



Ripley Wastewater Treatment Facility  
2022 Operation and Maintenance  
Annual Report

**PREPARED BY:**

Veolia Water Canada  
100 Cove Road  
Goderich, ON  
N7A 3Z2

**TO:**

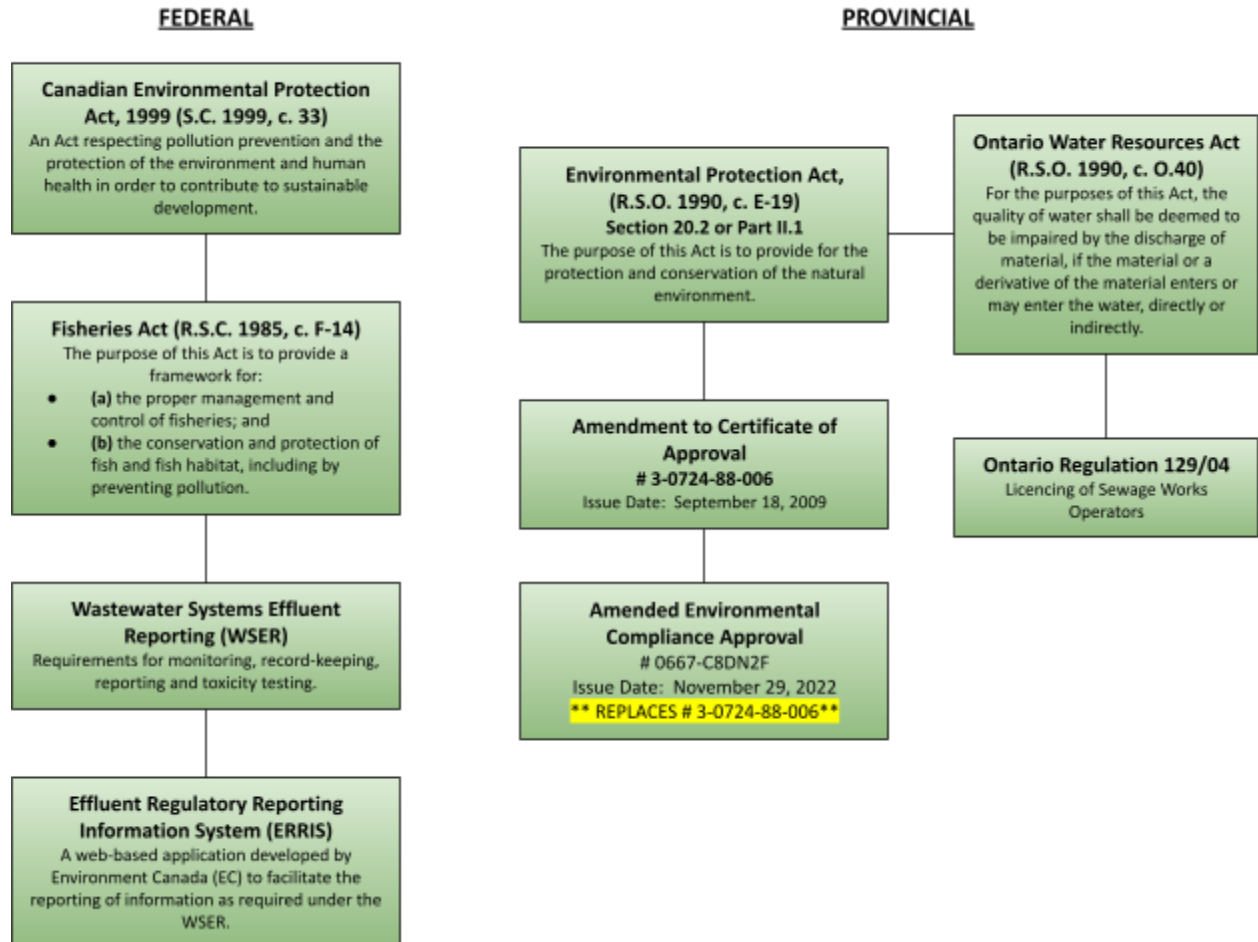
Township of Huron-Kinloss  
Box 130  
21 Queen Street  
Ripley, ON, N0G 2R0



# Ripley Wastewater Treatment Facility Annual Report

For the 2022 Operating Year

## Legislative Framework for Ripley Wastewater Treatment Facility



# **Ripley Wastewater Treatment Facility Annual Report**

*For the 2022 Operating Year*

## **EXECUTIVE SUMMARY:**

This report is a summary of the Ripley Wastewater Treatment Facility's performance in accordance with the Ministry of the Environment, Conservation and Parks (MECP) Amended Certificate of Approval (C. of A) No. 3-0724-88-006, Issued: September 18, 2009, and the Federal Wastewater Systems Effluent Regulations (WSER) for most of the 2022 operating year.

In late 2022, a new Amended Environmental Compliance Approval No. 0667-C8DN2F, Issued: November 29, 2022, was received. This Amended ECA **replaces** the Amended C. of A.

## **DESCRIPTION OF FACILITIES:**

**Works Number: 110002773**

### **Component**

### **Location**

Sewage Pumping Station	59 Park St (Lot 56, Plan 100)
Stabilization Ponds (Lagoons)	76 Park St (Lot 14, Concession 7)
Outfall to South Pine River	Lot 14, Concession 6
Streamflow Monitoring Station	Sideroad No. 10, at South Pine River Crossing
Collection System	Village of Ripley

## **SEWAGE PUMPING STATION**

- Wet well structure (2.4 m diameter x 10.2 m deep)
- Two (2) raw sewage pumps (rated at 15.6 L/s at 18.5 m, 11hp each)
- Milltronics level sensor and volume totalizer
- Endress-Hausser ProMag Flow Meter (installed in September 2021)
- Standby generator (10 kW, 30hp), diesel fuel tank and containment
- Aluminum sulphate storage tank (27,000 L) and containment
- Two (2) chemical feed pumps (30L/h each, max)
- Force Main: 467 m x 150 mm diameter

## **WASTE STABILIZATION PONDS (CONVENTIONAL FACULTATIVE LAGOON SYSTEM)**

- Cell No. 1: 36,500 m<sup>3</sup>
- Cell No. 2: 43,200 m<sup>3</sup>
- Cell No. 3: 43,200 m<sup>3</sup>
  - Three cells sized for a minimum retention time of 200 days at annual average influent design flow of 600 m<sup>3</sup>/d
- Aeration Cell 4: 10,400 m<sup>3</sup> (12 hours retention at peak discharge rate of 5,338 m<sup>3</sup>/d)
- Blower: Hick Hargreaves HH4063: 540 - 1,080 m<sup>3</sup>/h (at 57 kPa)
- Electrically operated knife gate valve (Rotorx)
- Discharge control structure: 90° V-Notch weir and Milltronics level sensor
- Outfall pipe: 550 m x 375 mm diameter
- Stream flow gauge at the South Pine River (maintained by Saugeen Valley CA)

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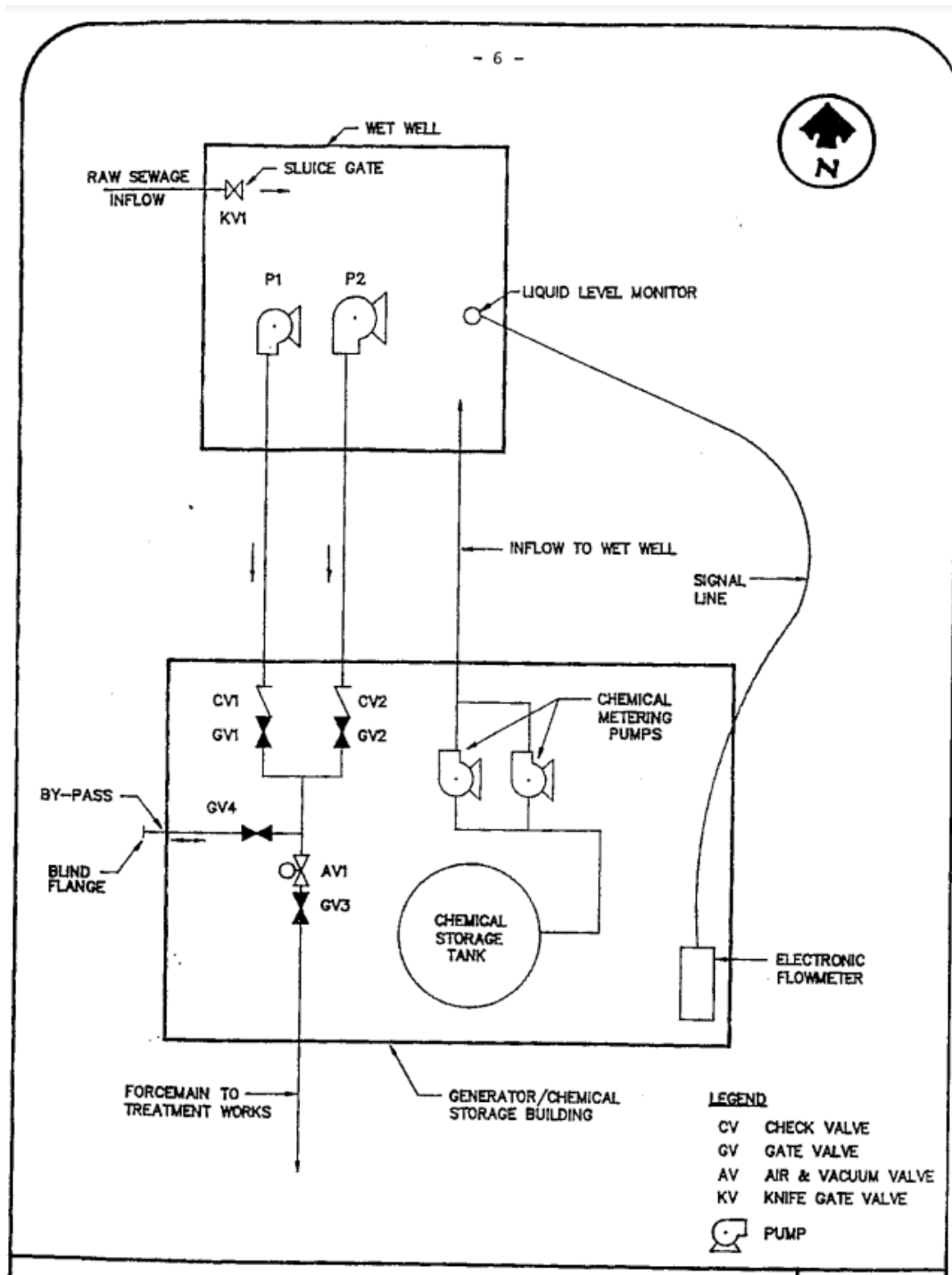
**Ripley Site Map**



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## Ripley Sewage Pumping Station Schematic

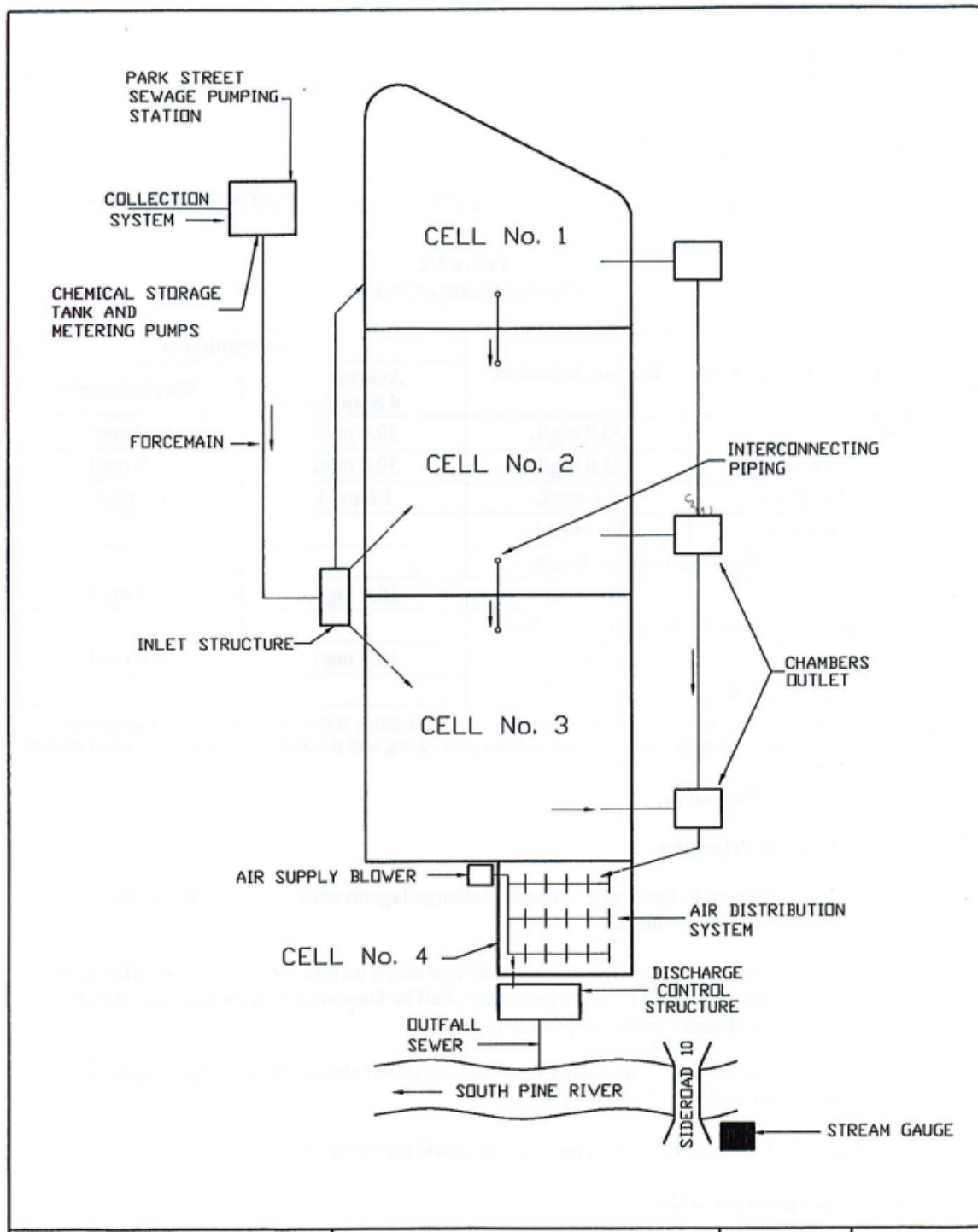




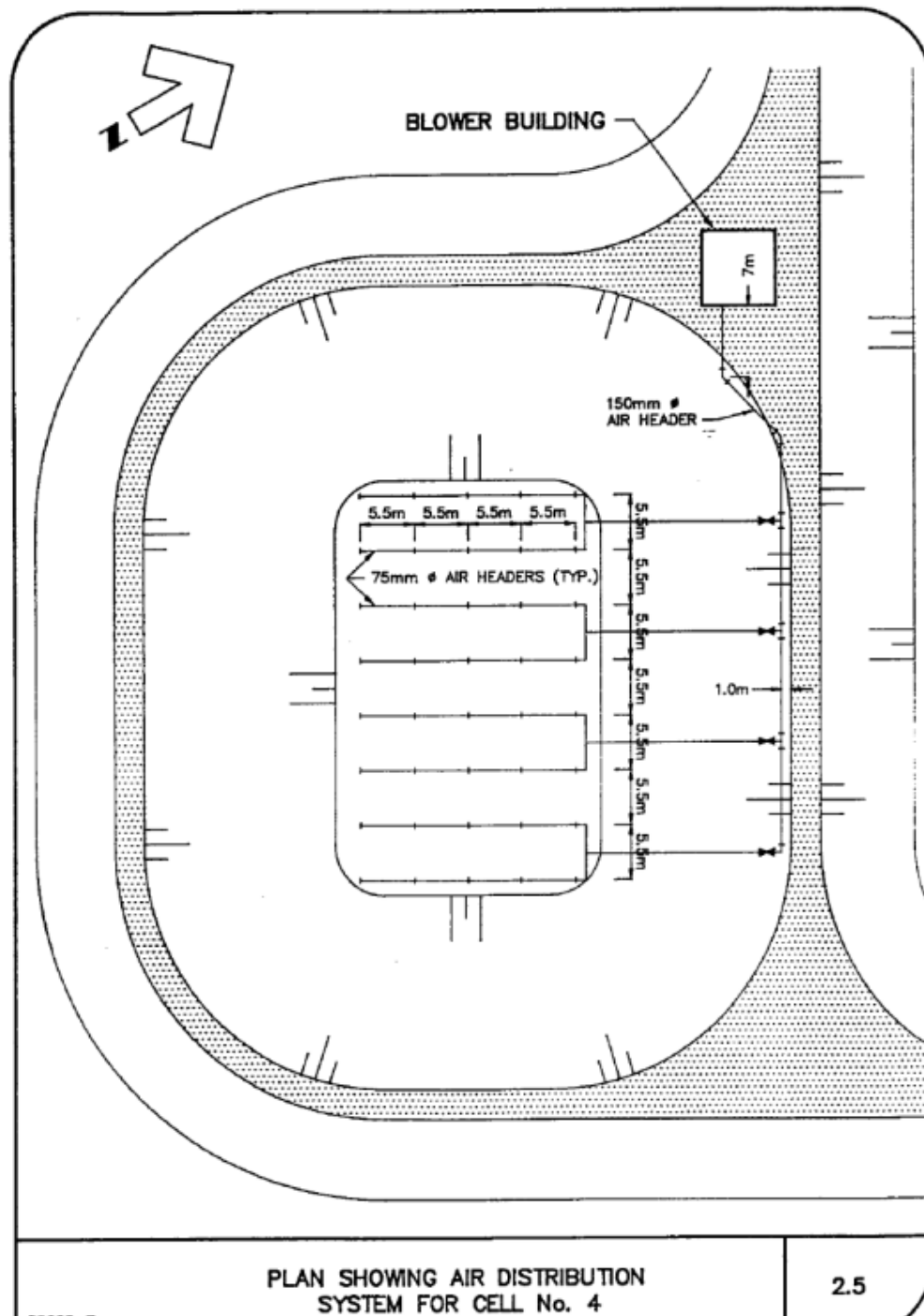
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## Ripley Sewage Process Schematic



**Ripley Sewage Lagoon Aeration Cell Schematic**



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### UNIT PROCESS:

In 2022, the Ripley Wastewater Treatment System was operated as follows:

Raw sewage from the collection system flowed to the wet well structure at the Sewage Pumping Station. Aluminum sulphate (alum) was added to promote phosphorus removal before it was pumped to Lagoon Cell No. 1 via the forcemain. The Lagoon Cells worked in series (i.e. Cell 1 --> Cell 2 --> Cell 3), with water depths between 0.3 - 1.8 m.

The Ministry C. of A. and the new Amended ECA allows the treated effluent to be discharged between October 15th to May 1st. When discharge is permitted, the effluent was directed from Cell 3 to Aeration Cell 4, where a blower was used to supply air through a submersible diffuser system. The treated effluent was then directed to the discharge control structure, where the flow was measured prior to entering the outfall pipe to the South Pine River.

### CERTIFICATE OF APPROVAL # 3-0724-88-006 AMENDED REQUIREMENTS - EFFLUENT:

**Condition 3. (1)** Subject to Subsection (2), the sewage treatment facilities should be designed, constructed and operated such that the concentrations of the materials named below as Effluent Parameters shall not be exceeded in the effluent from the facilities, calculated in accordance with Subsection (3).

Effluent Parameters	Design Objectives	Non-Compliance (Average Over Discharge Period)
BOD-5	15.0 mg/L	25.0 mg/L
Suspended Solids	15.0 mg/L	30.0 mg/L
Total Phosphorus	0.5 mg/L	0.8 mg/L
Free Ammonia	Fall: 3.0 mg/L Spring: 6.0 mg/L	Fall: 6.0 mg/L Spring: 10.0 mg/L
Hydrogen Sulphide	Absent	--

### Federal Wastewater Systems Effluent Regulations (WSER)

Prescribed Deleterious Substances	Authorization to Deposit - Conditions (Average Concentration per Section 6 (3))
CBOD	25 mg/L
Suspended Solids	25 mg/L
Total Chlorine Residual	0.02 mg/L max
Un-ionized Ammonia	1.25 mg/L

Note: The laboratory reports Provincial Unionized Ammonia which is calculated from total ammonia, field pH and field temperature provided on the Chain of Custody form and is the same as Free Ammonia. The Federal Unionized Ammonia (WSER) is calculated using total ammonia and laboratory pH measured at 15°C.



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### **AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL # 0667-C8DN2F (Beginning November 29, 2022)**

#### **Schedule B and C: Final Effluent Concentration Limits (Oct 15 - May 1)**

Final Effluent Parameter	Averaging Calculator	Design Objective	Compliance Limit
CBOD5	Seasonal Average	15.0 mg/L	25.0 mg/L
Total Suspended Solids (TSS)	Seasonal Average	15.0 mg/L	30.0 mg/L
Total Phosphorus (TP)	Seasonal Average	0.5 mg/L	0.8 mg/L
Total Ammonia Nitrogen (TAN)	Seasonal Average	Fall: 3.0 mg/L Spring: 6.0 mg/L	Fall: 6.0 mg/L Spring: 10 mg/L
E. Coli	Monthly Geometric Mean	150 cfu/100 mL	200 cfu/100 mL
pH	Single Sample Results	6.5 - 8.5	6.0 - 9.5
Hydrogen Sulphide (H <sub>2</sub> S)	Single Sample Results	Not detectable	absent

#### **Condition 6: Design Objectives**

- Exceedance of the Design Objective concentrations for CBOD5, TSS, TP, and TAN is deemed to have occurred when the arithmetic mean of analytical results of at least four (4) consecutive grab samples is greater than the corresponding concentration in the table.
- Exceedance of the Design Objective concentrations for H<sub>2</sub>S is deemed to have occurred when a positive result from any single sample is greater than the corresponding concentration in the table.

#### **Condition 7: Compliance Limits**

- Exceedance of the Compliance concentrations for CBOD5, TSS, TP and TAN is deemed to have occurred when the arithmetic mean of analytical results of at least four (4) consecutive grab samples is greater than the corresponding concentration in the table.
- Exceedance of the Compliance concentrations for H<sub>2</sub>S is deemed to have occurred when a positive result from any single sample is greater than the corresponding concentration in the table.
- The unionized ammonia concentration in the South Pine River after mixing with the lagoons' discharge (downstream) should not exceed 0.02 mg/L in accordance with Provincial Water Quality Objectives (PWQOs).

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### Effluent (Grab) Sample Results (mg/L) - Weekly during discharge

Date	BOD-5	CBOD	Total Suspended Solids	Total Phosphorus	Free Ammonia	Calculated Unionized Ammonia (WSER)
Jan 3	10	6	27	0.05	0.002	0.028
Mar 7	< 4	< 4	10	0.05	0.054	0.104
Mar 14	7	4	10	0.06	0.040	0.081
Mar 22	7	8	16	0.03	0.124	0.259
Mar 29	6	6	35	0.06	0.112	0.117
Apr 19	6	4	18	< 0.03	0.062	0.098
Apr 26	7	< 4	50	0.08	0.059	0.002
Oct 17	< 4	< 4	8	< 0.03	< 0.001	0.002
Nov 7	3	4	20	0.04	0.005	0.012
Nov 15	4	6	33	0.03	0.017	0.014
Nov 22	9	7	15	0.04	0.015	0.014
Nov 28	6	2	17	0.09	0.024	0.009
Min	3	2	8	< 0.03	< 0.001	0.002
Max	10	8	50	0.09	0.124	0.259
Spring Avg	7	5	24	0.05	0.067	0.098
Fall Avg	5	5	19	0.05	0.012	0.010
Annual Avg	6	5	22	0.05	0.044	0.062
# Samples	12	12	12	12	12	12
Objectives	15	--	15	0.5	Fall: 3 Spring: 6	--
Non-Compliance <sup>1</sup>	25	--	30	0.8	Fall: 6 Spring: 10	--
WSER <sup>2</sup>	--	25	25	--	--	1.25
Compliant	YES	YES	YES	YES	YES	YES

Six sample results exceeded the C. of A. maximum for Total Suspended Solids (TSS) objectives, however, the arithmetic mean for each discharge period (i.e. Spring and Fall) was within compliance:

- Spring average: 24 mg/L
- Fall average: 19 mg/L

The annual average TSS (22 mg/L) was in compliance with the Federal WSER limit.

Notes:

<sup>1</sup> For C. of A. compliance:

The average concentration of the effluent parameters listed in the amended C. of A. shall not be exceeded during each discharge period (Spring: Jan 1 - May 1, and Fall: Oct 15 - Dec 31).

<sup>2</sup> For compliance to WSER:

The average concentration of CBOD, and Suspended Solids did not exceed the corresponding concentrations set out in Table 2 of the C. of A., and the maximum concentration of un-ionized ammonia in the effluent was less than 1.25 mg/L, expressed as Nitrogen (N), at 15°C ± 1°C.

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### CERTIFICATE OF APPROVAL # 3-0724-88-006 REQUIREMENTS - RAW FLOWS:

**Condition 3. (2)** The Ripley sewage treatment works is approved to treat sewage at an average flow of 600 cubic meters per day. Average flows for the year not to exceed 600 m<sup>3</sup> per day, based on the arithmetic mean of 365 consecutive days flow, and have no negative impact on the receiving stream.

#### Flows: Raw Sewage Collected at Sewage Pumping Station

Date	Volume, m <sup>3</sup>	Daily Max, m <sup>3</sup>	Daily Min, m <sup>3</sup>	Average, m <sup>3</sup>
January	9,958	441	209	321
February	13,632	1,217	234	487
March	16,519	993	180	533
April	14,111	835	224	470
May	11,174	629	214	360
June	9,917	526	191	331
July	8,575	485	147	277
August	8,307	534	147	268
September	8,052	601	146	268
October	11,387	860	171	367
November	9,695	487	226	323
December	12,346	1,337	248	398
Total	133,673	—	—	—
Maximum	16,519	1,337	—	—
Minimum	8,052	—	146	—
Average Month	11,139	—	—	—
Arithmetic Mean*	—	—	—	366
Compliant	---	---	---	YES

Note: \* Arithmetic mean of 365 days flow.

**Rated Capacity (average):** 600 m<sup>3</sup>/day

**Performance (average):** 61.0%

**Condition 3. (9)(ii):** The *Owner* shall, when annual average flows reach 500 m<sup>3</sup>/day (83.3% capacity), further examine the lagoon performance and receiving stream and confirm, in writing to the *District Manager* and the *Director*, that the rated capacity of 600 m<sup>3</sup>/day will have no negative impact on the receiver.

In 2022, the annual average flow was below 500 m<sup>3</sup>/day, therefore, further examination of lagoon performance and receiving stream is not required at this time. See **Figure 1** for annual average flow trending.

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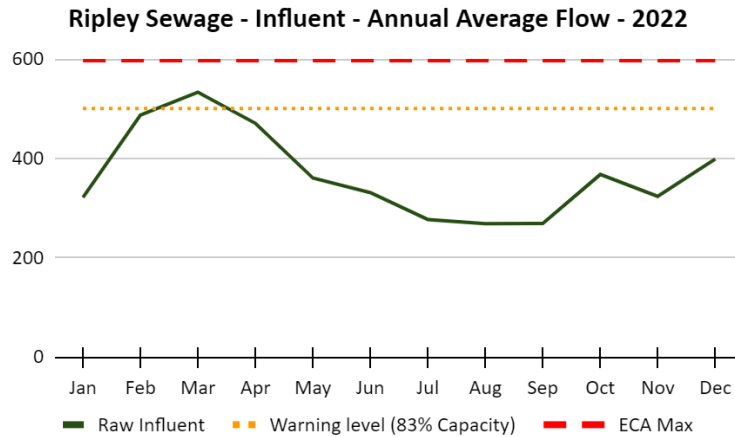


Figure 1

## CERTIFICATE OF APPROVAL # 3-0724-88-006 REQUIREMENTS - EFFLUENT FLOWS:

**Condition 3. (3)** The effluent volume from the Treatment Works shall be adjusted according to the stream flow available in the South Pine River.

### Flows: Effluent Discharged to South Pine River

Date	Volume, m <sup>3</sup>	Daily Max, m <sup>3</sup>	Daily Min, m <sup>3</sup>	*Average, m <sup>3</sup>
January	19,093	3,387	0	2,728
February	--	--	--	--
March	66,440	4,783	0	3,691
April	41,382	4,484	0	3,183
May	--	--	--	--
June	--	--	--	--
July	--	--	--	--
August	--	--	--	--
September	--	--	--	--
October	--	--	--	--
November	41,671	5,123	0	1,812
December	--	--	--	--
<b>Total</b>	<b>168,586</b>	--	--	--
<b>Maximum</b>	---	5,123	--	--
<b>Minimum</b>	---	--	0	--
<b>Monthly Average</b>	---	--	--	2,374 *
<b>Annual Average</b>	---	---	---	462 **
<b>Total # days discharged</b>	71			

Notes:

\* The monthly average is calculated using the total monthly volume (m<sup>3</sup>) divided by the number of days discharged in that same month.

\*\* The annual average is calculated using the annual total volume (m<sup>3</sup>) divided by 365 consecutive days flow as per WSER reporting.

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### Flows: South Pine River Streamflow (m<sup>3</sup>/day), during discharge periods

(Data taken from Sideroad 10 Streamflow Monitoring Station - Saugeen Valley Conservation Authority)

2022	January	March	April	November
Max	19,008	136,080	185,760	83,722
Min	13,824	19,008	15,206	9,590
Avg	15,552	65,016	44,729	25,510

### CERTIFICATE OF APPROVAL # 3-0724-88-006 REQUIREMENTS - UNIONIZED AMMONIA:

#### Condition 3. (4)

The unionized ammonia concentration in the South Pine River after mixing with the discharge should not exceed 0.02 mg/L in accordance with the Ministry's Water Management Goals, Policies and Objectives. In order to comply with this criterion, the effluent discharge rate shall be controlled by the Operating Authority by varying the discharge rate in relation to stream flow in the South Pine River, considering such factors as pH and temperature of the receiving stream.

Parameter	Design Objectives	Non-Compliance
Downstream Ammonia (unionized)	---	> 0.02 mg/L

The discharge samples are sent to the laboratory where they are analyzed for Total Ammonia and Free Ammonia. The laboratory reports Provincial Unionized Ammonia, which is calculated from the Total Ammonia, field temperature and field pH, and is the same as Free Ammonia. The Federal Unionized Ammonia, required by WSER, is calculated using the Total Ammonia and laboratory pH at 15°C.

#### Spring Discharge (Grab) Sample Results (mg/L): Weekly sampling

Date	Provincial Upstream Result Unionized Ammonia	Provincial Effluent Result Unionized Ammonia	Provincial Downstream Result Unionized Ammonia
Jan 3	< 0.001	0.020	0.002
Mar 14	< 0.003	0.040	0.008
Mar 22	< 0.002	0.124	0.005
Mar 29	< 0.001	0.112	0.005
Apr 19	< 0.001	0.062	0.002
Apr 26	< 0.002	0.059	< 0.003
Maximum	< 0.003	0.124	0.008
MAC	—	—	< 0.02
Compliant	—	—	YES

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Spring effluent discharging was conducted during the following periods:

- January 1 to January 7
- March 14 to April 1
- April 18 to April 29

The total Spring discharge volume was **126,915 m<sup>3</sup>** in 48 days.

### Fall Discharge (Grab) Sample Results (mg/L):

### Weekly sampling

Date	Provincial Upstream Result Unionized Ammonia	Provincial Effluent Result Unionized Ammonia	Provincial Downstream Result Unionized Ammonia
Nov 7	0.001	0.005	0.002
Nov 15	0.002	0.017	0.002
Nov 22	0.001	0.015	< 0.001
Nov 28	0.003	0.024	0.004
Maximum	<b>0.003</b>	<b>0.024</b>	<b>0.004</b>
MAC	—	—	<0.02
Compliant	—	—	YES

Fall discharge began on November 4, 2022 and continued until November 30, 2022.

The total Fall discharge volume was **41,671 m<sup>3</sup>** in 23 days.

**GRAND TOTAL DISCHARGE VOLUME:**      **168,586 m<sup>3</sup>** in 71 days

### CERTIFICATE OF APPROVAL # 3-0724-88-006 REQUIREMENTS - EFFLUENT SAMPLING:

#### Condition 4.

Grab samples of the final effluent (discharge) shall be collected at least once weekly during the discharge periods. In addition, 24-hour composite samples of the final effluent must also be collected during each discharge period. All final effluent samples must be analyzed for at least the following parameter:

BOD-5  
Suspended Solids  
Total Kjeldhal Nitrogen (TKN)  
Nitrite  
Nitrate  
Total Phosphorus  
Temperature  
pH  
Hydrogen Sulphide (when odour is present)



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### Effluent (Grab) Sample Monitoring Results (mg/L): Weekly sampling during discharge

Date	DO	Temp. (°C)	pH	E. Coli	TKN	Total Ammonia
Jan 3	13.00	6.0	8.18	< 2	1.6	1.0
Mar 7	11.18	9.0	8.03	< 2	4.0	3.0
Mar 14	11.42	5.7	8.21	2	3.1	1.9
Mar 22	13.98	5.2	8.44	2	5.6	3.7
Mar 29	14.41	4.0	8.40	2	5.7	4.0
Apr 19	12.90	5.9	8.35	14	4.7	2.1
Apr 26	11.92	12.1	8.37	6	2.0	1.2
Oct 17	9.20	12.5	7.96	870	1.2	< 0.1
Nov 7	9.06	15.6	7.69	158	1.2	0.4
Nov 15	12.13	8.2	8.57	26	1.9	0.3
Nov 22	13.37	5.4	8.51	6	1.6	0.4
Nov 28	11.36	8.8	8.57	4	2.1	0.4
Minimum	9.06	4.0	7.69	< 2	1.2	0.1
Maximum	14.41	15.6	8.57	870	5.7	4.0
Average	11.99	8.2	8.27	9 *	2.9	1.5
# Samples	12	12	12	12	12	12

\*Geomean

### Effluent (Composite) Sample Results (mg/L): Once per discharge period

Date	BOD-5	CBOD	TSS	TKN	Nitrite	Nitrate	TP	Temp. (°C)	pH
Mar 29	10	7	29	5.3	< 0.03	0.27	0.10	6.7	8.07
Nov 7	< 4	5	21	1.2	—	—	0.06	11.8	8.31
Minimum	< 4	5	21	1.2	< 0.03	0.27	0.06	6.7	8.07
Maximum	10	7	29	5.3	< 0.03	0.27	0.10	11.8	8.31
Average	7	6	25	3.3	< 0.03	0.27	0.08	9.3	8.19
# Samples	2	2	2	2	1	1	2	2	2
Compliant	YES	YES	YES	--	--	--	YES	--	--

### CERTIFICATE OF APPROVAL # 3-0724-88-006 REQUIREMENTS - RAW SEWAGE SAMPLING:

#### Condition 5.

Grab samples of the raw sewage shall be collected at least every two weeks. In addition, 24-hour composite samples of the raw sewage must also be collected every two months. All raw sewage samples must be analyzed for at least the following parameters:

BOD-5

Suspended Solids

Total Kjeldhal Nitrogen (TKN)

Total Phosphorus

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### Raw Sewage (Grab) Sample Results (mg/L): Bi-weekly sampling

Date	BOD-5	CBOD	TKN	TP	TSS
Jan 10	136	135	23.0	2.36	86
Jan 25	179	167	31.4	3.15	108
Feb 7	96	88	18.6	1.82	104
Feb 22	69	72	34.2	3.22	183
Mar 7	44	50	12.2	1.50	157
Mar 22	38	38	20.8	2.11	164
Apr 4	132	132	18.2	1.88	118
Apr 19	82	82	37.2	3.80	191
May 2	112	90	15.0	1.66	123
May 16	76	82	13.1	1.11	100
May 31	205	119	22.0	2.86	335
Jun 13	142	107	19.5	1.85	152
Jun 27	353	205	25.8	3.16	113
Jul 11	237	230	47.3	4.84	175
Jul 25	116	122	24.9	2.62	158
Aug 8	171	166	35.8	3.87	166
Aug 22	193	152	60.4	4.76	151
Sep 6	158	164	36.4	4.02	154
Sep 19	130	117	23.8	3.45	107
Oct 3	176	195	24.5	2.61	213
Oct 17	112	96	13.0	1.60	92
Oct 31	120*	158	27.4	2.88	97
Nov 14	161	148	26.6	2.49	145
Nov 28	132	148	28.4	3.10	110
Dec 12	136	143	41.2	3.90	239
Dec 28	195	181	31.9	3.25	154
Minimum	38	38	12	1.11	86
Maximum	353	230	60	4.84	335
Average	142	130	27	2.84	150
# Samples	26	26	26	26	26

\*Oct 31 sample was reported as UAL (Unreliable: Sample Age Exceeds Normal Limit)

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### Raw Sewage (Composite) Sample Results (mg/L): Bi-monthly sampling

Date	CBOD	TSS	TP	TKN
Jan 4	124	133	1.58	19.3
Mar 15	80	135	1.60	19.4
May 10	116	116	2.05	21.7
Jul 12	154	137	2.87	27.2
Sep 13	171	147	2.83	29.4
Nov 8	119	107	2.89	33.3
Minimum	80	83	1.58	19.3
Maximum	171	230	2.89	33.3
Average	127	143	2.30	25.1
# Samples	6	6	6	6

### Aluminum Sulphate Liquid (48.5%) Usage and Dosage

Aluminum Sulphate (alum) acts as a coagulant and flocculant that adsorbs and precipitates soluble phosphorus and other compounds such as organic matter, forming clumps that settle to the bottom of the lagoon. Typical alum dosages for wastewater treatment are between 50 - 200 mg/L.

Month	Total Alum Usage, L	Total Alum Usage, kg	Average Alum Dosage, mg/L
January	1,530	991	99
February	2,363	1,530	113
March	2,590	1,677	96
April	2,430	1,573	112
May	1,303	844	77
June	1,080	699	72
July	1,080	699	84
August	990	641	78
September	1,080	700	87
October	1,395	903	80
November	1,260	816	85
December	1,686	1,092	88
Total	18,788	12,165	–
Average	1,566	1,014	89

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### **CERTIFICATE OF APPROVAL # 3-0724-88-006 REQUIREMENTS - Operational**

**Condition 9. (3) (e)** Documentation of plant upsets, by-passes, equipment failures, process failures, and the corrective actions taken along with an explanation of why the event occurred.

#### **Operational Problems, Corrective Actions, and Maintenance:**

Date	Comments
Feb 17	High flows
Mar 2	RSP 2 not running - attempt backflush; BP & GN onsite - RSP 1 set as lead
Mar 4	RSP 2 pulled out - broken shaft; replaced with temporary unit but left in OFF position
May 21	Power outage
Jun 20	Iconix onsite for flow meter calibration
Jul 12	Diesel generator annual service (Sommers)
Aug 4	Annual backflow preventer verification (Fergusons)
Sep 8	Stantech onsite for hoist/davit arm inspections
Oct 17	High flows (rain event)
Oct 20	High flows (weather); Georgian Bay Fire Services annual inspection
Nov 5	Power interruption
Nov 9	Alum tank filled
Dec 24	No site visit - Blizzard, roads closed
Dec 25	No site visit - Blizzard, roads closed
Dec 30	High flows (weather) - ran RSP2 on hand
Dec 31	High flows (weather) - ran RSP2 on hand

### **2022 Performance Summary**

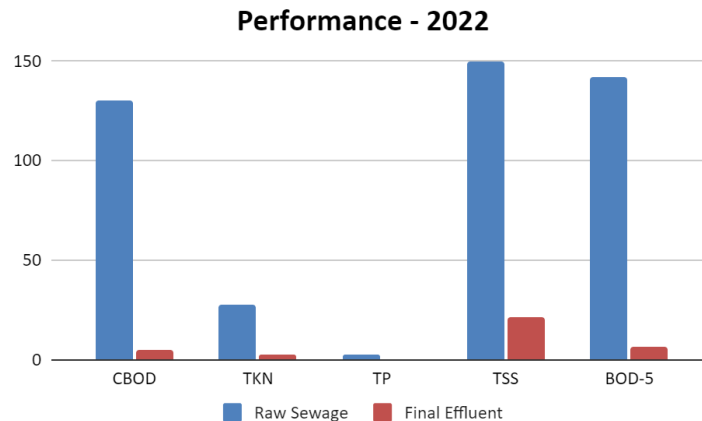
The following is a summary of the overall effectiveness of the treatment of raw sewage from its entry to the Works through the effluent chamber.

#### **Overall Sewage Renovation Based on Annual Averages**

Parameter	Raw Sewage	Effluent	Non-Compliance	% Removal
BOD5	142	6	25.0	95.7%
CBOD	130	5	---	96.2%
TKN	27.4	2.9	---	89.4%
TP	2.84	0.05	0.8	98.3%
TSS	150	22	30.0	85.6%

## Ripley Wastewater Treatment Facility Annual Report

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### SLUDGE ACCUMULATION:

Sludge accumulates in the bottom of the lagoon cells. Fortunately, for the Ripley Sewage Treatment Facility, the lagoons have a large surface area, therefore, accumulated sludge is quite low. The amount of sludge accumulated in 2022 was estimated based on the average amount of solids processed through treatment. The following calculation is taken from the *US Army Corps and Engineers Cold Region Research & Engineering Laboratory, Special Report 84-8, Accumulation, Characterization, and Stabilization of Sludges for Cold Region Lagoons, April 1984*. No sludge was removed from the Ripley Lagoons in 2022.

Assumption: 65% of Total Suspended Solids is volatile (35% is the actual Total Solids)  
80% of solids accumulate in Cell # 1  
15% of solids accumulate in Cell # 2  
5% of solids accumulate in Cell # 3  
Concentration of solids is 30% by mass (300 kg/m<sup>3</sup>)  
Lagoon Retention Time is 200 days total  
Sludge Specific Gravity is 1.3

Known: Lagoon Cell Count: 3  
Aerated Cell Count: 1 (not used in calculations; 12h retention)  
TSS - Raw: 150 mg/L  
TSS - Effluent: 22 mg/L  
Average Flow: 366 m<sup>3</sup>/day  
Density of water: 1,000 kgm<sup>-3</sup>  
Lagoon Cell Surface Area: 21,114 m<sup>2</sup> Cell 1 (irregular)  
Aerated Cell Surface Area: 1,120.5 m<sup>2</sup> (41.5 m x 27.0 m at bottom)

## Ripley Wastewater Treatment Facility Annual Report

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### Calculations:

#### Annual Accumulated Solids:

$$TS_i = SS_i \times Q \times t(365) 10^{-3}$$

Where  $TS_i$  = total solids into lagoon over operating time, t, (kg)  
 $SS_i$  = influent suspended solids concentration, (mg/L)  
 $Q$  = average daily inflow, (m<sup>3</sup>/day)  
 $t$  = operating time of lagoon, (year)

**Raw**  $TS_i$  = 150 mg/L x 366 m<sup>3</sup> x 1(365) 10<sup>-3</sup>  
= 20,039 kg  
Subtract 65% volatiles (13,025 kg)  
**= 7,013 kg Total Raw Solids**

**Effluent**  $TS_i$  = 22 mg/L x 366 m<sup>3</sup> x 1(365) 10<sup>-3</sup>  
= 2,939 kg  
Subtract 65% volatiles (1,910 kg)  
**= 1,029 kg Total Solids Lost in Effluent**

#### Solids Deposited:

Total Solids Deposited = Total Raw Solids - Total Solids Lost in Effluent  
= 7,013 kg - 1,029 kg  
**= 5,985 kg Total Solids Deposited in Lagoon Cells**

#### Total Solids Deposited (kg) converted to Total Solids Deposited (m<sup>3</sup>):

Total Solids Removed = 5,985 kg Total Solids Removed ÷ 300 kg/m<sup>3</sup>  
= 19.95 m<sup>3</sup> Total Solids Deposited in Lagoon Cells  
(Assume concentration of solids is 30% by mass)

#### Annual Accumulation of Sludge:

Sludge Added = 19.95 m<sup>3</sup> ÷ 21,114 m<sup>2</sup> (Cell 1 surface area) x 1000  
At Cells **= 0.94 mm Annual increase of Sludge**  
= 0.76 mm in Cell # 1 (80%)  
= 0.14 mm in Cell # 2 (15%)  
= 0.05 mm in Cell # 3 (5%)

Using this calculation, values were reviewed from 2009 to 2022, and the annual average sludge accumulation is approximately 1.0 mm total for all cells. With this information, it was estimated that the running total accumulation since the new Cell (1) was put into service in 2009 is approximately 14.1 mm (Cell # 1: 11.26 mm, Cell # 2: 2.11 mm, Cell # 3: 0.70 mm). See **Figure 2** for historical trending of estimated average annual accumulation of sludge. **Figure 3** illustrates the running total of estimated annual accumulation of sludge.

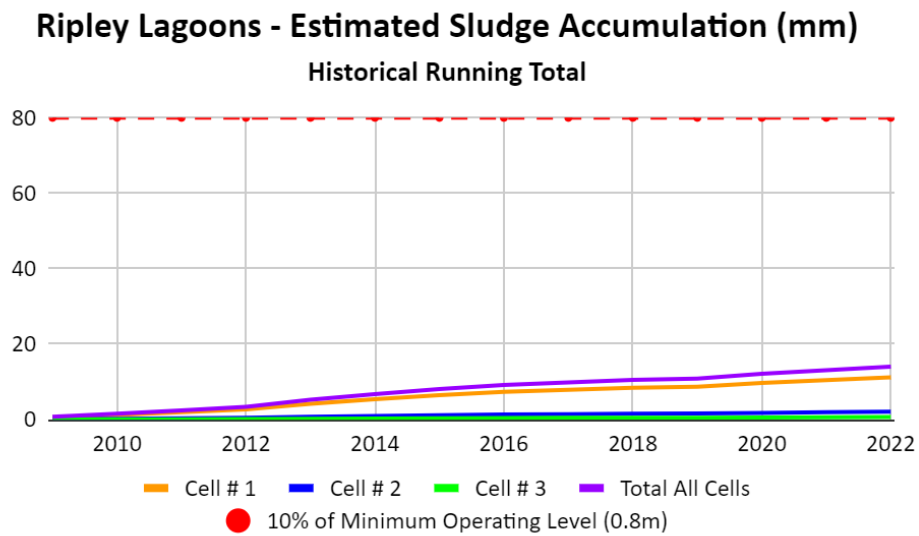
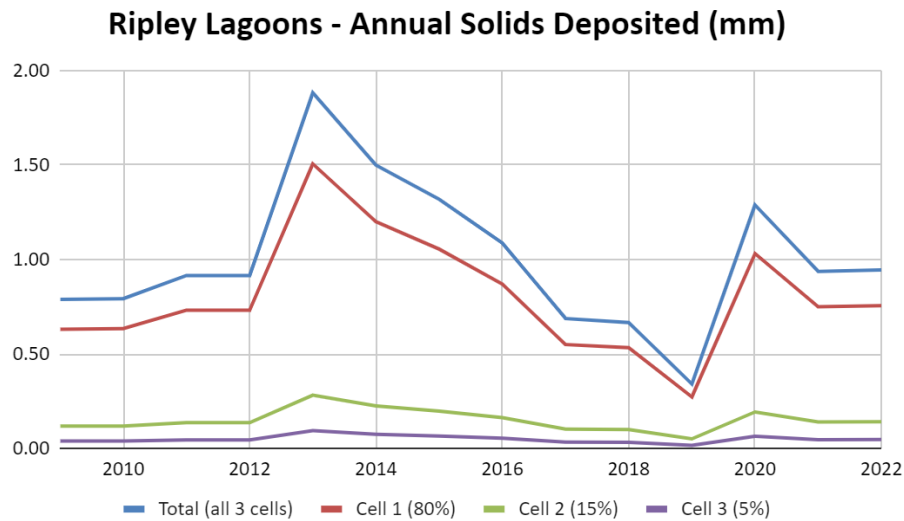


## Ripley Wastewater Treatment Facility Annual Report

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### “SLUDGE JUDGE” TESTING

“Sludge Judge” testing was not conducted in 2022.



## ***Ripley Wastewater Treatment Facility Annual Report***

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### **Other Observations:**

- **NON-COMPLIANCE:** The magnetic flowmeter at the Ripley Sewage Pumping Station did not pass its annual calibration in June 2022. The other method that was previously used for measuring flow (Milltronics), was not verified in 2022. After tracking down the contractor who conducted the testing, the failed report was received at the end of the year. Corrective action to repair/retest the magmeter was not taken in 2022. A more reliable contractor is being sourced for future flow meter calibrations/maintenance.
- No complaints were reported for the period under review.
- No sewage bypasses were reported for the period under review.
- No Imported Sewage was received for the period under review.
- No modifications to the treatment system were carried out during the period under review.
- There were several significant precipitation events in 2021 (>15 mm/24 h):
  - March 26, 28
  - April 11, 12
  - May
  - June 9, 25, 27
  - July 13, 24, 29
  - August 11, 21
  - October 16, 25
  - November 3, 11, 15, 17
  - December 5, 11
- The V-notch flow measuring device was verified in December 2022. It can only be verified during a discharge period.
- The Stream Gauge Monitoring Station located on Sideroad 10S is maintained by the Saugeen Valley Conservation Authority. All monitoring and annual verifications are conducted by the SVCA - Flood Forecasting and Warning Coordinator.

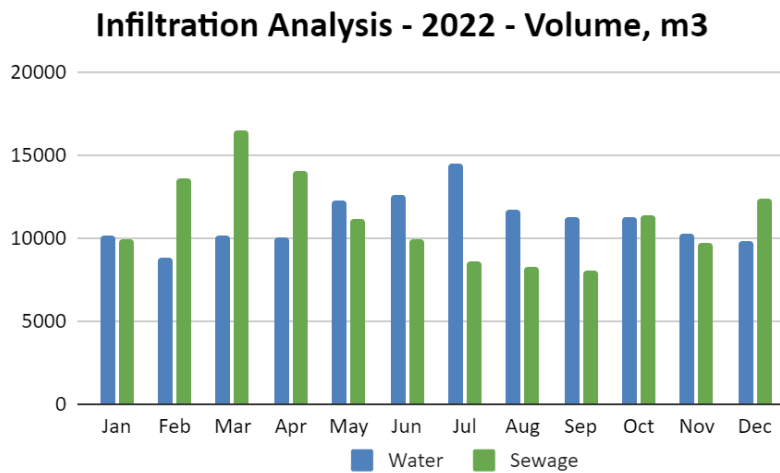
### **Infiltration Analysis:**

Wastewater flows were compared to the drinking water flows in an effort to estimate the amount of infiltration observed within the sewage collection system. Higher summer drinking water flows are likely related to lawn watering endeavours. Higher sewage flows in February, March, April and December were related to spring thaw and heavy rain events.

Historical maximum day flows for each month provide some indication that direct inflow from storm water is occurring at times. Action should be considered to identify and remove any illegal sanitary connections that exist.

## Ripley Wastewater Treatment Facility Annual Report

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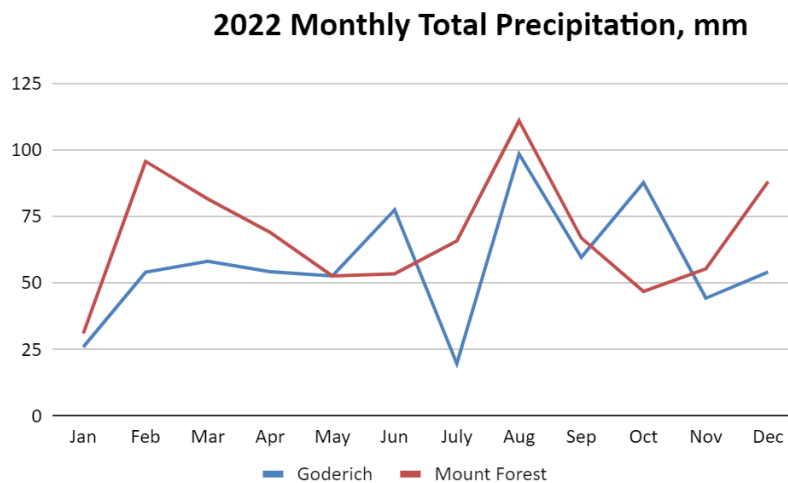


### Weather and Precipitation: (source: Environment Canada)

Month	Goderich			Mount Forest		
	Temp, °C Min	Temp, °C Max	Precip Total, mm	Temp, °C Min	Temp, °C Max	Precip Total, mm
Jan	-21.9	3.3	25.9	-27.2	2.0	31.0
Feb	-21.1	7.7	54.0	-27.1	6.3	95.6
Mar	-11.4	18.3	58.1	-15.0	16.8	81.5
Apr	-4.4	25.2	54.2	-5.8	24.6	69.0
May	1.1	27.9	52.6	2.2	29.5	52.6
Jun	4.0	30.4	77.4	4.3	31.5	53.4
Jul	8.2	30.8	19.7	8.8	30.6	65.8
Aug	8.6	30.2	98.4	6.8	30.3	110.9
Sep	3.0	28.3	59.6	1.9	28.2	66.9
Oct	-1.3	23.7	87.6	-1.6	22.0	46.8
Nov	-5.3	22.8	44.3	-9.1	21.2	55.3
Dec	-11.5	11.8	54.1	-14.8	8.2	88.0
<b>TOTAL</b>			<b>685.9</b>			<b>816.8</b>

## Ripley Wastewater Treatment Facility Annual Report

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### Additional Information:

- **Imported Sewage / Landfill Leachate Disposal**

The new Amended ECA allows for the Township to receive Imported Sewage for co-treatment at the Sewage Treatment Plant, including Landfill Leachate disposal. The Landfill Leachate volume should be kept to not more than 1,000 m<sup>3</sup>/year, and receipt of Leachate should only occur during the non-discharge period for the lagoons, and the discharge of Final Effluent to the receiver (South Pine River) should not occur within 60 days from the last date of receiving Landfill Leachate at the Ripley Sewage Lagoons. The Leachate must also be received at the sewage lift station or at a manhole upstream from the lift station. The leachate (as received) must be sampled quarterly as leachate disposal occurs. A quarterly effluent sample must be analyzed for the Leachate Parameters outlined in Schedule D of the ECA.

- **Municipal Utility Monitoring Program Reports (MUMPs)**

The monthly compilation forms of discharge data are submitted annually to the Ministry. The Ministry uses these forms to publicly report Municipal monitoring data. Please note that the Ministry has revised the format in which this data is uploaded to their website. The Ministry is no longer accepting locally generated reports to be submitted by email. Instead, Operators are required to use the Ministry-provided on-line forms available in the MECP form repository. These forms are populated with appropriate data for submission directly to the Ministry's database. The 2022 data was submitted to the Ministry on January 27, 2023.

- **Wastewater Systems Effluent Regulations (WSER) - On-line Reporting**

Since the Ripley Wastewater Treatment Facility discharges to the South Pine River, which is frequented by fish, we are required by WSER to submit a monitoring report through the Effluent Regulatory Reporting Information System (ERRIS) portal on an annual basis. The 2022 data was submitted to the portal and approved on January 23, 2023.

# Ripley Wastewater Treatment Facility Annual Report

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## CONCLUSIONS AND RECOMMENDATIONS

The following are the conclusions and recommendations resulting from the analysis of operating and monitoring data for the Ripley Wastewater Treatment Facility during 2022:

1. The annual average sewage influent flow was 366.23 m<sup>3</sup>/day in 2022, as determined by the flow measuring instrumentation in the Ripley Sewage Pumping Station. Given that the approved flow to the works is 600 m<sup>3</sup>/day, the works operated at 61.0% of the design capacity. The 2022 average daily flow is 3.9% higher than the average flow during the previous four years (352.78 m<sup>3</sup>/day). See Figure 2 for Historical % Capacity.

Historically, maximum day flows will typically be greatest during spring months and be lowest during the summer months. During 2022, the maximum day trend was characteristic, with the maximum day flow of 1,217 m<sup>3</sup>/day occurring in February. Historical maximum day flows for each month provide some indication that direct inflow from storm water is occurring at times, such as rain events and spring thaw. Action should continue to be taken to identify and remove any illegal connections that exist.

Year	Max Volume	Avg Volume	Capacity	Total Volume	Mount Forest	Goderich
	m3	m3	%	m3	Total Precip, mm	Total Precip, mm
2008	1,289	345.68	57.6%	126,518	1,251.8	1,269.6
2009	1,434	309.32	51.6%	112,902	990.7	767.7
2010	1,075	306.04	51.0%	111,703	926.9	736.1
2011	1,079	310.78	51.8%	113,435	1,102.2	1,018.0
2012	599	269.28	44.9%	98,555	693.4	600.3
2013	1,701	348.79	58.1%	127,310	1,174.5	944.5
2014	1,323	333.26	55.5%	121,640	908.6	812.2
2015	766	292.92	48.8%	106,917	773.5	663.5
2016	1,217	318.98	53.2%	116,745	933.5	895.0
2017	849	339.95	56.7%	124,081	1,044.3	981.2
2018	1,221	308.04	51.3%	112,436	912.7	915.6
2019	1,414	367.55	61.3%	134,154	332.5	777.8
2020	1,770	354.82	59.1%	129,863	745.7	675.2
2021	1,330	380.17	63.5%	138,960	941.8	909.8
2022	1,217	366.23	61.0%	133,673	816.8	685.9
Previous 4-Year Average	1,434	352.78	58.8%	128,853	866.7	824.7

## Ripley Wastewater Treatment Facility Annual Report

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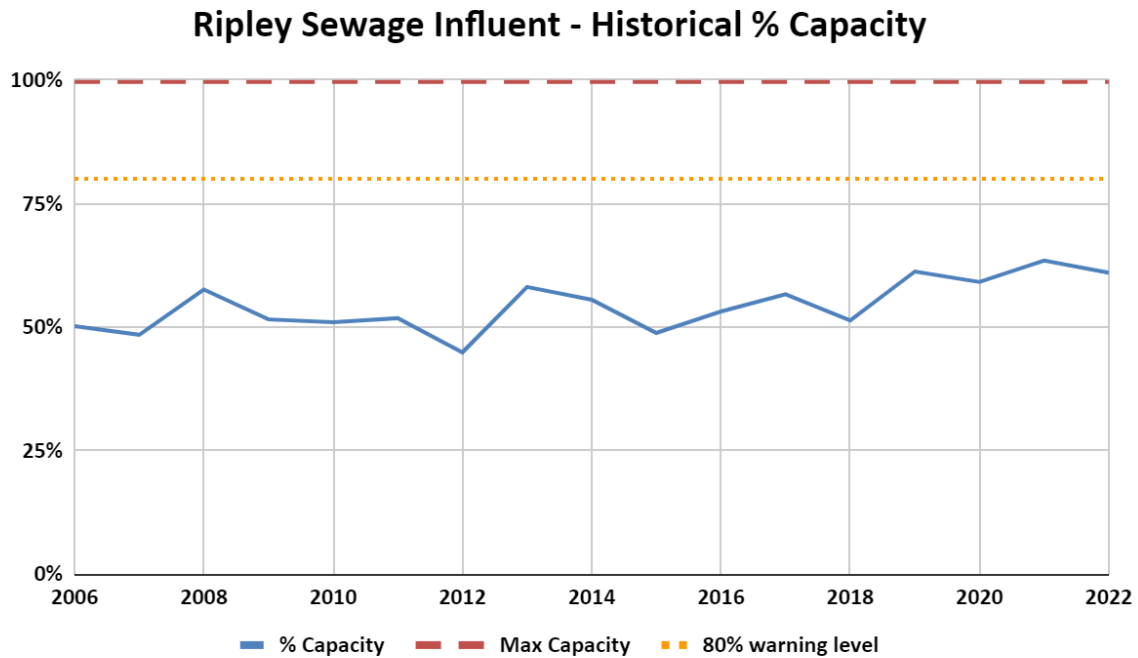


Figure 2

2. Raw sewage concentrations and loadings for BOD<sub>5</sub>, TSS, TKN and TP have remained relatively consistent since 2017, however, in 2022, loadings were lower than typical domestic sewage loadings on a per capita basis:

Parameter	Typical Loadings (mg/L)	2022 Loadings (mg/L)	Historical Loadings (5-Year Average)
BOD <sub>5</sub>	170	142	150
TKN	35	27.4	30
TP	7	2.84	3.61
TSS	200	150	155

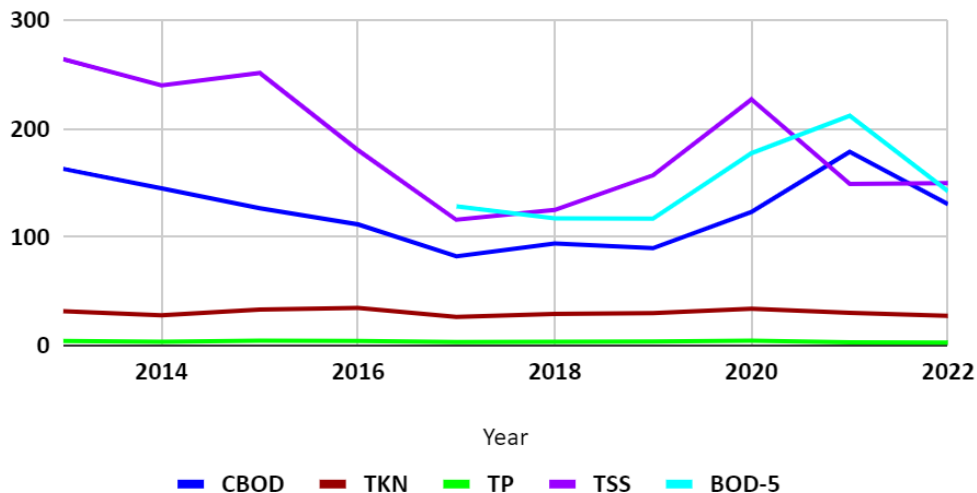
3. Based on the calculated removal rates of 85.6% to 98.3%, it is concluded that the Ripley Wastewater Treatment Facility provided excellent treatment of sewage in 2022.



## Ripley Wastewater Treatment Facility Annual Report

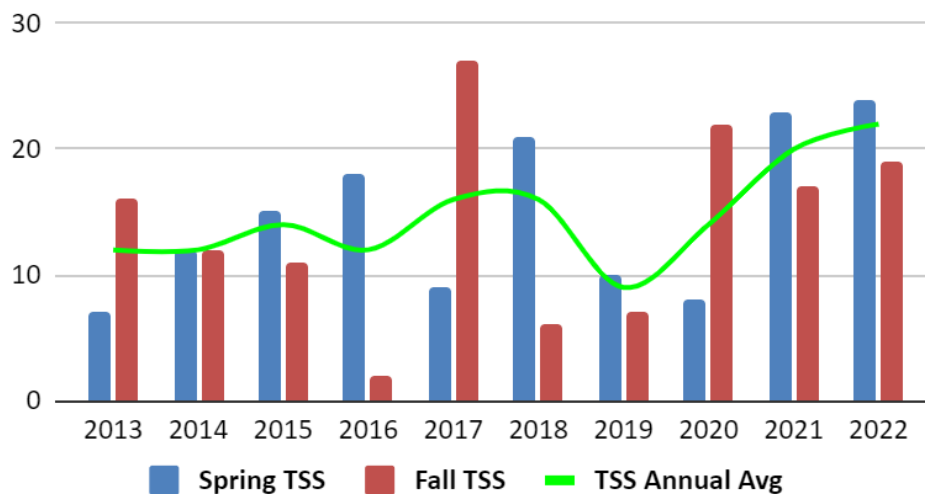
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### Raw Influent - Historical Characteristics



4. Effluent quality, as measured at the effluent structure, generally remained excellent throughout the discharge periods in 2022. There were three (3) sample results for Total Suspended Solids (TSS) that exceeded the C. of A. limit, however, the average concentration limits for each discharge period were in compliance. It was noted that the Total Suspended Solids results were trending higher than in previous years, and that values were in excess of the design objectives more than 50% of the time in 2022 (67%).
- a. It is recommended to conduct an investigation to identify the cause of the elevated TSS results before it becomes a bigger problem.

### Ripley Effluent - Historical TSS (mg/L)



## ***Ripley Wastewater Treatment Facility Annual Report***

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5. The new amended ECA has some new requirements:

**a. BYPASSES:**

- Summary reports for any Bypass Event(s) - these are due quarterly, no later than the following dates for each calendar year: Feb 15, May 15, Aug 15 and Nov 15.
- The summary report shall contain, at a minimum, a summary of the types of information set out in Paragraphs (3), (4) and (5) of the Approval and either a statement of compliance or non-compliance notifications submitted as required under Paragraph 1 of Condition 12 of the Approval.
- If there is no Bypass Event during a quarter, a statement of no occurrence of Bypass is deemed sufficient.

**b. OVERFLOWS:**

- Summary reports for any Overflow Event(s) - these are due quarterly, no later than the following dates for each calendar year: Feb 15, May 15, Aug 15 and Nov 15.
- The summary report shall contain, at a minimum, the types of information set out in Paragraphs (3), (4) and (5) of the Approval.
- If there is no Overflow Event during a quarter, a statement of no occurrence of Overflow is deemed sufficient.

**c. LEACHATE:**

- The landfill leachate volume eventually disposed of to the Ripley Sewage Lagoons should be kept to not more than 1,000 m<sup>3</sup>/year.
- The discharge of the landfill leachate to the Ripley Sewage Lagoons (including discharge via the Raw Sewage Pumping Station or its upstream maintenance hole) should only occur during the non-discharge period for the lagoons, and the discharge of Final Effluent to the receiver (South Pine River) should not occur within 60 days from the last date of the landfill leachate disposal to the Ripley Sewage Lagoons.

**d. REPORTING:**

- The Owner shall report to the District Manager orally as soon as possible any non-compliance with the compliance limits, and in writing within seven (7) days of non-compliance.
- The Owner shall prepare performance reports on a calendar year basis and submit to the District Manager by March 31 of the calendar year following the period being reported upon.

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- A summary of efforts made to achieve the design objectives of the Approval, including an assessment of the issues and recommendations for pro-active actions if any are required under the following situations:
  1. When any of the design objectives is not achieved more than 50% of the time in a year, or there is an increasing trend in deterioration of Final Effluent quality;
  2. When the Annual Average Daily Influent Flow reaches 80% of the Rated Capacity (80% of 600 m<sup>3</sup>/day = 480 m<sup>3</sup>/day).
- A tabulation of the measured volume of sludge accumulated in the lagoon cells in five year intervals and the estimated volume in the interim years and when sludge is disposed of during the reporting period, a summary of disposal locations and volumes of sludge disposed at each location.
- Schedule F - Methodology for Calculating and Reporting Monthly Average Effluent Concentration, Annual Average Effluent Concentration and Monthly Geometric Mean Density

### **e. SAMPLING:**

- Schedule B, Schedule C, and Schedule D of the Approval:
  1. The only change from the previous ECA is the addition of hydrogen sulphide sampling. A grab sample shall be collected from the lagoon cell in which the content is scheduled for discharge in the seasonal discharge period (Cell 3 and Cell 4) and analyzed for hydrogen sulphide (in addition to the other parameters identified in Schedule D).
  2. Imported Sewage (leachate) grab sampling is required on a Quarterly basis. These samples are to be collected at the leachate receiving location (Ripley Sewage Pump Station or a maintenance hole located upstream of the SPS). Parameters are listed in Schedule D of the Approval.
  3. Final Effluent shall be sampled twice per week, with a minimum of five (5) samples during discharge that captures the beginning of the seasonal discharge, at 25%, 50%, 75% drawdown, and at the end of the seasonal discharge.
    - a. Parameters to be analyzed:
      - i. CBOD<sub>5</sub>, TSS, TP, TAN, TKN, Nitrate (as N), Nitrite (as N), E. Coli, Hydrogen Sulphide, DO, pH, temperature.
      - ii. Note: pH and temperature of the final effluent shall be determined in the field at the time of sampling for TAN.

## **Ripley Wastewater Treatment Facility Annual Report**

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- b. The concentration of Un-ionized Ammonia shall be calculated using the Total Ammonia concentration, pH and temperature using the methodology stipulated in “Ontario’s Provincial Water Quality Objectives” dated July 1994 as amended.
- 4. Sludge/Biosolids - holding tank/truck loading bay; Grab sample shall be taken annually as sludge removal from the lagoons for off-site disposal occurs and analyzed for the following parameters: TS, TP, TAN, Nitrate (as N), Phenols, Metals scan (As, Cd, Co, Cr, Cu, Pb, Hg, Mo, Ni, P, Se, V, Zn).
- 5. Leachate Related - Final Effluent sampling point; Grab samples are to be taken **quarterly** as lagoon discharge occurs and analyzed for the following parameters: (B, Co, Mg, Mn, P, Sr, Phenols, Chloride, Sulfide, DOC, TDS, Bis (2-ethylhexyl) Phthalate).
- 6. Surface water - surface monitoring stations (upstream and downstream); Grab samples shall be collected weekly as lagoon discharge occurs and analyzed for the following parameters: TAN, Temperature, pH, Un-ionized Ammonia. Temperature and pH shall be determined in the field at the time of sampling for TAN. The concentration of un-ionized ammonia shall be calculated using the Total Ammonia concentration, pH and temperature using the methodology stipulated in *Ontario’s Provincial Water Quality Objectives, dated July 1994* as amended.
- f. **SCHEDULE E** - Limited Operational Flexibility - Protocol for Pre-Authorized Modifications to Municipal Sewage Works
- g. **SCHEDULE G** - Municipal and Local Services Board Wastewater System Profile Information Form