2018 Jarvis Sewage Lagoons Annual Report

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1. Background

The Jarvis influent pumping station and sewage lagoons, consisting of 4 cells, are owned by Haldimand County and operated by Veolia Water. The lagoons were operated under C of A # 5311-5SDLLA until May 11, 2017, after which a newly Amended Environmental Compliance Approval # 9261-AKJL76 was issued. The lagoon system has a nominal design flow of 853 m^3/d with a total working volume of 225,566 m^3 (as per capacity assessment from 2011). The lagoons are seasonally discharged in the Spring and Fall. Cells 1 & 2 and cells 3 & 4 have separate metered discharges into a tributary of the Sandusk Creek, which eventually discharges into Lake Erie.

2. Per Capita Flows and Loadings

Table 1 summarizes the 2018 Jarvis per capita flows and loadings and compares to 2017 data and typical results.

Table 1 – Jarvis Sewage Lagoons Per Capita Flows and Loadings			
Parameter	**2017**	**2018**	
Population	1,037	1,037	
Average Daily Influent Flow (m^3/d)	985	1,010	
Peak Daily influent Flow (m^3/d)	5,363	5,783	
Average Influent BOD_5 (mg/L)	133	115	
Average Influent TSS (mg/L)	156	127	
Average Influent TKN (mg/L)	29	27	
Average Influent TP (mg/L)	7.8	5.7	
Per Capita Flows and Loadings			
Parameter	**2017**	**2018**	**Typical***
Per Capita Wastewater Flow (L/person/day)	949	974	350 – 500 332**
Per Capita BOD_5 Loading (g/person/day)	126	112	80
Per Capita TSS Loading (g/person/day)	148	123	90
Ratios			
Peak Day / Annual Average Flow	5.4	5.7	2.0 – 3.0
Influent TSS/BOD_5	1.2	1.1	0.8 – 1.2
Influent TKN/BOD_5	0.2	0.2	0.1 – 0.2

Notes:
*Results are for typical residential wastewater as identified in Metcalf and Eddy, Wastewater Treatment and Reuse (4th Edition).
**Grand River Conservation Authority, "2017 Watershed Overview of Wastewater Treatment Plant Performance", July, 2018

Comments:

- The 2018 average daily flow of (1,010 m^3/d) is 118% of the rated design flow of 853 m^3/d.
- Recorded average day flows to the facility have increased following the installation of new magnetic flow meters on the two separate forcemains to cells 1 & 2 and 3 & 4;
- Influent concentrations have decreased slightly in 2018. This may be due to increased precipitation over the year; (2017 precipitation = 667 mm, 2018 precipitation = 794mm);
- The per capita wastewater flows and concentrations are well above typical residential waste-water values; this may be due to the 2016 census as the population significantly decreased as a result of the changes to the urban boundary. Also, the new flow meters have indicated an increase in flow;
- Peak day to annual average flow is still significantly higher than typical probably due to inflow and infiltration to the collection system;
- The influent TSS/$TBOD_5$ and TKN/BOD_5 ratios are within typical values.

3. Performance

Table 2 is a summary of the discharge quality compared to the ECA objectives and limits for the spring and fall discharge periods. The entire effluent data set is attached (Tables 7 and 8).

Table 2 – Summary of Discharge Quality Compared to ECA Objectives and Limits				
Spring Discharge				
Parameter	**2017 Avg. Conc.**	**2018 Avg. Conc.**	**Objective**	**Limit**
$cBOD_5$ (mg/L)	4.1	3.8	15	25
TSS (mg/L)	7.8	4.6	15	25
Total Phosphorous (mg/L)	0.3	0.14	0.5	0.5
Total Ammonia Nitrogen (mg/L)	5.9	8.1	15	25
pH (Range)	7.12 – 8.36	7.07 - 8.20	6.0 – 9.5	6.0 – 9.5
E. Coli Geo-mean (CFU / 100 mL)	13.9	5.9	N/A	N/A
Temperature (° C)	12.5	8.8	N/A	N/A
Fall Discharge				
Parameter	**2017 Avg. Conc.**	**2018 Avg. Conc.**	**Objective**	**Limit**
$cBOD_5$ (mg/L)	3.3	3.9	15	25
TSS (mg/L)	6.4	6.6	15	25
Total Phosphorous (mg/L)	0.17	0.25	0.5	0.5
Total Ammonia Nitrogen (mg/L)	4.7	4.5	15	25
pH (Range)	6.68 – 8.27	7.29 – 8.21	6.5 – 8.5	6.0 – 9.5
E. Coli Geo-mean (CFU / 100 mL)	62	43	200	N/A
Temperature (° C)	6.6	7.1	N/A	N/A
Notes: Average concentrations are calculated based on the arithmetic average of grab samples collected on the first and last day of the effluent discharge period as well as every three (3) calendar days during the effluent discharge period. except E. Coli which is calculated as a geometric mean density.				

Table 3 is a summary of the annual effluent loading to the receiving waters.

Table 3 – Summary of Jarvis Lagoons Annual Average Effluent Loading		
Parameter	**2018 Annual Avg. Loading* (kg/d)**	**Limit**
$cBOD_5$ (mg/L)	3.88	21.3
TSS (mg/L)	5.57	21.3
Total Phosphorous (mg/L)	0.25	0.43
Annual average loading is calculated using annual average effluent concentrations (using spring and fall discharge periods) and the average daily influent flow.		

Comments:

- A new ECA was implemented in May of 2017.
    - The TP limit decreased from 1.0 mg/L to 0.5 mg/L;
    - Effluent loading limits were added.
- There was no exceedance of effluent loading limits in 2018.

Table 4 is a summary of the number of days discharged and the total volume discharged.

Table 4 – Summary of Discharge Period			
	Spring Discharge		
Parameter	**2017 Results**	**2018**	**Requirement**
Days of Discharge	9 days	25	21 - 30 days
Volume Discharged	140,832 m^3	155,038	
	Fall Discharge		
Parameter	**2017 Results**	**2018**	**Requirement**
Days of Discharge	21 days	28	21 - 30 days
Volume Discharged	238,495 m^3	186,362 m^3	

Discharge Period Observations

- Based on the averages over the discharge periods, the quality met the effluent objectives and limits in the spring and fall;
- The influent flow to the facility for the period following the 2017 fall discharge to the end of the 2018 fall discharge was approximately 365,000 m^3;
- The total volume discharged during the 2018 operating season was 341,400 m^3;
- The effluent from the works was essentially free of floating and settling solids and did not contain oil or any other substance in amounts sufficient to create a visible film or sheen or foam or discolouration on the receiving waters.

4. Operational Issues

- High collection system inflow following significant rain events continue;

- Flow meter calibrations conducted in the Spring by an independent contractor identified a set up error with the effluent discharge flow measuring devices from Cells 1&2 and 3&4. The error was corrected and the flow measuring devices were verified for accuracy;
- During an electrical storm in the Fall the lagoon site experienced an electrical surge due to a lightning strike. The strike damaged a number of electrical devices on-site but did not affect the pumping station operation. Necessary repairs were made in a timely manner to fully restore the facility's operation.

5. Sludge Volume

In July and August 2016, County staff profiled the depth of sludge over a cross-section of cells 3 and 4. The results of the study are summarized in Table 5.

Table 5 – Summary of Lagoon Sludge Volumes and Depths

Lagoon Cell	Total Cell Volume (m^3)	Estimated Total Sludge Volume (m^3)	Average Sludge Depth (mm)
Cell #1	33,686	-	-
Cell #2	40,109	-	-
Cell #3	29,593	4,900	249
Cell #4	52,313	4,200	149

Sludge Volume Observations

- Cell #1 and #2 solids were removed in 2012 and 2013 respectively;
- Sludge volumes in Cells #3 and #4 are fairly insignificant relative to their overall storage volume.

6. Completed Activities for 2018

- Continued on-going Sandusk Creek sampling program;
- Rehab work which included crack sealing and lining was completed on 11 manholes in the Jarvis collection system;
- The diesel fuel storage tank for the emergency back-up generator was replaced to conform with new standards for safe storage.

7. Planned Activities for 2019

- Engineering work for identifying preferred option to obtain additional treatment capacity including:
  - Municipal Class Schedule 'C' EA
- Continuing receiving water quality sampling and monitoring.

8. Bypasses, Overflows and Spills

Table 6 is a summary of all bypass and overflow events at the Jarvis Lagoons in 2018.

Table 6 – Summary of Bypass Events

Date(s)	Duration (hours.min)	Volume Bypassed (m^3)	Reason	Process Bypassed
November 02, 2018	1.45	315	High Flows	Overflow

9. Discharge Data (attached)

- Table 7 displays all data for the spring discharge period.
- Table 8 displays all data for the fall discharge period.

10. Calibration Reports

- See attached

11. Maintenance Activities

Routine preventative maintenance was performed on the lagoons and pumping station equipment during the reporting period. This includes tasks such as:

- vegetation control and inspection of lagoon cell berms;
- the removal, inspection and servicing of submersible pumps;
- the inspection and servicing of HVAC systems;
- the inspection, testing and servicing of the back-up generator system;
- See attached for the complete annual maintenance report.

Table 7 – Spring 2018 Discharge Period Effluent Data

	EFFLUENT CELLS 1 & 2								EFFLUENT CELLS 3 &4							
	Discharge Flow	CBOD	TSS	Phosphorous	pH	Ammonia	Un-Ionized Ammonia	EColi	Discharge Flow	CBOD	TSS	Phosphorous	pH	Ammonia	Un-Ionized Ammonia	EColi
Date	(m^3/d)	(mg/l)	(mg/l)	(mg/l)	(SU)	(mg/l)	(mg/l)	(No/100ml)	(m^3/d)	(mg/l)	(mg/l)	(mg/l)	(SU)	(mg/l)	(mg/l)	(No/100ml)
3-Apr	1,625.65	2	3	0.06	7.07	5.03	0.01070	1	1,377.56	2.2	4	0.23	7.57	12.00	0.07880	1
4-Apr	3,790.77								3,187.43							
5-Apr	3,689.36								2,495.93							
6-Apr	3,614.44	4	4	0.06	7.08	5.10	0.01160	1	1,445.43	4	4	0.3	7.36	13.90	0.06090	1
7-Apr	3,528.98								1,429.04							
8-Apr	2,770.04								1,469.71							
9-Apr	1,593.10	4	5	0.08	7.45	6.26	0.02150	1	1,550.20	4	6	0.25	7.66	13.80	0.08470	1
10-Apr	1,545.37								1,549.86							
11-Apr	1,499.11	4	5	0.09	7.44	5.38	0.02090	1	1,536.14	4	2	0.27	7.42	13.10	0.05300	1
12-Apr	1,450.06							1	1,529.11							3
13-Apr	1,594.11	4	5	0.21	7.61	13.00	0.08140	1	1,517.92	4	2	0.26	7.49	14.90	0.06970	1
14-Apr	1,640.84								1,398.85							
15-Apr	1,615.13								1,290.56							
16-Apr	2,102.27	4	3	0.05	7.99	3.68	0.04780	7	1,367.40	4	4	0.09	7.90	6.65	0.07140	52
17-Apr	1,989.99								3,084.38							

18-Apr	1,174.36	4	5	0.10	8.01	3.54	0.05270	49	4,746.49	4	3	0.14	7.81	6.26	0.05830	52
19-Apr	1,139.48								4,801.06							
20-Apr	2,580.11	4	12	0.13	7.97	5.86	0.01640	91	5,626.72	4	6	0.17	7.88	12.40	0.19100	28
21-Apr	4,445.49								7,542.89							
22-Apr	5,780.72								8,365.47							
23-Apr	5,717.14	4	7	0.09	8.02	2.74	0.05520	48	6,533.58	4	3	0.08	7.73	7.16	0.07250	8
24-Apr	5,768.95								5,358.95							
25-Apr	4,762.00	4	6	0.11	8.20	4.42	0.13100	8	6,026.02	4	3	0.1	7.82	6.89	0.08900	34
26-Apr	3,329.20								6,170.28							
27-Apr	1,038.29				7.94			36	3,852.24				7.80			18

Table 7 – Fall 2017 Discharge Period Effluent Data

	EFFLUENT CELLS 1 & 2								EFFLUENT CELLS 3 &4							
	Discharge Flow	CBOD	TSS	Phosphorous	pH	Ammonia	Un-Ionized Ammonia	EColi	Discharge Flow	CBOD	TSS	Phosphorous	pH	Ammonia	Un-Ionized Ammonia	EColi
Date	(m^3/d)	(mg/l)	(mg/l)	(mg/l)	(SU)	(mg/l)	(mg/l)	(No/100ml)	(m^3/d)	(mg/l)	(mg/l)	(mg/l)	(SU)	(mg/l)	(mg/l)	(No/100ml)
1-Nov									2,734.9	4	5	0.39	7.29	4.42	0.01880	10
2-Nov									4,844.1							
3-Nov									4,775.0							
4-Nov									5,534.7	4	4	0.37	7.34	4.86	0.01910	39
5-Nov									7,625.5							
6-Nov									8,012.2							
7-Nov									8,443.2	4	11	0.26	8.16	4.70	0.11900	
8-Nov									8,550.5							50
9-Nov									8,737.5	2.4	10	0.38	7.97	5.64	0.06890	
10-Nov									8,604.9							
11-Nov									5,898.5							
12-Nov	2,260.4	4	3	0.13	8.02	5.80	0.08640	76	4,189.9	4	6	0.12	8.12	2.89	0.05790	36
13-Nov	3,221.9								3,757.4							
14-Nov	3,128.8	4	2	0.12	8.02	5.54	0.07740	33	3,600.6	4	11	0.22	7.92	5.44	0.05690	2,500
15-Nov	3,057.6								3,518.3							
16-Nov	4,007.1	4	2	0.12	7.89	5.64	0.09220	100	3,439.8	4	18	0.41	8.14	4.26	0.08590	2,400

17-Nov	4,881.3								3,319.7							
18-Nov	4,744.5								3,180.8							
19-Nov	4,575.9	4	5	0.40	7.84	6.18	0.05360	830	4,003.6	4	11	0.38	7.95	6.50	0.07630	1,600
20-Nov	5,507.1								4,773.4							
21-Nov	7,113.5	4	4	0.12	8.21	3.68	0.07900	10	2,686.5	4	13	0.27	8.09	3.62	0.05560	10
22-Nov	6,934.7															
23-Nov	6,511.4	4	4	0.15	7.48	3.49	0.01470	1								
24-Nov	6,167.6															
25-Nov	5,577.1															
26-Nov	4,519.2	4	2	0.21	7.30	3.00	0.00810	1								
27-Nov	2,678.2															
28-Nov	1,245.2	4	1	0.17	7.74	0.08	0.00070	1								