

**MUNICIPALITY OF WEST ELGIN
WEST LORNE WASTEWATER TREATMENT PLANT**

**2017 ANNUAL REPORT
January 1 to December 31, 2017**

Environmental Compliance Approval # 3-0442-90-938

Prepared by:



**Ontario Clean Water Agency
Agence Ontarienne Des Eaux**

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Appendix A: Analytical Data

Section 1: Overview

Overall the West Lorne Wastewater Treatment Plant provided effective wastewater treatment in 2016. The wastewater treatment plant was operated under Environmental Compliance Approval 3-0042-90-938 dated November 8, 1993 with amendments July 6, 1994 and September 24, 1998.

Collection System

The collection system contains gravity sewers that lead to the Main Pumping Station located on Marsh Line. It contains a wet well with three submersible pumps that pump to the treatment plant. There is a receptacle for a portable generator should the need arise for backup power. In emergencies, the wetwell contains an overflow pipe that discharges to the West Lorne Lagoon.

Plant Description

The West Lorne Wastewater Treatment Plant is an extended aeration facility which consists of: grit removal and screening, extended aeration, settling, phosphorus removal, filtration and UV disinfection (seasonal). The extended aeration process is designed to remove carbonaceous and nitrogenous organic compounds (BOD). Aluminum Sulphate is used for phosphorus removal. After the clarifier the effluent is seasonally disinfected using ultraviolet light, then discharged to Zoller Drain. Zoller Drain is connected to Brock's Creek and then from there it goes to Lake Erie. Sludge is directed to the lagoon for storage and settling. Decant liquid off the lagoon is returned to the influent of the plant for treatment.

Process Details

- Wastewater is directed into the sewage lift station from the Village of West Lorne by gravity. Wastewater is then pumped from the sewage lift station located on Mash Line into a reinforced concrete inlet channel, provided with a mechanical rake bar screen.
- The secondary treatment system consists of two trains each consisting of: aeration tank, clarifier tank, and two return activated sludge pumps.
- The phosphorous removal system consists of one 15,000L plastic tank with 2 diaphragm type metering pumps 1 duty and 1 standby.
- Lime system for pH and alkalinity control (currently not in use)
- The objective of the system is to remove organics, total Kjeldahl nitrogen (TKN), phosphorous and ammonia-nitrogen.
- Two rotary lobe blowers one duty and one standby supply low pressure air to the aeration tanks.
- The tertiary treatment system consists of three continuous back wash, up flow, deep bed, granular single media sand filtration units housed in the filter building. The disinfection system consists of a ultra-violet (UV) unit through which the effluent is discharged.
- Operations are controlled by a programmable logic controller (PLC). A data logging computer system with local monitoring capability
- Laboratory space is also located at the WWTP to allow for basic laboratory analyses to be conducted by the plant operator

Section 2: Monitoring Data

Sample Collection and Testing

All samples are collected and tested as per the requirements of the Environmental Compliance Approval.

Raw sewage is sampled bi-weekly and tested for BOD₅, total suspended solids, total phosphorus, total Kjeldahl nitrogen, and alkalinity. The raw samples are collected as 24 hour composite samples.

Final effluent is sampled bi-weekly and tested for BOD₅, total suspended solids, total phosphorus, free ammonia nitrogen, total Kjeldahl nitrogen, nitrite, nitrate, pH and alkalinity. Samples are collected using an automatic composite sampler and collected over a 24 hour period. A grab sample of temperature and dissolved oxygen is collected bi-weekly. A grab sample for E. coli is sampled bi-weekly during the disinfection period from April 15 to October 15.

In-house tests are conducted on a weekly basis on the final effluent, raw influent and the mixed liquor suspended solids at the plant to check plant performance and to make any operational changes as required.

In 2017, all chemical and microbiological sample analyses were conducted by SGS Lakefield Research. Temperature, pH and dissolved oxygen were conducted by operators at the treatment plant.

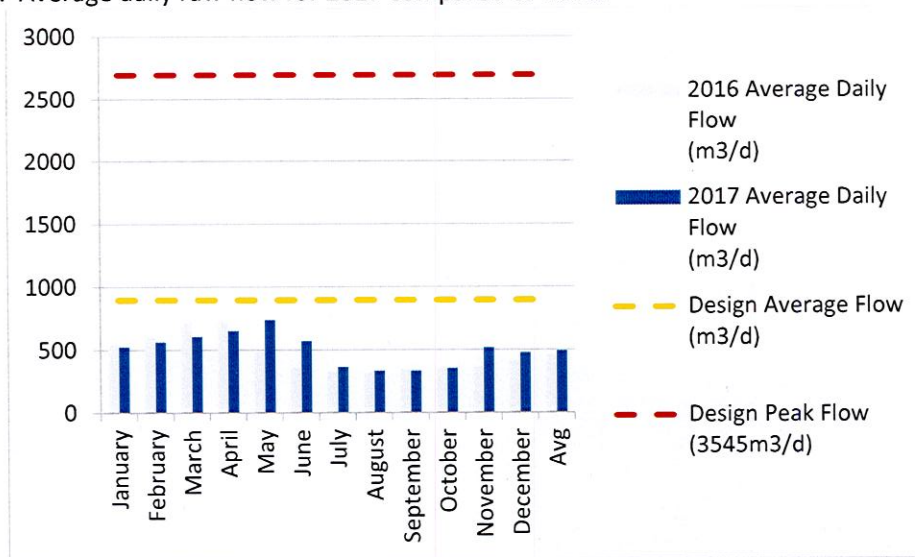
The receiving stream temperature is monitored.

Flows

Detailed monthly flow information is summarized in Appendix A.

The total flow treated in 2017 was 181,075m³, which corresponds to a 6% increase from 2016 raw flows, refer to Chart 1. The annual average daily flow in 2017 was 496m³/day, or 55% of the plant's rated design capacity of 900m³/day.

Chart 1. Average daily raw flow for 2017 compared to 2016.



The design average daily flow for the plant was exceeded 5 times during the year, compared to 13 times in 2016 (refer to Table 1). The hydraulic peak flow of 2,700m³/day for the plant was not exceeded in 2017.

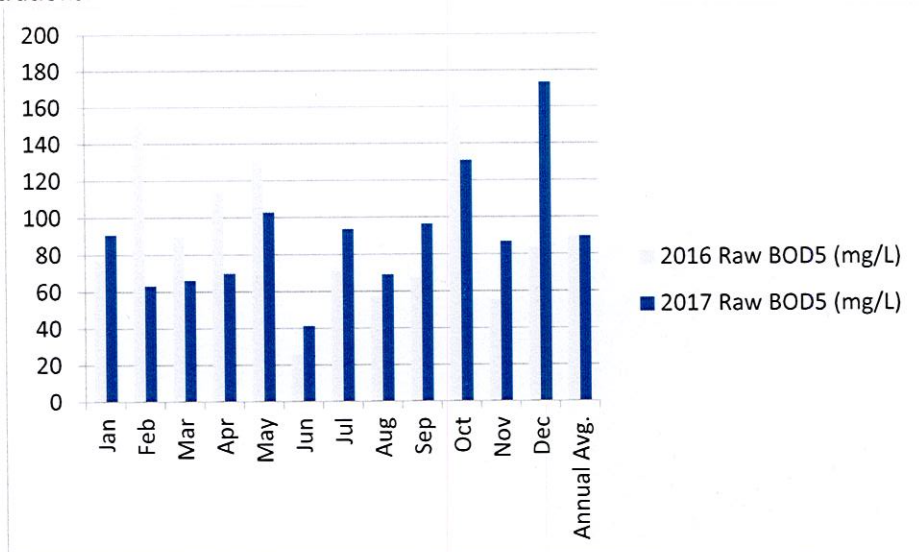
Table 1. Daily design flow exceedances in 2017.

Date	Flow (m ³ /day)
02/07/2017	935
03/30/2017	1,240
05/05/2017	1,477
05/06/2017	1,512
05/07/2017	1,512

Raw Sewage Quality

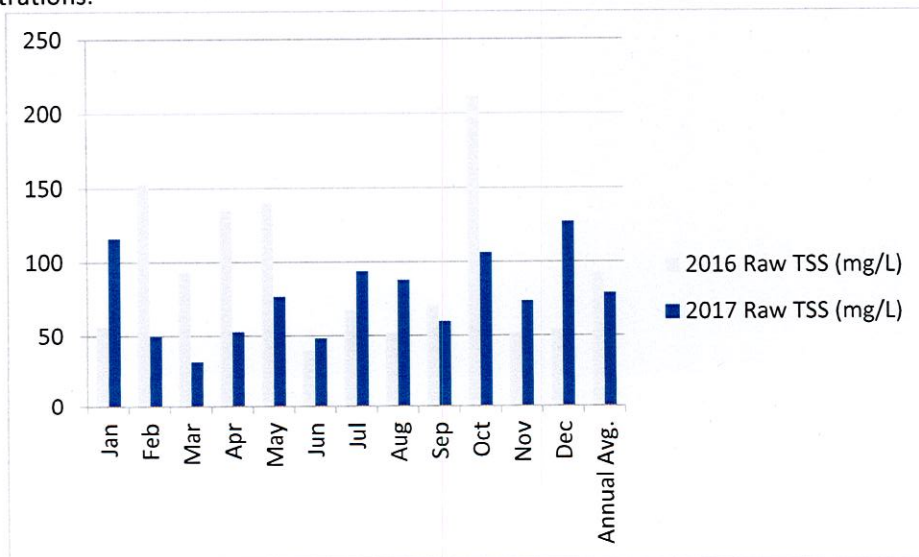
The annual average raw sewage BOD₅ concentration to the plant was 90mg/L with a maximum concentration of 199mg/L. The average concentration of BOD₅ has decreased 0.3% from 2016, refer to Chart 3. The average BOD₅ loading to the plant was 46kg/d for 2017. Refer to Appendix A for detailed analytical data.

Chart 3. Raw sewage average monthly concentration of BOD₅ for 2017 compared to 2016 concentrations.



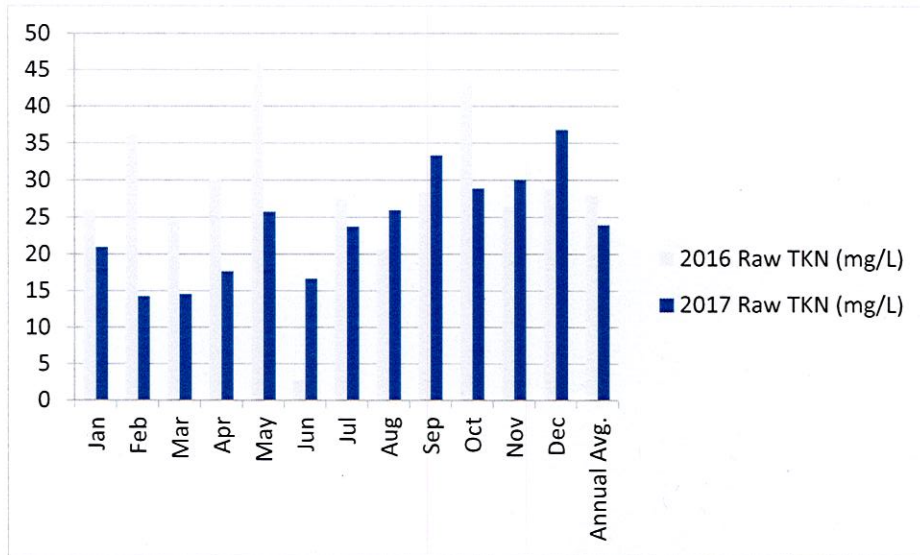
The annual average raw sewage suspended solids (TSS) concentration to the plant was 79.2mg/L, which is a 14% decrease from 2016 (refer to Chart 4). This corresponds to an average TSS loading to the plant of 39.3kg/day. Refer to Appendix A for detailed analytical data.

Chart 4. Raw sewage average monthly concentration of TSS for 2017 compared to 2016 concentrations.



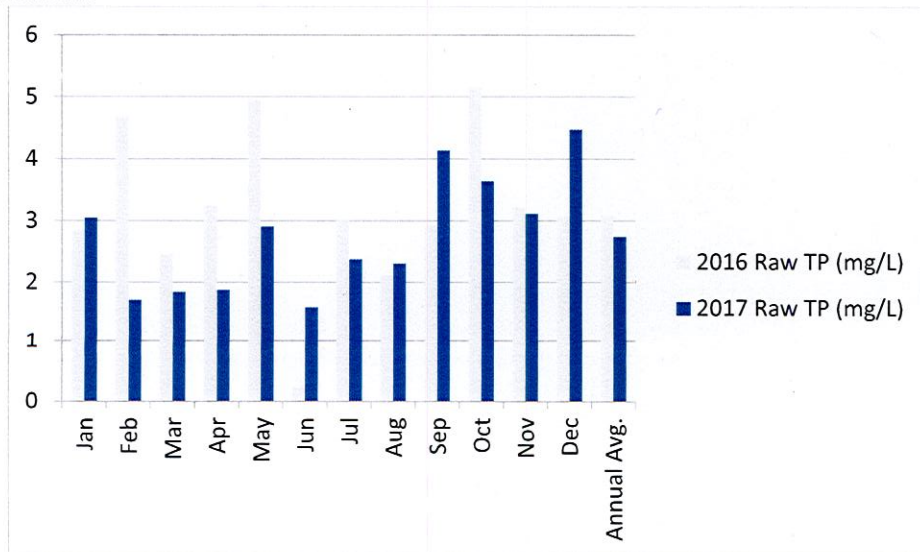
The annual average raw sewage nitrogen concentration (as represented by TKN) to the plant was 24mg/L with a loading of 11.9kg/d. This is a decrease of 14.6% from the 2016 annual average concentration, refer to Chart 5. Refer to Appendix A for detailed analytical data.

Chart 5. Raw sewage average monthly concentration of TKN for 2017 compared to 2016 concentrations.



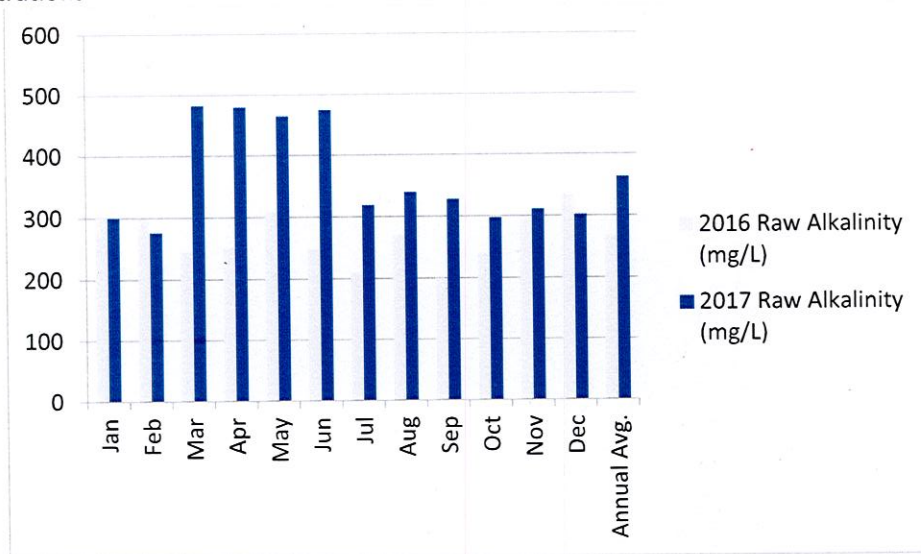
The annual average raw sewage total phosphorus (TP) to the plant was 2.75mg/L, with a loading of 1.36kg/d. This is a decrease of 11% from 2016 annual average of TP, refer to Chart 6. Refer to Appendix A for detailed analytical data.

Chart 6. Raw sewage monthly average concentrations of TP for 2017 compared to 2016 concentrations.



The annual average raw sewage alkalinity to the plant was 363.5mg/L. This is an increase of 35% from 2016 annual average alkalinity, refer to Chart 7. Refer to Appendix A for detailed analytical data.

Chart 7. Raw sewage average monthly concentrations of alkalinity for 2017 compared to 2016 concentrations.



Effluent Limits

Detailed analytical data is attached to this report as Appendix A. The following table provides a summary of monthly average effluent result ranges and loading ranges compared to the compliance limits in the Environmental Compliance Approval.

Summary and Comparison of Compliance Data

Table 1. Monthly average Effluent limits and monthly average loading limits compared to sample results received at the West Lorne WWTP.

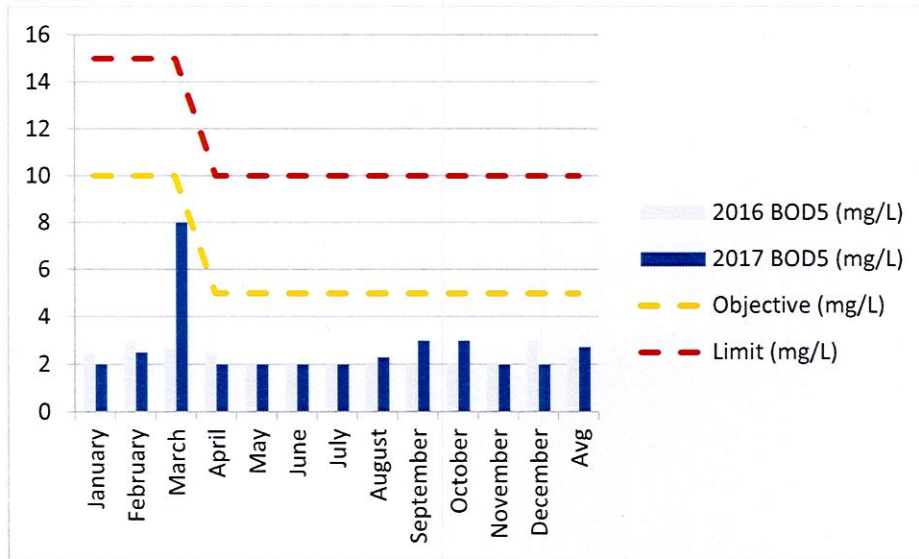
Parameter	Monthly Average Effluent Limit (mg/L)	Monthly Average Effluent Result Ranges (mg/L)	Average Monthly Loading Limit (kg/d)	Monthly Average Loading Ranges (kg/d)
BOD ₅	10(a)	<2 – 3.5	9.0(a)	0.7 – 1.5
	15(b)	<2 – 8.0	13.5(b)	1.1 – 4.9
Suspended Solids	10(a)	<2 – 8.0	9(a)	0.7 – 2.7
	15(b)	3 – 5.7	13.5(b)	1.8 – 3.0
Total Phosphorus	0.5(a)	0.06 – 0.37	0.45(a)	0.03 – 0.12
	1.0(b)	0.09 – 0.15	0.9(b)	0.05 – 0.08
Total (Ammonia + Ammonium) Nitrogen	3.0(a)	<0.1 – 0.7	2.7(a)	0.03 – 0.24
	5.0(b)	<0.1 – <0.1	4.5(b)	0.05 – 0.06
E. coli (geomean)	200	<2 - 77		

NOTE: (a) limit applies during the non-freezing period
 (b) limit applies during the freezing period

Discussion on Monitoring Data as Compared to the Effluent Limits

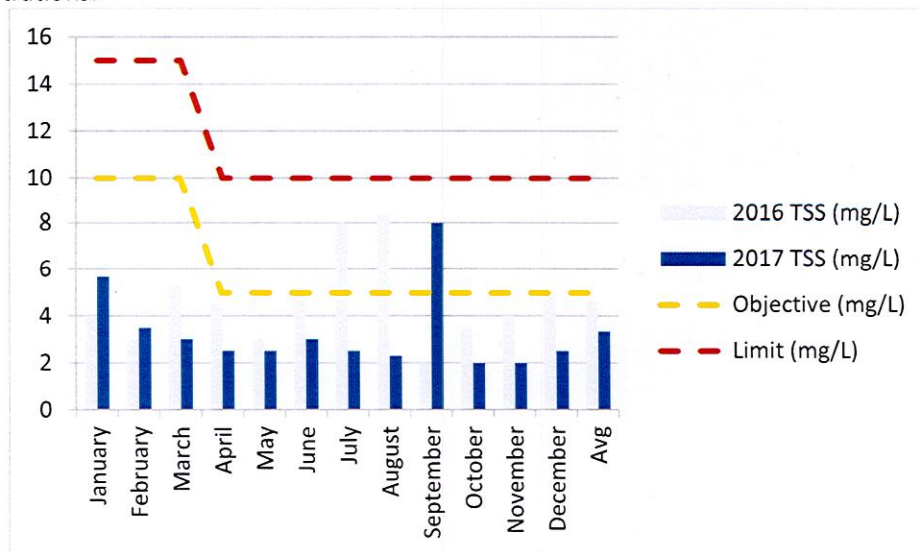
The annual average effluent BOD₅ in 2017 was 2.7mg/L, which is an increase by 11% from 2016 (refer to Chart 8). The annual loading of BOD₅ was 1.35kg/d. Refer to Table 1 for a list of monthly average effluent limits and loading limits.

Chart 8. The effluent monthly average concentration of BOD₅ in 2017 compared to 2016 concentrations.



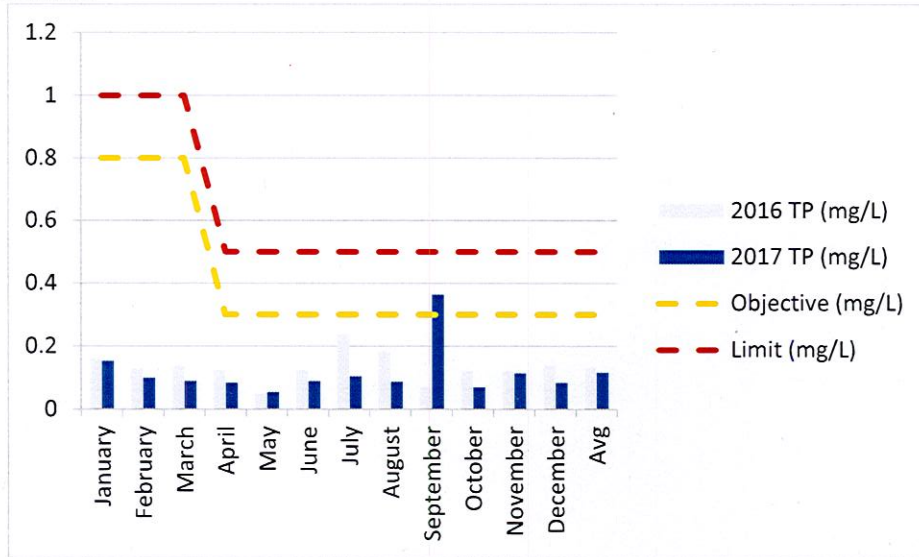
The annual average effluent Total Suspended Solids (TSS) for 2017 was 3.3mg/L, which is a 31% decrease from 2016 (refer to Chart 9). The annual loading of TSS at the plant in 2017 was 1.7kg/d. Refer to Table 1 for a list of monthly average effluent limits and loading limits.

Chart 9. The effluent monthly average concentration of TSS in 2017 compared to 2016 concentrations.



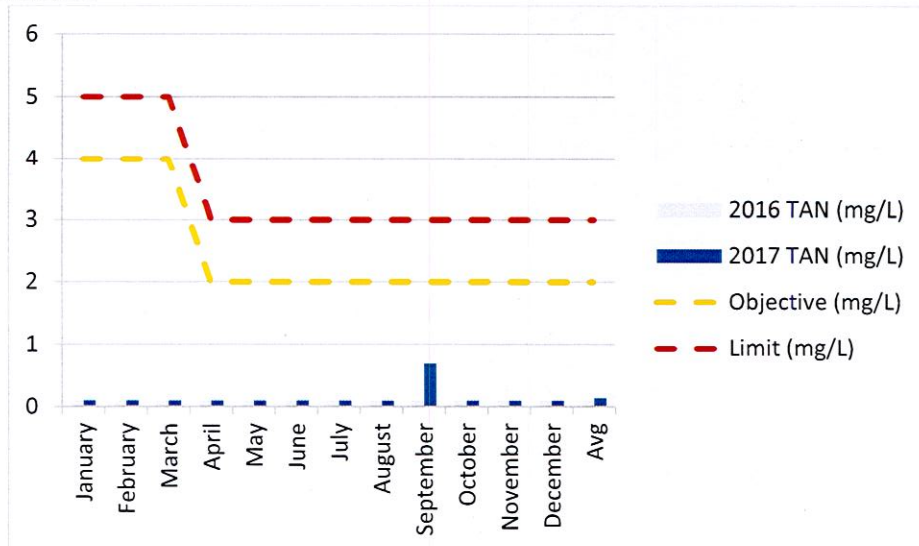
The annual average effluent Total Phosphorus (TP) for 2017 was 0.12mg/L, which is a 13% decrease from 2016 (refer to Chart 10). The annual loading of TP at the plant in 2017 was 0.06kg/d. Despite this large increase the concentrations remain below the limits identified in the ECA. Refer to Table 1 for a list of monthly average effluent limits and loading limits.

Chart 10. The effluent monthly average concentration of TP in 2017 compared to 2016 concentrations.



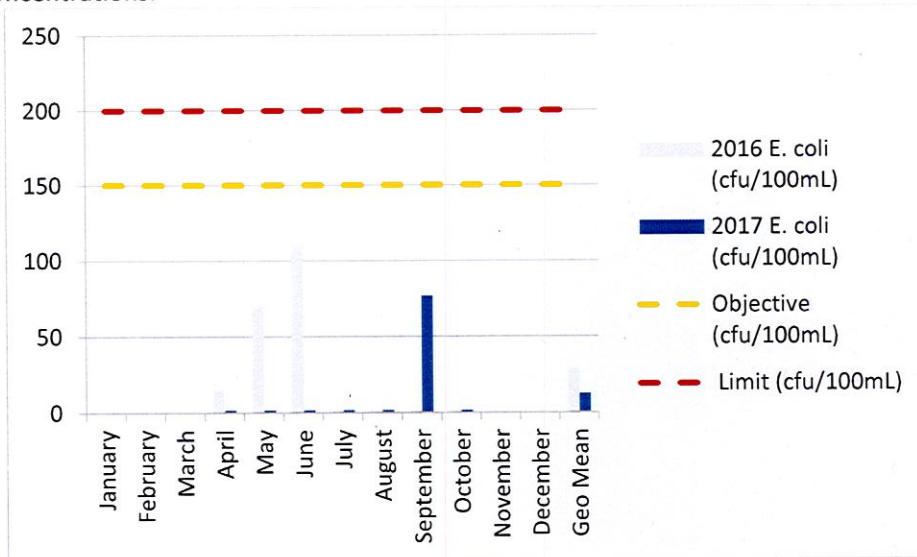
The annual average effluent Total Ammonia + Ammonium Nitrogen (TAN) for 2017 was 0.15mg/L, which is a 46% increase from 2016 (refer to Chart 11). Despite the large increase the concentrations of TAN are well below the limits identified in the ECA. The annual loading of TAN at the plant in 2017 was 0.07kg/d. Refer to Table 1 for a list of monthly average effluent limits and loading limits.

Chart 11. The effluent monthly average concentration of TAN in 2017 compared to 2016 concentrations.



The annual geometric mean effluent E. coli for 2017 was 13cfu/100mL, which is a 56% decrease from 2016 (refer to Chart 12). E. coli is monitored only during the disinfection season which is from April 15th to October 15th. This large decrease is attributed to a failure of the UV System in 2016, which resulted in higher concentrations of E. coli. The UV system was replaced in September 2016. Refer to Table 1 for a list of monthly average effluent limits.

Chart 12. The effluent monthly geometric mean concentration of E. coli in 2017 compared to 2016 concentrations.



The West Lorne WWTP provides an effective treatment process complying with all the monthly average limit requirements set out in the Environmental Compliance Approval.

Section 3: Operating Problems and Corrective Actions

The SCADA system has failed communications several times; an upgrade should be completed to replace the aging equipment.

The sand filters continue to be an ongoing issue. They are also on the capital list for upgrades.

Despite these issues, the plant operated very well in 2017 with no non-compliances.

Section 4: Maintenance

Regular scheduled monthly preventative maintenance is assigned and monitored using the Workplace Management System (WMS) program. The following is a summary of maintenance performed other than WMS work orders:

- Bar screen repairs
- Replace one pump at Marsh Pump Station
- Repair pump at Marsh Pump Station
- Generator repairs
- Repair to scum pump
- replace sump pump in Filter Building
- Clean out West Aeration for assessment
- Replace SCADA UPS
- Repairs to autosampler

Section 5: Effluent Quality Assurance

Effluent quality assurance is evaluated by monitoring parameters and changes throughout the plant processes. The operators monitor the aeration tank by performing weekly tests on the mixed liquor. These tests include dissolved oxygen, pH, temperature, settling tests, Mixed Liquor Suspended Solids (MLSS), and Mixed Liquor Volatile Suspended Solids (MLVSS). As well, monitoring of the alum dosages, wasting volumes and Return Activated Sludge suspended solids is completed. Data collected from these tests provide information to the operator to make the appropriate adjustments in the treatment process and take corrective actions before the plant reaches its effluent limits.

Section 6: Calibration and Maintenance

Regular scheduled monthly preventative maintenance is assigned and monitored using the Workplace Management System program.

Annual maintenance on the generator was completed in July by Albert's Generator Service. Flow Metrix Technical Services Inc. performed the annual calibration on the flow meter in April.

In house meters for pH and dissolved oxygen are calibrated by OCWA operators as per manufacturer's instructions.

Section 7: Effluent Quality

Effluent Objectives

The following table represents the monthly average effluent result ranges and the monthly average loading ranges compared to the objectives outlined in the Environmental Compliance Approval.

Table 2. Effluent objectives compared to monthly average concentrations and loadings.

Parameter	Effluent Objective (mg/L)	Monthly Average Effluent Ranges (mg/L)	Monthly Loading Objective (kg/day)	Monthly Average Loading Ranges (kg/d)
BOD ₅	5(a)	<2 – 3.5	4.5(a)	0.7 – 1.5
	10(b)	<2 – 8.0	9.0(b)	1.1 – 4.9
Suspended Solids	5(a)	<2 – 8.0	4.5(a)	0.7 – 2.7
	10(b)	3 – 5.7	9.0(b)	1.8 – 3.0
Total Phosphorus	0.3(a)	0.06 – 0.37	0.27(a)	0.03 – 0.12
	0.8(b)	0.09 – 0.15	0.72(b)	0.05 – 0.08
Total (Ammonia + Ammonium) Nitrogen	2.0(a)	<0.1 – 0.7	1.8(a)	0.03 – 0.24
	4.0(b)	<0.1 – <0.1	3.6(b)	0.05 – 0.06
E. coli	150	<2 - 77		
Dissolved Oxygen*	5	4.84 – 8.99		
Design Flow (m ³ /d)**	900	282 – 1,512		

Note: (a) objective applies during the non-freezing period

(b) objective applies during the freezing period

*Dissolved Oxygen objective is expressed as a minimum, where all other parameters are expressed as maximums.

**design flow is average daily flows, not monthly average flows.

Discussion of Effluent Objectives

The West Lorne WWTP did not meet all the effluent objectives identified in the ECA. In September the objective for total suspended solids and total phosphorus were not met (refer to Chart 9 and 10). This was due to a low alum dosage and wasting of MLSS too much.

Adjustments were made to ensure compliance with the effluent limits. The effluent dissolved oxygen concentration was not met in August. This was attributed to the maintenance performed on the west aeration tank. It was taken out of service for inspection and therefore all wastewater was temporarily diverted to the east aeration tank. Close monitoring was conducted to ensure compliance with effluent limits during this time.

The annual average flow for 2017 was 496m³/d, which is below the design flow of 900m³/d. However, there were 5 instances where the daily design flow was exceeded compared to 15

instances in 2016 (refer to Section 2). These were all due to infiltration into the collection system when there was snow melt and/or rain.

Section 8: Biosolids

The lagoon is used for sludge digestion and storage as per the Environmental Compliance Approval. The waste activated sludge (WAS) is transferred to the lagoon. The sludge settles on the bottom of the lagoon and the liquid is pumped to the head of the plant for treatment. In 2017, the total amount of WAS transferred to the lagoon was approximately 4,200m³. For 2018 this amount will be similar, approximately 4,000m³. The lagoon has ample storage for the sludge and will not require cleanout in the coming year.

Section 9: Community Complaints

There were no community complaints received in 2017.

Section 10: Bypasses, Spills, and Abnormal Discharges

There were no by-pass, spill or abnormal discharge events for the West Lorne WWTP or for the Pumping Station during 2017.

Section 11: Proposed Alteration, Extension or Replacement of Works

The expected upgrades were not completed in 2017, however, will be completed in 2018. Over the next reporting period there are some significant replacements that are expected to be undertaken, some of which may require amendments to the current ECA. The proposed work may include:

- blower replacement
- filter replacement
- SCADA system upgrade
- grit removal system replacement

Section 12: Modifications to Works

There were no modifications to the works in 2017. As identified in Section 11, there are planned upgrades in 2018.

Section 13: Summary

Overall the West Lorne Wastewater Treatment Plant provided effective treatment in 2017 with no effluent limit non-compliances.

APPENDIX A

Analytical Data

