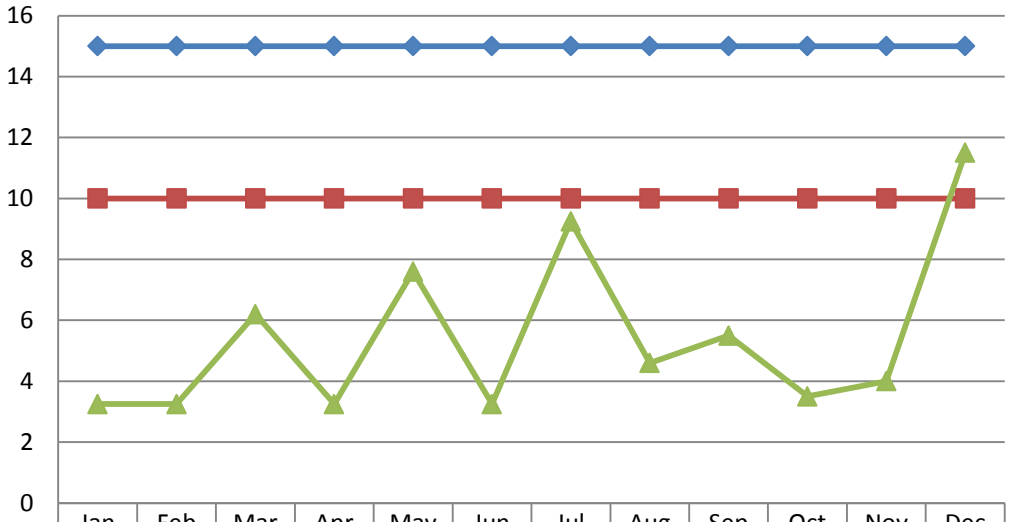
Loading (kg/d)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Limit	142.5	142.5	142.5	142.5	142.5	142.5	142.5	142.5	142.5	142.5	142.5	142.5
Average	19.816	15.72	35.251	29.568	17.894	15.267	19.601	16.162	10.96	10.609	9.697	16.915

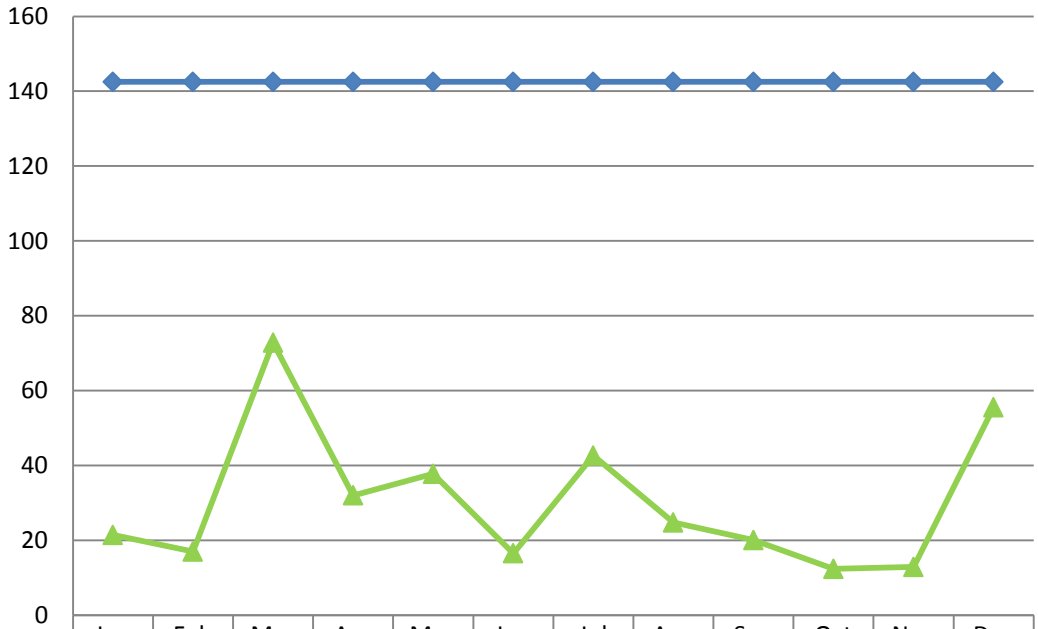
Total Suspended Solids

Concentration (mg/L)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Limit	15	15	15	15	15	15	15	15	15	15	15	15
Objective	10	10	10	10	10	10	10	10	10	10	10	10
Average	3.3	3.3	6.2	3.3	7.6	3.3	9.3	4.6	5.5	3.5	4.0	11.5

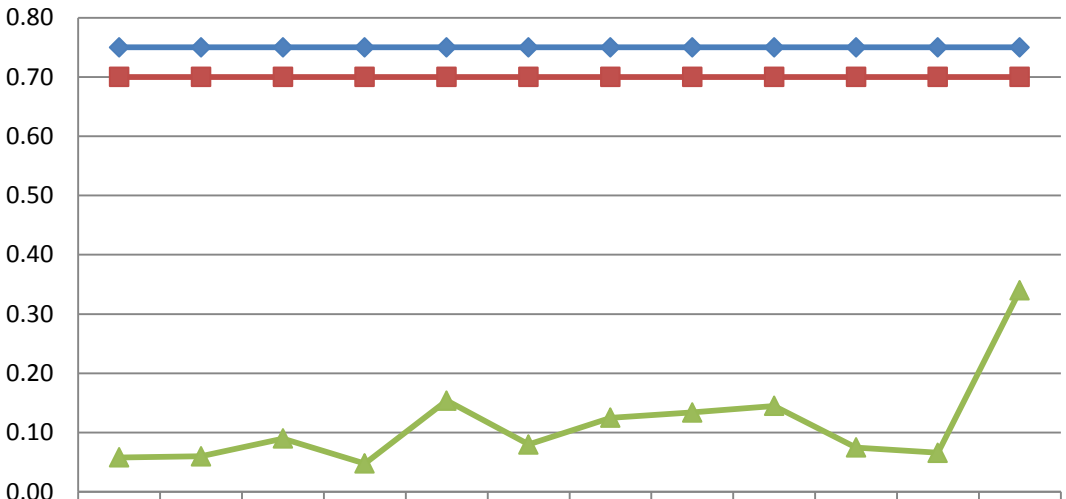
Loading (kg/d)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Limit	142.5	142.5	142.5	142.5	142.5	142.5	142.5	142.5	142.5	142.5	142.5	142.5
Average	21.5	17.0	72.9	32.0	37.8	16.5	42.7	24.8	20.1	12.4	12.9	55.6

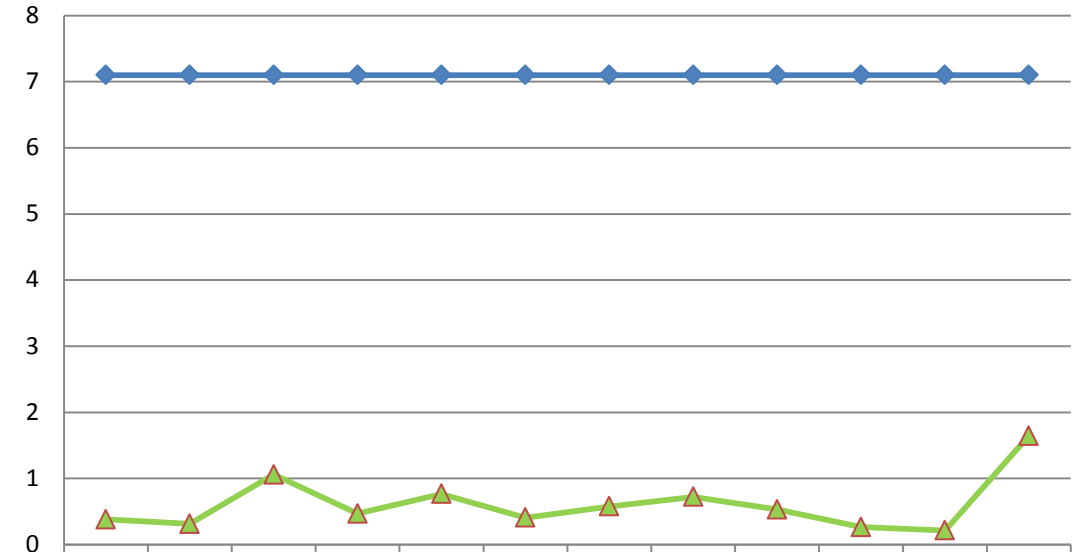
Total Phosphorus

Concentration (mg/L)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Limit	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Objective	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Average	0.06	0.06	0.09	0.05	0.15	0.08	0.13	0.13	0.15	0.08	0.07	0.34

Loading (kg/d)



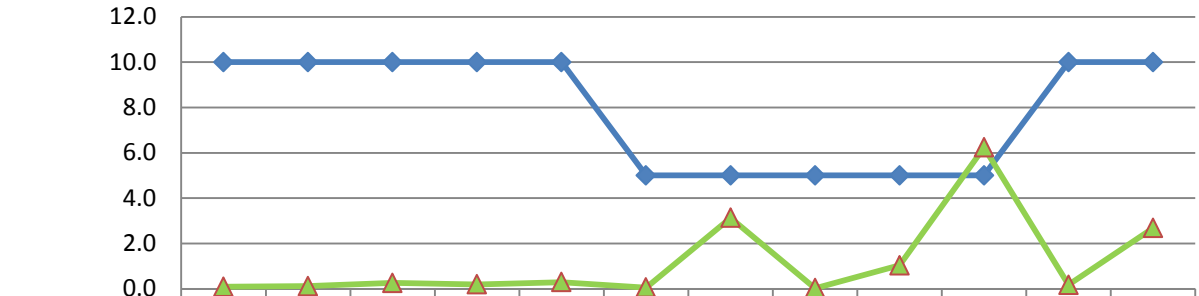
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Limit	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
Average	0.4	0.3	1.1	0.5	0.8	0.4	0.6	0.7	0.5	0.3	0.2	1.6

Ammonia Nitrogen Series

There are no limits regarding ammonia concentration or loading. Compliance is based on acute lethality.

Total Ammonia Nitrogen Concentration (mg/L)

The objective was exceeded for October. Please see Effluent Exceedance summary.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Objective	10.0	10.0	10.0	10.0	10.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0
Average	0.1	0.1	0.3	0.2	0.3	0.1	3.1	0.0	1.0	6.2	0.2	2.7

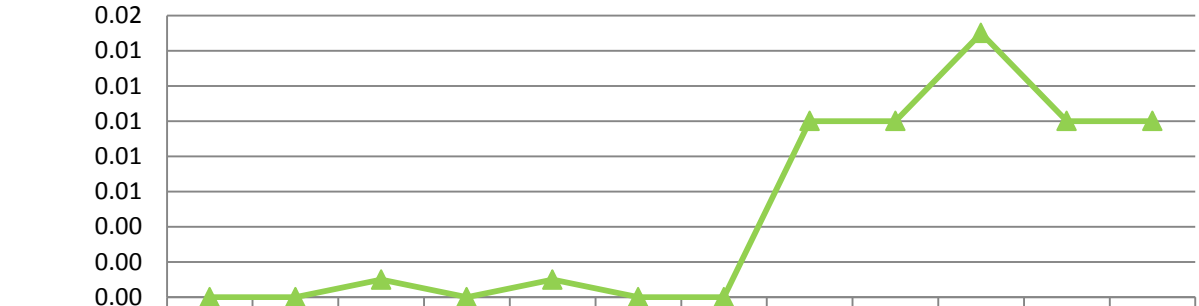
Acute Lethality

There were two (2) samples collected in 2016 and tested for acute lethality (Rainbow Trout and Daphnia Magna). Results are displayed as % mortality. Sampling has changed from annually to quarterly after the issue of the amended Environmental.

Quarter	Rainbow Trout	Daphnia Magna
1st Quarter	0%	0%
2nd Quarter	Only Annual sampling required under Previous ECA	
3rd Quarter	Only Annual sampling required under Previous ECA	
4th Quarter	0%	0%

Un-Ionized Ammonia

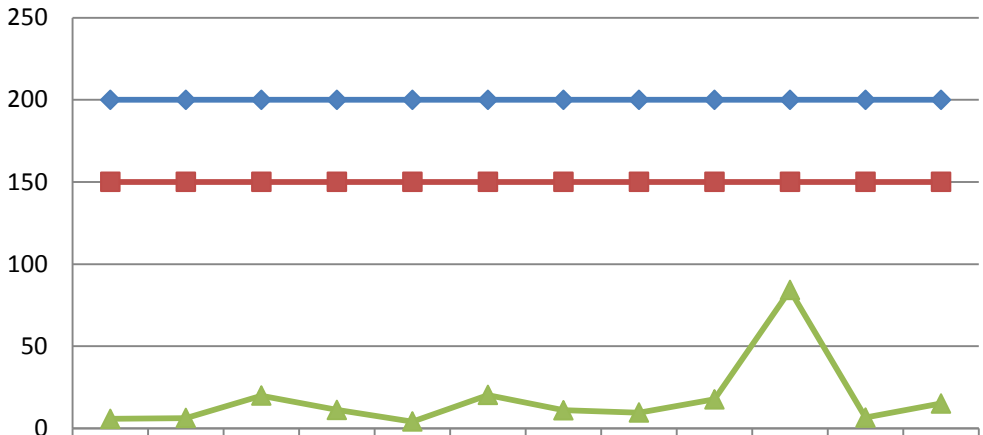
Sampling from January to July were completed in-house. Samples from August to December were completed by the lab and were less than the detection limit.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.01	0.01

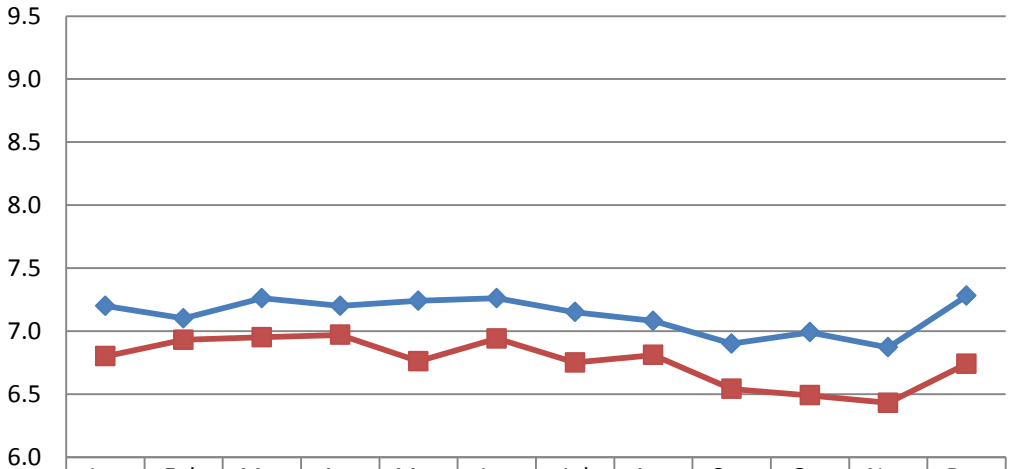
E-coli

Geometric Mean Average (cfu/100mL)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Limit	200	200	200	200	200	200	200	200	200	200	200	200
Objective	150	150	150	150	150	150	150	150	150	150	150	150
Geometric Mean Avg	6	6	20	11	4	20	11	10	18	84	7	15

pH



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max Monthly pH	7.2	7.1	7.3	7.2	7.2	7.3	7.2	7.1	6.9	7.0	6.9	7.3
Min Monthly pH	6.8	6.9	7.0	7.0	6.8	6.9	6.8	6.8	6.5	6.5	6.4	6.7

Imported Wastewater Quality

There were no imported wastewaters accepted into the treatment plant.

Biosolids

Please note Section 10 (6) of Environmental Compliance Approval 4237-ACPJ6Y asks to include discussion on lagoon cells. The Renfew Wastewater Treatment facility does not utilize a lagoon process.

The Renfrew WPCP uses aerobic sludge digestion followed by sludge dewatering. Dewatering is done using either centrifuge or Fournier press. The dewatered sludge is land filled.

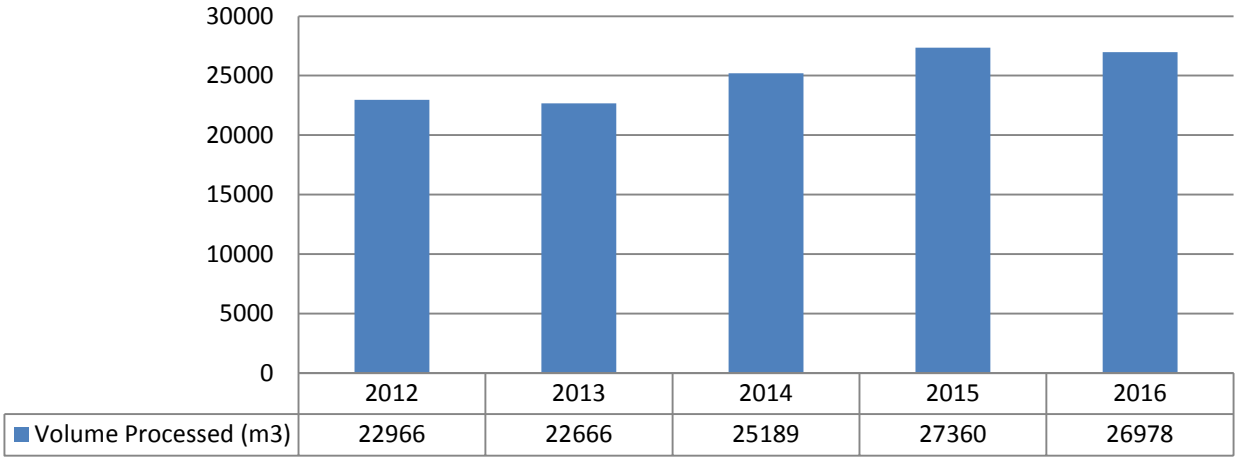
Centrifuge

Approximately 26 978 m^3 of liquid sludge were processed. This equates to approximately 301.32 metric tons of solids being land filled.

Fournier Press

The Fournier Press was not utilized in 2016.

Annual Comparison



It is anticipated that sludge volumes will remain constant.

Quality

The biosolids sampling results are summarized in Appendix E. All results met the established guidelines.

Summary of Complaints

The following were received community complaints related to the operations of the Renfrew WPCP.

Date	Location	Details	Corrective Action Taken
There were no complaints received during the reporting period.			

Summary of Bypass/Overflows

Start Date	End Date	Details	Actions Taken	Volume (m3)	Duration (h)
05-Jun-2016	16-Jun-2016	Heavy rains in area increased flows to Renfrew WPCP above the design capacity.	Extra flow bypassed process as designed into the Bonnechere River. Bypass flow was chlorinated using chlorine pucks.	72.03	35.01
09-Jul-2016	19-Jul-2016	Heavy Rains in area caused increase flows to WPCP	Operator called in, disinfection provided through chlorine pucks	0.06	1
22-Jul-2016	08-Aug-2016	Heavy Rains in area	Operator called in, disinfection provided through chlorine pucks.	0.05	2
16-Aug-2016	26-Aug-2016	Heavy Rains in area caused increased flows to WPCP. Pumps overheated	Operator returned pumps to service, grabbed samples and disinfected using pucks.	13.62	18

Summary of Spills/Abnormal Discharges

Date Start	Date End	Details	Corrective Action
29-Mar-2016	01-Apr-2016	Old Renfrew WPCP experienced total flooding to the point facility could not be accessed. River blockage downstream.	Allow flood to continue and OCWA pumped out old plant under direction from MOECC. Town to put through insurance.

Maintenance

OCWA uses a risk-based preventative maintenance framework that ensures assets are maintained to manufacturer's and/or industry standards. Maintenance is completed using various tools and operational supports. The Ottawa Valley Hub has specialized certified staff such as Millwrights, Electricians and Instrumentation Specialists to name a few.

OCWA uses a Workplace Maintenance System (WMS). WMS is a maintenance tracking system that can generate work orders as well as give summaries of completed and scheduled work. During the year, the operating authority at the facility generates scheduled work orders on a weekly, monthly and annual basis. The service work is recorded in the work order history. This ensures routine and preventive maintenance is carried out. Emergency and capital repair maintenance is completed and added to the system.

Capital projects are listed and provided to the Town of Renfrew in the form of a "Capital Forecast". This list is developed by facility staff and provides recommendations for facility components requiring upgrading or improvement.

Maintenance Highlights

WO #	Summary
125236	Capital SCADA Programming Raw Pumps
147415	Capital Distribution analyzer Chlorine
170754	Capital #1 grit valve actuator
171350	Capital VFD Fail Headworks HVAC
171673	Capital Odour Control unit failure
190740	Capital weir plate modification
211901	Capital SCADA UPS
212579	Capital Progressive Cavity Pump 02 Dewatering
212856	Capital Actuator Grit 01 Failure
105561	Capital Air Compressor
106584	Capital VFD Blower grit channel
147913	Capital Anoxic Tank Clean Out
29084	Capital Corrective Cross Collector 02
29094	Capital Transfer Switch
29336	Capital UVT Maintenance
35982	Capital Centrifuge Rebuild
36048	Capital Control Network Retrofit
36970	Capital UV System Parts
48558	Capital Aeration Blower 2 VFD Service
61716	Capital EATON 50HP VFD Replacement
62058	Capital Centrifuge Communications Troubleshooting
73806	Capital SCADA network connectivity
87427	Capital #1 Aeration Blower

Submitted Notice of Modifications to Sewage Works

Approval was granted to increase the treatment plant bypass weir. Work will commence in 2017. There have been no submissions since receiving the amended Environmental Compliance Report in October.

There have been a few instances in the past where a volume of less than $1m^3$ had bypassed. In an effort to reduce these small bypass situations and divert more flow to treatment it was decided that the bypass weir would be raised by 200 mm. This upgrade was engineered and approved by the Ministry of Environment and Climate Change in Environmental Compliance Approval 4237-ACPJ6Y issued on October 13, 2016. The new weir plate would be 1070 mm wide and 275 mm tall, SST, 6 mm thick, with beveled top edge of the weir plate. The weir will be installed using SST epoxy adhesive SS316 anchor bolts set to manufacturer's standard embedment (Hilti HAS threaded rod set in HY150 adhesive or equivalent). Three anchor bolts per side should be sufficient. The existing anchor bolts should be re-useable. A gasket will be installed between the weir plate and the concrete wall, extending from the bottom/ends of the weir plate to the top/edge of the wall. The gasket is to be closed cell neoprene, 50 durometer, and 6 mm thick. Bolt holes in the weir plate should be elongated (50 mm) to allow for adjustment of the weir plate.

Calibration

The flow meters were calibrated on September 7, 2016. Records are attached in Appendix D. Analyzers are scheduled for monthly maintenance in the WMS program. Work is completed and logged in the logbook and in WMS.

Appendix A

Facility Assessment Report

Ontario Clean Water Agency
Performance Assessment Report Wastewater/Lagoon

Report extracted 03/06/2017 12:03 **From: 01/01/2016 to 31/12/2016**

Facility: [5863] RENFREW WASTEWATER TREATMENT FACILITY

Works: [5863] RENFREW WASTEWATER TREATMENT FACILITY

	01/2016	02/2016	03/2016	04/2016	05/2016	06/2016	07/2016	08/2016	09/2016	10/2016	11/2016	12/2016	<--Total-->	<--Avg.-->	<--Max.-->
Flows:															
Raw Flow: Total - Raw Sewage Influent (m^3)	174446	151926	363162	293034	145688	144723	130525	155809	106588	112862	99703	155081	2033547		
Raw Flow: Avg - Raw Sewage Influent (m^3/d)	5627.29	5238.83	11714.9	9767.8	4699.61	4824.1	4210.48	5026.1	3552.93	3640.71	3323.43	5002.61		5552.4	
Raw Flow: Max - Raw Sewage Influent (m^3/d)	13712	7178	28759	26707	6140	10138	8352	16575	4525	5573	4733	14149			28759
Eff. Flow: Total - Final Effluent (m^3)	204768	151958	364258	295680	154088	152673	142974	167007	109596	109622	96966	149822	2099412		
Eff. Flow: Avg - Final Effluent (m^3/d)	6605.42	5239.93	11750.26	9856	4970.58	5089.1	4612.06	5387.32	3653.2	3536.19	3232.2	4832.97		5730.44	
Eff. Flow: Max - Final Effluent (m^3/d)	43841	7170	29147	27253	6377	10510	8816	17058	4845	5759	4624	13947			43841
Carbonaceous Biochemical Oxygen Demand: CBOD:															
Raw: Avg cBOD5 - Raw Sewage Influent (mg/L)	88.25	98.25	46	41.25	97.2	100.75	110.25	103.4	90.25	120.25	104	68.25		89.008	120.25
Raw: # of samples of cBOD5 - Raw Sewage Influent (mg/L	4	4	5	4	5	4	4	5	4	4	5	4	52		
Eff: Avg cBOD5 - Final Effluent (mg/L)	< 3	< 3	< 3	< 3	< 3.6	< 3	< 4.25	< 3	< 3	< 3	< 3	< 3.5		< 3.196	< 4.25
Eff: # of samples of cBOD5 - Final Effluent (mg/L)	4	4	5	4	5	4	4	5	4	4	5	4	52		
Loading: cBOD5 - Final Effluent (kg/d)	< 19.816	< 15.72	< 35.251	< 29.568	< 17.894	< 15.267	< 19.601	< 16.162	< 10.96	< 10.609	< 9.697	< 16.915		< 18.122	< 35.251
Percent Removal: cBOD5 - Raw Sewage Influent (mg/L)	96.601	96.947	93.478	92.727	96.296	97.022	96.145	97.099	96.676	97.505	97.115	94.872			97.505
Biochemical Oxygen Demand: BOD5:															
Raw: Avg BOD5 - Raw Sewage Influent (mg/L)	97.25	117.75	60	51.5	166.8	142.5	128.75	127.6	106	155.75	122.8	86.5		113.6	166.8
Raw: # of samples of BOD5 - Raw Sewage Influent (mg/L	4	4	5	4	5	4	4	5	4	4	5	4	52		
Eff: Avg BOD5 - Final Effluent (mg/L)	< 3	< 3.25	< 6	< 3.25	< 9.2	< 4.5	< 6.25	< 5.4	< 4.75	< 4.75	< 4	< 6		< 5.029	< 9.2
Loading: BOD5 - Final Effluent (kg/d)	< 19.816	< 17.03	< 70.502	< 32.032	< 45.729	< 22.901	< 28.825	< 29.092	< 17.353	< 16.797	< 12.929	< 28.998		< 28.5	< 70.502
Percent Removal: BOD5 - Raw Sewage Influent (mg/L)	96.915	97.24	90	93.689	94.484	96.842	95.146	95.768	95.519	96.95	96.743	93.064			97.24
Total Suspended Solids: TSS:															
Raw: Avg TSS - Raw Sewage Influent (mg/L)	120.5	160	71.6	91.5	167.2	230	209	164	160	242	192.8	120		160.717	242
Raw: # of samples of TSS - Raw Sewage Influent (mg/L)	4	4	5	4	5	4	4	5	4	4	5	4	52		
Eff: Avg TSS - Final Effluent (mg/L)	< 3.25	3.25	< 6.2	< 3.25	< 7.6	< 3.25	9.25	< 4.6	5.5	< 3.5	< 4	< 11.5		< 5.429	11.5
Eff: # of samples of TSS - Final Effluent (mg/L)	4	4	5	4	5	4	4	5	4	4	5	4	52		
Loading: TSS - Final Effluent (kg/d)	< 21.468	17.03	< 72.852	< 32.032	< 37.776	< 16.54	42.662	< 24.782	20.093	< 12.377	< 12.929	< 55.579		< 30.51	72.852
Percent Removal: TSS - Raw Sewage Influent (mg/L)	97.303	97.969	91.341	96.448	95.455	98.587	95.574	97.195	96.563	98.554	97.925	90.417			98.587
Total Phosphorus: TP:															
Raw: Avg TP - Raw Sewage Influent (mg/L)	2.728	3.32	1.822	1.508	3.284	3.53	3.063	3.382	3.645	3.965	4.064	2.838		3.096	4.064
Raw: # of samples of TP - Raw Sewage Influent (mg/L)	4	4	5	4	5	4	4	5	4	4	5	4	52		
Eff: Avg TP - Final Effluent (mg/L)	0.058	0.06	0.09	0.048	0.154	0.08	0.125	0.134	0.145	0.075	0.066	0.34		0.115	0.34
Eff: # of samples of TP - Final Effluent (mg/L)	4	4	5	4	5	4	4	5	4	4	5	4	52		
Loading: TP - Final Effluent (kg/d)	0.38	0.314	1.058	0.468	0.765	0.407	0.577	0.722	0.53	0.265	0.213	1.643		0.612	1.643
Percent Removal: TP - Raw Sewage Influent (mg/L)	97.892	98.193	95.06	96.849	95.311	97.734	95.918	96.038	96.022	98.108	98.376	88.018			98.376
Nitrogen Series:															
Raw: Avg TKN - Raw Sewage Influent (mg/L)	20.048	23	15.18	11.815	23.26	22.225	20.475	23.64	26.275	32.8	28.52	23.625		22.572	32.8
Raw: # of samples of TKN - Raw Sewage Influent (mg/L)	4	4	5	4	5	4	4	5	4	4	5	4	52		
Eff: Avg TAN - Final Effluent (mg/L)	0.09	< 0.115	0.262	0.197	0.292	0.055	< 3.135	< 0.026	1.033	6.235	< 0.176	< 2.682		< 1.192	6.235
Eff: # of samples of TAN - Final Effluent (mg/L)	4	4	5	4	5	4	4	5	4	4	5	4	52		
Loading: TAN - Final Effluent (kg/d)	0.594	< 0.603	3.079	1.947	1.451	0.28	< 14.459	< 0.14	3.772	22.048	< 0.569	< 12.964		< 5.159	22.048
Disinfection:															
Eff: GMD E. Coli - Final Effluent (cfu/100mL)	5.785	6.26	19.966	11.303	4.183	20.341	11.089	9.579	17.69	84.201	6.575	15.117		17.674	84.201
Eff: # of samples of E. Coli - Final Effluent (cfu/100mL)	4	4	5	4	5	4	4	5	4	4	5	4	52		

Appendix B

Raw Sewage Loading Summary

Ontario Clean Water Agency
Time Series Info Report

Report extracted 03/06/2017 15:56

From: 01/01/2016 to 31/12/2016

Facility Org Number: 5863
Facility Works Number: 120000603
Facility Name: RENFREW WASTEWATER TREATMENT FACILITY
Facility Owner: Municipality: The Corporation of the Town of Renfrew
Facility Classification: Class 3 Wastewater Treatment
Receiver: Bonnechere River
Service Population:
Total Design Capacity: 9500.0 m3/day

	01/2016	02/2016	03/2016	04/2016	05/2016	06/2016	07/2016	08/2016	09/2016	10/2016	11/2016	12/2016	Total	Avg	Max	Min
Raw Sewage Influent / Loadings BOD - kg/d																
Count IH	4	4	5	4	5	4	4	5	4	4	5	4	52			
Max IH	612.744	646.492	572.13	891.529	1985.581	978.305	783.125	1491.75	563.04	950.64	572.648	445.2			1985.581	
Mean IH	523.685	573.424	446.687	574.935	834.898	696.327	561.983	803.019	423.547	646.718	427.629	389.866		579.29		
Min IH	479.588	525.525	254.28	399.2	516.776	492.884	398.565	414.594	287.86	317.52	309.981	319.986				254.28
Total IH	2094.741	2293.695	2233.435	2299.74	4174.488	2785.309	2247.931	4015.094	1694.188	2586.87	2138.146	1559.462	30123.1			
Raw Sewage Influent / Loadings Suspended Solids - kg/d																
Count IH	4	4	5	4	5	4	4	5	4	4	5	4	52			
Max IH	871.008	1153.876	707.18	1955.612	1089.712	1382.116	1453.512	2055.3	767.04	1207.36	1071.532	667.8			2055.3	
Mean IH	673.94	789.883	572.9	1090.627	822.362	1142.187	949.196	1050.036	639.861	983.432	690.746	534.92		824.931		
Min IH	448.448	554.136	228.852	718.56	692.376	781.816	455.532	267.48	373.44	703.456	541.576	371.36				228.852
Total IH	2695.762	3159.532	2864.5	4362.508	4111.808	4568.748	3796.784	5250.18	2559.444	3933.728	3453.732	2139.68	42896.41			
Raw Sewage Influent / Total Kjeldahl Nitrogen: TKN - mg/L																
Count Lab	4	4	5	4	5	4	4	5	4	4	5	4	52			
Max Lab	26	26	27.4	17.7	25.4	35.5	25	28.6	35.7	44	33.8	28.8			44	
Mean Lab	20.048	23	15.18	11.815	23.26	22.225	20.475	23.64	26.275	32.8	28.52	23.625		22.578		
Min Lab	9.49	18.8	5.25	8.68	20.8	11.7	12.2	20	22.2	23.7	23.6	16.7				5.25
Raw Sewage Influent / Total Phosphorus: TP - mg/L																
Count Lab	4	4	5	4	5	4	4	5	4	4	5	4	52			
Max Lab	3.49	4.26	3.39	2.14	4.29	6.08	5.27	5.03	5	5.45	4.42	3.38			6.08	
Mean Lab	2.728	3.32	1.822	1.508	3.284	3.53	3.063	3.382	3.645	3.965	4.064	2.838		3.099		
Min Lab	1.48	2.71	0.97	1.18	2.64	1.71	1.03	2.07	2.14	2.18	3.85	2.1				0.97

Appendix C

Biosolids Quality

Ontario Clean Water Agency
Biosolids Quality Report - Liquid

Solids and Nutrients

Facility: RENFREW WASTEWATER TREATMENT FACILITY
Works: 5863
Period: 01/01/2016 to 12/01/2016

Facility Works Number:
Facility Name: *RENFREW WASTEWATER TREATMENT FACILITY*
Facility Owner: *Municipality: The Corporation of the Town of Renfrew*
Facility Classification: *Class 3 Wastewater Treatment*
Receiver: *Bonnechere River*
Service Population:
Total Design Capacity: *9500.0 m3/day*
Period Being Reported: 01/01/2016 12/01/2016

Note: all parameters in this report will be derived from the Bslq Station

Month	Avg. Total Solids (mg/L)	Avg. Volatile Solids (mg/L)	Avg. Total Phosphorus (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	Ammonia + Nitrate (mg/L)	Potassium (mg/L)
Site									
Station									
Parameter Short Name	TS	VS	TP	NH3p_NH4p_N	NO3-N	NO2-N	TKN	calculation in report - no T/S	K
T/s	Lab Published Month Mean	Lab Published Month Mean	Lab Published Month Mean	Lab Published Month Mean	Lab Published Month Mean	Lab Published Month Mean	Lab Published Month Mean		Lab Published Month Mean
Jan	11,100.000	6,260.000	187.000	12.600	5.400	0.100	533.000	9.000	43.100
Feb	12,800.000	7,510.000	213.000	1.980	0.200	0.100	509.000	1.090	49.900
Mar	12,900.000	7,440.000	198.000	7.890	0.100	0.100	568.000	3.995	55.100
Apr	14,100.000	7,080.000	178.000	6.290	0.100	0.100	474.000	3.195	64.600
May	12,600.000	6,230.000	197.000	18.600	0.100	0.100	452.000	9.350	48.900
Jun	10,500.000	5,600.000	204.000	11.800	0.100	0.100	464.000	5.950	43.300
Jul	12,100.000	6,220.000	203.000	17.100	0.100	0.100	426.000	8.600	46.900
Aug	14,200.000	6,850.000	265.000	6.800	32.300	0.100	530.000	19.550	45.600
Sep	11,100.000	5,440.000	205.000	3.530	20.200	0.100	385.000	11.865	40.500
Oct	11,200.000	6,370.000	215.000	7.580	0.100	0.100	459.000	3.840	40.100
Nov	10,400.000	6,260.000	214.000	21.100	0.100	0.100	509.000	10.600	36.900
Dec	11,200.000	6,600.000	211.000	13.900	0.100	0.100	563.000	7.000	49.800
Average	12,016.667	6,488.333	207.500	10.764	4.908	0.100	489.333	7.836	47.058
Total	144,200.000	77,860.000	2,490.000	129.170	58.900	1.200	5,872.000	94.035	564.700

Ontario Clean Water Agency
Biosolids Quality Report - Liquid

Metals and Criteria

Facility: RENFREW WASTEWATER TREATMENT FACILITY
Works: 5863
Period: 01/01/2016 to 12/01/2016

Note: all parameters in this report will be derived from the Bslq Station

Month	Arsenic (mg/L)	Cadmium (mg/L)	Cobalt (mg/L)	Chromium (mg/L)	Copper (mg/L)	Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Lead (mg/L)	Selenium (mg/L)	Zinc (mg/L)
Station	**Bslq Station only**										
Parameter Short Name	**As**	**Cd**	**Co**	**Cr**	**Cu**	**Hg**	**Mo**	**Ni**	**Pb**	**Se**	**Zn**
T/s	**Lab Published Month Mean**	**Lab Published Month Mean**	**Lab Published Month Mean**	**Lab Published Month Mean**	**Lab Published Month Mean**	**Lab Published Month Mean**	**Lab Published Month Mean**	**Lab Published Month Mean**	**Lab Published Month Mean**	**Lab Published Month Mean**	**Lab Published Month Mean**
Jan	0.100	0.030	0.110	0.670	2.910	0.006	0.060	0.210	0.200	0.100	2.770
Feb	0.100	0.030	0.100	0.760	3.370	0.002	0.050	0.210	0.200	0.100	2.630
Mar	0.100	0.030	0.030	0.800	3.430	0.002	0.080	0.230	0.200	0.100	2.730
Apr	0.100	0.030	0.060	0.900	3.420	0.003	0.060	0.260	0.200	0.100	3.490
May	0.100	0.030	0.030	0.760	2.530	0.009	0.050	0.240	0.200	0.100	2.530
Jun	0.100	0.030	0.120	0.790	3.270	0.003	0.060	0.220	0.200	0.100	3.020
Jul	0.100	0.030	0.040	0.820	3.670	0.004	0.060	0.250	0.200	0.100	3.330
Aug	0.100	0.030	0.050	0.980	3.630	0.004	0.050	0.310	0.300	0.100	3.970
Sep	0.100	0.030	0.050	0.740	3.360	0.003	0.070	0.230	0.200	0.100	3.230
Oct	0.100	0.030	0.030	0.710	3.630	0.003	0.070	0.210	0.200	0.100	3.520
Nov	0.100	0.030	0.030	0.550	3.080	0.002	0.050	0.170	0.200	0.100	2.680
Dec	0.100	0.030	0.080	0.840	4.010	0.015	0.080	0.180	0.200	0.100	3.180
Average	0.100	0.030	0.061	0.777	3.359	0.005	0.062	0.227	0.208	0.100	3.090
Max. Permissible Metal Concentrations (mg/kg of	170.000	34.000	340.000	2,800.000	1,700.000	11.000	94.000	420.000	1,100.000	34.000	4,200.000
Metal Concentrations in Sludge (mg/kg)	8.322	2.497	5.062	64.632	279.542	0.388	5.132	18.863	17.337	8.322	257.143

Appendix D

Calibrations

Franklin Empire Inc
900 Major Bennett Dr.
Peterborough ON K9J 6X6, CANADA

Tel: (705) 745-1626
Fax: (705) 745-3493
E-mail:
Website: www.feinc.com

OCWA Renfrew

2016 WWTP Calibrations

Leaders in Instrumentation and Control

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CALIBRATION REPORT

Report No.:	FIT-260000
Date:	Sep 07

SITE:	Renfrew WWTP	**SERVICE DATE:**	Sep 07 2016
PROCESS AREA:	Digested Sludge		
INSTR. TAG:	FIT-260000	**TECHNICIAN:**	M Humphries
MANUFACTURER:	ROSEMOUNT		
MODEL:	8712DR12N0M4	**JOB REFERENCE:**	160907
SERIAL No.:	0860252718		
SENSOR No.:	155549		

Input	**(Test)**	**Output**	**(Signal)**	**(Process)**
Type:	SIMULATOR	**Type or EGU:**	mA	m3/day
Min:	0.00	**Min:**	4.00	0.00
Max:	30 FEET/SEC.	**Max:**	20.00	1300.00
DN (mm):	2 INCH			

CALIBRATION # 0938005909358005

			Before Calibration		**After Calibration**	
Input (Y pos)	**Input %**	**Calc. O/P (mA)**	**Output (mA)**	**%Error**	**Output (mA)**	**%Error**
0.00	0.00%	4.00	4.00	0.00%	4.00	0.00%
3.00	10.00%	5.60	5.60	0.00%	5.60	0.00%
10.00	33.33%	9.33	9.33	-0.04%	9.33	-0.04%
30.00	100.00%	20.00	19.99	-0.05%	19.99	-0.05%

Calibration Equipment			
Type:	FLOWTUBE SIMULATOR	DMM	
Manufacturer:	ROSEMOUNT	FLUKE	
Model:	8714D	87 V	
Serial No.:	0332294	94140067	
Last Cal. Date:	October 12, 2015	March 24, 2016	

Comments:

1,2,GND, 17,18,19
W,B,S,S,W,B
coil resistance, 12.4 ohms, open to ground
356210 m3

AS FOUND: PASS **AS LEFT:** PASS

CERTIFIED BY:

CALIBRATION REPORT

Report No.:	FIT-254002
Date:	Sep 07

SITE:	Renfrew WWTP	**SERVICE DATE:**	Sep 07 2016
PROCESS AREA:	Digested Sludge		
INSTR. TAG:	FIT-254002	**TECHNICIAN:**	M Humphries
MANUFACTURER:	ROSEMOUNT		
MODEL:	8712DR12N0M4	**JOB REFERENCE:**	160907
SERIAL No.:	0860252903		
SENSOR No.:	155715		

Input	**(Test)**	**Output**	**(Signal)**	**(Process)**
Type:	SIMULATOR	**Type or EGU:**	mA	m3/day
Min:	0.00	**Min:**	4.00	0.00
Max:	30 FEET/SEC.	**Max:**	20.00	15120.00
DN (mm):	8 INCH			

CALIBRATION # 1024705909988005

			Before Calibration		**After Calibration**	
Input (Y pos)	**Input %**	**Calc. O/P (mA)**	**Output (mA)**	**%Error**	**Output (mA)**	**%Error**
0.00	0.00%	4.00	4.00	0.00%	4.00	0.00%
3.00	10.00%	5.60	5.60	0.00%	5.60	0.00%
10.00	33.33%	9.33	9.33	-0.04%	9.33	-0.04%
30.00	100.00%	20.00	19.99	-0.05%	19.99	-0.05%

Calibration Equipment			
Type:	FLOWTUBE SIMULATOR	DMM	
Manufacturer:	ROSEMOUNT	FLUKE	
Model:	8714D	87 V	
Serial No.:	0332294	94140067	
Last Cal. Date:	April 13, 2016	March 24, 2016	

Comments:

1,2,GND, 17,18,19
W,B,S,S,W,B
coil resistance, 10.8 ohms, open to ground
Total 6923701 m3

AS FOUND: PASS **AS LEFT:** PASS

CERTIFIED BY: 

FRANKLIN EMPIRE INC

CALIBRATION REPORT

Report No.: FIT-251002

Date: Sep 07

SITE:	Renfrew WWTP	**SERVICE DATE:**	Sep 07 2016
PROCESS AREA:	Digested Sludge		
INSTR. TAG:	FIT-251002	**TECHNICIAN:**	M Humphries
MANUFACTURER:	ROSEMOUNT		
MODEL:	8712DR12N0M4	**JOB REFERENCE:**	160907
SERIAL No.:	0860252902		
SENSOR No.:	155714		

Input	**(Test)**	**Output**	**(Signal)**	**(Process)**
Type:	SIMULATOR	**Type or EGU:**	mA	m3/day
Min:	0.00	**Min:**	4.00	0.00
Max:	30 FEET/SEC.	**Max:**	20.00	15120.00
DN (mm):	8 INCH			

CALIBRATION # 1043906310175005

			Before Calibration		**After Calibration**	
Input (Y pos)	**Input %**	**Calc. O/P (mA)**	**Output (mA)**	**%Error**	**Output (mA)**	**%Error**
0.00	0.00%	4.00	3.99	-0.25%	3.99	-0.25%
3.00	10.00%	5.60	5.59	-0.18%	5.59	-0.18%
10.00	33.33%	9.33	9.31	-0.25%	9.31	-0.25%
30.00	100.00%	20.00	19.96	-0.20%	19.96	-0.20%

Calibration Equipment

Type:	FLOWTUBE SIMULATOR	DMM	
Manufacturer:	ROSEMOUNT	FLUKE	
Model:	8714D	87 V	
Serial No.:	0332294	94140067	
Last Cal. Date:	April 13, 2016	March 24, 2016	

Comments:

1,2,GND, 17,18,19
W,B,S,S,W,B
coil resistance, 10.7 ohms, open to ground
6840589 m3

AS FOUND: PASS **AS LEFT:** PASS

CERTIFIED BY:

FRANKLIN EMPIRE INC

CALIBRATION REPORT

Report No.: FIT-721003

Date: Sep 07

SITE:	Renfrew WWTP	**SERVICE DATE:**	Sep 07 2016
PROCESS AREA:	Polymer		
INSTR. TAG:	FIT-721003	**TECHNICIAN:**	M Humphries
MANUFACTURER:	ROSEMOUNT		
MODEL:	8712DR12N0M4	**JOB REFERENCE:**	160907
SERIAL No.:	0860252878		
SENSOR No.:	155699		

Input	**(Test)**	**Output**	**(Signal)**	**(Process)**
Type:	SIMULATOR	**Type or EGU:**	mA	Liter/min
Min:	0.00	**Min:**	4.00	0.00
Max:	30 FEET/SEC.	**Max:**	20.00	160.00
DN (mm):	1.5 INCH			

CALIBRATION # 0926707109243005

			Before Calibration		**After Calibration**	
Input (Y pos)	**Input %**	**Calc. O/P (mA)**	**Output (mA)**	**%Error**	**Output (mA)**	**%Error**
0.00	0.00%	4.00	4.00	0.00%	4.00	0.00%
3.00	10.00%	5.60	5.60	0.00%	5.60	0.00%
10.00	33.33%	9.33	9.33	-0.04%	9.33	-0.04%
30.00	100.00%	20.00	20.00	0.00%	20.00	0.00%

Calibration Equipment			
Type:	FLOWTUBE SIMULATOR	DMM	
Manufacturer:	ROSEMOUNT	FLUKE	
Model:	8714D	87 V	
Serial No.:	0332294	94140067	
Last Cal. Date:	April 13, 2016	March 24, 2016	

Comments:

1,2,GND, 17,18,19
W,B,S,S,W,B
coil resistance, 12.3 ohms, open to ground

AS FOUND: PASS **AS LEFT:** PASS

CERTIFIED BY:

CALIBRATION REPORT

Report No.: 160907 FIT-722003

Date: Sep 07

SITE:	Renfrew WWTP
PROCESS AREA:	Polymer
INSTR. TAG:	FIT-722003
MANUFACTURER:	ROSEMOUNT
MODEL:	8712DR12N0M4
SERIAL No.:	0860252879
SENSOR No.:	155700

SERVICE DATE:	Sep 07 2016
TECHNICIAN:	M Humphriess
JOB REFERENCE:	160907

Input	**(Test)**	**Output**	**(Signal)**	**(Process)**
Type:	SIMULATOR	**Type or EGU:**	mA	Liter/min
Min:	0.00	**Min:**	4.00	0.00
Max:	30 FEET/SEC.	**Max:**	20.00	160.00
DN (mm):	1.5 INCH			

CALIBRATION # 0963907209615005

			Before Calibration		**After Calibration**	
Input (Y pos)	**Input %**	**Calc. O/P (mA)**	**Output (mA)**	**%Error**	**Output (mA)**	**%Error**
0.00	0.00%	4.00	4.00	0.00%	4.00	0.00%
3.00	10.00%	5.60	5.60	0.00%	5.60	0.00%
10.00	33.33%	9.33	9.33	-0.04%	9.33	-0.04%
30.00	100.00%	20.00	20.00	0.00%	20.00	0.00%

Calibration Equipment

Type:	FLOWTUBE SIMULATOR	DMM	
Manufacturer:	ROSEMOUNT	FLUKE	
Model:	8714D	87 V	
Serial No.:	0332294	94140067	
Last Cal. Date:	April 13, 2016	March 24, 2016	

Comments:

1,2,GND, 17,18,19
W,B,S,S,W,B
coil resistance, 11.5 ohms, open to ground
3 ft/sec. 72.0 l/min, 11.22mA 4319

AS FOUND: PASS **AS LEFT:** PASS

CERTIFIED BY:

FRANKLIN EMPIRE INC

CALIBRATION REPORT

Report No.: FIT-602001

Date: Sep 07

SITE:	Renfrew WWTP
PROCESS AREA:	Digested Sludge
INSTR. TAG:	FIT-602001
MANUFACTURER:	ROSEMOUNT
MODEL:	8712DR12N0M4
SERIAL No.:	0860252720
SENSOR No.:	870155551

SERVICE DATE:	Sep 07 2016
TECHNICIAN:	M Humphries
JOB REFERENCE:	160907

Input	**(Test)**	**Output**	**(Signal)**	**(Process)**
Type:	SIMULATOR	**Type or EGU:**	mA	m3/day
Min:	0.00	**Min:**	4.00	0.00
Max:	30 FEET/SEC.	**Max:**	20.00	1000.00
DN (mm):	2 INCH			

CALIBRATION # 0939005409368005

			Before Calibration		**After Calibration**	
Input (Y pos)	**Input %**	**Calc. O/P (mA)**	**Output (mA)**	**%Error**	**Output (mA)**	**%Error**
0.00	0.00%	4.00	4.00	0.00%	4.00	0.00%
3.00	10.00%	5.60	5.60	0.00%	5.60	0.00%
10.00	33.33%	9.33	9.33	-0.04%	9.33	-0.04%
30.00	100.00%	20.00	19.99	-0.05%	19.99	-0.05%

Calibration Equipment			
Type:	FLOWTUBE SIMULATOR	DMM	
Manufacturer:	ROSEMOUNT	FLUKE	
Model:	8714D	87 V	
Serial No.:	0332294	94140067	
Last Cal. Date:	April 13, 2016	March 24, 2016	

Comments:

1,2,GND, 17,18,19
W,B,S,S,W,B
coil resistance, 12.6 ohms, open to ground

AS FOUND: PASS **AS LEFT:** PASS

CERTIFIED BY:

CALIBRATION REPORT

Report No.: 160907 FIT-601001

Date: Sep 07

SITE:	Renfrew WWTP
PROCESS AREA:	To Centrifuge
INSTR. TAG:	FIT-601001
MANUFACTURER:	ROSEMOUNT
MODEL:	8712DR12N0M4
SERIAL No.:	0860232719
SENSOR No.:	870155550

SERVICE DATE:	Sep 07 2016
TECHNICIAN:	M Humphries
JOB REFERENCE:	160907

Input	**(Test)**	**Output**	**(Signal)**	**(Process)**
Type:	SIMULATOR	**Type or EGU:**	mA	m3/day
Min:	0.00	**Min:**	4.00	0.00
Max:	30 FEET/SEC.	**Max:**	20.00	1000.00
DN (mm):	2 INCH			

CALIBRATION # 0915405409132005

			Before Calibration		**After Calibration**	
Input (Y pos)	**Input %**	**Calc. O/P (mA)**	**Output (mA)**	**%Error**	**Output (mA)**	**%Error**
0.00	0.00%	4.00	4.00	0.00%	4.00	0.00%
3.00	10.00%	5.60	5.60	0.00%	5.60	0.00%
10.00	33.33%	9.33	9.34	0.07%	9.34	0.07%
30.00	100.00%	20.00	20.00	0.00%	20.00	0.00%

Calibration Equipment

Type:	FLOWTUBE SIMULATOR	DMM	
Manufacturer:	ROSEMOUNT	FLUKE	
Model:	8714D	87 V	
Serial No.:	0332294	94140067	
Last Cal. Date:	April 13, 2016	March 24, 2016	

Comments:

1,2,GND, 17,18,19
W,B,S,S,W,B
coil resistance, 12.4 ohms, open to ground

AS FOUND: PASS **AS LEFT:** PASS

CERTIFIED BY:

CALIBRATION REPORT

Report No.:	FIT-170000
Date:	Sep 07

SITE:	Renfrew WWTP	**SERVICE DATE:**	Sep 07 2016
PROCESS AREA:	Raw		
INSTR. TAG:	FIT-170000	**TECHNICIAN:**	M Humphries
MANUFACTURER:	ROSEMOUNT		
MODEL:	8712DR12N0M4	**JOB REFERENCE:**	160907
SERIAL No.:	0860253445		
SENSOR No.:	156132		

Input	**(Test)**	**Output**	**(Signal)**	**(Process)**
Type:	SIMULATOR	**Type or EGU:**	mA	m3/day
Min:	0.00	**Min:**	4.00	0.00
Max:	30 FEET/SEC.	**Max:**	20.00	75000.00
DN (mm):	12 INCH			

CALIBRATION # 1061804910357005

			Before Calibration		**After Calibration**	
Input (Y pos)	**Input %**	**Calc. O/P (mA)**	**Output (mA)**	**%Error**	**Output (mA)**	**%Error**
0.00	0.00%	4.00	4.00	0.00%	4.00	0.00%
3.00	10.00%	5.60	5.60	0.00%	5.60	0.00%
10.00	33.33%	9.33	9.33	-0.04%	9.33	-0.04%
30.00	100.00%	20.00	19.99	-0.05%	19.99	-0.05%

Calibration Equipment			
Type:	FLOWTUBE SIMULATOR	DMM	
Manufacturer:	ROSEMOUNT	FLUKE	
Model:	8714D	87 V	
Serial No.:	0332294	94140067	
Last Cal. Date:	April 13, 2016	March 24, 2016	

Comments:

1,2,GND, 17,18,19
W,B,S,S,W,B
coil resistance, 8.6 ohms, open to ground
Total 15245154 m3

AS FOUND: PASS **AS LEFT:** PASS

CERTIFIED BY:

CALIBRATION REPORT

Report No.:	160907 FIT-Final Effluent
Date:	Sep 07

SITE:	Renfrew WWTP	**SERVICE DATE:**	Sep 07 2016
PROCESS AREA:	Final Effluent		
INSTR. TAG:	FIT-Final Effluent	**TECHNICIAN:**	M Humphriess
MANUFACTURER:	Siemens		
MODEL:	MR200	**JOB REFERENCE:**	160907
SERIAL No.:			
INSTR. RANGE:	0-50,000 m³/day		

Input	**(Test)**		**Output**	**(Signal)**	**(Process)**
Type:	Head cm		**Type or EGU:**	mA	m3/day
Min:	0.00		**Min:**	4.00	0.00
Max:	67.63		**Max:**	20.00	50000
Weir Width (in.)	18	**Parshall Flume**			
exponent	1.538				
constant	3803				

			Before Calibration		**After Calibration**	
Input (cm)	**m3/day**	**Calc. O/P (mA)**	**m3/day**	**Error (%FS)**	**Output (mA)**	**Error (%FS)**
0.00	0.00	4.00	4.00	0.00%	4.00	0.00%
27.46	12504	8.00	7.90	-0.62%	7.90	-0.62%
43.09	25004	12.00	11.91	-0.56%	11.91	-0.56%
56.08	37498	16.00	15.85	-0.94%	15.85	-0.94%
67.62	50003	20.00	19.93	-0.44%	19.93	-0.44%

Calibration Equipment			
Type:		DMM	Laser Distance Meter
Manufacturer:		Fluke	Fluke
Model:		Model 87	424D
Serial No.:		94140067	
Last Cal. Date:		March 24, 2016	

Comments:

AS FOUND: PASS **AS LEFT:** PASS

CERTIFIED BY: