



Annual Report

*For the 2024 Operating Year
Lucknow Sewage Treatment Works*

PREPARED BY:

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TO:

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Lucknow Wastewater Treatment Facility Annual Report

For the 2024 Operating Year

EXECUTIVE SUMMARY:

This report is a summary of the Lucknow Wastewater Treatment Facility's performance in accordance with the Ministry of the Environment, Conservation and Parks (MECP) Certificate of Approval (C of A) *No. 0667-C8DN2F*, Issued: *November 29, 2022*, and the Federal Wastewater Systems Effluent Regulations (WSER) for the 2024 operating year.

DESCRIPTION OF FACILITIES: Works Number: 110002764 Component Location

Sewage Pumping Station 432 Inglis Street - Northeast of the Ackert Drain Aerated Ponds (Lagoons) 65 Washington St - Lots 53 and 54, Conc.1 Winter/Emergency Storage Lagoon 65 Washington St - Lots 54 and 55, Conc.1 Infiltration Basin System 65 Washington St - Lot 54, Conc.1 Groundwater Seepage to Swale 65 Washington St - Lot 55, Conc.1 Collection System Village of Lucknow

SEWAGE PUMPING STATION

- Wet well structure (4.70 m x 2.10 m x 10.83 m deep)
- One (1) raw sewage pump (15 hp), 8.68 L/s
- Two (2) raw sewage pumps (40 hp each), 32.5 L/s each
- Miltronics level sensor
- Volume totalizer (magnetic flow meter)
- Endress + Hauser data logger for flows
- Standby generator (100hp), 935 L diesel fuel tank and containment
- Force Main: 2,600 m x 200 mm diameter
- Bypass Pipe : 150 mm diameter, 06096 m long, 0.4064 m high

WASTE STABILIZATION PONDS (CONVENTIONAL FACULTATIVE LAGOON SYSTEM)

- Aluminum sulphate storage tank (27,000 L) and containment
- Alum metering pumps, max. 44L/hour (one duty, one standby)
- Cell No. 1, 2, and 3 : 10,700 m³ each cell
- 4.0 m liquid depth, 0.9 m freeboard each cell
- Aerators (Cell No. 1 and 2) : Flygt submersible pumps, self-aspiring Oxyjet (2 per cell)

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WINTER STORAGE LAGOON (EMERGENCY STORAGE)

- Total operative volume : 67,500 m³
- 3.0 m liquid depth, 0.6 m freeboard

WINTER STORAGE LAGOON (EMERGENCY STORAGE)

- Infiltration basin pumping station
 - 2.4 m precast concrete wet well structure
 - Two (2) submersible sewage pumps, 16.5 L/s (each)
- Splitter box structure
- Six (6) infiltration basins
- Bottom dimensions : 10.0 m x 7.0 (each)
- Top-of-Berm dimensions : 16.0 m x 13.0 (each)
- Total depth : 1.0 m (each)

EFFLUENT-GROUNDWATER REGIME

- Groundwater discharge/seepage conduit
- Maximum daily flow rate : 1,000 m³/day
- Sampling location : 100 mm diameter tile

UNIT PROCESS:

In 2024, the Ripley Wastewater Treatment System was operated as follows:

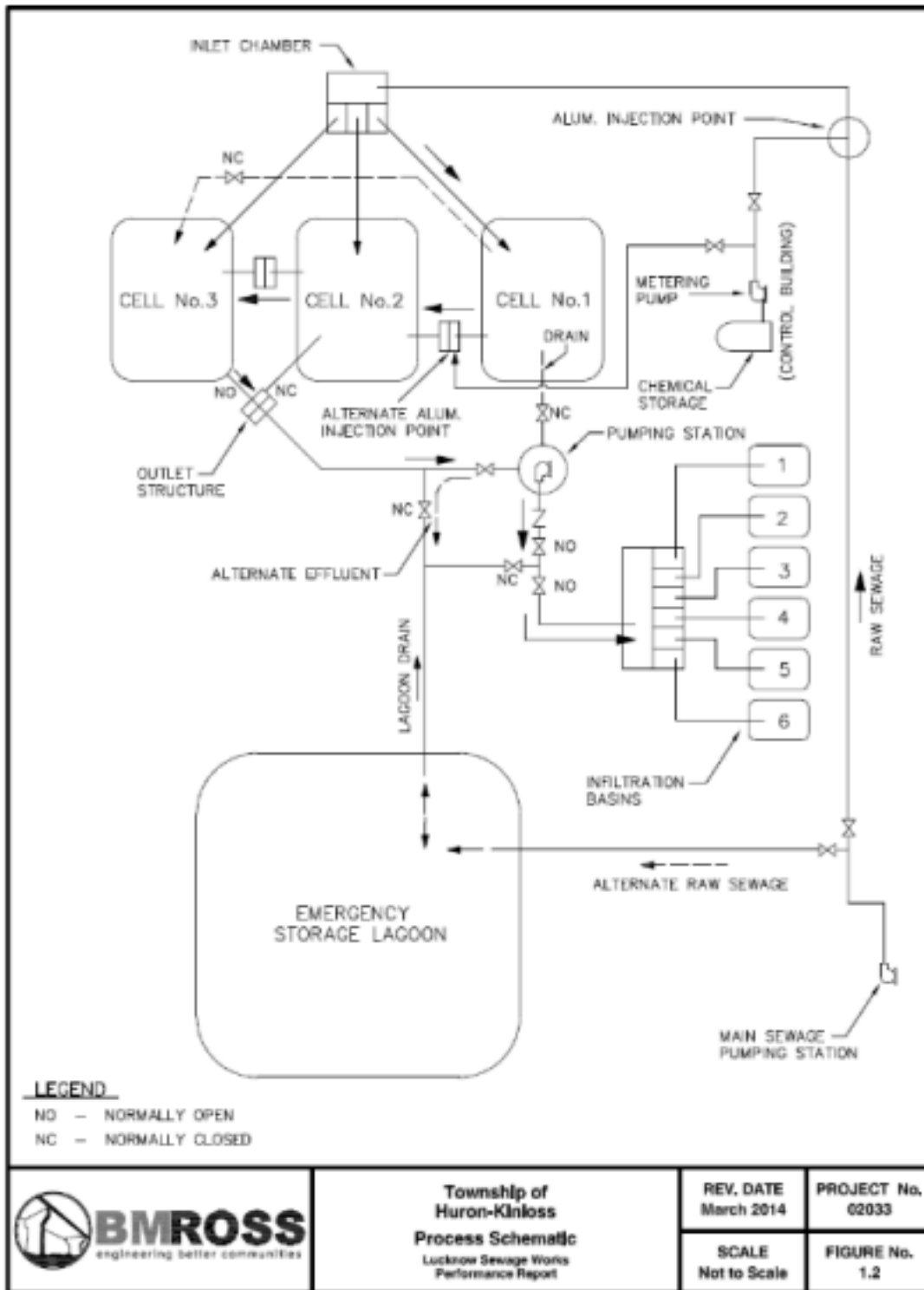
Raw sewage from the collection system flowed to the wet well structure at the Sewage Pumping Station. Aluminum sulphate (alum) was added to promote phosphorus removal before it was pumped to Lagoon Cell No. 1 via the forcemain. The Lagoon Cells worked in series (i.e. Cell 1 --> Cell 2 --> Cell 3), with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

The Ministry C. of A. and the new Amended ECA allow 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.

Lucknow Sewage Process Schematic

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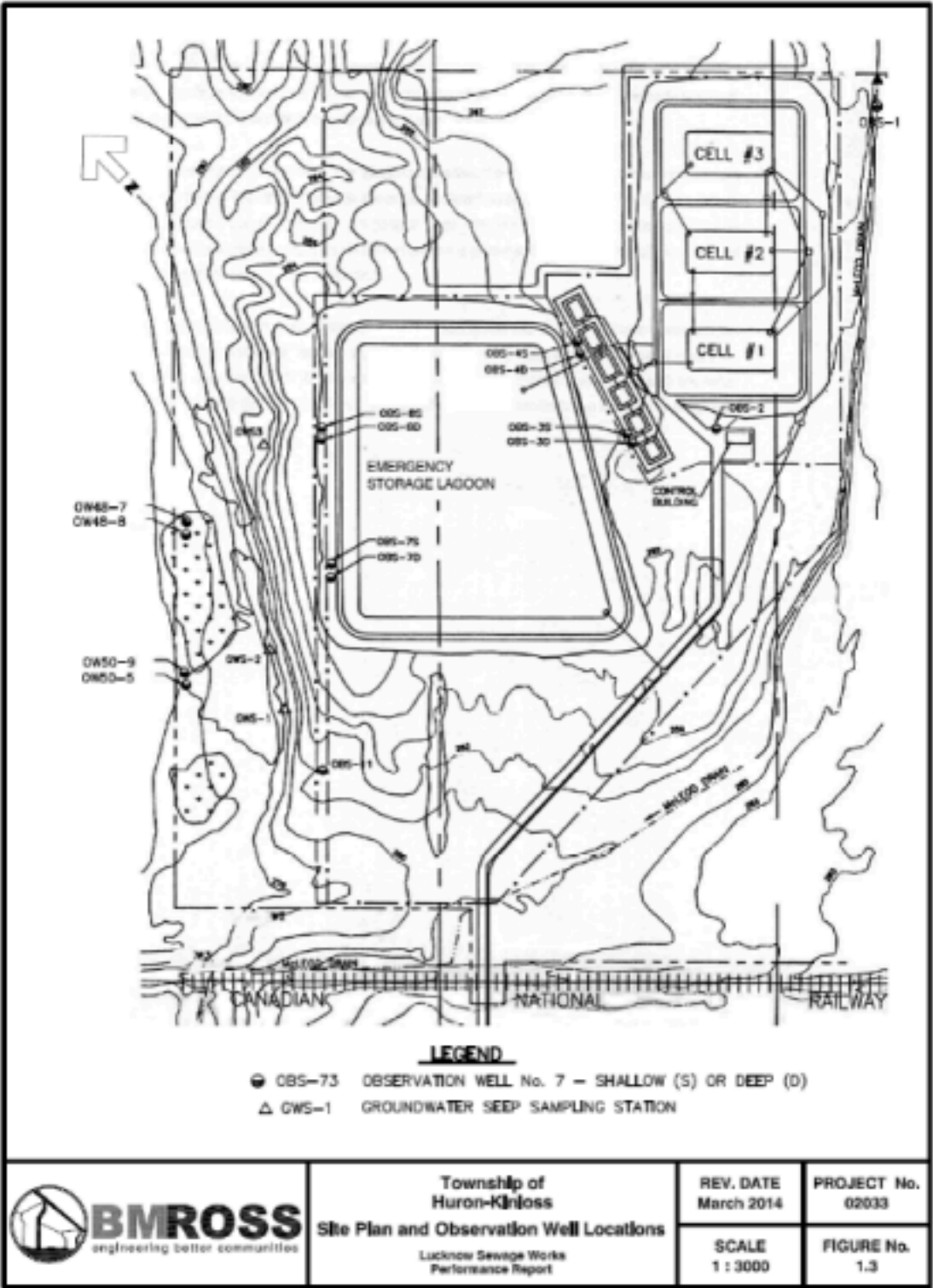
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Lucknow Sewage Lagoon Aeration Cell Schematic

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BY-PASSES :

There were no By-passes or Plant-Overflows at the Lucknow Sewage Treatment Works in 2024.

RAW INFLUENT :

Flow data for the reporting period was obtained from the utility monitoring system records maintained by Veolia, the operator of works. The flows are recorded from a magnetic flow meter located in the Sewage Pumping Station at 432 Inglis Street.

All of the influent flow from the Village of Lucknow is pumped to the Sewage Treatment Facility via the Sewage Pumping Station. Below is a summary of the 2024 monthly flows as reported by Veolia. The annual average daily flow was 595 m³/day, which is in compliance with the rated capacity of 750 m³/day stated in the ECA.

Influent flow :

Rated Capacity : 750 m³/day

Date	Volume, m ³	Daily Max, m ³	Daily Min, m ³	Average, m ³	Capacity, %
January	26,366	1,307	479	850.52	113.40%
February	23,036	1,138	545	794.34	105.91%
March	21,751	907	526	701.65	93.55%
April	22,973	1,469	389	765.77	102.10%
May	16,411	774	245	529.39	70.59%
June	13,732	653	306	457.73	61.03%
July	14,805	615	331	477.58	63.67%
August	15,492	673	315	499.74	66.63%
September	13,912	574	339	463.73	61.83%
October	13,998	611	329	451.55	60.21%
November	13,941	670	347	464.70	61.96%
December	20,680	1,521	472	689.33	91.91%
Total	217,097	–	–	–	–
Maximum	–	1,521	–	–	–
Minimum	–	–	306	–	–
Average				594.79	79.40%

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Raw Sewage Sample Results (collected Quarterly) :

Date	CBOD ₅	TKN	TP	TSS
January	185	18.9	2.12	374
April	113	21	1.95	80
July	160	22	2.54	166
October	204	24.2	2.42	220
Average	165.5	21.53	2.26	210
# Samples	4	4	4	4

Aluminum Sulphate Liquid (48.5%) Usage

Aluminum Sulphate (alum) is added to the raw water at the Lucknow Lagoon Facility. 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	3,108.00	2,012.35	84.66
February	2,953.13	1,912.08	88.43
March	3,244.19	2,100.53	97.69
April	2,513.65	1,627.53	77.73
May	4,325.00	2,800.33	171.83
June	3,066.00	1,985.16	147.49
July	1,703.65	1,103.07	79.04
August	1,921.25	1,243.96	82.02
September	1,621.39	1,049.81	77.27
October	2,766.75	1,791.40	131.37
November	2,036.76	1,318.75	97.00
December	1,474.79	954.89	48.10
Total	30,734.56	19,899.86	–
Average	–	–	98.55 avg

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EFFLUENT OBJECTIVES :

The *Owner* shall use best efforts to design construct and operate the *Works* with the objective that the concentrations of the materials named below as effluent parameters are not exceeded in the effluent from the aerated lagoon system (Cell #3) :

Aerated Lagoon Effluent Objectives (Cell #3)	
Effluent Parameter	Average Concentration (mg/L)
CBOD ₅	20.0
Total Suspended Solids	20.0
Total Phosphorus	1.0

The *Owner* shall use best efforts to :

- (a) Maintain the pH of the effluent from the *Works* within the range of 6.5 - 8.5, inclusive, at all times;
- (b) Operate the *Works* within the *Rated Capacity* of the *Works*;
- (c) Ensure that the effluent from the *Works* is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film or sheen or foam or discolouration of the receiving waters.

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Aerated Lagoon Effluent (Cell #3) Sample Results (collected monthly) :

Date	Total Ammonia	Free Ammonia	CBOD ₅	E.Coli	TP	TSS	Field DO	Field pH	Field Temp. °C
January	12.23	0.16	8.7	1,703	0.24	13	8.95	7.87	8.30
February	10.95	0.082	10	745	0.14	9.5	9.57	7.75	5.45
March	11.15	0.132	< 9.3	337	0.16	11.25	8.46	7.78	10.63
April	13.26	0.134	6	55	0.28	10.8	3.81	7.60	14.10
May	10.55	0.104	<4	31	0.27	4	3.19	7.40	19.83
June	9.30	0.102	<5	44	0.21	6.5	5.18	7.47	18.15
July	0.10	0.001	9	162	0.08	24	5.79	7.38	22.4
August	0.40	0.014	5	470	0.10	12	2.64	7.91	22.80
September	0.90	0.10	7	284	0.11	21	4.66	7.46	20.30
October	1.90	0.023	5	420	0.12	8	4.24	7.54	17.90
November	5.10	0.061	7	1220	0.08	17	6.40	7.69	13.80
December	11.40	0.075	7	5800	0.08	14	12.25	7.79	3.20
Average	9.65	0.100	6.91	939.25	0.16	12.59	6.19	7.64	13.52
Objectives	--	--	20.0	--	1.0	20.0	--	6.5 - 8.5	--

*Average Monthly Geometric Mean Density

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.

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EFFLUENT LIMITS :

The Owner shall operate and maintain the Works such that the concentration of the materials named below as groundwater parameters are not exceeded in the groundwater monitoring well no.

GWS-3 (GWSS) :

Groundwater Limits	
Effluent Parameter	Average Concentration (mg/L)
CBOD ₅	5.0
Total Suspended Solids	5.0
Total Phosphorus	0.1
Total Ammonia Nitrogen	2.5
Unionized Ammonia	0.1
E.Coli	100 cfu/100 mL (monthly geometric mean density)

For the purposes of determining compliance with and enforcing subsection (1) :
(a) The *Monthly Average Concentration* of a parameter shall not exceed the corresponding maximum concentration.

NOTE : Free Ammonia is the same as the Provincial Unionized Ammonia calculated from field pH and the temperature provided on the Chain of Custody form.

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Groundwater Seepage to Swale Sample Results (collected weekly) :

Date	Total Ammonia	Free Ammonia	CBOD ₅	E.Coli	TP	TSS	DO	pH	Temp. °C
January	0.16	<0.002	<2	0	<0.03	<2	6.52	7.48	13.22
February	<0.13	<0.001	<2	0	<0.03	<1	6.88	7.40	14.33
March	<0.10	<0.001	<2	0	<0.03	<2.50	7.33	7.38	11.90
April	<0.14	<0.001	<2	0	<0.03	<1	6.79	7.38	14.06
May	0.18	<0.001	<2	0	<0.03	<1.25	7.34	7.25	15.70
June	0.18	<0.001	<2	0	<0.03	<1	7.40	7.27	16.85
July	0.32	0.004	<2	0	<0.03	<1	7.66	7.49	18.32
August	0.65	0.12	<2	1	<0.03	<1	7.65	7.68	19.33
September	0.84	0.005	<2.4	0	<0.03	<1	7.94	7.27	16.82
October	1	<0.005	<2	0	<0.03	<1	7.84	7.09	14.13
November	0.83	0.005	<2	0	<0.03	<1	8.68	7.39	11.75
December	0.64	<0.003	<2	0	<0.03	<1.40	8.36	7.31	10.74
Annual Average	< 0.43	< 0.0035	< 2.08	0*	< 0.03	< 1.17	7.53	7.37	14.75
Objectives	2.5	0.1	5.0	100*	0.1	5.0	--	6.5 -8.5	--

*Average Monthly Geometric Mean Density

SLUDGE ACCUMULATION :

Sludge accumulates in the bottom of the aerated cells. No sludge was removed from the lagoon in 2024. The amount of sludge accumulated for 2024 was estimated based on the average amount of solids processed through treatment.

The annual average sludge accumulation is approximately 64 mm total. With this information, it was estimated that the running total accumulation since the sludge was removed in 2004 is approximately 920 mm (Cell #1 : 737 mm, Cell #2 : 139 mm, Cell #3 : 46 mm).

“SLUDGE JUDGE” TESTING

“Sludge Judge” testing was not conducted in 2024. The last testing was performed near the end of summer in 2016. At that time, all three lagoon cells were probed using a core sampling device to measure the actual depth of biosolids contained in each of the three lagoon cells.

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Other Observations:

- No complaints were reported for the period under review
- No sewage bypasses were reported for the period under review
- There was one spill of effluent from the RIB to the grass Ref#1#4MLAOM
- No modifications to the treatment system were carried out during the period under review.

Operational Problems, Corrective Actions and Maintenance

Date	Site	Comments
Monthly	Lagoons	pH meter calibrated
Jan 2	Lagoons	All RIBs full due to high flows
Jan 20	Lagoons	New hour meter for Aerator #2 installed
Mar. 7	Lagoons	Power Outage - aerators were off
Apr. 23	Lagoons	Feed to Winter storage
May	Lagoons	Caldecott installed weir in Cell #3
May 3	Lagoons	Repaired holes in side walls of RIBs (rodents)
May 24	Lagoons	Kemptions onsite to clean-up RIBs and add concrete pavers under pipes for splash pads
May 29	Lagoons	A hole in the splitter box at Cell #6 was repaired
June 12	Lagoons	Repaired a hole in RIB #6
June 25	Lagoons	SGS onsite to seal leak at injection point to the Alum
Aug. 19	Lagoons	Pollock Electric onsite to replace #4 contactor (#3 out of service Pollock to come back to investigate)
Oct 19	Lagoons	Aerators #1 & #4 faulted in panel (Pollock Electric contacted to investigate)
April 3	Lift Station	Power Outage
April 11	Lift Station	Replaced pump #3
May 24	Lift Station	CT Environmental onsite to clean out wet well and around pump #1 connection (to test low amp and no flow)
June 25	Lift Station	AC Power fail
July 11	Lift Station	Fergusons onsite to test backflow preventers
July 31	Lift Station	Sommers onsite for Annual generator Inspection/testing
Sept. 18	Lift Station	Caldecott onsite for check valve and air release replacement
Oct. 31	Lift Station	Power Outage (generator ran)

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Performance Summary Based on Annual Averages :

Below is a summary of the overall effectiveness of the treatment of raw sewage from its entry to the Works through the groundwater regime.

Performance Summary :

Parameter	Raw Sewage	Cell #3 Effluent	Design Objective	Groundwater Seepage	Non Compliance Criteria
BOD ₅	--	--	--		--
CBOD ₅	165.50	6.91	20.0	<2.08	5.0
TSS	210.00	12.59	20.0	<1.17	5.0
Total Ammonia	--	9.65	--	<0.43	2.5
Total Phosphorus	2.26	0.16	1.0	<0.03	0.1
E.Coli (CFU/100 mL)	--	939.25	--	0	100*
Free (Unionized) Ammonia	--	--	--	<0.0035	0.1

*Average Monthly Geometric Mean Density

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 2024:

1. The annual average sewage influent flow was 595 m³/day in 2024, as determined by the flow measuring instrumentation in the Lucknow Sewage Pumping Station. Given that the approved flow to the works is 750 m³/day, the works operated at 79.33% of the design capacity. Historically, maximum day flows will typically be greatest during spring months and be lowest during the summer months. During 2024, the maximum day trend was characteristic, with the maximum day flow of 1,521 m³/day occurring in December.
2. Raw sewage concentrations and loadings for BOD₅, TSS, TKN and TP have remained relatively consistent since 2016, however, in 2024, loadings were lower than typical domestic sewage loadings on a per capita basis :

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Parameter	Typical Loadings (mg/L)	2023 Loadings (mg/L)	% Difference
BOD ₅	170	165.5	2.65% lower
TKN	35	21.53	38.49% lower
TP	7	2.26	67.71% lower
TSS	200	210	1.05% higher

3. Effluent quality, as measured at the effluent structure (GWSS), remained excellent throughout 2024.

Additional Information:

● Municipal Utility Monitoring Program Reports (MUMP)

The monthly compilation forms of discharge data are submitted annually to the Ministry. The Ministry uses these forms to publicly report Municipal monitoring data.

● Infiltration-Inflow Investigations

In the fall of 2019, the Municipality retained the services of BM Ross and initiated sanitary sewer flow monitoring, and a comprehensive in-sewer flow metering program was conducted from October 2020 to June 2021. During that period, 149 of the 168 manholes were inspected; 19 were inaccessible. Debris was removed from the north quadrant (45 manholes) on November 18, 2020.

The following results were reported :

- The existing annual average Infiltration-Inflow (I-I) flows are lower than expected extraneous values for older collection systems.
- Extraneous flow issues were obvious in the northeast and the southwest edges of Lucknow.
- Infiltration (groundwater seepage into the collection system) was more significant than inflow (water entering from the surface, any conduits and illegal connections).
- 38 manholes (23%) were identified as contributing infiltration.
- Inflow (directly related to precipitation) is not significant, and infiltration in general is not significant, but is widely dispersed throughout the collection system.

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- **BM Ross Infiltration-Inflow Recommendations :**

1. On-going efforts to locate and address contributing locations.
2. An on-going program of investigation and maintenance will prevent the collection system from worsening with age :
 - a. CCTV inspections :

These should take place in spring or fall when infiltration and inflow is expected to be present.
 - b. Manhole Repairs :

A program of manhole repairs should be developed, starting with the areas suspected to have the most infiltration and inflow.