

THE TOWNSHIP OF ST. JOSEPH

**RICHARDS LANDING
WATER POLLUTION CONTROL PLANT**

2016 ANNUAL OPERATING REPORT

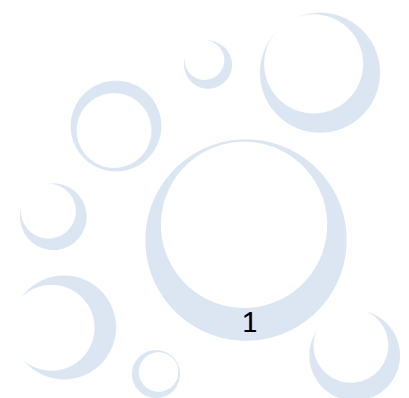
JANUARY 1, 2016 - DECEMBER 31, 2016



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Introduction

The Richards Landing Sewage Treatment Plant Annual Report provides staff, stakeholders and customers an overview of the performance of the Richards Landing STP in 2016. Furthermore, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment and Climate Change (MOECC). The enclosed 2016 report for the above referenced facility summarizes the performance and related activities in accordance with C of A #3-0545-93-006. The performance report demonstrates the commitment of ensuring that the STP continues to deliver wastewater services to our customers in an environmentally responsible manner. The certificate of Classification for this plant can be seen at Appendix B of this report.

The Sewage Treatment Plant is situated at the west side of the community at the end of Shore Road. The plant forms part of the sewage collection and treatment system comprising of the underground sewage collection system and Sewage Pumping Station located on Highway 548 and Russell Street.

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 General Description

The sewage flows by gravity to the sewage pumping station from where it is pumped to the sewage treatment plant. The sewage pumping station is designed for a 20-year peak flow and is supplied with emergency power from the generator located at the water plant. The sewage treatment plan is a modern rotating biological contactor RBC design followed by a secondary clarification system. The disinfected effluent is then discharged by gravity via a sewage outfall line to a diffuser located 450m offshore which is designed to dilute and disperse the effluent away from the shore to protect downstream domestic and recreational users.

Wastewater is collected in sanitary sewers in the Richards Landing service area and is conveyed to the treatment facility. Aluminum sulphate is added at the station to enhance the settling of solids and phosphorus removal.

Sewage Works

The Sewage Pumping Station is designed for a 20 year peak flow of 17.8LLs (282 USgpm) at a total discharge head of 46.0m (151ft) and is supplied with emergency power from the generator located at the Water Plant.

The Ministry of Environment has approved treatment to secondary level (15 mg/L BOD₅, 15 mg/L SS & 1mg/L Phosphorous) for discharge of effluent to St. Mary's River. The disinfected effluent is discharged by gravity via a sewage outfall line to a diffuser located 450m offshore and designed to provide adequate dispersion and dilution of the effluent to ensure the effluent is directed away from the shore, to protect downstream domestic and recreational users. The plant is equipped with a 75KW generator for emergency power. A brief description of the sewage plant and a Process Flow Diagram follows.

Primary Clarification

The Sewage Treatment Plant comprises of a sewage flow splitter box with a manually raked bar screen. Adjacent to the splitter box is a composite sampler which collects composite samples of raw sewage for testing purposes. The flow is directed into two primary clarification

and sludge storage septic tanks with a total volume of approximately 450m³ (119,000 USgal) which includes approximately six months' storage volume for primary and secondary sludge. These tanks overflow through two weirs into the equalization tanks.

Flow Equalization

Flow is directed into the two aerated equalization tanks, with a total flow equalization capacity of approximately 230m³ (60,750 US gal) equipped with three submersible pumps (two duty and one standby) each having a rated capacity of 6.7 L/s (106 USgpm) at 3.3m (10.8ft.) T.D.H., and coarse bubble air-diffusion system equipped with air blower having a capacity of 230m³/h (135 cfm) against 38 kPa (5.5 psi).

Secondary Treatment

Comprising of three 3.6m (12ft) diameter by 6.1m (20ft) long Rotating Biological Contactor Units with a total of 22,850 m² (245,800 ft²) bio support media divided into four separate stages and equipped with one air blower and supplementary air diffusion system for the first two stages and having a capacity of 255 m³/h (150 cfm) against 23.5 kPa (3.50 psi).

Secondary Clarification

Three secondary clarifiers, each approximately 3.5m x 3.5m (11.5ft x 11.5ft) dimensions and each equipped with one air-lift sludge return pump and one air lift surface skimmer.

Phosphorous Removal

Chemical phosphorous removal system comprising one aluminum sulphate (alum) storage tank, day tank, transfer pump and three positive displacement diaphragm metering pumps feeding alum to the head of the clarifiers.

Disinfection

Sodium Hypochlorite (chlorine) disinfection system comprising of one day tank and a metering pump feeding chlorine into the chlorine contact chamber having a detention time of 30 minutes.

Control Building

A 135m² control building situated on top of the equalization tanks and housing the chemical storage and feeding facilities, air blowers, standby power, electrical and control panels. The overall plant has been designed to run manually with automatic controls for pump, air lift pumps and scum skimmer. Levels are monitored automatically and the plant effluent flow charted electronically. The plant effluent flow in turn controls the level of alum dosage to the clarifier. All major components of the plant are monitored and alarms are activated via a telephone line to the relevant personnel in case of an emergency. Overall the plant is very functional in terms of the original design criteria of simplicity in design and maintenance with low operational costs.

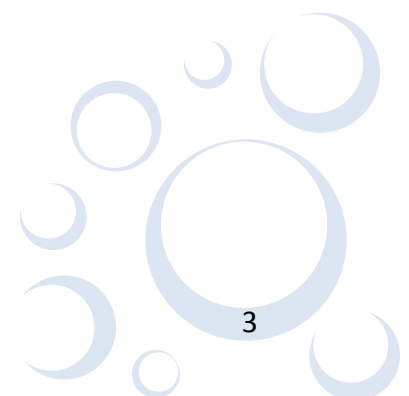
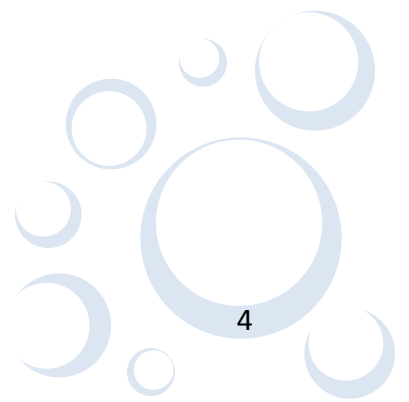
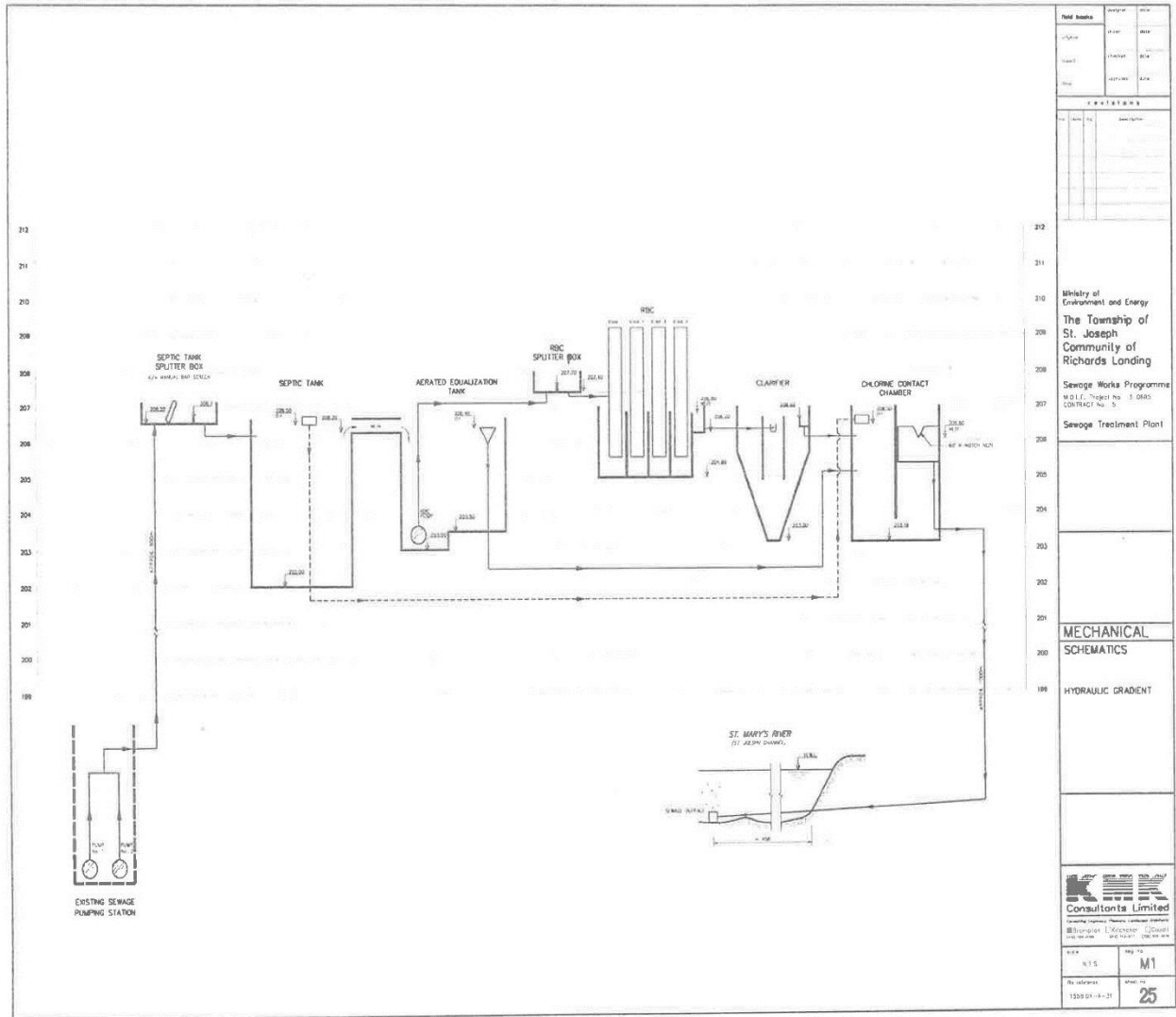


Figure 1 - Process Flow Diagram



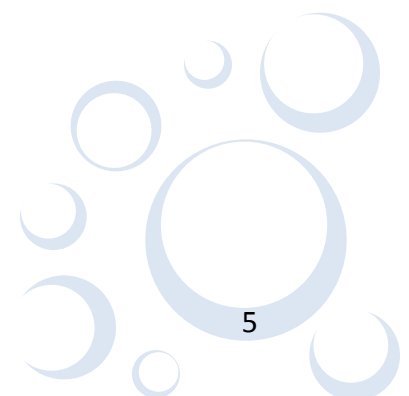
Compliance Approval

In compliance with section 17 of C of A # 3-0545-93-006, The Township of St. Joseph produces this annual report. Below is an overview of the success and adequacy of the sewage treatment program. The Based on the information in Table 1 the plant far surpassed all objectives that the plant was designed and required to perform.

Table 1 - Summary and Overview of adequacy of sewage treatment program.

Month	Total Weekly Flow (m3)	# of days	Lab Results			Plant Performance-Average Loadings			
			Average Day Flow (m3)	BOD5 (mg/L)	TP (mg/L)	TSS (mg/L)	BOD5 (kg/d)	TP (kg/d)	TSS (kg/d)
January 2016	2370	31	76.45161	4	0.54	4	0.305865	0.041284	0.305807
16-Feb	2039	29	70.31035	4	0.9	6	0.281241	0.063279	0.421862
16-Mar	3847	31	124.0968	4	0.61	10	0.496387	0.075699	1.240968
16-Apr	4078	30	135.9333	4	0.38	6	0.543733	0.051655	0.8156
16-May	3939	31	127.0645	4	0.65	8	0.508258	0.082592	1.016516
16-Jun	3535	30	117.8333	4	0.73	7	0.471333	0.086018	0.824833
16-Jul	4005	31	129.1936	4	0.67	4	0.516774	0.08656	0.516774
16-Aug	1212	31	135.871	4	0.93	6	0.543484	0.12636	0.815226
16-Sep	3370	30	112.3333	4	0.54	5	0.449333	0.06066	0.561667
16-Oct	3042	31	98.12903	4	0.31	6	0.392516	0.03042	0.588774
16-Nov	2656	30	88.53333	4	0.37	5	0.354133	0.032276	0.442667
16-Dec	3289	31	106.0968	4	0.36	6	0.424387	0.038195	0.636581
Non-Compliance Limits				25	25	1	10.5	10.5	0.4
Effluent Objectives				15	15	1	6.3	6.3	0.4

	Average (mg/l)
Effluent Parameter - BOD ₅	<4
Suspended Solid - 15	6.0
Total Phosphorus - 1	.58



Effluent quality at all times surpassed the objectives set out in the C of A based on the information in Table 2. Flows through the sewage treatment plant did not exceed the specified average daily flow of 422.5m³/d in any month in 2016. The average daily flow being 110m³ in 2016 which is 26% of the design flow. The maximum daily flow of 175m³ was recorded on August 10, 2016 and was 11% of Maximum daily flow designed of 1537.9m³/d.

Table 2 - Annual Flow Through

2016 Flow Through							
	Flow m ³	Alum	Cl	Dosage	Average	Max	
January	2370	643.2	93.9	4.75	76	81	
February	2039	561	72.8	4.28	70.3	78.7	
March	3847	817.9	72.8	2.26	124	156	
April	4078	880	80.4	2.37	136	147	
May	3939	821	76.6	2.34	127	139	
June	3535	581	80.3	2.73	118	139	
July	4005	657	90.2	2.70	129	142	
August	4212	748	83.3	2.37	139	175	Maximum
September	3370	612	89	3.17	112	117	
October	3042	651	95.6	3.77	98.1	129	
November	2656	754	93.4	4.22	88	96	
December	3289	867	99	3.61	106	128	
	40382	8593.1	1027.3	38.57			

Sludge

When the sludge tanks are full, the sludge is hauled and disposed of at drying beds located at the Township of St. Joseph Landfill Site C of A No. A561701. In 2016, 34, 800 gallons of sludge were removed from the plant and in 2017 it is anticipated that approximately 45,000 gallons of sludge will be generated. The sludge was hauled by licenced hauler Edwin Karhi, Licence #900494, and it is anticipated that the same contractor and location will be used for sludge removal for the upcoming 2017 reporting period.

Testing

Raw and treated parameters set out by the C of A are analyzed at SGS Lakefield Research an accredited laboratory located in Lakefield Ontario. In house testing is done by a Licensed Operator. The information generated from this program is used to monitor the treatment efficiency of the treatment process and to assist with changes to improve the quality of the effluent from the plant. There were no bypasses through the plant of any kind and no exceedances in 2016.

The testing includes, but is not limited to, the following parameters; carbonaceous biochemical oxygen

demand (CBOD5), total suspended solids (TSS), total and soluble phosphorus (TP and SP), pH, total solids (TS), volatile solids (VS), volatile acids, ammonia, chemical oxygen demand (COD), capillary suction time (CST), alkalinity and ultraviolet transmittance (UVT). An external accredited laboratory also conducts monthly (bimonthly for metals) tests for metals, COD, ammonia, and total Kjeldahl nitrogen (TKN). The laboratory also provided the analytical support for the Sewer Use Control Program.

As seen in Figure 2, the meters used for the in-house testing were calibrated by the Sault Ste. Marie Public Utility Commission (PUC) Services Inc. on February 24, 2016.

A new Hach PH meter was purchased to do the in-house monitoring of PH & temperature.

Figure 2- Instrument Verification Certificate

INSTRUMENT VERIFICATION CERTIFICATE		Cal Date:	Feb 24/16			
		Due Date:	Feb 24/17			
		Frequency:	1/yr			
Instrument ID:	Richard's Landing Waste Water Flow	Type:	Multiranger Plus (OCM)60 Deg. V-notch			
Instrument Number:	FIT-300	PUC Asset:	300016			
Instrument Range:	0 - 16 L/s	Output:	4 - 20mA			
Accuracy (%+/-):	+/- 15.00%	Note:	Ops/Mtce Manual PL-313			
Calibration Standard:	Stainless ruler and flowrate calculation for 60 degree V-Notch weir	Recertification Date:	N/A			
Calibration/Verification Data						
OCM Depth m	Reference flow L/s	Flow as found L/s	% error before	As found Pass/Fail	Flow as left L/s	% error after
0.100	2.519	2.450	-2.75	PASS	2.450	-2.75
0.131	4.948	4.900	-0.98	PASS	4.900	-0.98
0.143	6.161	6.130	-0.50	PASS	6.130	-0.50
CALIBRATION PLOT						
Remarks: Distance was measured using tape measure then compared to milltronics input.						
Flow formula used ($Q=796.7 H^{2.5}$)						
Depth of water = s:an - measured distance from top of water to transducer face.						
Weir dimensional data should be documented here. 0.66						
Conformity						
<input checked="" type="checkbox"/> Instrument calibration is within acceptable tolerance <input type="checkbox"/> Instrument calibration not within acceptable tolerance						
Calform Richard's Landing Waste Flow 2016		Instrumentation Technician:		Jeremy Callahan		

Due to the efficient operations of the plant, there were no complaints from any of the nearby neighbours of odour or noise generated by the plant in 2016.

Maintenance and Repairs

All maintenance is scheduled using information supplied by the equipment manufacturer and taken from the O & M Manuals. Aside from routine maintenance outlined in the manuals, there were no major repairs undertaken on any major structure, equipment or mechanism of the works in 2016.

Aside from the routine maintenance undertaken his year, some minor repairs included the replacement of the #2 Equalization Tank Pump and a rebuild of the #2 sewage pump. The rebuild of the pump was completed by ASL

There were no operating or environmental problems encountered during this past year.

What's Planned for 2017

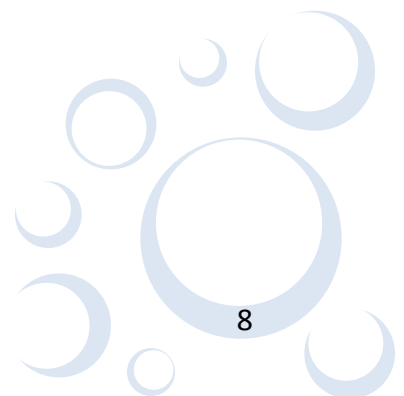
The Township of St. Joseph will receive funds in 2017 from the Ontario Community Infrastructure Fund (OCIF) to install an Ultra Violet (UV) disinfection system. This new disinfection system will replace the hypo system planned alterations for the year 2017. The new UV system will provide a final disinfection of the effluent prior to sending the water to the St. Joseph Channel of St. Mary's River.

There are numerous permits that are required for the extent of the work being done. Once all permits are in place, Kresin Engineering has been contracted to do the project.

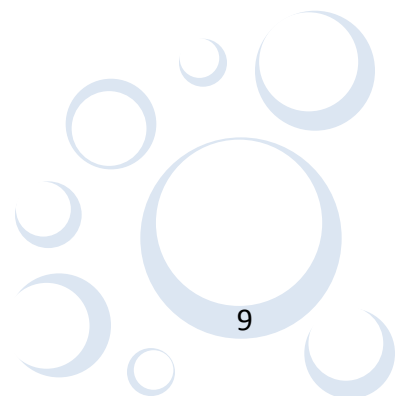
Information provided from records by:

B. Elliott Superintendent of Water & Sewer Services

Carol O. Trainor, AMCT
Clerk Administrator
March 31, 2017



Appendix A - Copy of the Operators Certificate



Appendix B - Certificate of Classification



CERTIFICATE OF CLASSIFICATION / CERTIFICAT DE CATÉGORIE

TOWNSHIP OF ST. JOSEPH
COMMUNITY OF RICHARDS LANDING
SEWAGE TREATMENT PLANT
WASTEWATER TREATMENT

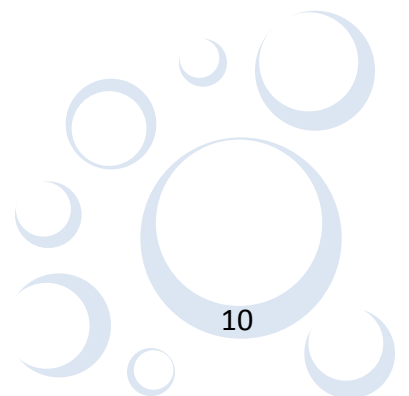
CLASS 2

Date issued / Délivré le MARCH 21, 1995

Certificate No. / Certificat n° 2366

Director
Directeur(trice)

Minister of Environment and Energy
Ministre de l'Environnement et de l'Énergie



Appendix C – 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 arithmetic 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.

BOD₅ Five Day Biochemical Oxygen Demand

(also known as total BOD₅) 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.

CBOD₅ -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.

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).

m³ - (Cubic Metre)

Volume measurement, 1m³ = 1000 litres or 220 imperial gallons.

m³/d - (Cubic Metre Per Day)

Flow measurement, 1m³ = 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 NO₃ 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.

RBC

Rotating Biological Contactor

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: NH_3 (this is called unionized ammonia) NH_4^+ (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 (NH_4^+).

WPCP - Water Pollution Control Plant

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

