Executive Summary

The Guelph Wastewater Treatment Plant (WWTP) Operating within the Wastewater Services Department provides treatment of domestic, commercial, institutional and industrial wastewater collected from the City of Guelph and the neighbouring community of the Township of Guelph/Eramosa. The facility, located at 530 Wellington Street West, provides tertiary treatment with disinfected effluent being discharged to the Speed River.

This report documents the performance of the sewage works as specified in the Amended Environmental Compliance Approval 8835-9QJKSD.

The WWTP provides preliminary screening and grit removal, primary treatment by sedimentation, secondary treatment by conventional and extended aeration activated sludge and two stage tertiary treatments utilizing rotating biological contactors (RBC) followed by sand filtration. Disinfection of the final effluent is a requirement and is accomplished by the addition of sodium hypochlorite followed by the addition of sodium bisulphite for de-chlorination prior to discharge to the receiving stream.

Process loading to the facility in 2016 was within typical values and the sludge accountability for the facility closed at 8% .The average total daily wastewater flow for this reporting period was 53.000 ML/day. The maximum total daily flow was 102.1 ML on April 1st 2016.

Overall, the WWTP performed satisfactorily during the reporting period. A summary of effluent quality data is included as Table 3.1 of this report. The data indicates that the facility recorded annual removal efficiencies for $cBOD_5$ – 98.4%, TSS – 99.2%, TP – 96.6%, TKN 96.5% and TAN – 98.1%.

Solids generated during treatment were stabilized by anaerobic digestion and subsequently mechanically dewatered. During the reporting period a total of 4227 dry tonnes of dewatered biosolids were generated. All material was diverted from landfill and was beneficially land applied.

The facility has no provision for primary treatment or raw sewage bypass directly to the Speed River. The facility does have provision for secondary treatment bypass, complete tertiary bypass and partial tertiary bypass. In 2016, all flow through the facility received at a minimum complete secondary treatment. . There were three partial sandfilter bypasses and one tertiary bypass in 2016. Please see section 5.0 for details.

A plant flow diagram of the facilities process operations is presented as Appendix A of this report

Introduction

A key component of a Comprehensive Performance Evaluation (CPE) is to perform a process loading assessment. This evaluation examines the measured flow and mass loading for the population and compares it to typical per capita contributions.
As seen by the table below the City of Guelph WWTP was overall typical in terms of process loading for 2016.

Process Loading Evaluation 2016
Population : 134,894 (includes Rockwood)

Parameter	Actual	Typical
Per Capita Flows and Loads		
Per Capita Wastewater Flow	393 L/d per person	350-500 L/d per person
Per Capita BOD_5 Loading	90 g/d per person	80 g/d per person
Per Capita TSS Loading	104 g/d per person	90 g/d per person
Per Capita TKN Loading	15 g/d per person	13 g/d per person
Ratios		
Flows: Peak Day/Annual Average	1.9	2.5-4.0
Raw: TSS/BOD_5	1.15	0.8-1.2
Raw: TKN/BOD_5	0.16	0.1-0.2

Another important part of the CPE is to conduct a Sludge Accountability on the process. Sludge accountability compares measured sludge production from the data collected and compares it to projected sludge production results. This comparison, which has a best practice acceptable range of plus/minus 15%, is valuable in measuring the reliability of the data being collected to properly represent the facility performance. Contributing factors to successful sludge accountability include accurate sampling and a knowledgeable facility staff to take care of the day to day process requirements.

For 2016 the City of Guelph sludge accountability resulted in an 8% accuracy which is well within the acceptable variability and therefore validates the reliability of the data collection and analysis.

Sludge Accountability Summary 2016

Reported Sludge	kg/d	**Projected Sludge**	kg/d
Intentional Wasting	13,548.7	Primary Sludge Production	8,669
Unintentional Wasting	108.7	Biological Sludge Production	4,383
Sidestream	1,033	Chemical Sludge Production	603
Total	12,624		13,655
Sludge Accountability	**8%**		

Note: plus/minus 15% is best practice

Appendix E demonstrates the calculations that were made to obtain the above results.

1.0 Wastewater Flow

A Parshall flume complete with secondary instrumentation is provided immediately downstream of the facilities chlorine contact chamber. The effluent flow rate through the flume is continuously measured, integrated and totalized on a daily basis in the facilities Supervisory Control and Data Acquisition System (SCADA). This daily data is manipulated electronically in spreadsheet software to calculate and report the average total daily flow and maximum total daily flow for each month. Flow data for the 2016 reporting period is included as Table 1.1 of this report as well as represented in chart 1.0. A comparison of total flow per month between 2015 and 2016 can be seen in chart 1.2

The average total daily flow for the year 2016 is 53.000 MLD. A maximum total daily flow of 102.100 ML was recorded on April 1st, 2016.

Table 1.1
City of Guelph Wastewater Treatment Plant
Wastewater Flow Data, Year 2016

2016	Average Total Daily Flow ML	Maximum Total Daily Flow ML
January	50.013	54.000
February	51.928	59.100
March	59.934	92.600
April	70.914	102.100
May	52.140	56.500
June	49.496	54.100
July	48.600	58.200
August	50.474	58.300
September	52.461	58.800
October	50.503	53.600
November	50.311	60.300
December	49.226	57.000
Annual Average	53.000	x
Winter Average	52.283	x
Summer Average	53.513	x

Chart 1.1

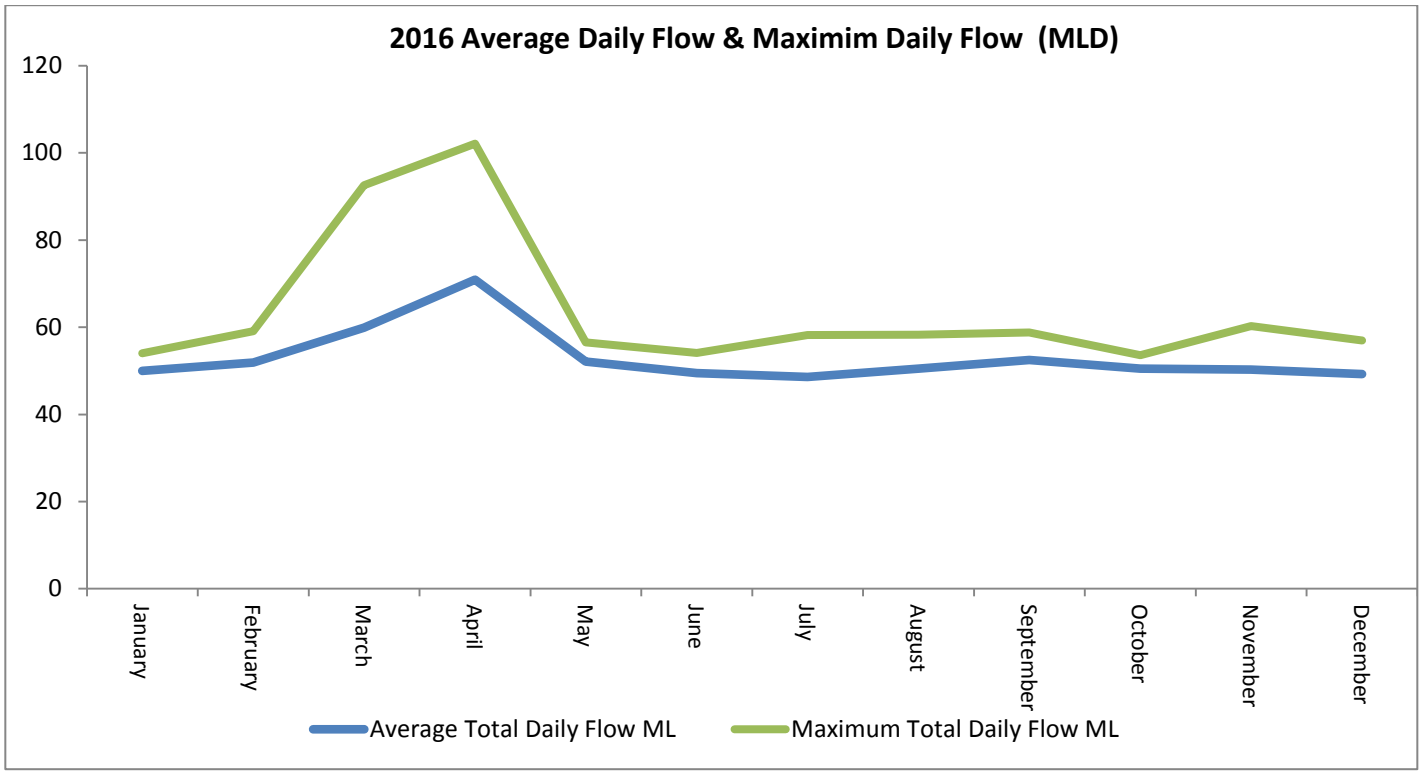
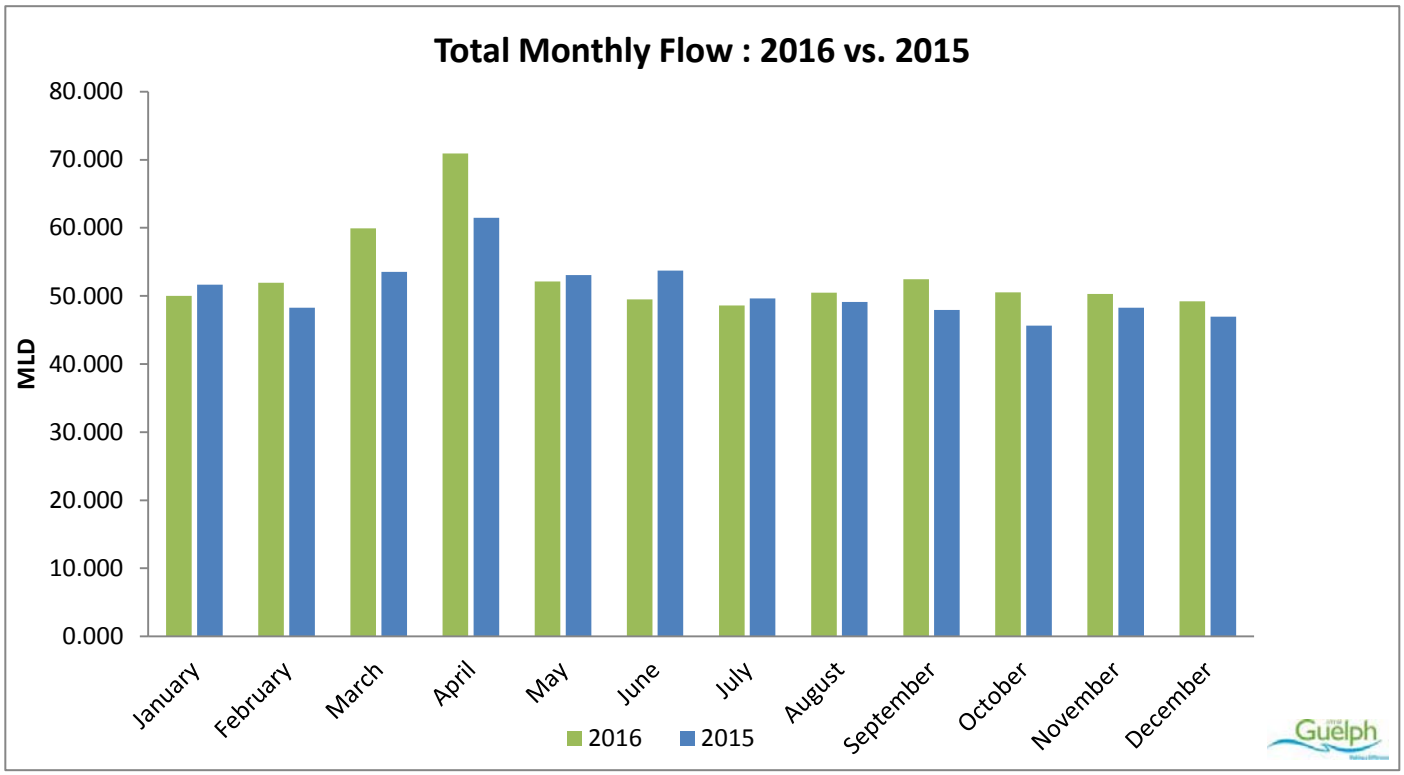


Chart 1.2 illustrates the total average monthly flow comparison between 2015 and 2016; to which the facility saw a 4.2% increase in total flow.

Chart 1.2



2.0 Raw Influent Wastewater Quality

Considerable effort is undertaken in monitoring the characteristics of WWTP influent, effluent and intermediate process streams to provide the necessary data for process optimization by plant staff and meet Environmental Compliance Approval monitoring and reporting requirements. Twenty-four hour flow proportional composite samples are routinely collected and analyzed. The raw influent wastewater data analyzed by the Guelph WWTP and CALA (Canadian Association for Laboratory Accreditation) certified outside laboratories is combined and a monthly summary is presented in Table 2.1.

Table 2.1
City of Guelph Wastewater Treatment Plant
Raw Influent Wastewater Quality Data, Year 2016

2016	pH	[1]$cBOD_5$ (mg/L)	TSS (mg/L)	P_{Tot} (mg/L)	TKN (mg/L)	NH_3-N (mg/L)
January	7.67	294	279	5.60	44.6	24.7
February	7.65	227	237	5.08	43.2	25.0
March	7.63	232	237	4.26	35.4	20.1
April	7.65	157	188	3.31	31.0	16.1
May	7.67	202	266	4.69	35.4	19.8
June	7.70	192	279	4.64	37.9	22.0
July	7.68	184	259	4.37	35.5	20.3
August	7.66	222	282	4.69	35.6	19.5
September	7.71	241	283	4.82	39.0	21.7
October	7.77	251	340	5.27	41.2	24.2
November	7.69	272	295	5.40	47.7	28.0
December	7.64	301	272	5.01	45.7	28.0
Annual Average	7.7	231	268	4.8	39.4	22.4
Winter Average	7.7	265	264	5.1	43.3	25.1
Summer Average	7.7	207	271	4.5	36.5	20.5

3.0 Final Effluent Quality

Primary sedimentation and secondary activated sludge treatment is provided by four separate treatment trains namely Plants 1, 2, 3 and 4. Plants 1, 2, and 3 incorporate conventional activated sludge with the secondary effluent from each of these three plants directed to a common pump well. The combined secondary effluent is lifted by vertical turbine pumps to the rotating biological contactors (RBC) influent distribution channel and evenly split to each of the four RBC trains. Each of the four RBC trains consists of eight shafts in series. The process objective of the RBC's is to provide additional biological treatment for the oxidation of ammonia. Effluent from the RBC trains is discharged to a common sand filter influent channel and distributed to the sand filters for additional suspended solids capture. The Plant 4 treatment train incorporates extended aeration activated sludge and is capable of complete nitrification. As such plant 4 secondary effluent can be directed to a separate pump well which discharges to the common sand filter influent channel for distribution to the sand filters for additional suspended solids capture. Plant 4 secondary effluent can also be directed through the RBC's as plants 1, 2 and 3.

The final treated effluent passes through a Parshall flume and is measured by an ultrasonic transmitter. Both the transmitter and remote recorder are calibrated yearly to ensure accuracy of total flows. (See appendix C) A Plant Flow Diagram is included as Appendix A. Design data for the treatment units are listed in Appendix B.

Effluent quality requirements as specified in the Environmental Compliance Approval differ for summer and winter conditions. These limits and performance charts can be reviewed in Appendix H.

An automatic sampling system collects a series of flow paced aliquots from the chlorine contact chamber and combines them in a container within a refrigerated compartment to produce a 24-hour flow proportional composite sample of the treated WWTP effluent. This composite sample is then analyzed by the Guelph WWTP laboratory, which is ISO 17025 accredited by the Canadian Association for Laboratory Accreditation (CALA). The results from the Guelph WWTP laboratory are tabulated in Table 3.1. This table provides a monthly summary of final effluent quality data.

Residual chlorine and sodium bisulphite are constantly monitored in the chlorine contact chamber in keeping with the year round requirement for disinfection. Both sodium hypochlorite and sodium bisulphite application and control is provided by ORP instrumentation. The objective of 200 E. Coli CFU/100mL of sample was met. Performance data is presented in Table 3.1.

As mandated by Environment Canada, the facility has optimized the disinfection/de-chlorination system to reduce the total residual chlorine to the speed river to 0.02mg/L.

The City of Guelph is committed to the development/maintenance of a quality management system for laboratory operations. In 2014, the Laboratory received formal ISO/IEC 17025 Accreditation by CALA. The fulfillment of the requirements of ISO/IEC 17025 means the laboratory meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically valid test results.

The scope of testing the laboratory provides has also been increased to include BOD_5, $CBOD_5$. The formal scope of accreditation can be found in the CALA Directory of Laboratories at www.cala.ca under the membership number 3222.

The quality system measures and best practices that have been put in place that qualify the laboratory for formal accreditation include, but are not limited to the following:

- All test methods on the laboratory scope of testing have been validated to prove method performance on site and prove any modifications to test methods are technically valid.

- A quality control program has been instituted for all test methods that have undergone validation. Typical QC samples introduced in a batch of 20 samples includes as appropriate: a method blank, a quality control standard, a calibration check standard, and a sample duplicate. Matrix spike samples are also analysed to monitor sample matrix interferences. Control limits for QC samples are statistically determined. When control limits are exceeded, corrective action is taken and either the analysis is repeated or the data is qualified.

- Participation in an external proficiency testing regime provided by CALA or other proficiency testing providers.

- Internal training program to ensure laboratory analysts are adequately trained when performing a test method and have proven proficient at the test methods they perform

- A Continual improvement program is in place to provide a systematic method of identifying and addressing issues that would bring about change and eventually impede the consistent production of valid test results.

- Annual ISO/IEC 17025 calibration of key measurement instruments for lab balances, pipettes, and thermometers. A daily monitoring program ensures verification of calibration for these instruments.

- A formal document control and records management program is in place to ensure changes to documents are authorized and controlled and laboratory records are managed to ensure integrity.

Table 3.1
City of Guelph Wastewater Treatment Plant
Final Effluent Quality Data, Year 2016

2016	pH	Temp	[1]cBOD$_5$		BOD5		TSS		P_{Tot}		TKN	TAN		NO_3-N	NO_2-N	[5]E. Coli	TCR	SBR
			Concentration	Loading	Concentration	Loading	Concentration	Loading	Concentration	Loading		Concentration	Loading					
		^{0}C	(mg/L)	(kg/d)	(mg/L)	(kg/d)	(mg/L)	(kg/d)	(mg/L)	(kg/d)	(mg/L)	(mg/L)	(kg/d)	(mg/L)	(mg/L)	(CFU/100 mL)	(mg/L)	(mg/L)
Jan	7.90	12.9	2.50	127	4.42	220	2.00	100	0.15	7	1.50	0.65	32	28.2	0.24	33	0.00	1.50
Feb	7.83	13.0	2.67	143	6.89	354	2.00	104	0.13	7	1.66	1.31	68	29.3	0.32	10	0.00	1.20
March	7.80	13.0	3.43	215	8.21	471	2.15	120	0.12	7	2.41	1.25	81	28.0	0.31	17	0.00	1.50
Apr	7.82	15.7	2.33	183	5.50	485	2.00	142	0.09	7	1.71	0.77	66	22.9	0.14	13	0.00	1.50
May	7.94	18.5	2.00	104	2.00	104	2.08	108	0.12	6	1.06	0.08	4	29.3	0.05	12	0.00	1.30
June	7.96	20.6	2.00	99	2.15	102	2.12	107	0.13	7	1.08	0.11	5	32.2	0.05	20	0.00	1.60
July	8.02	21.8	2.08	104	2.33	120	2.08	102	0.19	10	1.20	0.14	7	27.1	0.10	53	0.00	1.40
Aug	7.99	21.5	2.00	101	2.00	101	2.04	102	0.18	9	0.69	0.10	5	28.3	0.05	27	0.00	1.30
Sept	8.00	20.0	2.00	105	2.00	105	2.08	110	0.20	10	0.87	0.08	4	29.3	0.05	52	0.00	1.20
Oct	8.01	17.9	2.00	101	2.08	104	2.00	101	0.23	12	1.25	0.14	7	31.0	0.09	37	0.00	0.90
Nov	7.94	15.6	2.00	101	2.09	101	2.00	101	0.22	11	1.20	0.11	6	31.1	0.11	87	0.00	1.30
Dec	7.88	13.4	2.00	98	2.57	141	2.00	98	0.18	9	1.45	0.24	10	31.2	0.08	27	0.00	1.20
Annual Average	7.9	17.0	2.3	107.9	3.5	200.6	2.0	107.9	0.2	8.4	1.3	0.4	24.7	29.0	0.1	83.0	0.0	1.3
Winter Average	7.9	14.8	2.4	103.5	4.0	213.5	2.0	103.5	0.2	9.1	1.5	0.55	30.4	30.0	0.2	35.5	0.0	1.2
Summer Average	8.0	19.4	2.1	110.4	2.6	160.2	2.1	110.4	0.2	8.6	1.1	0.20	14.1	28.6	0.1	30.5	0.0	1.3
Notes:	1	All cBOD$_5$ and BOD5 analysis conducted by independent CAEAL accredited laboratory only.																
	2	SBR, sodium bisulphite residual																
	3	All analyses based on 24-hour flow paced composite samples.																
	4	The Summer period is April 1 to October 31. The Winter period is November 1 to March 31.																
	5	Escherichia Coli values are calculated geometric means.																

4.0 Solids Handling and Disposal

The raw sludge produced at the WWTP is thickened in the primary clarifiers and pumped to the anaerobic digestion system which consists of four primary digesters and one secondary digester. The waste activated sludge from all Plants are thickened in a rotary drum thickener and then sent to one of the primary digesters.

Following stabilization by anaerobic digestion, biosolids were directed from the secondary digester to the dewatering facility. The dewatering facility consists of four belt filter presses and associated auxiliary equipment.

A simplified solids flow diagram of the WWTP is presented in Appendix A.

A summary of solids production, handling and disposal is presented in Table 4.1. The results of routine laboratory analysis of the dewatered biosolids are presented in Table 4.2. The results of routine E. coli analysis of the dewatered biosolids are presented in Table 4.3. In reference to Table 4.3 only biosolids that received the Lystek treatment were land applied.

The Rotary Drum Thickener (to thicken Waste Activated Sludge) is automated to run 24hrs/day, provided sufficient waste activated sludge was available. The unit used a combination of anionic and cationic polymers at a ratio of approximately 1.10:1 to assist in thickening the waste activated sludge to 4.15% solids. Table 4.4 will reveal in more detail the monthly totals.

During the reporting period 4227 dry tonnes of dewatered biosolids were generated. The facility anticipates a similar quantity of bio-solids generation for the next reporting period. This reporting period resulted in 100% biosolids diversion from landfill. All dewatered biosolids were land applied during land application season or stored and processed for land application. Land application of this Class A equivalent bio-solid material (US EPA 503, CFR Part 40) to registered site numbers GLP-11018, GLP-7513, and 22536 occurred through the haulage and application services provided by Terratec Environmental Incorporated. The quality of the Lystek material can be found in Table 4.2.

The compost infrastructure was utilized as required to load trucks with dewatered biosolids cake to support both the landfill diversion aspect of the biosolids program.

Table 4.1
City of Guelph Wastewater Treatment Plant
Solids Handling and Disposal, Year 2016

Month	Average Digested Solids Total Solids (%)	Digested Solids Pumped to Dewatering (m^3/month)	Average Dewatered Cake Total Solids (%)	Cake Production (wet tonne)	Cake Production (dry tonne)	Average Lystek Total Solids (%)	Lystek to Land Application (m3/month)	Cake Equivalent (dry tonne)	Cake to Lystek (wet tonne)	Cake & Bulking to Landfill (wet tonne)	Cake to Landfill (wet tonne)	Processed for Land Application (wet tonne)
Jan	1.76	18347	20.60	1650.01	339.90	-	-	-	-	-	-	1193
Feb	1.84	16303	20.23	1560.87	315.76	-	-	-	-	-	-	1220
Mar	2.15	19200	22.90	1897.49	434.53	-	-	-	-	-	-	1248
Apr	1.93	23005	23.20	2014.50	467.36	11.86	-	-	-	-	-	1324
May	1.38	22051	22.54	1421.12	320.32	14.68	570	84	371	-	-	914
Jun	2.00	19599	23.98	1720.64	412.61	15.40	718	111	461	-	-	576
Jul	1.36	16990	24.58	989.53	243.23	15.80	649	103	417	-	-	564
Aug	1.66	16822	24.34	1207.65	293.94	14.63	345	50	207	-	-	784
Sep	1.94	16990	25.12	1381.19	346.95	15.00	397	60	237	-	-	784
Oct	2.05	19460	22.90	1833.74	419.93	14.02	497	70	304	-	-	739
Nov	1.75	17903	20.56	1604.05	329.79	13.70	415	57	276	-	-	936
Dec	1.63	17645	20.63	1467.53	302.75	-	-	-	-	-	-	1196
Totals		224,315	-	18,748	4,227	-	3591	533	2274	-	-	11,478
Average	1.79	-	22.63	-	-	14.76	-	-	-	-	-	-

Month	Lystek to Land Application			Lystek to Digester		Total Lystek Disposal	
	%Solids	m3 applied	Dry Tonnes	m3	Dry Tonnes	m3	Dry Tonnes
Jan	-	-	-	-	-	-	-
Feb	-	-	-	-	-	-	-
Mar	-	-	-	-	-	-	-
Apr	11.86	-	-	-	-	-	-
May	14.68	570	84	-	-	570	84
Jun	15.40	718	111	-	-	718	111
Jul	15.80	649	103	-	-	649	103
Aug	14.63	345	50	-	-	345	50
Sep	15.00	397	60	-	-	397	60
Oct	14.02	497	70	-	-	497	70
Nov	13.70	415	57	-	-	415	57
Dec	-	-	-	-	-	-	-
Totals		3591	533	0	0	3591	533

Total Volume for Procees Land Application	**11,478.15**
Dundalk - Lystek International	**Wet Tonnes**
Lystek International Inc. 191 Eco Park Way Dundalk, Ontario, N0C 1B0	

Lystek Land Application Report

Site Number	NASM Plan No.	Total Area Applied	Application Rate	Total Volume Applied
		acres	m3/acre	m3
GLP-7513	20484	4.43		228.90
TOR-11018	22117	48.94		1947.00
22536	22536	20.5		779.00
GLP-7513	20484	15.75		701.00
Totals		89.62		3655.9
Terratec Environmental				
System C of A Number: 4560-4QDFY9				

Table 4.2
City of Guelph Wastewater Treatment Plant
Biosolids Metal Analysis, Year 2016

	Total Solids (mg/L)		Total Volatile Solids (%)		pH (Units)		C:N Ratio		TKN (ug/g)		NH3 + NH4 as N (Total Ammonium Nitrogen) (ug/g)		NO3- + NO2- as N (Nitrate + Nitrite as Nitrogen) (ug/g)	
	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek
Jan	20.6	-		-		-		-		-		-		-
Feb	20.2	-	63.3	-	7.5	-	6.4	-	51,000	-	9,280	-	20.0	-
Mar	22.9	-	63.8	-	7.3	-	7.0	-	47,700	-	11,000	-	30.0	-
Apr	23.2	11.9	61.0	55.0	7.4	9.7	3.8	5.6	72,500	45,517	11,300	10,467	20.0	76.7
May	22.5	14.7	62.6	56.9	7.9	8.8	5.9	5.4	50,650	52,375	11,275	11,843	13.0	95.0
Jun	24.0	15.4	62.6	56.4	7.6	9.5	6.8	6.5	44,400	39,275	8,895	9,028	11.5	165.0
Jul	24.6	15.8	63.2	54.7	7.5	9.6	5.4	5.3	54,200	47,300	8,580	7,970	20.0	200.0
Aug	24.3	14.6	58.0	51.9	7.4	9.7	5.8	6.2	46,000	38,867	10,100	10,190	3.0	153.3
Sep	25.1	15.0		51.7		9.9		5.5		44,800		8,003		200.0
Oct	22.9	14.0	61.0	54.2	7.5	10.0	5.1	6.3	59,750	42,250	8,120	8,758	20.0	200.0
Nov	20.6	13.7	61.7	54.1	8.1	9.8	7.8	5.4	42,200	47,350	10,250	10,120	20.0	200.0
Dec	20.6	-	64.6	-	7.8	-	6.1	-	50,100	-	-	-	3.0	-

	Organic N (mg/kg)		Total P (Total Phosphorous) (ug/g)		Total K (Potassium) (ug/g)		Cd (mg/kg) (Cadmium)		Cr (mg/kg) (Chromium)		Co (mg/kg) (Cobalt)		Cu (mg/kg) (Copper)	
	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek
Jan		-		-		-		-		-		-		-
Feb	42,000	-	29,000	-	1,000	-	1.20	-	55	-	5.40	-	650	-
Mar	37,000	-	28,000	-	900	-	0.99	-	55	-	5.10	-	620	-
Apr	61,000	34,833	27,000	25,167	1,000	62,833	1.20	1.07	76	63	5.00	4.87	560	542
May	39,500	40,750	27,000	24,250	1,000	60,000	1.20	1.08	62	57	6.35	5.88	615	550
Jun	35,500	30,000	29,000	26,250	950	61,000	1.15	1.03	59	53	7.35	7.00	675	588
Jul	46,000	39,500	28,000	26,500	1,100	61,000	1.10	1.15	61	56	6.90	7.10	670	625
Aug	36,000	28,667	25,000	27,333	800	66,333	1.10	1.20	62	59	7.60	7.37	670	680
Sep		36,500		25,250		65,250		1.07		56		7.55		633
Oct	51,500	33,500	30,500	27,250	750	70,750	1.04	1.05	57	53	7.40	6.85	650	615
Nov	32,000	37,500	27,500	27,000	900	69,000	1.05	1.00	55	53	7.25	9.30	660	625
Dec	39,000	-	31,000	-	800		1.10	-	56	-	6.60	-	690	-

	Pb (mg/kg) (Lead)		Mo (mg/kg) (Molybdenum)		Ni (mg/kg) (Nickel)		Zn (mg/kg) (Zinc)		Hg (mg/kg) (Mercury)		As (mg/kg) (Aresenic)		Se (mg/kg) Selenium	
	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek
Jan		-		-		-		-		-		-		-
Feb	120.0	-	12.0	-	24.0	-	960	-	1.70	-	2.6	-	2.70	-
Mar	89.0	-	9.5	-	23.0	-	920	-	0.47	-	2.7	-	2.60	-
Apr	65.0	51.7	9.7	10.1	31.0	26.8	930	848	0.39	0.45	3.0	2.9	2.90	2.97
May	32.0	31.0	9.7	9.8	27.0	24.3	955	848	0.53	0.40	3.2	2.9	3.00	2.80
Jun	24.5	22.5	11.5	11.5	25.5	24.5	985	885	0.45	0.47	3.3	3.0	2.75	2.40
Jul	31.0	34.5	12.0	12.5	25.0	24.5	1,000	985	0.56	0.44	3.3	3.2	2.80	2.50
Aug	33.0	31.0	15.0	15.7	30.0	27.3	1,100	1,033	0.44	0.49	3.3	3.3	2.70	2.73
Sep		28.5		19.8		27.0		980		0.45		3.1		2.55
Oct	25.0	25.3	22.0	22.3	26.5	25.5	970	925	0.62	0.55	2.9	2.8	2.65	2.38
Nov	22.5	22.0	15.0	19.0	27.5	31.5	965	920	0.49	0.47	3.2	3.0	2.85	2.45
Dec	18.0	-	26.0	-	27.0	-	960	-	0.47	-	2.9	-	3.10	-

Table 4.3
City of Guelph Wastewater Treatment Plant
Dewatered Biosolids Analysis, Year 2016

E.coli DWCC (Presses)		4 Sample Geomean	E.coli DWCC (Presses)		4 Sample Geomean	E.coli DWCC (Presses)		4 Sample Geomean	E.coli DWCC (Presses)		4 Sample Geomean	E.coli DWCC (Presses)		4 Sample Geomean
Date	CFU/gm dry weight)		Date	CFU/gm dry weight)		Date	CFU/gm dry weight)		Date	CFU/gm dry weight)		Date	CFU/gm dry weight)	
2016-Jan-11	4700	12926	2016-May-09	39000	25065	2016-Sep-02	64000	55488	2016-Dec-16	57000	43518	-	-	-
2016-Jan-15	75000	13784	2016-May-13	21000	24501	2016-Sep-09	120000	70519	2016-Dec-19	130000	45374	-	-	-
2016-Jan-22	23000	15093	2016-May-16	54000	31407	2016-Sep-12	2800000	149129	-	-	-	-	-	-
2016-Jan-25	7700	15807	2016-May-20	33000	34757	2016-Sep-16	70000	196972	-	-	-	-	-	-
2016-Jan-29	50000	28547	2016-May-27	79000	41466	2016-Sep-19	6600	111621	-	-	-	-	-	-
2016-Feb-01	25000	21691	2016-Jun-03	90000	59662	2016-Sep-26	11000	61418	-	-	-	-	-	-
2016-Feb-05	110000	32077	2016-Jun-10	54000	59662	2016-Oct-07	83000	25485	-	-	-	-	-	-
2016-Feb-22	1400	20946	2016-Jun-20	39000	62206	2016-Oct-14	30000	20620	-	-	-	-	-	-
2016-Mar-04	7600	13079	2016-Jun-27	200000	78466	2016-Oct-21	86000	39176	-	-	-	-	-	-
2016-Mar-07	42000	14890	2016-Jul-04	5800	39535	2016-Oct-24	120000	71198	-	-	-	-	-	-
2016-Mar-11	46000	11974	2016-Jul-08	8100	24604	2016-Oct-28	79000	70325	-	-	-	-	-	-
2016-Mar-18	33000	26384	2016-Jul-11	14000	19044	2016-Oct-31	24000	66509	-	-	-	-	-	-
2016-Apr-04	5600	24444	2016-Jul-18	54000	13728	2016-Nov-14	43000	55927	-	-	-	-	-	-
2016-Apr-18	39000	23996	2016-Aug-11	170000	31942	2016-Nov-18	56000	46225	-	-	-	-	-	-
2016-Apr-22	16000	18428	2016-Aug-15	350000	81895	2016-Nov-21	13000	29441	-	-	-	-	-	-
2016-Apr-29	23000	16837	2016-Aug-22	46000	110260	2016-Nov-25	110000	43077	-	-	-	-	-	-
2016-May-02	20000	23147	2016-Aug-26	140000	139911	2016-Nov-28	22000	36432	-	-	-	-	-	-
2016-May-06	22000	20060	2016-Aug-29	23000	84854	2016-Dec-05	26000	30073	-	-	-	-	-	-

E.coli Lystek		4 Sample Geomean	E.coli Lystek		4 Sample Geomean	E.coli Lystek		4 Sample Geomean	E.coli Lystek		4 Sample Geomean	E.coli Lystek		4 Sample Geomean
Date	CFU/gm dry weight)	CFU/gm dry weight)	Date	CFU/gm dry weight)	CFU/gm dry weight)	Date	CFU/gm dry weight)	CFU/gm dry weight)	Date	CFU/gm dry weight)	CFU/gm dry weight)	Date	CFU/gm dry weight)	CFU/gm dry weight)
20-Apr-16	10	10	1-Jun-16	10	10	2016-09-13	10	10	-	-	-	-	-	-
20-Apr-16	10	10	8-Jun-16	10	10	2016-09-22	10	10	-	-	-	-	-	-
21-Apr-16	10	10	15-Jun-16	10	10	2016-09-28	10	10	-	-	-	-	-	-
21-Apr-16	10	10	22-Jun-16	10	10	2016-10-06	10	10	-	-	-	-	-	-
28-Apr-16	10	10	6-Jul-16	10	10	2016-10-12	10	10	-	-	-	-	-	-
28-Apr-16	10	10	13-Jul-16	10	10	2016-10-19	10	10	-	-	-	-	-	-
10-May-16	10	10	3-Aug-16	10	10	2016-10-26	10	10	-	-	-	-	-	-
11-May-16	10	10	11-Aug-16	10	10	2016-11-02	20	12	-	-	-	-	-	-
18-May-16	10	10	23-Aug-16	10	10	2016-11-10	10	12	-	-	-	-	-	-
26-May-16	10	10	8-Sep-16	10	10	-	-	-	-	-	-	-	-	-

Table 4.4
City of Guelph Wastewater Treatment Plant
Thickened Waste Activated Sludge Report (TWAS) Year 2016

2016	Volume to TWAS	Volume from TWAS	Reduction	Solids	Cationic Polymer Consumption	Anionic Polymer Consumption
	m^3	m^3	%	% D.S.	m^3	m^3
Jan	14,544	551	96	6.01	79	82
Feb	10,838	193	98	5.95	41	53
Mar	18,029	145	99	4.77	76	94
Apr	19,172	972	95	3.74	98	82
May	21,525	1,140	95	5.44	95	94
Jun	9,574	493	95	4.78	39	50
Jul	13,652	510	96	4.41	57	81
Aug	14,295	995	93	4.27	68	83
Sep	16,601	2,267	86	5.25	84	86
Oct	19,282	3,148	84	3.98	101	99
Nov	17,709	2,309	87	4.74	91	95
Dec	14,041	1,352	90	4.62	50	66
Average	14,765	2,398	84	4.15		
Totals	189,262	14,075				

5.0 Unusual Events/Process Upsets

The facility has no provision for primary treatment or raw sewage bypass directly to the Speed River. The facility does have provision for secondary treatment bypass, complete tertiary bypass or partial tertiary bypass. During this reporting period there were three (3) partial sandfilter bypasses and one (1) tertiary bypass. These events are listed in Table 5.1 and were reported to the MOECC Spills Action Centre as per standard operating protocol.

Table 5.1
City of Guelph Wastewater Treatment Plant
Bypass Summary 2016

Date	Occurrence Number	Duration hrs:min	m^3	$cBOD_5$ mg/L	TSS mg/L	NH_3-N mg/L	TP mg/L	Partial or Full Tertairy Bypass	Chlorinated
March 28, 2016	128831	2:40	839.7	2.0	6.0	2.62	0.24	Partial	yes
March 30, 2016	128871	0:04	0.5	5.0	<2	3.26	0.12	Partial	yes
September 20,2016	1635-ADZMV9	17:00	32,725	<2	3.0	<0.06	0.21	Partial	no
November 29,2016	3578-AG7J2-G	0:15	336	<2	8.0	0.07	0.35	Full	yes
June 26, 2016	1542-ABAP98	4:29	Incident involving loss of de-chlorination						

*Partial Tertiary Bypass:
All effluent receives RBC treatment, is chlorinated and de-chlorinated. The volumes listed indicate that amount that did not receive full sandfilter treatment.
*Full Tertiary Bypass:
All effluent receives emergency chlorination. The volumes listed indicate that amount that did not receive RBC and sandfilter treatment.

6.0 WWTP Projects and Upgrades

The following is a summary of Capital Projects, upgrades and major maintenance conducted during the reporting period.

TABLE 6.1
City of Guelph Wastewater Treatment Plant
Capital Project Summary, Year 2016

Project	Status
• SCADA upgrade at the plant	Ongoing
• Digester 3 Cleaning project	Complete
• Digester 3 Gas proofing and repairs/refurbishment Project	Ongoing
• Biosolids Storage Facility	Ongoing

TABLE 6.2
City of Guelph Wastewater Treatment Plant
Maintenance Project Summary, Year 2016

Project	Status
• Implementation of a pump replacement program for facility (annual)	Ongoing into 2017
• Installation of new scum troughs plant # 3 primary and secondary. Plant 2 primary and secondary to be completed in 2017	Ongoing into 2017
• Refurbish and Replacing Belt Presses in dewatering	Ongoing into 2017
• Computerised Maintenance management system, upgrade & reporting	Ongoing into 2017
• Lighting (energy efficiency) retrofit plant wide	Ongoing into 2017
• Install gas cleaning (aeration) for plants 1W-4. 1 east to be completed in 2017	Ongoing into 2017
• Upgrade of SCADA modules and related equipment & remote access	Ongoing into 2017

Optimization

The City of Guelph wastewater facility continued throughout 2016 to strive for a comprehensive optimization program. Maintaining the objectives of the program to work with City staff, regulatory agencies, and external partners and stakeholders to achieve exemplary, sustainable, and economical performance from the physical and human asset.

Data has been generated to support a capacity demonstration. The demonstration involves placing several unit processes on standby while treating the current wastewater flow in the tanks remaining in service. This data may potentially demonstrate the capability greater than the current rated capacities of each liquid train. The existing four liquid trains have a combined nominal rated capacity of 64 MLD. In 2016, the application for rerating the facility was submitted to the MOECC. If after MOECC review the application is approved, the success of the capacity demonstration will result in a re-rating of the existing facility to 73.3 MLD.

Capacity that is demonstrated through re-rating would extend the timelines of the current upgrade program and schedule. Strategically, any demonstrated capacity that results in either capital cost deferral or savings supports the City's Strategic Objective of the "City that makes a difference".

The facility is recognized as one of the leading wastewater treatment plants along the Grand River Watershed. A commitment to the optimization of all aspects of the process so to continue to be a leader in the protection of the environment and to establish best management practices is firmly in place.