Utilities Kingston

RAVENSVIEW
WASTEWATER TREATMENT PLANT

2019 ANNUAL REPORT

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REPORT CHECK LIST

Annual report submitted under Condition 10 of the certificate of approval number 2200-A82L2B.

Condition 10- The Owner shall prepare, and submit to the District Manager, a performance report, on an annual basis, within ninety (90) days following the end of the period being reported upon.

Condition 10- Each annual report shall contain at least the following information:

- Summary and interpretation of all monitoring data and a comparison to the effluent limits outlined in Condition 7, including an overview of the success and adequacy of the works.
- Description of any operating problems encountered and corrective actions taken.
- Summary of any effluent quality assurance or control measures undertaken in the reporting period.
- Summary of the calibration and maintenance carried out on all effluent monitoring equipment.
- Description of efforts made and results achieved in meeting the Effluent Objectives of Condition 7.
- Tabulation of the volume of sludge generated in the reporting period, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed.
- Summary of any complaints received during the reporting period and any steps taken to address the complaints.
- Summary of all By-pass, spill or abnormal discharge events.
- Any other information the District Manager requires from time to time.

EXECUTIVE SUMMARY

The Ravensview Wastewater Facility operates under a Ministry of the Environment, Conservation and Parks, certificate of approval #2200-A82L2B. For the reporting year 2019 the facility was in compliance with all conditions outlined in condition 7 of the above mentioned Certificate of Approval and are briefly described in the following sections of this report.

Average flows through the plant was 77,265 $m^{3/}$day.

The facility had two secondary bypass events in the 2019 reporting year All by-pass details are listed in Table 7, the Bypass Summary section of this report.

Since the facilities commissioning in 2009, staff have been able to enhance the operation and to make this facility a highly rated Treatment facility. The Ravensview Facility continues to generate interest from international groups. We also are providing research opportunities to local Universities such as Queens to provide graduate students with valuable hands on experience.

As we continue into 2020, operational staff will continue to improve the operation of Ravensview and to use its state of the art technology to continually improve and protect the environment and maintain the quality of service our residents have come to know.

Plant Overview

The following is a process overview and description of the treatment steps taken at the Ravensview Wastewater Treatment Plant.

Raw Wastewater receiving

Raw wastewater from the central and east portions of Kingston is conveyed to the influent works. A Parshall flume metering device continuously measures the flow of raw wastewater into the plant. A temporary septage receiving station is in place at the influent headworks for the local septic truck haulers while the new septage receiving station is under construction.

Screening

The first step in the treatment process is screening of the raw wastewater. Three large mechanical screens remove larger materials from the incoming wastewater stream. Screened material is conveyed to a screenings press where the material is compacted and stored for offsite disposal.

Grit Removal

Grit settles out of the sewage as the water flows through the tanks which are covered to keep the odours in. Air is bubbled into the tank to speed up the settling of the sand, gravel and other heavier and inorganic materials. In the bottom of the tank, a corkscrew like system pushes the settled grit into a hopper at the end of the tank. From there a pump lifts the grit and a small amount of water up into a separator, where the grit is rinsed, and then placed into a dumpster where it awaits disposal at a landfill.

Primary Clarifiers

After removing the floatables and grit, the only material left in the wastewater is organic material and dissolved contaminants. In the primary clarifier tanks, the wastewater flows very slowly from the one end of the tank to the other. As this happens, the solids, which are high in organic material, settle to the bottom. Large scrapers draw the material to the one end of the tank where it is pumped across to the digesters for further processing. At the end of the primary clarifiers, the now cleaner wastewater, termed primary effluent, flows into troughs which then direct it to the secondary treatment process. In the primary clarifiers, any grease, fats or oils that are suspended are skimmed off by rakes and are pumped to the digesters as well. Any floatable materials that may have slipped through the bars in the screening process will be ground up before entering the digester.

Biologically Aerated Filters

The primary effluent flows to a pumping facility which lifts the wastewater up to the channel running along the centre of the Biologically Aerated Filters (BAF) facility. In each of the 11 available cells, the wastewater flows from the central channel to the bottom of the filters, and up through the filter. As it does, the water is aerated to encourage growth of numerous micro-organisms which consume carbon dissolved in the water, as well as reducing ammonia and phosphorus. These microscopic organisms, referred to as biomass, stick onto the BioStyrene media (4 mm diameter polystyrene beads), which also act to filter any suspended materials. The beads are held in place under a concrete floor with nozzles which let the clean water flow out on the surface. The clean water is then disinfected with chlorine to kill any pathogenic micro-organisms which pass through the filters. Like other filters, these are backwashed occasionally to remove excess biomass growth and filtered particles, in order to restore the filters ability to process wastewater efficiently.

Disinfection

Disinfection is accomplished by adding sodium hypochlorite at the effluent of the BAF facility. The effluent flows by gravity to the chlorine contact chamber where chlorine is allowed to be in contact with the wastewater. Just prior to exiting the chlorine contact tank the wastewater is dosed with sodium bisulphite to de-chlorinate it, and to ensure no chlorine remains in the water entering the receiving stream.

Discharge to the St. Lawrence River

After the wastewater has been disinfected and de-chlorinated, it flows by gravity out a 1050 mm diameter outfall sewer with fourteen 250 mm elbow diffusers, approximately 240 m offshore, and into the St. Lawrence River.

Anaerobic Digesters

Solids from the raw sewage entering the plant and from the Biological Aerated Filter backwash water are settled in the clarifiers, then pumped into the digesters. The digesters are sealed, anaerobic (without oxygen). Inside, the mixture is heated to allow micro-organisms to grow and consume carbon, and to produce methane gas and carbon dioxide. One of the digesters is heated to 55 degrees celsius (thermophilic), which further assists in the destruction of harmful bacteria in the solids. After approximately 15 days, the solids are transferred in series to two other primary digesters which are heated to 36 degrees celsius (mesophilic), and remains for 15 days in each digester before being stored in the secondary digester and ultimately dewatered. The digestion process reduces the amount of carbon, stabilizing the material into what is called bio-solids, which is applied to approved farm fields, and used as soil nutrients and conditioning material.

Power Building

The Power Building houses two 575 kW electric back-up generators that are designed to run the wastewater treatment plant in the event of a power outage. These units are powered by 12 cylinders, low emission natural gas engines chosen specifically for this plant to avoid the need to use diesel fuel. These units will start automatically in the event of a power failure. A third unit within the power building is a combined heat and power generation system, or ‘Co-gen’ unit. This 8 cylinder engine is designed to work on natural gas, digester gas which has been cleaned and the moisture removed, or a blend of these two fuels. The Co-gen unit is designed to run continuously and produce 375 kW of electric power and 500 kW of heat. This beneficial use of the gas produced on the site helps offset the power purchased from the grid, and will offset the amount of gas required to heat the digesters.

Dewatering

Liquid bio-solids which is about 2% solid and 98% water, is funnelled from the digester holding tank into the centrifuge where a polymer is added to help the solids stick together. The centrifuge spins at a high speed forcing the solids to the outer drum and out of the liquid, where solids are pushed along and out of the centrifuge. The solids content (cake) is now about 30% and the cake material is augured to a hole in the floor where it falls into a hopper. When enough material is in the hopper, a piston pump pushes the solid cake (bio-solids) to the Bio-solids Storage building. Alternately, the cake materials can be loaded directly into a waiting dump truck in a separate loading bay. The remaining liquid contains many nutrients and some microorganisms. After the centrifuge processes this liquid, called centrate, is returned to the plant for treatment.

Bio-solids Storage

One of the three main beneficial products produced at Ravensview is a nutrient rich bio-solid material.

The dry product resulting from the treatment processes may be stored on site for up to 200 days in large concrete bunkers. When approved farmland is available, the material is loaded into trucks within the Bio-solids Storage Building, in an odour controlled room.

Land Application

The stored bio-solids are held onsite until they can be used for agricultural land application. The bio-solids are transported and applied on fields that have been tested and approved by the Ministry of Environment, Conservation and Parks to meet standards with respect to distance from homes, wells, water bodies and sensitive lands. After application, the bio-solids are ploughed into the field to prevent off-site odours or wash-off. By carefully regulating the application only to licensed fields, the public is protected from contact with this material that may still contain some micro-organisms.

Administration/ Lab Building

All of the different devices and processes used at the Ravensview Wastewater Treatment Plant are connected to an onsite SCADA system which can be used to monitor and adjust plant processes. This system is located within the administration building. The building also contains a fully operating laboratory for onsite testing of various wastewater parameters as well as offices and lunchroom facilities.

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PLANT PERFORMANCE

The enclosed performance assessment summarizes and confirms the facility's compliance. Refer to appendix A for detailed tables and graphs for various parameter results.

All effluent quality and quantity parameters outlined in condition 7 of certificate of approval number 2200-A82L2B were complied with during the reporting period of 2019.

The following tables summarize the results obtained through monitoring of plant performance in accordance with condition 7 of the certificate of approval number 2200-A82L2B.

Table 1: Effluent Parameters

Effluent Objectives		
Effluent Parameter	**Objective** (mg/l)	**2019 Results** (avg.)
$CBOD_5$	15.0	2 mg/l
Total suspended solids (TSS)	15.0	3.8 mg/l
Total Phosphorus	0.8	0.40 mg/l
Total Ammonia Nitrogen (October 01 to May 31) (June 01 to 30 and September 01 to 30) (July 01 to August 31)	 12.0 7.0 5.0	 0.94 mg/l 0.65 mg/l 0.44 mg/l
Total Chlorine Residual	Non-detectable	0.01 mg/l
E. Coli (Monthly Geometric Mean Density)	100 counts/ 100 ml	15 counts/ 100 ml

Table 2: Effluent Limits

Effluent Limits			
Effluent Parameter	**Concentration Limit** (mg/l)	**Loading Limit from effluent (kg/d)**	**2019 annual average**
$CBOD_5$	25.0	2,375	131 (kg/d)
Suspended solids (TSS)	25.0	2,375	286.5 (kg/d)
Total Phosphorus	1.0	95	29.0 (kg/d)
pH	Maintained between 6.0 and 9.5		7.55
Acute lethality to rainbow trout			pass

Table 3: Monthly Effluent Parameters

Maximum Monthly Comparison of Effluent 2018				
Month	**CBOD5 max concen/max loading (mg/L_kg/day)**	**TSS max concen/max loading (mg/L_kg/day)**	**TP max concen/max loading (mg/L_kg/day)**	**E. coli (Monthly geometric mean density)**
January	3mg/L-200kg/day	6mg/L 300kg/day	0.50mg/l 42kg/day	4
February	4mg/L-200kg/day	5mg/L 300kg/day	0.53mg/l 47kg/day	2
March	2mg/L-99kg/day	6mg/L 400kg/day	0.66mg/l 60kg/day	2
April	4mg/L-300kg/day	14mg/L 950kg/day	0.51mg/l 57kg/day	3
May	2mg/L-210kg/day	8mg/L 800kg/day	0.59mg/l 51kg/day	49
June	2mg/L-190kg/day	5mg/L 600kg/day	0.36mg/l 44kg/day	32
July	2mg/L-150kg/day	10mg/L 900kg/day	0.47mg/l 49kg/day	15
August	4mg/L-300kg/day	12mg/L 1000kg/day	0.52mg/l 46kg/day	39
September	2mg/L-130kg/day	18mg/L 1300kg/day	0.66mg/l 48kg/day	14
October	6mg/L-400kg/day	15mg/L 1100kg/day	0.31mg/l 26kg/day	11
November	19mg/L-1100kg/day	13mg/L 770kg/day	0.42mg/l 35kg/day	4
December	3mg/L -200kg/day	7mg/L 400kg/day	0.47mg/l 30kg/day	4

Table 4: Annual Plant Flows

Plant Flows (m^3/day)							
Parameter	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Avg. m^3/day	59,182	60,916	53,076	59,640	86,200	69,005	77,265
Max. m^3/day	158,736	185,620	136,899	179,987	169,266	181,067	160,459
Design. m^3/day	95,000	95,000	95,000	95,000	95,000	95,000	95,000
Design Peak m^3/day	193,000	193,000	193,000	193,000	193,000	193,000	193,000
% (daily/design)	62	69	56	63	91	73	81
% (peak/design)	82	96	71	93	88	94	83

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Table 5: Effluent Parameters

Final Effluent Parameter Results								
Parameter (mg/l)	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**LIMITS**
$CBOD_5$	2	2.2	1.5	1.78	1.17	2	2	**25 mg/l**
Suspended Solids	5.2	4.3	4.4	6.0	6.1	5	3.8	**25 mg/l**
Total Phosphorus	0.49	0.42	0.40	0.47	0.40	0.43	0.40	**1.0 mg/l**
Total Chlorine	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	**< 0.04 mg/l**
Acute Lethality	All Pass	All Pass	All Pass	All Pass	All Pass	All Pass	All Pass	**Pass**

MAINTENANCE

In 2019 we continued with our preventative maintenance program of vibration testing, oil analysis and electrical surge protection.

The following bullet points highlight other major projects completed this year.

- Both centrifuges had major overhauls
- Backwash tank cleanout
- Primary tank inspections
- Annual infrared scans on HV electrical
- Routine vibration monitoring

CAPITAL WORKS

The major highlights for capital works in 2019 at the Ravensview WWTP and associated sewage collection system were:

- Finish repair and waterproofing of digester roofs
- Continued work on the Wastewater Master Plan assessment.
- Construction of a new Septage receiving station
- Construction of the new Riverview Way Sewage Pumping Station
- Primary tank full parts change out from steel to plastic

Operations

Adequate staffing as well as preventative maintenance and regular equipment inspections lead to operational problems being diagnosed quickly and corrective actions implemented immediately.
Non flushable materials such as wipes and grease continue to be more prominent in the sewer system resulting in some operational and maintenance challenges. Utilities Kingston is still implementing a public education program to make customers more aware of what materials should not be flushed down the sewers. This program has included: radio and newspaper campaigns, through social media such as Twitter and Facebook, bill stuffers, information on back of parking tickets, and bus information signs. This has been an ongoing campaign for the past three years with some positive results.

BIO-SOLIDS MANAGEMENT

The dewatering facility is the primary method of solids handling at the Ravensview facility. The secondary digested sludge is dewatered through a centrifuge and then stockpiled onsite in the bio-solids storage building.

In January of 2018, the dewatering facility at Cataraqui Bay Sewage Treatment Plant was under construction so liquid sludge was hauled to the Ravensview WWTP for processing. An approximately volume of 27,817m^3 of liquid sludge was transported from Cataraqui Bay Wastewater Treatment Plant to the Ravensview Wastewater Treatment Plant in 2019. With the combination of both Ravensview WWTP and Cataraqui Bay WWTP liquid sludge to process a combined volume of 122,184 m^3 of liquid sludge was processed through the centrifuge, and approximately 14,887 m^3 of sludge cake was stored on site until land applied on licensed agricultural fields. Land application is completed by Terra Pure Environmental. They applied 9,517mt on fields.

It is too hard to predict exactly where and when we will spread in 2020, as crops and weather will be the major variables that we will be dealing with in the 2020 spreading season. Below are the active C of A's and addresses for the City of Kingston in which spreading can take place.

Table 6: Biosolids Recipients in 2019

C Of A and NASM Plan #	Address	Expiry Date
22383	Brown Rd.	31/12/2020
22685	Multiple farms	31/12/2020
22694	South Shore Rd.	31/12/2020
22853	Huffam Rd.	31/12/2021
22855	Lake Rd.	31/12/2021
22901	County Rd.8	31/12/2021
22987	Sunbury Rd.	31/12/2021
23007	County Rd. 4	31/12/2021
23047	Palace Rd.	31/12/2021
23048	Multiple farms	31/12/2021
23074	Simmons Rd.	31/12/2021
23110	Sunbury Rd.	31/12/2020
23119	Hamilton Rd.	31/12/2021
23215	Sand Hill Rd.	31/12/2021
23425	Parry/Chambers Rd.	31/12/2022
23430	Simmons Rd.	31/12/2022
23525	County Rd. 8	31/12/2022
23950	County Rd. 8	31/12/2023
24091	Multiple farms	31/12/2023

EQUIPMENT CALIBRATIONS

All of the facility flow meters are calibrated annually by third party contractors. As a result of this proactive approach, the facility saw limited downtime of major equipment and saw very few mechanical or electrical failures this year. Calibration records are available upon request.

COMPLAINTS

There was no odour complaints concerning the Ravensview Wastewater Treatment Plant operations for the reporting year 2019. Due to construction at the Cataraqui Bay Wastewater Treatment Plant and construction of the new septage receiving facility, liquid sludge hauling and a temporary septage receiving station resulted in additional odours. Operations were modified to alleviate odours from these activities.

BYPASS SUMMARY

Table 7 summarizes the locations, volumes and durations of bypass events for the reporting year 2019. Table 8 summarizes the test results from samples taken during the 2019 bypass events at King- George CSO as well as test results for secondary bypasses at Ravensview WWTP.

Table 7: Bypass Summaries

Bypass Event Record						
Date mm/dd/yyyy	Location	Start Time	End Time	Volume (m^3)	Reason For Bypass	Precip (mm)
02/8/2019	Earl St.	3:45	0:41	0.32	N/A	4.6
02/24/2019	Earl St.	10:45	16:27	257.74	Rain/rapid snow melt	13.8
03/30/2019	Earl St.	11:37	11:38	0.03	Rain	24.7
03/30/2019	Earl St.	21:54	06:40	69.51	Rain	24.7
03/31/2019	King-George CSO	8:10	13:40	1093.8	Rain	33.2
03/31/2019	King-Collingwood CSO	00:25	22:07	17513.62	Rain	33.2
04/15/2019	Earl St.	00:34	01:56	31.85	Rain	18.5
04/19/2019	Earl St.	17:29	19:08	272.47	Rain	23.1
04/20/2019	King-Collingwood CSO	07:10	22:40	2495	Rain	28.9
04/23/2019	Earl St.	18:48	20:17	23.87	N/A	8.2
04/26/2019	Earl St.	07:02	10:22	18.63	Rain	13
05/03/2019	Earl St.	07:01	08:52	29.83	N/A	9.9

Bypass Event Record						
05/9/2019	Earl St.	21:24	11:23	74.3	Rain	10.9
05/10/2019	King-George CSO	09:11	20:10	1563.3	Rain	21.1
05/13/2019	Earl St.	21:19	01:02	10.86	Rain	19.8
05/19/2019	Earl St.	22:02	22:48	9.55	N/A	5.7
05/23/2019	535 Rideau St.	18:38	20:46	60.70	Rain	7.7
05/23/2019	Earl St.	18:34	19:57	90.54	Rain	7.7
05/23/2019	King-Collingwood CSO	19:14	19:40	0.001	Rain	7.7
05/25/2019	Earl St.	19:39	21:31	16.58	Rain	12.3
05/28/2019	Earl St.	11:55	13:00	0.009	Rain	13.2
06/5/2019	Earl St.	16:58	20:32	50.12	Rain	14.5
06/05/2019	King-George CSO	17:53	21:30	1874.8	Rain	14.5
06/06/2019	535 Rideau	11:40	18:25	2485.78	Past Rain	0.0
06/06/2019	Lower Union St.	12:25	17:57	2.1	Past Rain	0.0
06/06/2019	West St.	12:00	18:00	37	Past Rain	0.0

Bypass Event Record						
06/06/2019	Barrack St.	12:34	14:49	3	Past Rain	0.0
06/06/2019	Orchard/Emma Martin	12:45	19:00	18000	Past Rain	0.0
06/06/2019	King George CSO	10:37	23:55	6463.4	Past Rain	0.0
06/10/2019	Earl St.	16:03	00:44	2.18	Rain	10.9
06/11/2019	King-George CSO	02:52	03:28	28.2	Past Rain	0.6
06/20/2019	Earl St.	10:57	13:37	46.27	Rain	17.9
06/20/2019	King-George CSO	11:50	13:23	1017.2	Rain	17.9
07/06/2019	Earl St.	03:57	04:38	4.14	N/A	2.4
07/06/2019	Earl St.	13:23	14:33	23.13	N/A	2.4
07/06/2019	King-George CSO	13:31	13:50	170	N/A	2.4
07/26/2019	Earl St.	05:20	05:21	0.279	Rain	13.3
08/03/2019	Earl St.	17:59	20:06	38.28	Rain	5.0
08/06/2019	Earl St.	14:29	15:11	1.37	Rain	8.6
08/07/2019	Earl St.	12:40	21:29	16.16	Rain	9.5

Bypass Event Record						
08/08/2019	Earl St.	07:06	16:03	364.36	Rain	6.0
08/10/2019	Earl St.	15:28	16:03	120.98	N/A	2.3
08/16/2019	Earl St.	20:38	23:43	205.53	N/A	0.0
08/17/2019	Earl St.	12:40	14:12	300.48	N/A	4.0
08/21/2019	Earl St.	07:53	07:36	375.92	Rain	5.5
08/23/2019	Earl St.	16:09	23:27	10.73	Possible Blockage	0.0
08/24/2019	Earl St.	08:16	10:36	18.67	Blockage	0.0
08/28/2019	Earl St.	07:38	07:58	14.46	Rain	11.2
09/02/2019	Earl St.	03:17	04:33	259.4	Heavy Rain	21.2
09/02/2019	Lowe Union St.	03:34	04:15	95.1	Heavy Rain	21.2
09/02/2019	King-George CSO	04:15	17:02	775.80	Heavy Rain	21.2
09/04/2019	Earl St.	04:00	04:45	30	Rain	6.1
10/01/2019	535 Rideau St.	02:06	02:20	117.67	Rain	12.7
10/01/2019	Lower Union St.	02:08	03:13	11.99	Rain	12.7

Bypass Event Record						
10/01/2019	Earl St.	02:00	05:30	94.57	Rain	12.7
10/22/2019	535 Rideau St.	17:25	18:35	127.39	Rain	17.1
10/22/2019	Earl St.	14:26	17:58	2.45	Rain	17.1
10/23/2019	Barret Crt.	09:40	22:30	900	Forcemain break	0.0
10/27/2019-10/28/2019	535 Rideau St.	06:21	23:49	6353.73	Heavy Rain	45
10/27/2019	Earl St.	06:19	09:54	260.99	Heavy Rain	45
10/27/2019	Lower Union	06:57	07:26	12.57	Heavy Rain	45
10/27/2019	King-George CSO	07:51	20:08	2912.3	Heavy Rain	45
10/27/2019	King-Collingwood CSO	07:52	15:25	3196	Heavy Rain	45
10/31/2019	Sherwood Dr.	21:48	02:23	1107.68	Heavy Rain	53
10/31/2019	Helen St.	17:57	06:34	269	Heavy Rain	53
10/31/2019	Union St.	17:39	21:51	4.47	Heavy Rain	53
10/31/2019	535 Rideau St.	20:18	02:46	1332.4	Heavy Rain	53
10/31/2019	Raglan Rd.	17:52	18:08	44.22	Heavy Rain	53

Bypass Event Record						
10/31/2019	Clarence St. W	17:51	18:11	155.54	Heavy Rain	53
10/31/2019	Earl St.	17:20	23:19	560	Heavy Rain	53
10/31/2019	Lower Union St.	17:29	21:55	42.45	Heavy Rain	53
10/31/2019	West St.	17:41	03:18	2221	Heavy Rain	53
10/31/2019	Quebec St.	17:40	22:52	189.32	Heavy rain	53
10/31/2019	King-Portsmouth PS	22:52	02:00	1000	Heavy rain	53
10/31/2019	King-George CSO	17:53	08:20	15655	Heavy rain	53
10/31/2019	King-Collingwood CSO	18:01	17:19	13046.13	Heavy rain	53
11/01/2019	Morton PS	04:05	12:40	350	Loss of Power	0.0
11/01/2019	Ravensview WWTP (Secondary Bypass)	11:00	13:00	2200	Past Heavy Rain	0.0
12/30/2019	Ravensview WWTP (Secondary Bypass)	20:55	21:01	180	Power Interruption	19.6

Table 8: Bypass Sampling Results

Parameter	Units	Ravensview WWTP (Secondary Bypass) Annual Avg.	King-George CSO Annual Avg.
Total Coliform	Cfu/100mL	N/A	2545812
E coli	Cfu/100mL	693	373985
HPC	Cfu/mL	N/A	1087464
CBOD5	Mg/L	2	19
TSS	Mg/L	4.5	106
TP	Mg/L	0.14	.63
TKN	Mg/L	1.3	4.5

Bypass Results Interpretations

All bypass discharges have a higher bacteria count due to no disinfection occurring. $CBOD_5$, TP & TKN results are much lower than typical raw sewage influent to the sewage plant due to the dilution of rain water during these events. All efforts are made to contain any debris in these discharges to the lake. After each bypass event, shoreline inspections near discharge points are done to monitor any debris that may come ashore. Clean up is done if debris is found.

APPENDIX A – MONITORED PARAMETERS RESULTS AND GRAPHS

RAVENSVIEW Wastewater Treatment Plant
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Monthly data

Month		Raw sewage CBOD	Final Effluent CBOD	Removal CBOD	Raw sewage Suspended solids	Final Effluent Suspended solids	Removal Suspended solids
	Units	mg/L	mg/L	%	mg/L	mg/L	%
JAN.		38.0	2.0	95%	69.0	3.0	96%
FEB.		37.0	2.0	95%	44.0	3.0	93%
MAR.		36.0	2.0	94%	57.0	2.0	96%
APR.		28.0	2.0	93%	37.0	4.0	89%
MAY		22.0	2.0	91%	32.0	3.0	91%
JUN.		18.0	2.0	89%	24.0	3.0	88%
JUL.		21.0	2.0	90%	48.0	4.0	92%
AUG.		31.0	2.0	94%	58.0	5.0	91%
SEP.		30.0	2.0	93%	50.0	6.0	88%
OCT.		30.0	2.0	93%	44.0	5.0	89%
NOV.		30.0	3.0	90%	50.0	5.0	90%
DEC.		45.0	2.0	96%	57.0	3.0	95%
	Average	30.5	2.1	93%	47.5	3.8	92%
	Objective		15.0			15.0	
	Limit		25.0			25.0	

RAVENSVIEW Wastewater Treatment Plant
2019 ANNUAL REPORT
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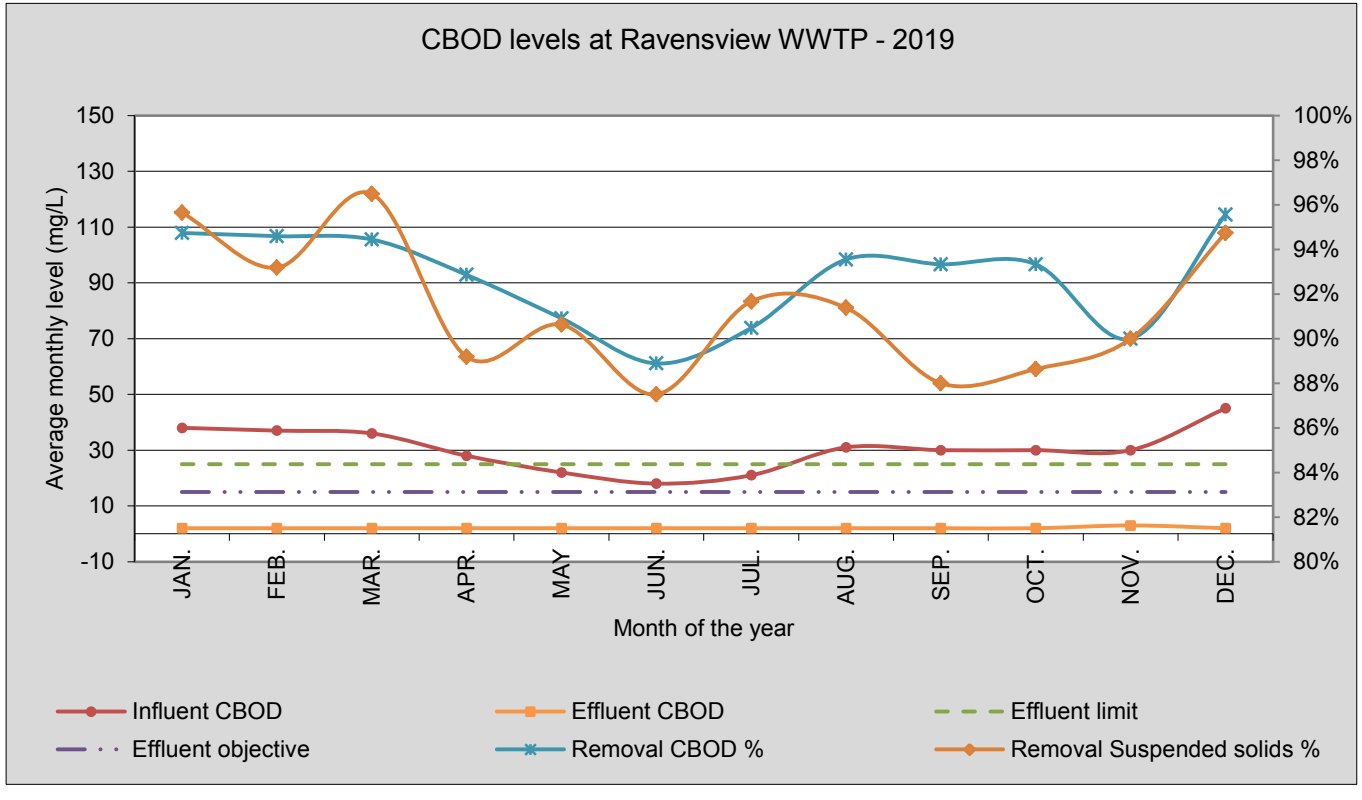

RAVENSVIEW Wastewater Treatment Plant
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		Raw sewage	Final Effluent	Final Effluent	Final Effluent	Final Effluent
			Final Effluent results			
Month		Free Ammonia (NH_3)	Ammonia (NH_3+NH_4)	Ammonia Objective	Nitrites & nitrates	Acute lethality to trout
	Unit	mg/L	mg/L	mg/L	mg/L	pass / fail
JAN.		0.34	1.66	12.0	15.30	pass
FEB.		0.22	1.37	12.0	16.30	pass
MAR.		0.31	1.45	12.0	15.20	pass
APR.		0.24	0.75	12.0	10.80	pass
MAY		0.23	0.60	12.0	11.10	pass
JUN.		0.08	0.33	7.0	7.70	pass
JUL.		0.15	0.57	5.0	10.60	pass
AUG.		0.15	0.43	5.0	11.00	pass
SEP.		0.32	0.97	7.0	16.40	pass
OCT.		0.62	0.85	12.0	16.70	pass
NOV.		0.37	0.53	12.0	13.80	pass
DEC.		0.12	0.30	12.0	12.10	pass
Average		0.26	0.82		13.1	
Objective			Variable			
Limit						

RAVENSVIEW Wastewater Treatment Plant
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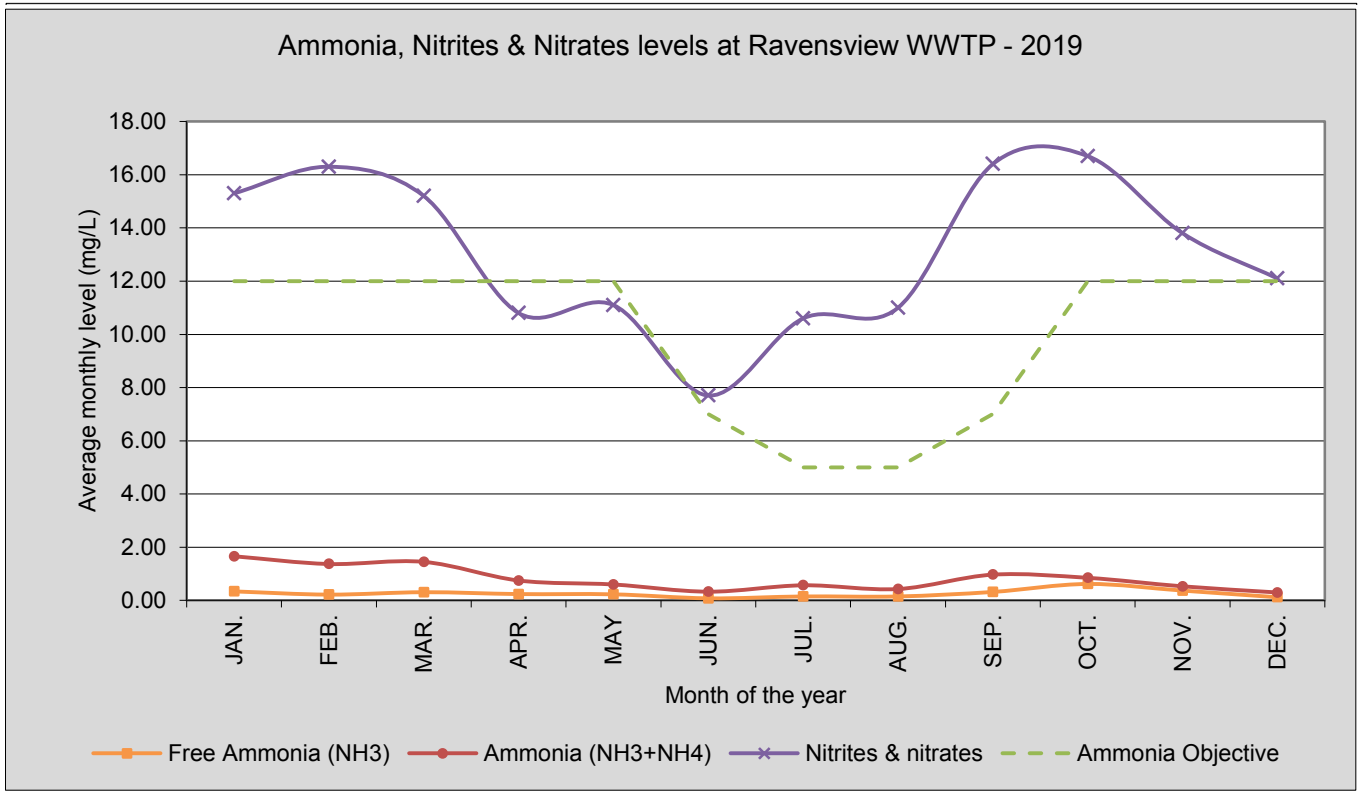

RAVENSVIEW Wastewater Treatment Plant
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Ferric chloride

Month	Unit	**Dosage** Litres / day	**Dosage** Kg / day	**Dosage** Litres / month	**Dosage** Kg / month	**Dosage** mg/L
JAN.		1,185	184	36,740	5,704	3.38
FEB.		1,261	196	35,310	5,482	3.41
MAR.		1,270	199	39,380	6,114	2.99
APR.		1,276	198	38,280	5,943	2.44
MAY		1,473	229	45,650	7,087	2.10
JUN.		1,423	221	42,680	6,626	2.03
JUL.		1,441	224	44,660	6,934	2.37
AUG.		1,331	207	41,250	6,404	2.67
SEP.		1,467	228	44,000	6,831	3.61
OCT.		1,863	289	57,750	8,966	4.63
NOV.		1,401	217	42,020	6,524	3.33
DEC.		1,352	210	41,910	6,507	3.47
Average		1,395	217	42,469	6,593.50	3.04
Objective						
Limit						

RAVENSVIEW Wastewater Treatment Plant
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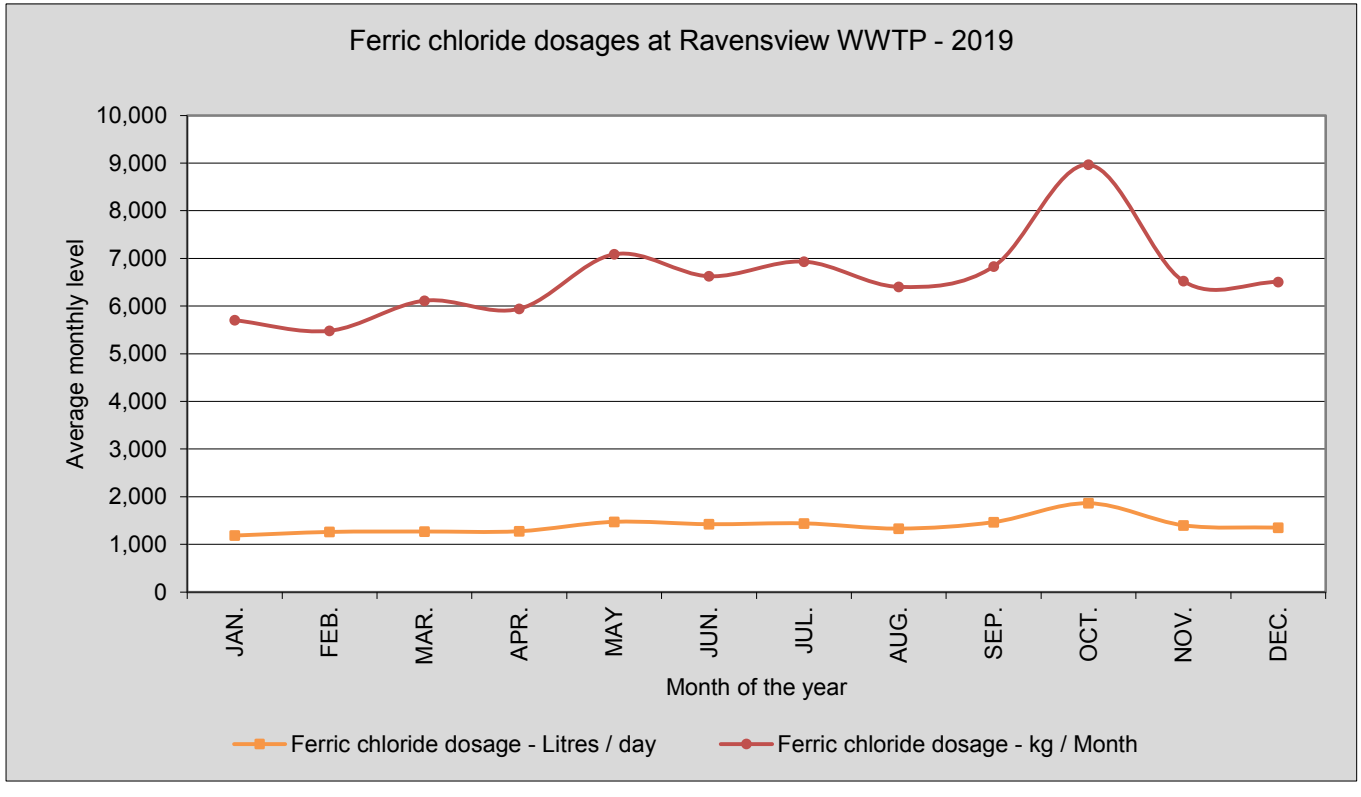

RAVENSVIEW Wastewater Treatment Plant
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Bacterial results

Month	Unit	Final Effluent **E. Coli.** counts / 100mL	**E-Coli Objective** counts / 100mL	**E-Coli Limit** counts / 100mL	Final Effluent **Total Coliforms (second axis)** counts / 100mL	Final Effluent **Fecal Streptococci** counts / 100mL
JAN.		4	100	200	152	67
FEB.		2	100	200	22	54
MAR.		2	100	200	34	72
APR.		3	100	200	133	76
MAY		49	100	200	441	64
JUN.		32	100	200	535	63
JUL.		15	100	200	975	114
AUG.		39	100	200	962	47
SEP.		14	100	200	1,023	50
OCT.		11	100	200	1,913	128
NOV.		4	100	200	479	74
DEC.		4	100	200	343	91
Average		14.92			584.33	75.00
Objective		100				
Limit		200				

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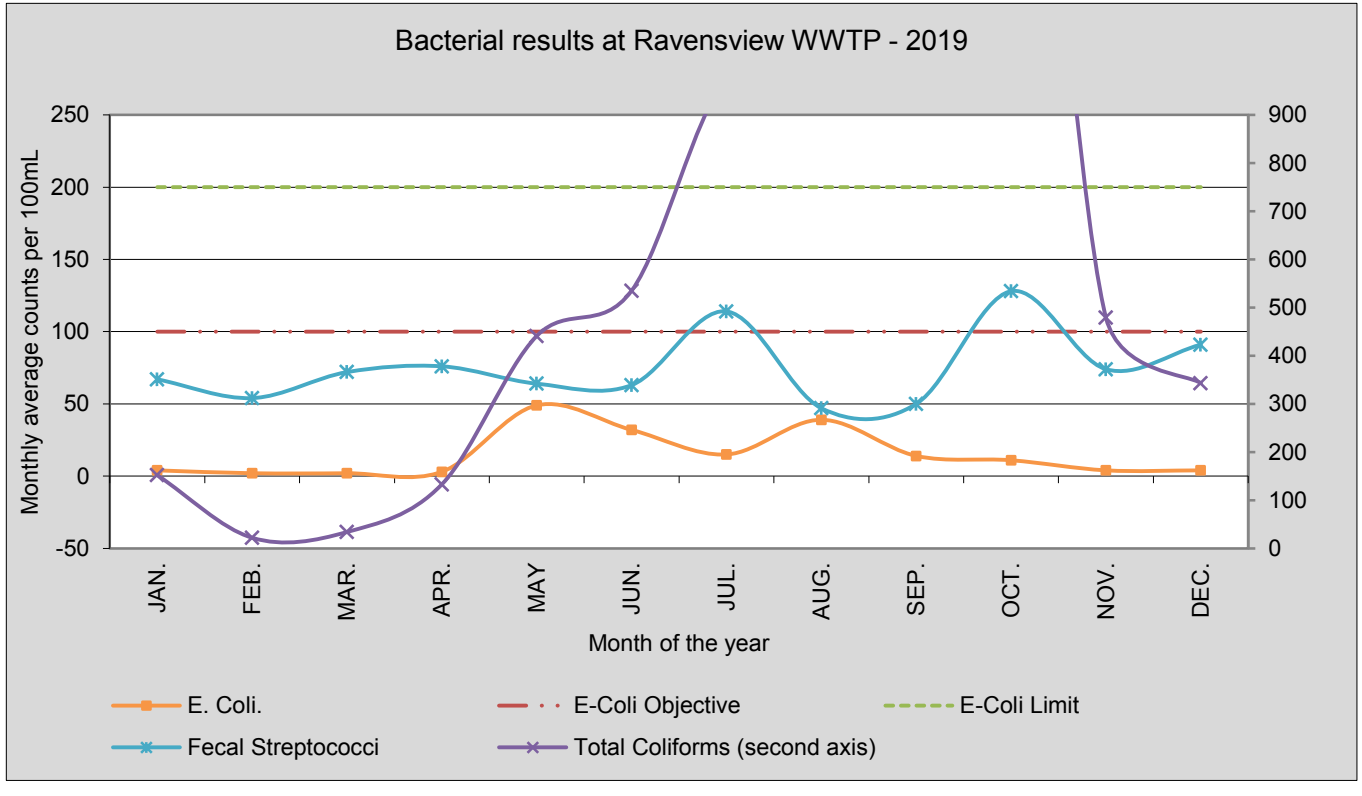

RAVENSVIEW Wastewater Treatment Plant
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Sodium hypochlorite

Month	Unit	**Dosage** Litres / day	**Dosage** Kg / day	**Dosage** Litres / month	**Dosage** Kg / month	**Dosage** mg/L	**Residual** mg/L
JAN.		860	121	26,671	3,745	2.24	0.94
FEB.		876	123	24,523	3,443	2.16	0.90
MAR.		849	119	26,306	3,693	1.94	0.90
APR.		1,077	151	32,310	4,536	1.92	0.77
MAY		1,315	185	40,759	5,722	1.71	0.60
JUN.		1,433	201	42,997	6,037	1.85	0.63
JUL.		1,410	198	43,722	6,138	2.10	0.70
AUG.		1,138	160	35,275	4,953	2.05	0.61
SEP.		1,055	148	31,642	4,443	2.31	0.62
OCT.		1,080	152	33,494	4,702	2.40	0.79
NOV.		1,099	154	32,976	4,630	2.36	0.89
DEC.		818	115	25,344	3,558	1.89	0.76
Average		1,084	152.3	33,002	4,633	2.08	0.76
Objective							
Limit							

RAVENSVIEW Wastewater Treatment Plant
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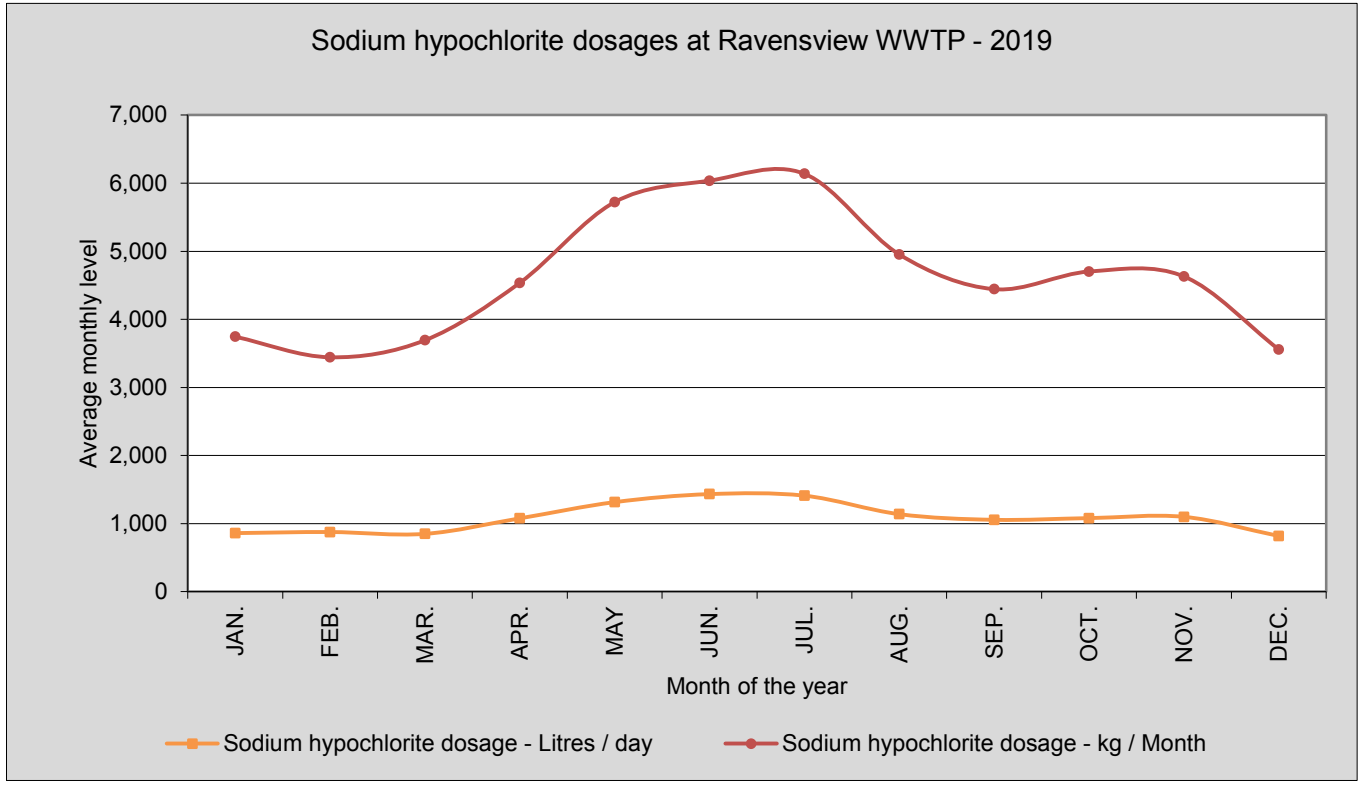

RAVENSVIEW Wastewater Treatment Plant
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Sodium BiSulphite

Month		**Dosage**	**Dosage**	**Dosage**	**Dosage**	**Dosage**	**Residual**	**Compliance**
	Unit	Litres / day	Kg / day	Litres / month	Kg / month	mg / L	mg / L	Yes / No
JAN.		354	180	10,972	5,590	3.37	0.0	yes
FEB.		351	179	9,828	5,007	3.19	0.0	yes
MAR.		418	213	12,948	6,597	3.31	0.0	yes
APR.		456	232	13,666	6,963	2.93	0.0	yes
MAY		486	248	15,080	7,684	2.31	0.0	yes
JUN.		499	254	14,976	7,631	2.34	0.0	yes
JUL.		508	259	15,756	8,028	2.74	0.0	yes
AUG.		445	226	13,780	7,021	2.93	0.0	yes
SEP.		321	163	9,620	4,902	2.55	0.0	yes
OCT.		285	145	8,838	4,503	2.31	0.0	yes
NOV.		315	161	9,464	4,822	2.48	0.0	yes
DEC.		307	156	9,516	4,849	2.56	0.0	yes
Average		395	201	12,037	6,133	2.75	0.01	
Objective								
Limit								

RAVENSVIEW Wastewater Treatment Plant
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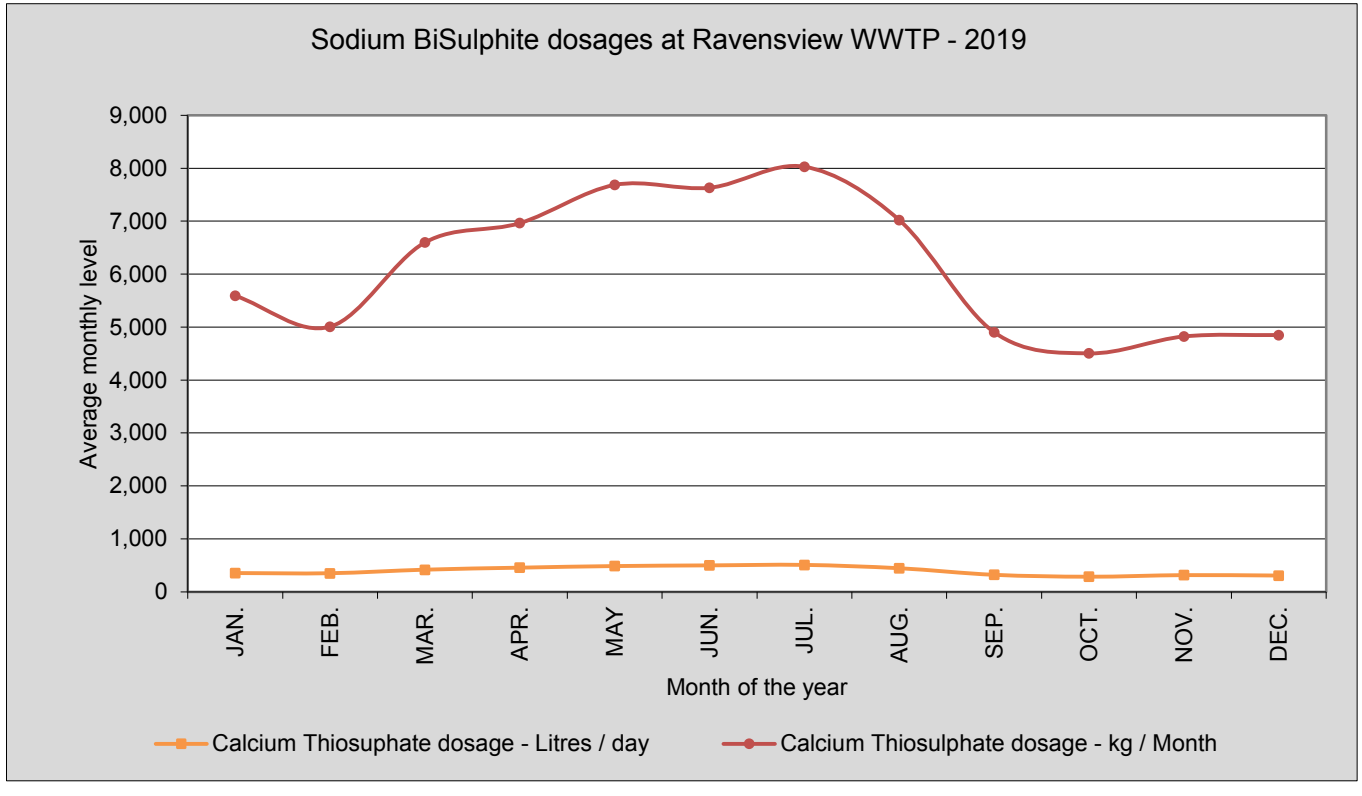

RAVENSVIEW Wastewater Treatment Plant
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		Digested sludge			Sludge Cake		
Month		**Sludge processed**	**Total solids in sludge**	**Volatile solids in sludge**	**Sludge Cake output**	**Total solids in sludge cake**	**Vol. Solids sludge cake**
	Unit	M3 / Month	%	%	M3 / Month	%	%
JAN.		9201	2.2%	58.5%	1,173	25.7%	57.7%
FEB.		9006	2.5%	56.2%	993	25.3%	59.9%
MAR.		8329	2.3%	58.6%	1,212	25.3%	59.0%
APR.		9674	2.5%	58.4%	1,326	25.7%	57.1%
MAY		10000	2.5%	58.3%	1,350	25.7%	58.0%
JUN.		10240	2.5%	56.4%	1,296	26.5%	56.9%
JUL.		11276	2.1%	59.2%	1,518	25.5%	59.2%
AUG.		11470	2.1%	58.0%	1,500	25.0%	59.0%
SEP.		10628	2.0%	63.0%	1,424	25.3%	61.9%
OCT.		10461	2.0%	61.8%	1,349	24.9%	60.4%
NOV.		15473	1.8%	60.3%	845	26.7%	59.5%
DEC.		6424	1.6%	59.8%	761	27.6%	60.2%
Average		10,182	2.2%	59.0%	1,229	25.8%	59.1%
Total		122182					

* Processed volumes are a combination of both Cataraqui Bay WWTP & Ravensview WWTP sludge productions.

RAVENSVIEW Wastewater Treatment Plant
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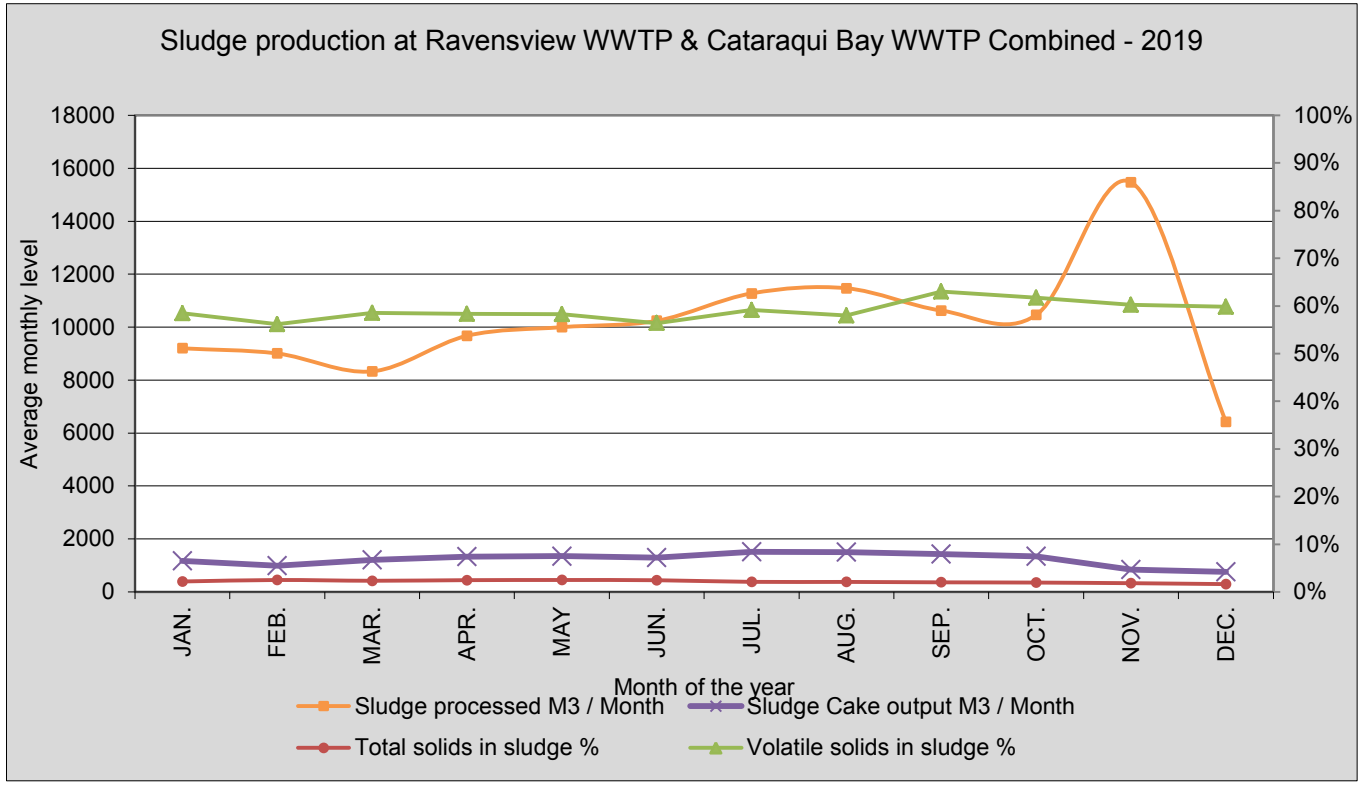

RAVENSVIEW Wastewater Treatment Plant
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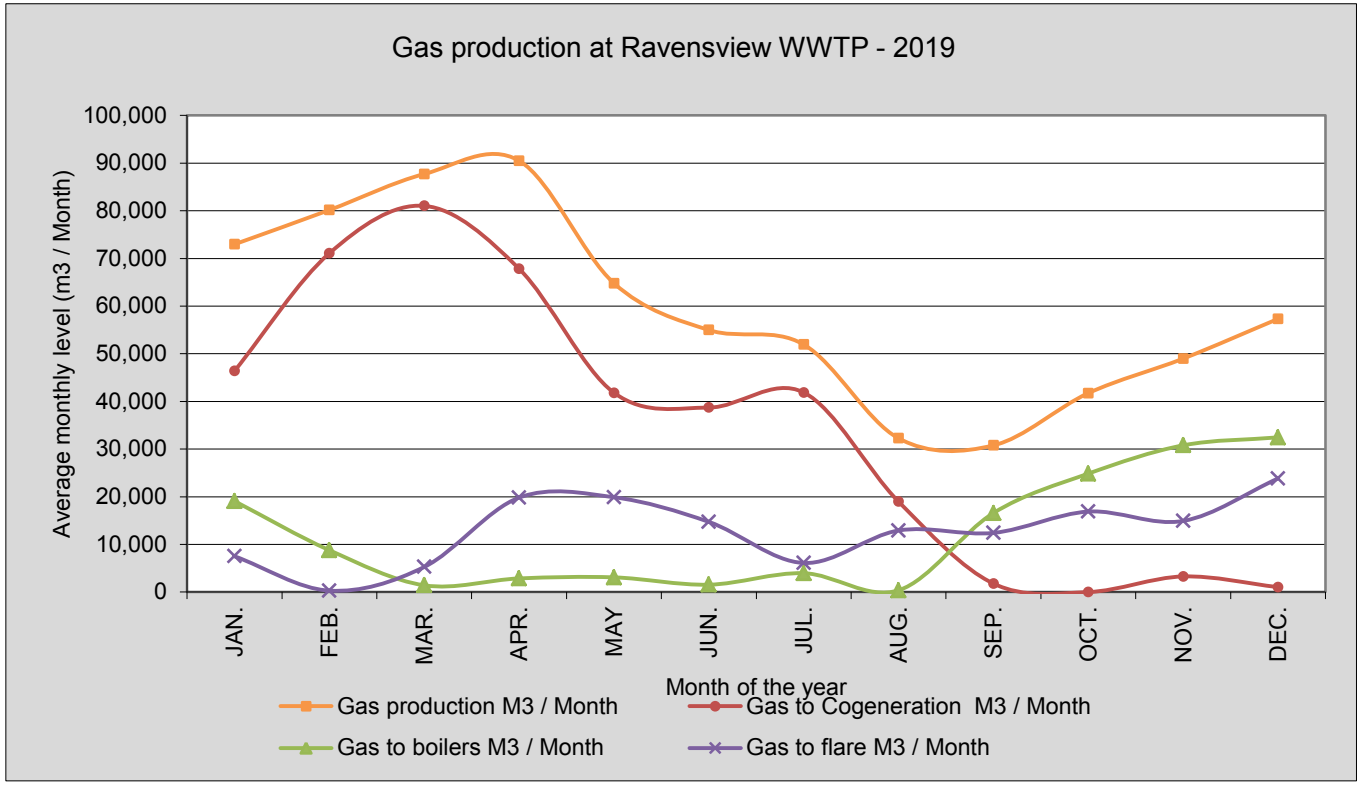
Digester gas production

Month	Unit	**Gas production** M3 / Month	**Gas to Cogeneration** M3 / Month	**Gas to boilers** M3 / Month	**Gas to flare** M3 / Month
JAN.		72,973	46,379	19,080	7,514
FEB.		80,159	71,080	8,781	298
MAR.		87,715	81,036	1,416	5,263
APR.		90,512	67,839	2,859	19,814
MAY		64,795	41,819	3,083	19,893
JUN.		54,986	38,713	1,547	14,726
JUL.		51,944	41,885	3,959	6,100
AUG.		32,259	18,971	368	12,920
SEP.		30,779	1,779	16,584	12,416
OCT.		41,740	1	24,852	16,887
NOV.		48,981	3,275	30,784	14,922
DEC.		57,326	1,036	32,459	23,831
Average		59,514	34,484.4	12,147.7	12,882.0
Total		**714,169**	**413,813**	**145,772**	**154,584**

RAVENSVIEW Wastewater Treatment Plant
2019 ANNUAL REPORT
Monthly Graphs



RAVENSVIEW Wastewater Treatment Plant
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Effluent Summary from daily samples

Month	Final Effluent pH	Final Effluent pH lower limit	Final Effluent pH top limit	Final Effluent Temperature	Eff Chlorine residual
Unit				degrees Celcius	mg / L (second axis)
JAN.	7.54	6	9.5	11.2	0.0
FEB.	7.48	6	9.5	10.0	0.0
MAR.	7.52	6	9.5	10.7	0.0
APR.	7.53	6	9.5	10.1	0.0
MAY	7.65	6	9.5	13.0	0.0
JUN.	7.43	6	9.5	15.9	0.0
JUL.	7.47	6	9.5	20.1	0.0
AUG.	7.42	6	9.5	20.1	0.0
SEP.	7.61	6	9.5	19.4	0.0
OCT.	7.68	6	9.5	17.4	0.0
NOV.	7.68	6	9.5	14.1	0.0
DEC.	7.68	6	9.5	11.8	0.0
Average	7.6			14.5	0.01
Objective					
Limit					

RAVENSVIEW Wastewater Treatment Plant
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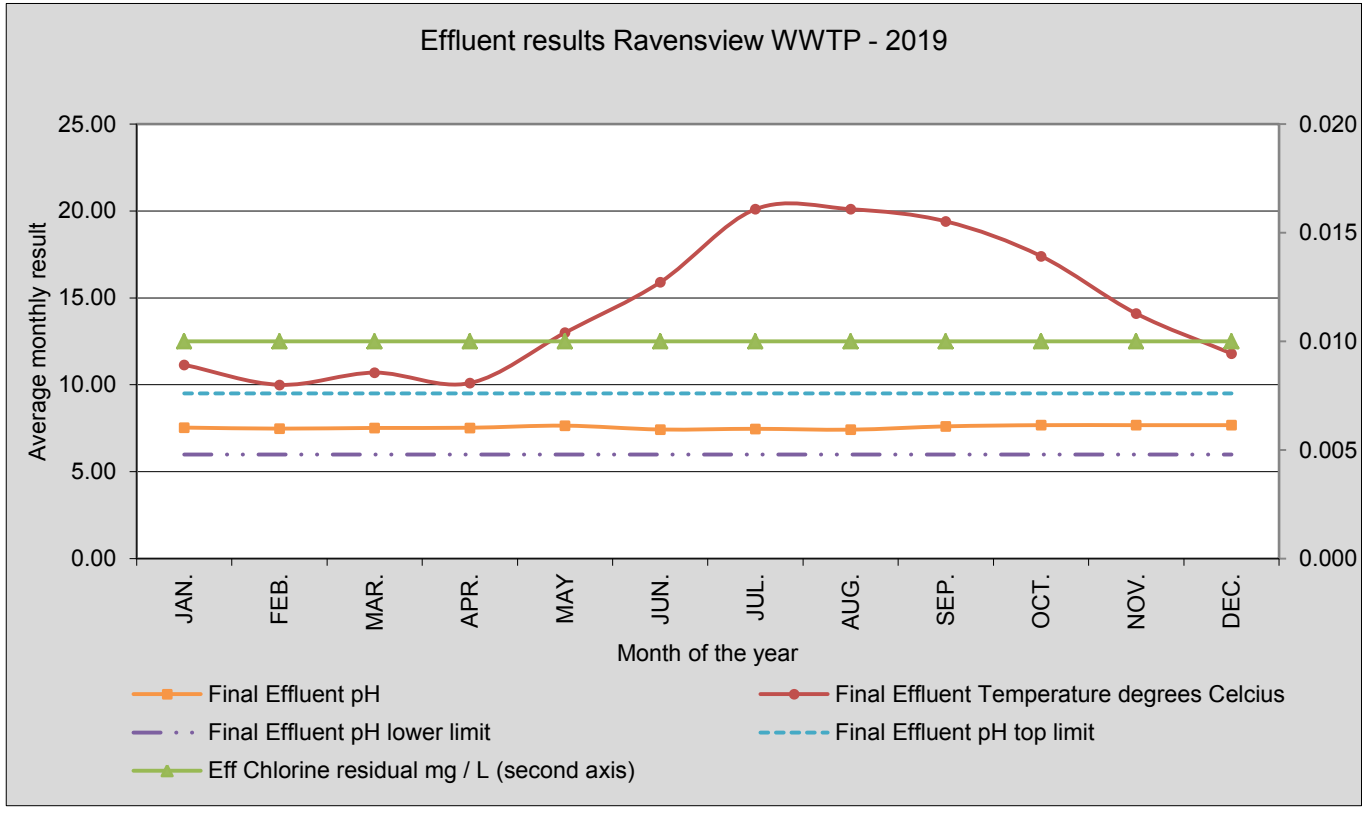

RAVENSVIEW Wastewater Treatment Plant
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Polymer dosage

Month	Unit	**Dosage*** Kg / day	**Dosage** Kg / month	**Dosage** mg / L
JAN.		3	68	0.04
FEB.		3	80	0.05
MAR.		3	93	0.05
APR.		3	94	0.04
MAY		3	80	0.03
JUN.		3	77	0.02
JUL.		2	77	0.03
AUG.		3	82	0.03
SEP.		3	86	0.04
OCT.		3	85	0.04
NOV.		3	89	0.05
DEC.		3	82	0.04
Average		2.92	83	0.04
Objective Limit				

Note: *: Calculated value

RAVENSVIEW Wastewater Treatment Plant
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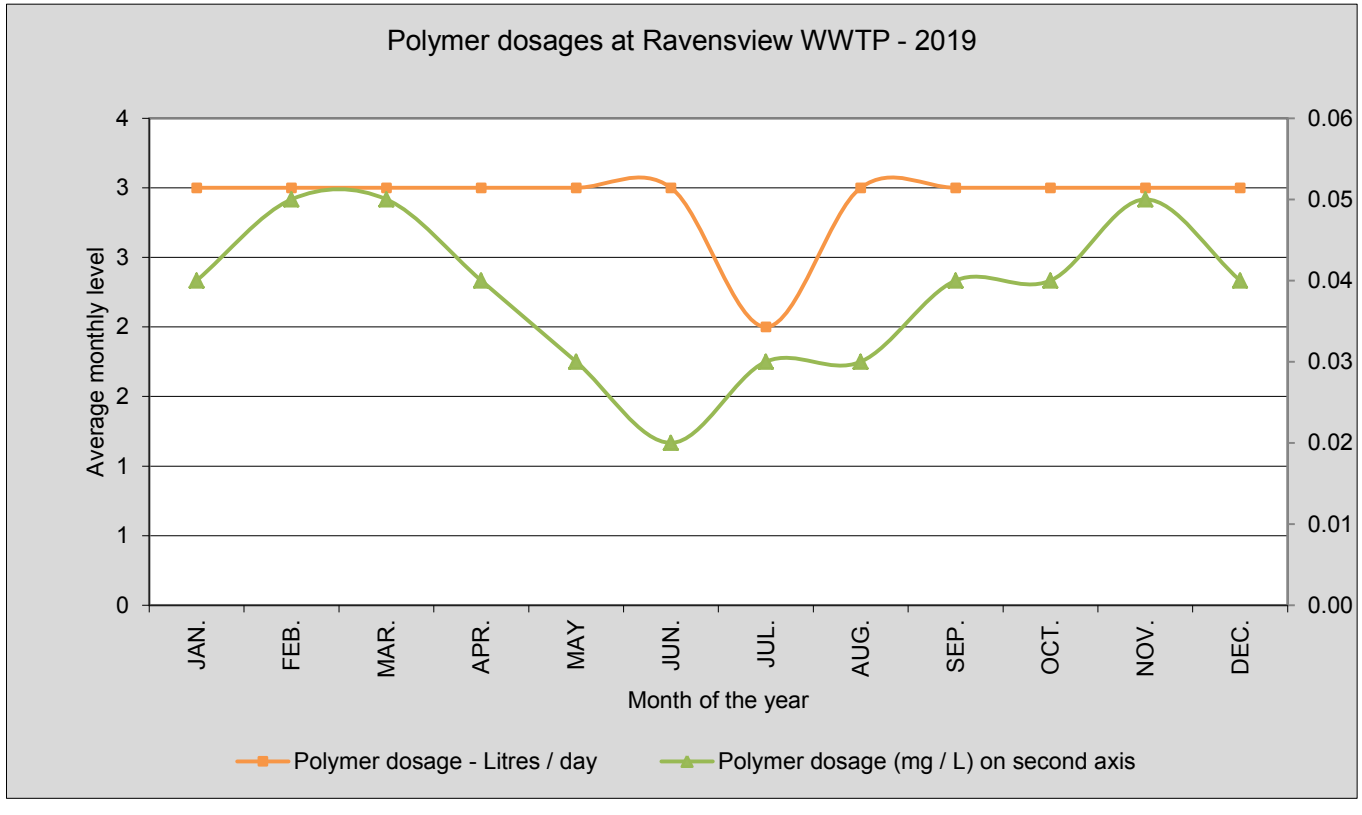

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		TKN / Influent pH / Phosphorus						
		Influent	Final Effluent	Removal	Influent	Influent	Final Effluent	Removal
Month		TKN	TKN	TKN	pH	Phosphorus	Phosphorus	Phosphorus
	Unit	mg / L	mg / L	%		mg / L (second axis)	mg / L (second axis)	%
JAN.		16.80	3.00	82%	7.76	1.72	0.35	80%
FEB.		17.00	2.80	84%	7.69	1.82	0.48	74%
MAR.		15.50	3.00	81%	7.70	1.91	0.57	70%
APR.		13.60	2.20	84%	7.67	1.36	0.45	67%
MAY		10.60	1.70	84%	7.76	1.35	0.34	75%
JUN.		6.40	1.40	78%	7.59	0.85	0.33	61%
JUL.		7.20	1.80	75%	7.66	0.88	0.43	51%
AUG.		10.30	2.00	81%	7.61	1.46	0.42	71%
SEP.		14.30	2.30	84%	7.77	1.49	0.52	65%
OCT.		13.80	2.00	86%	7.87	1.56	0.27	83%
NOV.		15.90	1.90	88%	7.79	1.85	0.34	82%
DEC.		14.10	1.80	87%	7.74	1.63	0.31	81%
Average		12.96	2.16	83%	7.72	1.49	0.40	72%
Objective							0.8	
Limit							1.0	

RAVENSVIEW Wastewater Treatment Plant
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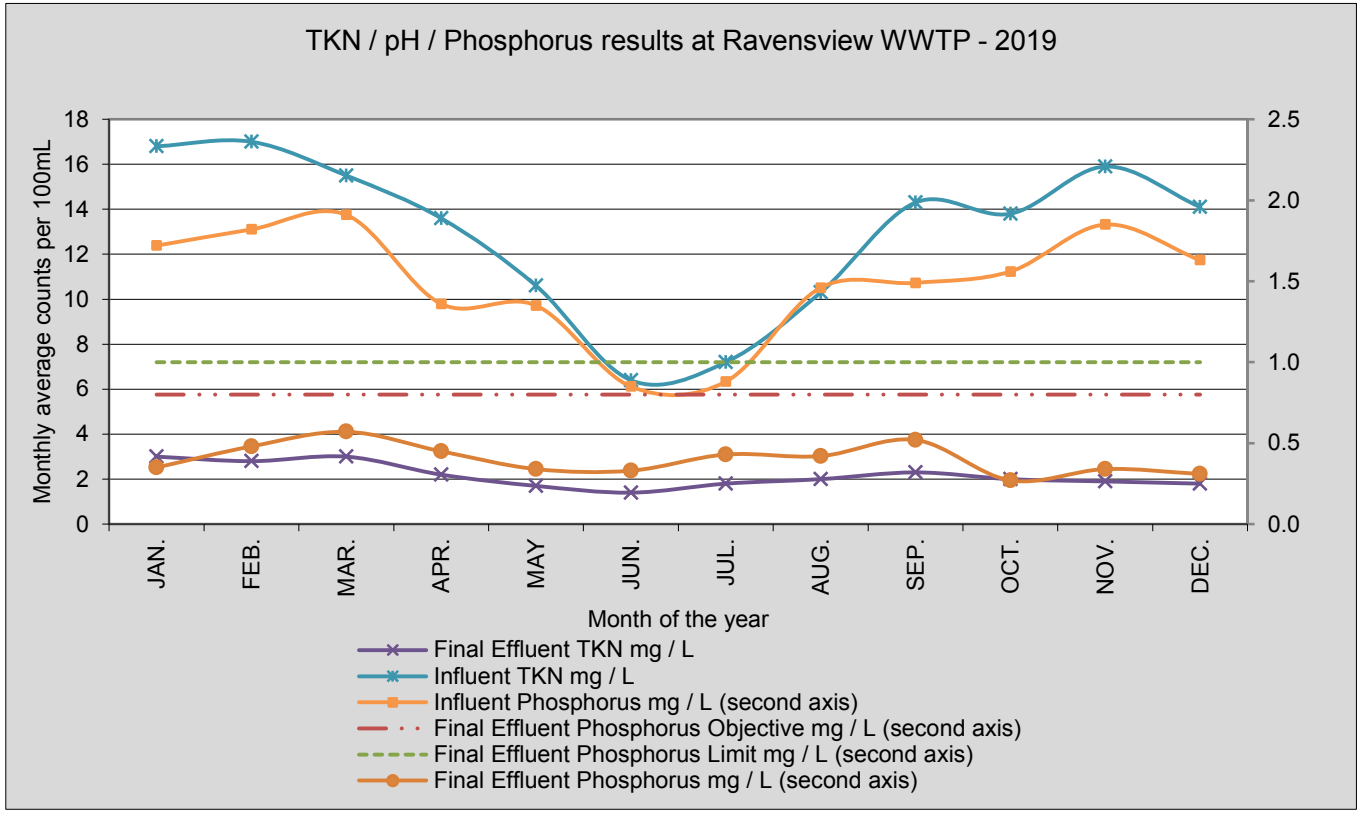

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		Flows					
Month		**Monthly Minimum Flow**	**Monthly Rated capacity Flow**	**Monthly Maximum Flow**	**Monthly Average Flow**	**Monthly Total Flow**	**Monthly Total Grit removal (Estimate)**
	Unit	m3 / day	m3 / day	m3 / day	m3 / day	m3 / Month	m3 / Month
JAN.		43,491	95,000	84,799	54,813	1,699,215	2
FEB.		54,084	95,000	127,707	70,278	1,967,794	2
MAR.		47,603	95,000	145,420	67,099	2,080,078	2
APR.		55,425	95,000	144,447	81,749	2,452,462	2
MAY		84,095	95,000	138,059	108,840	3,374,048	2
JUN.		83,850	95,000	128,862	109,036	3,271,084	2
JUL.		88,500	95,000	104,856	94,564	2,931,492	2
AUG.		64,977	95,000	88,290	77,335	2,397,392	2
SEP.		53,677	95,000	98,916	64,825	1,944,751	2
OCT.		47,703	95,000	126,369	65,500	2,030,512	2
NOV.		54,516	95,000	160,459	67,621	2,028,637	2
DEC.		25,100	95,000	120,823	65,516	2,030,982	2
Average		58,585	95,000	122,417	77,265	2,350,704	2.0
Objective							
Limit							

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