REGIONAL DISTRICT OF NANAIMO

2023 Annual Report

Greater Nanaimo Pollution Control Centre

February 2024

Submitted to the Ministry of Environment and Climate Change Strategy
envauthorizationsreporting@gov.bc.ca

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Executive Summary

The Regional District of Nanaimo (RDN) owns and operates the Greater Nanaimo Pollution Control Centre (GNPCC), located at 4600 Hammond Bay Road in Nanaimo. GNPCC provides secondary treatment using Modified Ludzack-Ettinger (MLE) activated sludge process. In 2017, construction began on the Secondary Treatment Upgrade Project. Construction achieved substantial completion in September 2020. Treated effluent from GNPCC is discharged to the Strait of Georgia.

Operation of GNPCC is regulated by Environmental Management Permit No. PE00338, most recently amended by the BC Ministry of Environment and Climate Change Strategy in 2020. The authorized treatment works include a screening facility; grit and skimmings removal systems; primary sedimentation tanks; secondary treatment bioreactors; secondary clarifiers; sludge digestion systems; sludge dewatering facility; reuse of digester gas for fueling boilers; a cogeneration system which can produced electricity for treatment operations and sell excess electricity back to BC Hydro; an outfall extending 2 km out from mean low water to a maximum depth of 70 m below mean low water; a diffuser; and related appurtenances.

This report was written by RDN staff as a permit requirement and summarizes and interprets the GNPCC monitoring data for 2023. The summary of 2023 monitoring data at GNPCC is as follows:

Summary of Compliance	Permit	2023	Permit Exceedances
Maximum Daily Flow	80,870 m^3/day	95,897 m^3/day	2
Average Daily Flow	40,950 m^3/day	33,547 m^3/day	0
Average Daily $cBOD_5$	130 mg/L	7.97 mg/L	0
Average Daily TSS	130 mg/L	8.52 mg/L	0

- **Flow –** The total flow discharged from GNPCC in 2023 was 12,244,604 m^3, at an average daily flow of 33,547 m^3/day. GNPCC had two maximum daily flow non-compliances.
- **5-day Carbonaceous Biochemical Oxygen Demand** – The influent and effluent average 5-day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$) concentration for 2023 was 262 mg/L and 7.97 mg/L, respectively. The average removal efficiency in 2023 was 96.7%.

  There was a $cBOD_5$ non-compliance due to no effluent composite sample being taken on July 8th. Appendix C contains additional information on this non-conformance and corrective actions.
- **Total Suspended Solids** – The influent and effluent average Total Suspended Solids (TSS) concentration in 2023 was 543 mg/L and 8.52 mg/L, respectively. The average TSS removal efficiency in 2023 was 98.1 %.

  There was a TSS non-compliance due to no effluent composite sample being taken on July 8th. Appendix C contains additional information on this non-conformance and corrective actions.
- **General parameters, metals, volatile and semi-volatile compounds** – 2023 results were all consistent with historical data.
- **Biosolids** – Biosolids generated by GNPCC in 2023 met the standards for Class B biosolids in Schedules 3 and 4 of the Organic Matter Recycling Regulation. GNPCC Biosolids are currently being land applied in a Forest Fertilization Program.

Table of Contents

1) Introduction

The Regional District of Nanaimo (RDN) owns and operates the Greater Nanaimo Pollution Control Centre (GNPCC) located at 4600 Hammond Bay Road in Nanaimo. Treated effluent from GNPCC is discharged to the Salish Sea. Operation of the treatment plant is regulated by the Ministry of Environment and Climate Change Strategy (ENV) under Environmental Management Permit No. PE00338 (the Permit), issued on April 15, 1970, and most recently amended on December 11, 2020 (see Appendix A). The RDN has been in discussion with ENV about establishing an Operational Certificate at GNPCC.

The authorized treatment works include a screenings facility, grit and scum removal systems, primary sedimentation tanks, secondary treatment bioreactors, secondary clarifiers, sludge thickening systems, sludge digestion systems, sludge dewatering facility, and outfall extending 2,030 m from mean low water to a minimum depth of 70 m, diffusers, and related appurtenances.

Since 2009, GNPCC has been operating with Chemically Enhanced Primary Treatment (CEPT). In 2009, two gravity thickeners were added to the treatment process. In September 2012, a cogeneration system was installed which produced electricity from 2012 to 2018. The electricity generated by cogeneration was sold to BC Hydro. A third digester and fourth sedimentation tank were added in 2013. In 2016, the RDN commissioned the replacement of the marine and land sections of the outfall from GNPCC.

In 2017, construction began on the Secondary Treatment Upgrade Project. Construction achieved substantial completion in September 2020. In October 2020, the secondary treatment process commenced operation.

This report summarizes and interprets GNPCC monitoring data for 2023.

1.1 Environmental Management System

The RDN's Wastewater Services department's Environmental Management System is ISO 14001:2015 certified. ISO 14001 is an international Environmental Management System standard based on a model of continual improvement. The overall aim of ISO 14001 is to support environmental protection and prevent pollution in balance with socio-economic needs. Visit www.rdn.bc.ca/environmental-management-system for more information.

2) Site Description and Neighborhood

The neighbourhood surrounding GNPCC is predominately a single and multifamily residential area. There are approximately 1,000 residential properties within a 1 km radius of the treatment facility. Ecole Hammond Bay School is also nearby. Neck Point Park borders the property to the northeast. There were no significant changes to the layout of the neighbourhood in 2023. Walley Creek runs in front of the treatment facility parallel to Hammond Bay Road.

3) Permit Requirements

3.1 Minor Permit Amendment

On September 12, 2019, the Permit was amended to include a screenings facility, secondary treatment bioreactors and secondary clarifiers among the authorized treatment works. On December 11, 2020, the Permit was amended to capture the commissioning of secondary treatment at GNPCC.

3.2 Authorized Discharges

Section 1.1.1 of the Permit states the following daily effluent discharge limits:

- 40,950 m^3/day for average annual flow
- 80,870 m^3/day for maximum daily flow.

Section 1.1.2 of the Permit states that the characteristics of the discharge shall not exceed:

- 5-Day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$): 130 mg/L
- Total Suspended Solids (TSS): 130 mg/L.

3.3 Monitoring Requirements

Table 1 summarizes the Permit monitoring requirements. Quarterly reports submitted to ENV in 2023 reported all required test results.

Table 1. Monitoring Requirements by Permit Subsection Number

3.1.1 Flow Measurement A flow-measuring device must be provided and maintained to record, once per day, the effluent volume discharged over the preceding 24-hour period.
3.1.2 Sampling and Analysis Suitable sampling facilities must be installed and maintained to obtain composite samples and analyses of the effluent.
3.2 Biosolids Monitoring A sample of the treated biosolids must be obtained once every quarter for chemical analysis.
3.3 Monitoring of the Receiving Environment The receiving environment in the vicinity of the treatment plant outfall shall be monitored, and the monitoring program is subject to approval by the Regional Waste Manager.

3.4.1 Sampling and Analytical Procedures

Sampling and flow measurement shall be carried out in accordance with the procedures described in the *British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air Emission, Water, Wastewater, Sediment and Biological Samples (2013 Edition)*, or by suitable alternative procedures authorized by the Regional Waste Manager.

Analyses are to be carried out in accordance with procedures described in the *British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment, Biological Materials and Discrete Air Samples (2020)*, or by suitable alternative procedures authorized by the Regional Waste Manager.

3.4.2 Toxicity

Toxicity analyses for effluent are conducted by an external laboratory.

Additional methodologies used for the analyses are described in the "*Standard Methods for the Examination of Water and Wastewater*," 23rd Edition, American Public Health Association, 2017.

An automatic sampler was used to withdraw effluent samples on a flow-proportioned basis over a 24-hour period. The effluent composite sampler was functional over the entire period.

3.4 Outfall Inspection

The Permit requires inspection of the GNPCC outfall every 5 years. The outfall was last inspected by GreatPacific Consulting Ltd. in November 2022 and was reported to be in good condition. The outfall inspection report was submitted to ENV. The next inspection is scheduled for 2027.

4) Flow Monitoring

Flow was measured in 2023 by a Parshall Flume and totalized by GNPCC's SCADA system.

4.1 2023 Flows

Daily flow monitoring data for GNPCC in 2023 is presented in Appendix B. The total flow discharged from GNPCC in 2023 was 12,244,604 m^3, at an average daily flow of 33,547 m^3/day. Higher daily flows recorded in January and December were associated with seasonal patterns of rainfall.

The Average Dry Weather Flow (ADWF) for 2023 was determined to be 27,507 m^3/day based on average daily flow during August, the month with lowest total precipitation. The precipitation data from 2023 was obtained from the Nanaimo City Yard weather station (see Environment Canada).

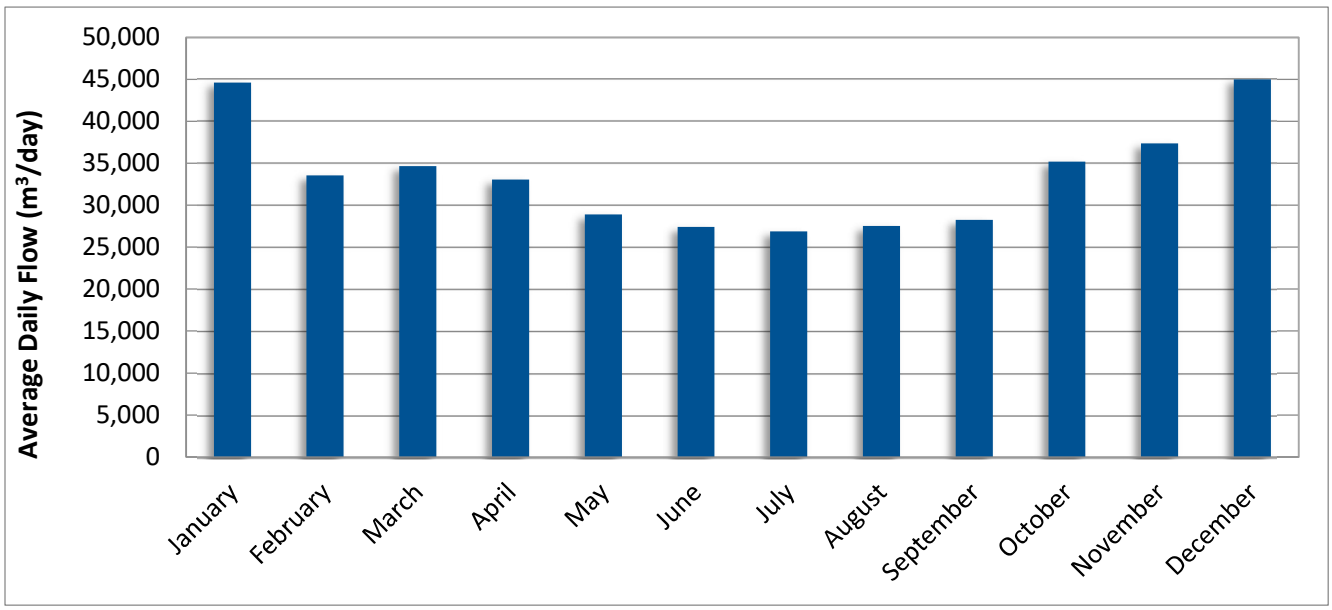
GNPCC had two maximum daily flow non-conformances in 2023 which both occurred during high precipitation events. These non-conformances are believed to be attributed to inflow and infiltration (I&I) entering the sanitary collection system. As part of the LWMP process, the RDN is working collaboratively with the City of Nanaimo and the District of Lantzville to reduce I&I in the sanitary sewer collection system.

Appendix C contains more information on the flow non-conformances. Results are summarized in Table 2 and graphed in Figure 1.

Table 2. 2023 Summary of Flows from GNPCC

Month	Average Daily Flow (m^3/day)	Total Flow (m^3)	Maximum Flow (m^3/day)	Minimum Flow (m^3/day)	Permit Exceedances (Max daily flow)	Total Monthly Precipitation (mm)
January	44,592	1,382,354	95,897	32,048	2	169.8
February	33,551	939,441	38,615	30,761	0	51.6
March	34,654	1,074,284	49,803	29,664	0	56.2
April	33,039	991,177	40,526	29,192	0	88.0
May	28,909	896,165	36,002	25,713	0	26.4
June	27,402	822,064	30,153	26,342	0	29.1
July	26,863	832,758	34,330	21,844	0	15.6
August	27,507	852,721	28,771	26,084	0	12.6
September	28,231	846,916	31,537	25,878	0	62.6
October	35,192	1,090,959	63,051	24,027	0	185.8
November	37,375	1,121,264	51,451	30,302	0	121.6
December	44,984	1,394,501	76,992	35,935	0	197.2
Average	**33,547**					**1,017**
Total		**12,244,604**			**2**	
Maximum			**95,897**			
Minimum				**21,844**		

Figure 1. 2023 Average Daily Flow Per Month



4.1.1 Historical Trends

Flow data reported over the past ten years are summarised in Table 3 and graphed in Figures 2 and 3.

Note, flow measurement techniques have varied over the years:

- Readings prior to December 2014 were measured using by a Parshall Flume.
- Flow was measured from December 2014 to January 2018 by an ISCO LaserFlow meter on an interim basis after the old Parshall Flume was removed from service during the secondary treatment upgrade. It is believed that the LaserFlow meter was reading high in terms of average daily flows.
- Flows after January 2018 were measured using a new Parshall Flume.

Table 3. Historical Trends: GNPCC Flows

Year	Average Daily Flow (m^3/day)	Total Flow (m^3)	Maximum Flow (m^3/day)	Maximum Daily Flow Exceedances
2014	31,753	11,589,771	88,300	1
2015	34,991	12,736,880	105,400	2
2016	41,151	15,061,083	96,700	6
2017	42,535	15,525,250	133,200	3
2018	29,945	10,930,000	91,100	2
2019	28,189	10,289,016	102,400	1
2020	29,426	10,769,976	92,213	2
2021	32,112	11,720,796	90,730	2
2022	32,290	11,785,797	104,451	4
2023	33,547	12,244,604	95,897	2

Figure 2. Historical Flows from GNPCC

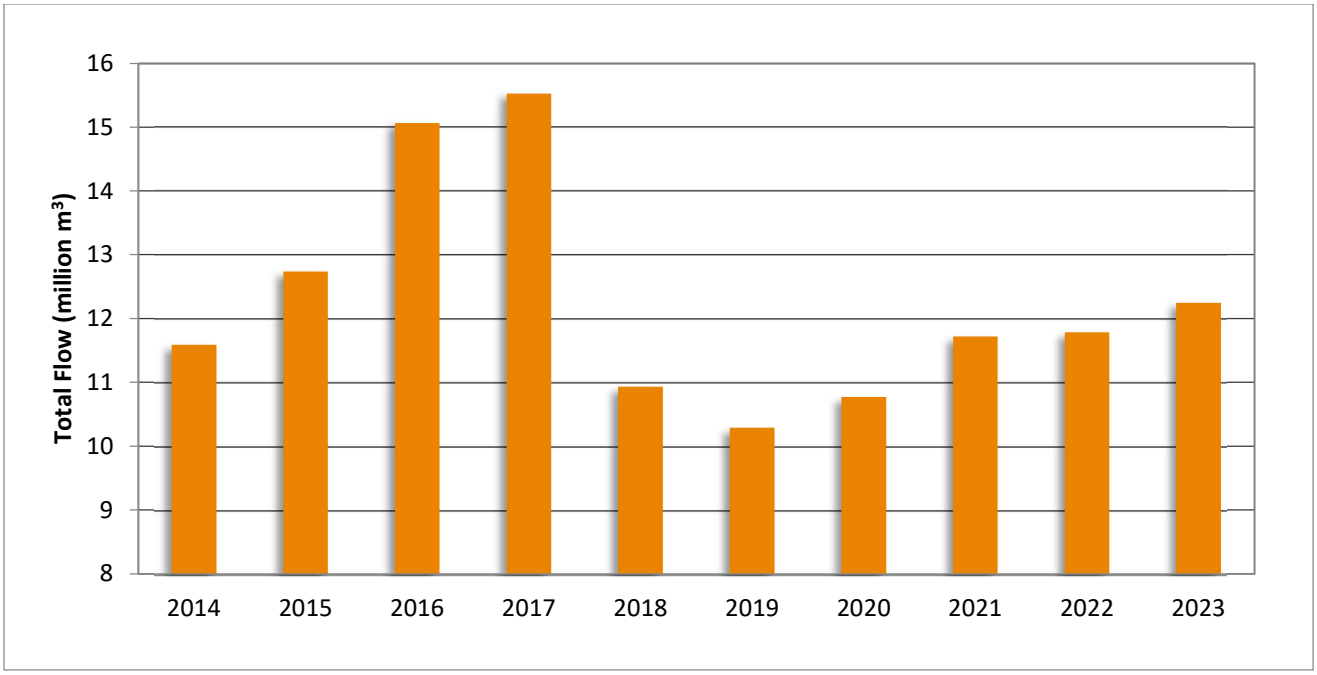
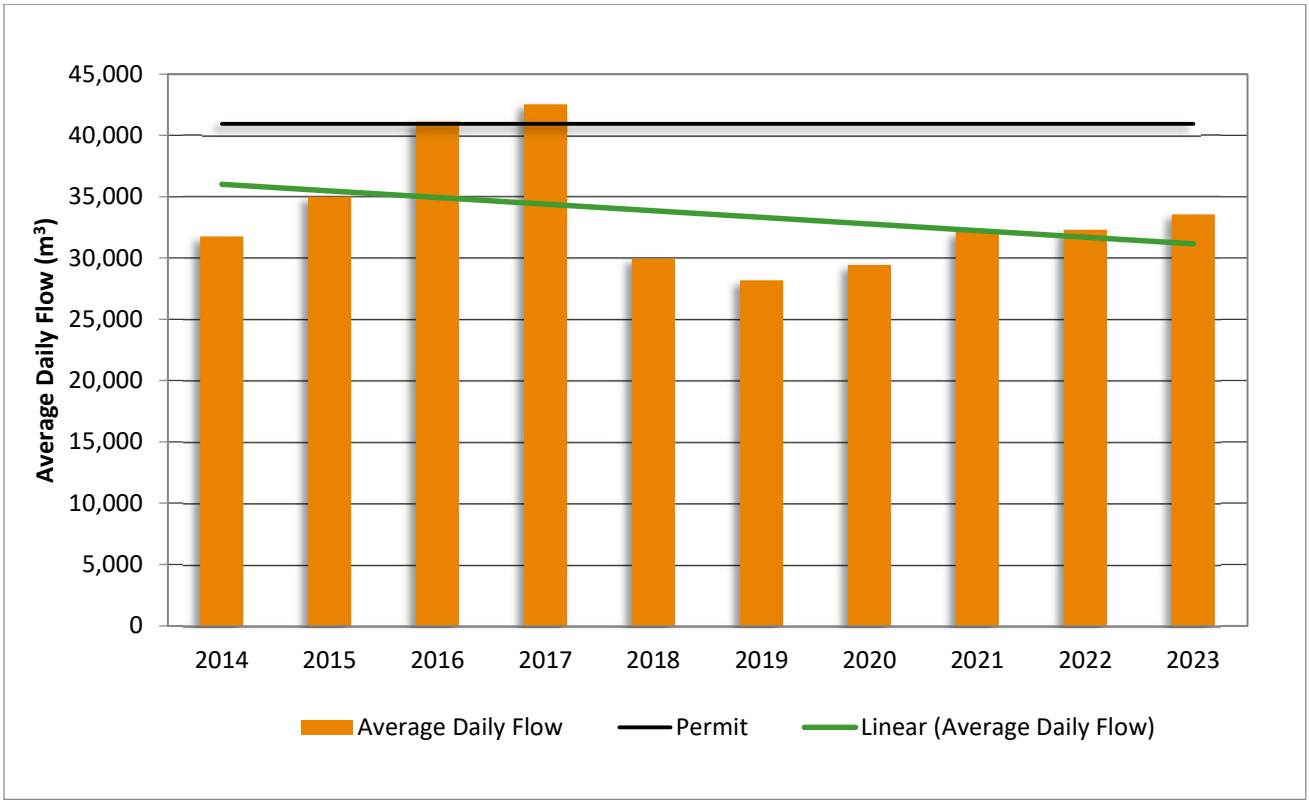


Figure 3. Historical Trends: Average Daily Flow by Year



5) Effluent Monitoring

5.1 5-Day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)

Five-day carbonaceous biochemical oxygen demand ($cBOD_5$) is a measure of the quantity of oxygen consumed by microorganisms to break down organic matter in water in which the contribution from nitrogenous bacteria has been suppressed. A high $cBOD_5$ means less oxygen is available to support aquatic life. Thus, high $cBOD_5$ levels result in the contamination of the receiving environment.

The Permit requires $cBOD_5$ testing of the effluent once per day and establishes the maximum permitted concentration at 130 mg/L (Appendix A). The average influent and effluent $cBOD_5$ concentration for 2023 was 262 mg/L and 7.97 mg/L, respectively. The average $cBOD_5$ removal efficiency was 96.7%. Appendix B contains the daily $cBOD_5$ test results.

There was one sampling $cBOD_5$ non-compliance in 2023:

- No sample was taken on July 8th due to the sampler not being turned on in the morning. As a result of this non-compliance a final effluent sampler check sheet was created.

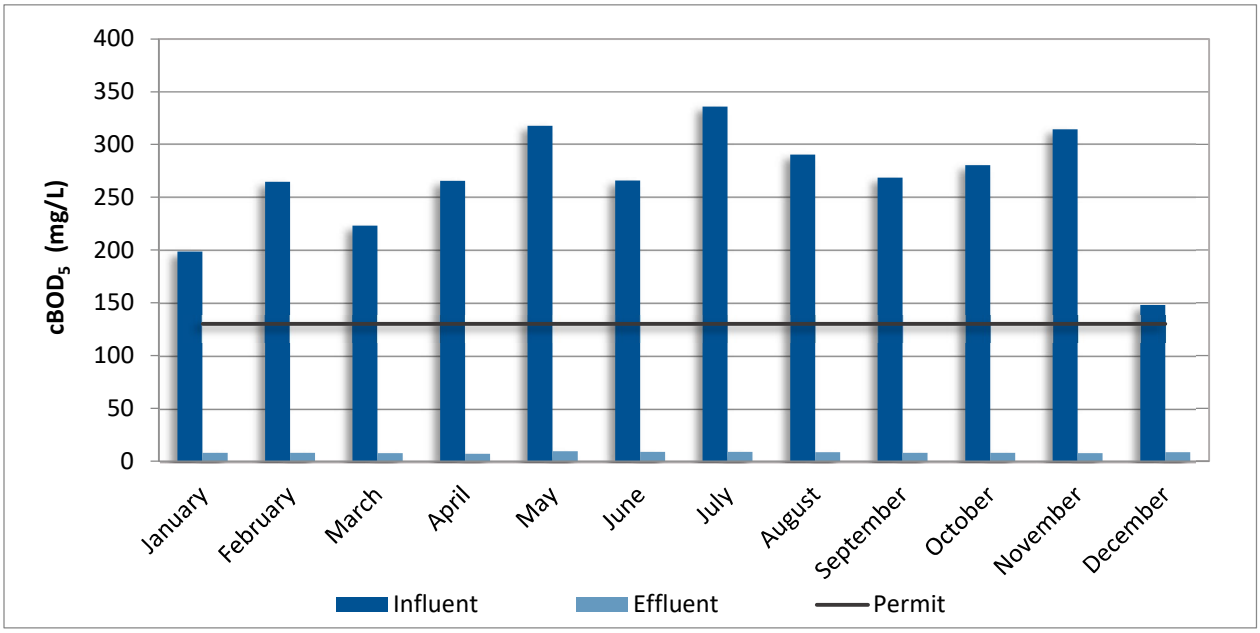
Appendix C contains additional information on this non-compliance.

Monthly averages are summarized Table 4 and graphed in Figure 4.

Table 4. 2023 Influent & Effluent $cBOD_5$ Concentrations

Month	Average $cBOD_5$ (mg/L)		Average % Reduction in $cBOD_5$	Permit Exceedances ($cBOD_5$>130 mg/L)
	Influent	Effluent		
January	199	7.66	95.7%	0
February	265	7.65	96.9%	0
March	223	7.46	96.6%	0
April	266	6.70	97.4%	0
May	318	9.23	97.3%	0
June	266	8.68	96.4%	0
July	336	8.55	97.1%	0
August	290	8.34	97.1%	0
September	269	7.85	96.5%	0
October	280	7.70	96.6%	0
November	314	7.42	97.6%	0
December	148	8.38	95.3%	0
Average	**262**	**7.97**	**96.7%**	
Total				**0**

Figure 4. 2023 Influent & Effluent Monthly Average $cBOD_5$ Concentration



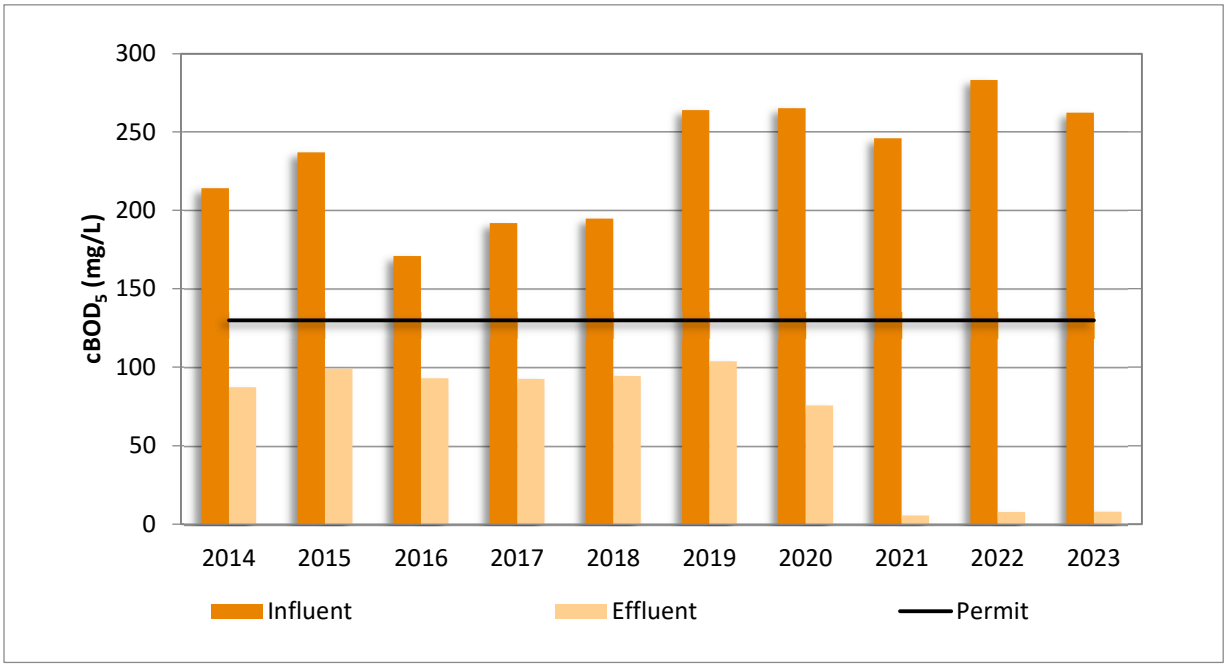
5.1.1 Historical Trends

Historical influent & effluent $cBOD_5$ concentrations, reduction efficiencies and the number non-compliances reported over the past ten years are summarised in the Table 5 and graphed in Figure 5. The addition of the secondary process since September 2020 has resulted in increased $cBOD_5$ removal.

Table 5. Historical Trends: Influent & Effluent $cBOD_5$ Concentrations

Year	Average $cBOD_5$ (mg/L)		Average % Reduction in $cBOD_5$	Permit Exceedances ($cBOD_5$>130 mg/L)
	Influent	Effluent		
2014	214	87.2	56.8%	5
2015	237	99.0	55.0%	15
2016	171	93.0	44.9%	3
2017	192	92.6	49.2%	7
2018	195	94.3	48.2%	3
2019	264	103.7	57.3%	4
2020	265	75.5	63.5%	11
2021	246	5.32	97.8%	0
2022	283	7.69	97.1%	0
2023	262	7.97	96.7%	0

Figure 5. Historical Trends: Influent & Effluent Yearly Average $cBOD_5$ Concentration



5.2 Total Suspended Solids

Total suspended solids (TSS) are solids within wastewater that can be captured on a fine filter paper. They are visible in water and decrease water clarity. High concentrations of TSS can cause problems for aquatic life.

The Permit requires daily TSS testing of the effluent, with a maximum permitted concentration of 130 mg/L (See Appendix A). The influent and effluent average TSS concentration in 2023 was 543 mg/L and 8.52 mg/L, respectively. The average TSS removal efficiency in 2023 was 98.1%. Appendix B contains the daily TSS results. Results are summarized in Table 6 and graphed in Figure 6.

The addition of the secondary process since September 2020 has resulted in increased TSS removal.

There was one sampling TSS non-compliance in 2023:

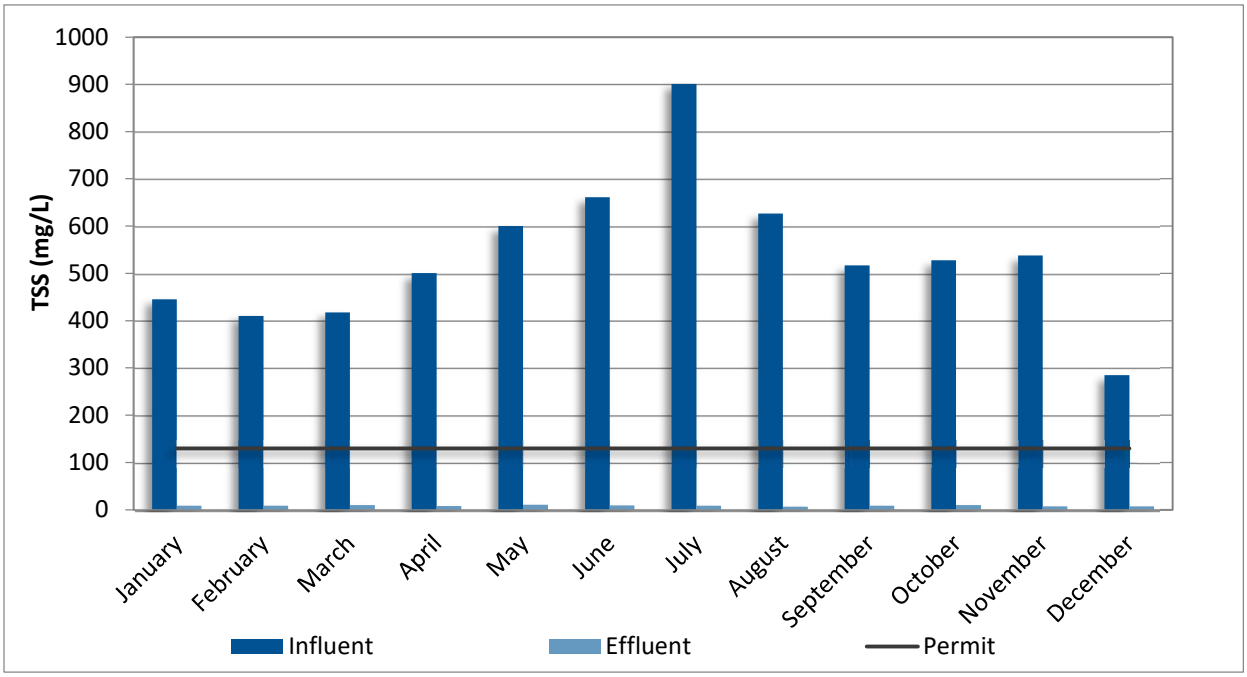
- No sample was taken on July 8th due to the sampler not being turned on in the morning. As a result of this non-compliance a final effluent sampler check sheet was created.

Appendix C contains additional information on this non-compliance.

Table 6. 2023 Influent & Effluent TSS Concentrations

Month	Average TSS (mg/L)		Average % Reduction in TSS	Permit Exceedances (TSS>130 mg/L)
	Influent	Effluent		
January	445	8.61	97.7%	0
February	410	8.67	97.8%	0
March	417	9.81	97.2%	0
April	501	7.65	98.4%	0
May	600	10.74	98.1%	0
June	661	9.5	98.3%	0
July	901	8.33	98.9%	0
August	627	6.23	98.9%	0
September	517	8.63	98.2%	0
October	528	10.14	97.9%	0
November	538	6.94	98.5%	0
December	285	6.94	97.5%	0
Average	**543**	**8.52**	**98.1%**	
Total				**0**

Figure 6. 2023 Influent & Effluent Monthly Average TSS



5.2.1 Historical Trends

Historical influent and effluent average TSS concentration, reduction efficiencies and the number of non-compliances reported over the past ten years are summarised in Table 7 and graphed in Figure 7. Data from 2023 are consistent with historical values.

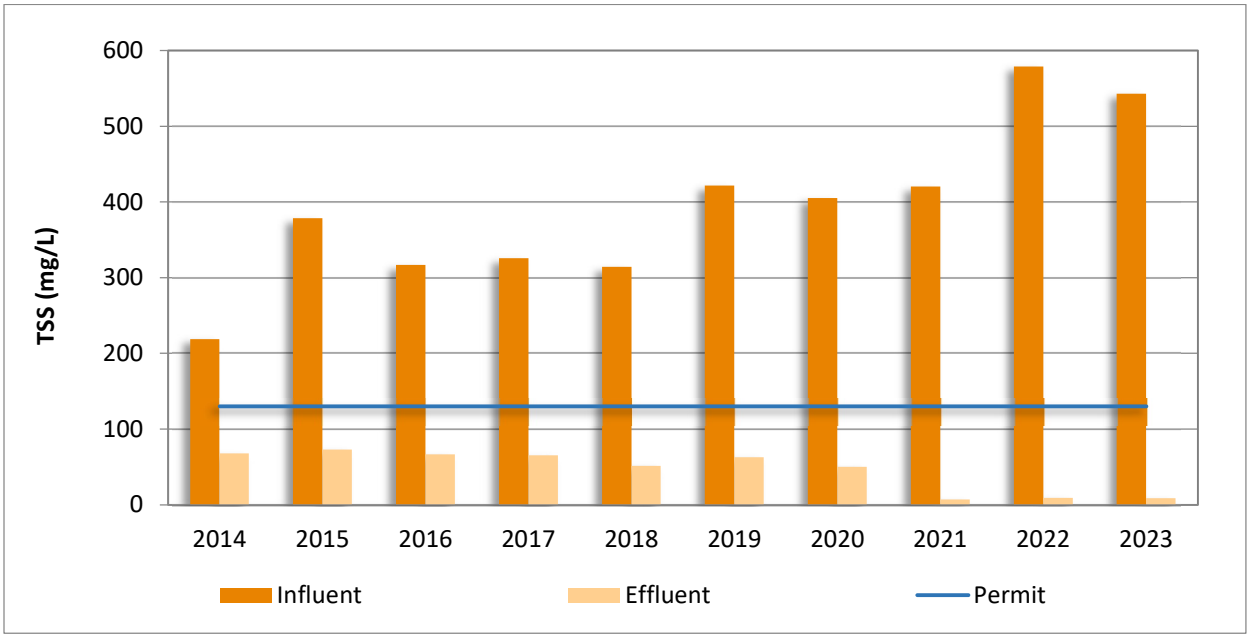
August 2011 to July 2013 and May to December 2014 influent data were less representative due to the grab sampling method. The influent TSS concentrations were higher after 2015 due to the composite sampling method. The composite sampling method would yield higher results due to the inclusion in the composite of higher concentrated night flows.

Effluent TSS results decreased after the secondary treatment was operational after October 2020.

Table 7. Historical Trends: Influent & Effluent TSS

Year	Average TSS (mg/L)		Average % Reduction in TSS	Permit Exceedances (TSS>130 mg/L)
	Influent	Effluent		
2014	219	67.8	67.9%	1
2015	379	72.8	79.1%	1
2016	317	66.4	77.8%	0
2017	326	65.5	78.6%	0
2018	314	51.3	82.1%	0
2019	421	63.0	82.8%	0
2020	405	50.2	83.3%	1
2021	420	7.09	98.0%	1
2022	579	9.28	98.0%	0
2023	543	8.52	98.1%	0

Figure 7. Historical Trends: Influent & Effluent Yearly Average TSS



5.3 Ammonia and Toxicity

Ammonia is one of the typical constituents found in domestic wastewater. Ammonia can be harmful to both freshwater and marine fish and is monitored along with toxicity to determine potential impacts to the receiving environment.

Toxicity testing, or a bioassay, is used to determine the strength of a material by studying the reaction of a living organism exposed to it. The accepted method used to determine the toxicity of water and wastewater is called an LC_{50} 96-hour test. This means the lethal concentration at which 50% of test organisms die within 96 hours. The result is given as a percentage, referring to the amount of effluent, in relation to dilution water, used in the test. A toxicity result of 100% is not acutely toxic. The lower the toxicity result (expressed as a percentage), the more toxic the effluent.

Ammonia testing is completed internally at the GNPCC lab on composite samples from the effluent. Table 8 contains the average of the 2023 Ammonia testing results for each month. Appendix B contains weekly test results. The average ammonia nitrogen concentration in the effluent for 2023 was 20.0 mg/L.

The following trends were observed in the monthly Ammonia results. Results were lower in November and January due to dilution due to inflow and infiltration. Ammonia results also decreased after September 2020 due to ammonia nitrification in the secondary wastewater treatment process.

Table 8. 2023 Effluent Ammonia Nitrogen Concentrations

Month	Effluent Ammonia Nitrogen (mg/L)
January	12.2
February	20.6
March	23.7
April	17.8
May	18.4
June	21.4
July	25.0
August	22.0
September	24.4
October	20.0
November	16.4
December	18.7
AVERAGE	**20.0**

*Total as N

The GNPCC laboratory conducts daily testing of un-ionized ammonia levels to exceed the requirements of its Wastewater Systems Effluent Regulations (WSER) transitional authorization. Un-ionized ammonia levels were lower than the WSER limit of 1.25 mg N/L. Table 9 contains the average monthly un-ionized ammonia testing results. Appendix B contains the weekly test results.

Table 9. 2023 Un-ionized Ammonia Results

Month	Un-ionized Ammonia (mg/L)
January	0.027
February	0.085
March	0.096
April	0.059
May	0.062
June	0.091
July	0.137
August	0.107
September	0.111
October	0.064
November	0.039
December	0.047
AVERAGE	**0.077**

*Total as N

The Permit requires the toxicity of the effluent to be tested quarterly. Toxicity testing is conducted by an external laboratory (see Appendix D for test reports) based on % survival of rainbow trout in undiluted effluent. Table 10 contains the LC_{50} Toxicity testing results. The average LC_{50} toxicity of the effluent was non acutely toxic with >100% survival of rainbow trout as determined in 4 tests.

Table 10. 2023 LC_{50} Toxicity Results

Date	Effluent LC_{50} Toxicity (%)
28-Feb-23	>100
08-May-23	>100
28-Aug-23	>100
15-Nov-23	>100
Average	**>100**
test organisms = rainbow trout	

5.3.1 Historical Trends

Historical average ammonia nitrogen and toxicity results for effluent reported over the past ten years are summarised in Table 11 and graphed in Figure 8.

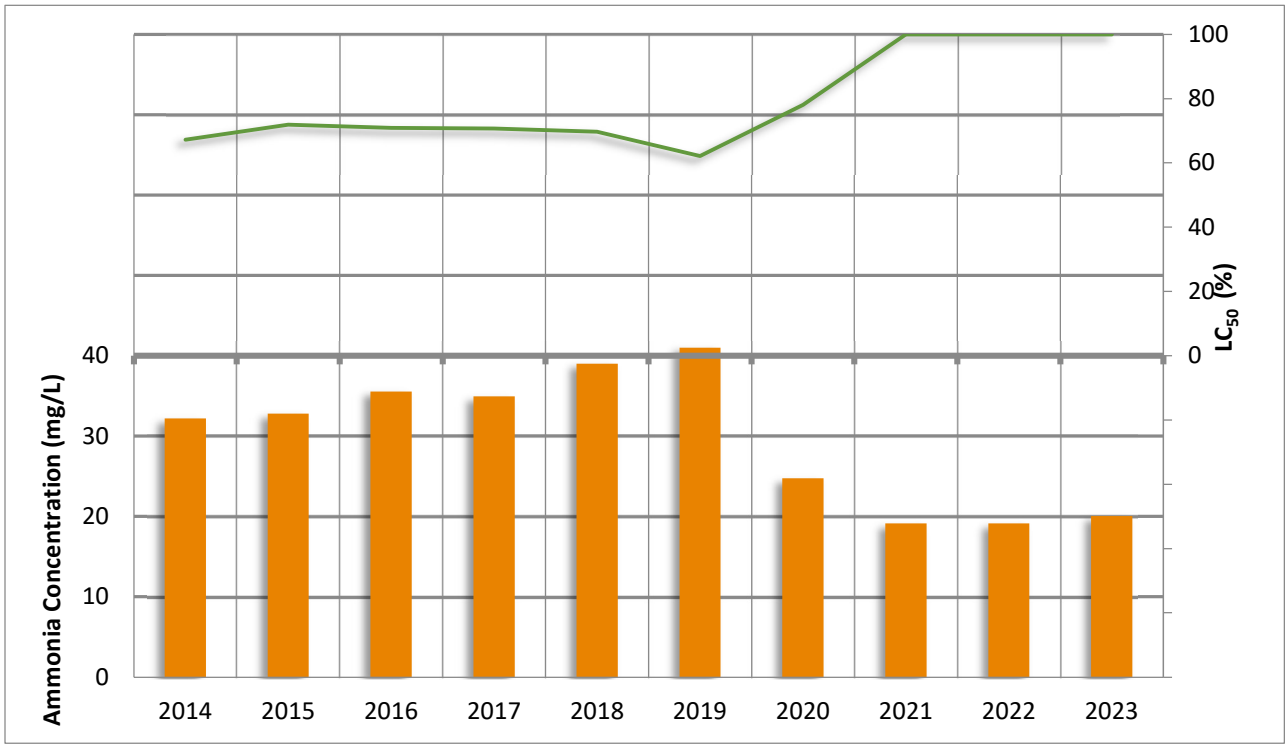
Ammonia results since 2021 are lower than historical values due to ammonia nitrification occurring in the secondary treatment process. Results after October 2020 reflect the secondary process in operation.

The effluent has consistently tested non-acutely toxic since the addition of a secondary treatment process in September 2020.

Table 11. Historical Trends: Effluent Average Ammonia Nitrogen Concentrations and LC_{50} Toxicity

Year	Effluent Average Ammonia (mg/L)	Effluent Average LC_{50} (%)
2014	32.2	67.2
2015	32.8	71.9
2016	35.5	70.9
2017	35.0	70.7
2018	39.0	69.7
2019	41.0	62.2
2020	24.7	78.0
2021	19.1	>100
2022	19.1	>100
2023	20.0	>100

Figure 8. Historical Trends: Effluent Yearly Average Ammonia Nitrogen and LC_{50} Toxicity



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5.4 Alkalinity and Total Phosphorous

The Total Phosphorous and Alkalinity were tested by the internal laboratory starting in 2022. In previous years, these parameters were tested by an external laboratory.

Monthly average results for 2023 are tabulated in Table 12 and charted in Figure 9 and 10.

Table 12. Effluent Total Phosphorous and Alkalinity Results

Month	Total Phosphorous (mg/L)	Effluent Average Alkalinity (mg/L)
January	2.90	66.0
February	4.32	113
March	4.08	117
April	5.06	86.9
May	5.02	89.6
June	4.25	102
July	4.49	115
August	4.64	104
September	3.96	115
October	3.47	97.6
November	3.25	86.4
December	3.63	105
Average*	**4.15**	**100**

Figure 9. Effluent Monthly Total Phosphorous Results

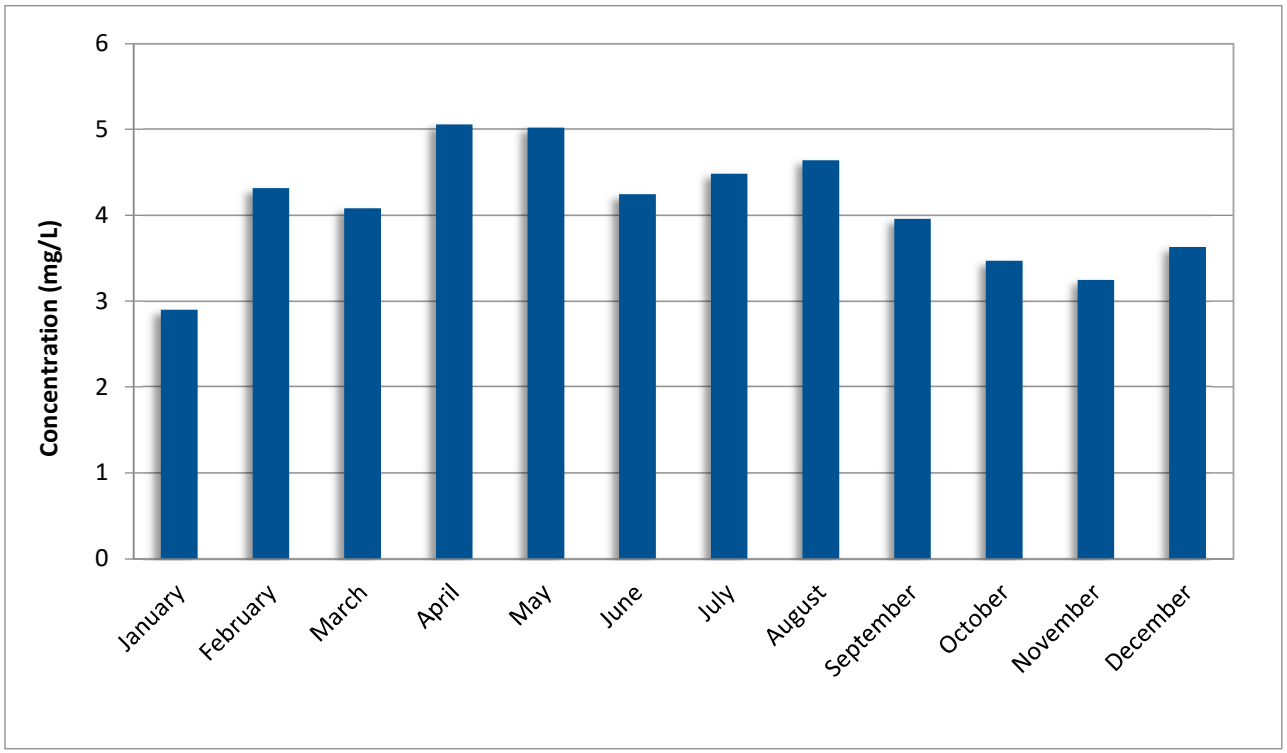
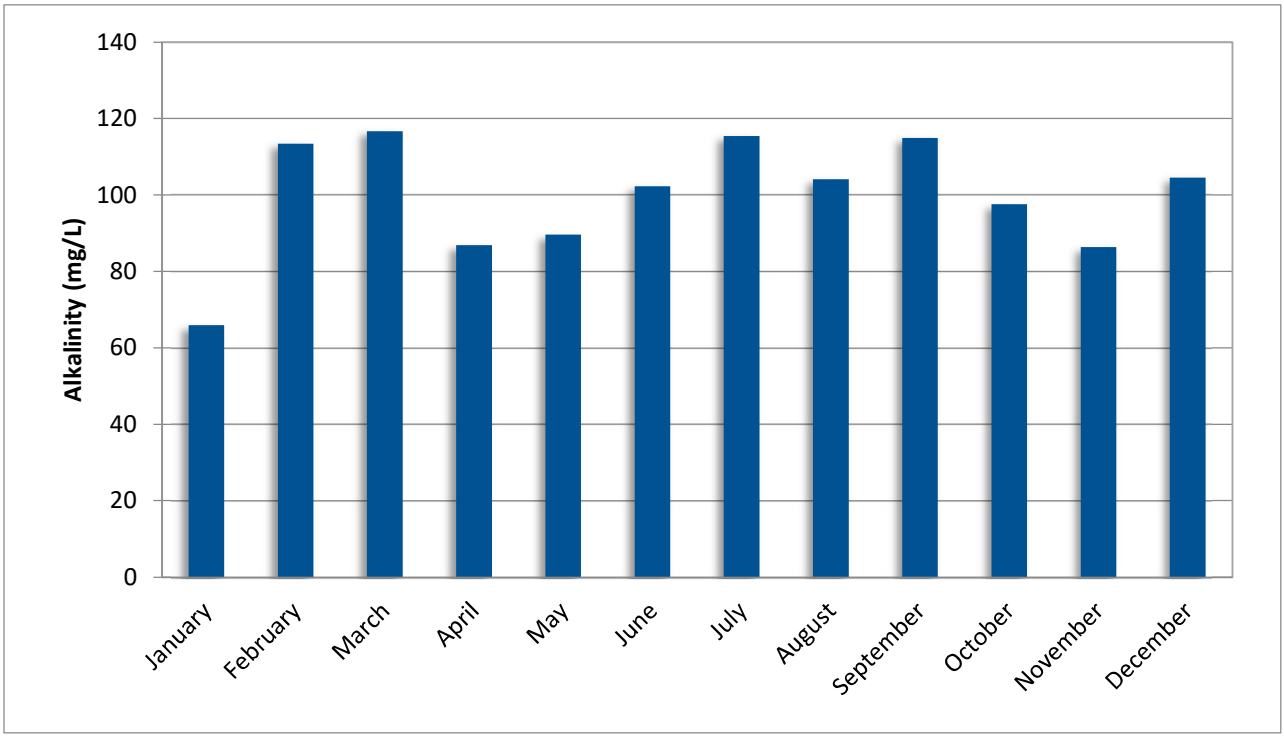


Figure 10. Effluent Monthly Alkalinity Results



5.5 Other General Parameters

The Permit requires testing of the effluent for the following parameters every six months:

Alkalinity	Dissolved Sulphate	pH	Total Organic Carbon
Chloride	Total Sulphide	Total Cyanide	Total Phosphorus
Dissolved Fluoride	Oil and Grease	Total Kjeldahl Nitrogen	

Samples of the effluent are tested in June and December of each year by an external laboratory (see Appendix D for test results). Historical trends of the general parameters reported over the past ten years are summarised in Table 13.

Decreases in pH, alkalinity, oil and grease, and Total Kjeldahl Nitrogen were observed after 2020 due to the secondary treatment process.

Total Alkalinity, pH, and Total Phosphorous are tested by the internal laboratory. Prior to 2022, these parameters were tested by an external lab.

Table 13. Historical Trends: Effluent General Parameters

Parameter	Units	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
pH*	-	7.16	7.17	7.63	7.29	7.22	7.22	7.51	7.17	6.96	7.24
Total Alkalinity*	mg/L	176	133	153	153	128	214	157	107	206	100
Dissolved Chloride	mg/L	277	158	165	150	133	220	104	200	150	145
Total Kjeldahl Nitrogen	mg/L	28.6	36.5	45.6	37.3	40.4	45.7	35.7	13.2	18.9	15.0
Total Oil and Grease	mg/L	35.0	19.5	8.1	7.9	4.9	14.8	<9.6	<1.0	<1.0	<1.3
Dissolved Sulphate	mg/L	67	46	52	48	53	70	42	39	35	34
Total Sulphide (as H2S)	mg/L	<0.05	0.08	0.059	0.082	0.064	0.100	0.053	0.013	0.022	<0.012
Total Cyanide	mg/L	0.0060	0.0040	0.0017	0.0015	<0.0050	0.0058	<1.86	0.0018	0.0015	0.0016
Dissolved Fluoride	mg/L	0.100	0.105	0.051	0.043	0.037	0.109	<0.085	<0.056	<0.053	<0.052
Total Organic Carbon	mg/L	63	64	33	47	33	35	25	32	15	16
Total Phosphorus*	µg/L	3,500	2,415	2,845	3,125	2,770	2,680	2,510	2,550	3,847	4,146

*Results reflect average annual internal laboratory results starting in 2022. Prior to 2022, Alkalinity and Total Phosphorous determined by external laboratory testing.

5.6 Metals

The Permit requires testing of the effluent for the following metals every six months:

Aluminum (total)	Chromium (total)	Manganese (dissolved)	Selenium (total)
Arsenic (total)	Cobalt (dissolved)	Mercury (total)	Silver (total)
Barium (dissolved)	Copper (dissolved)	Molybdenum (total)	Tin (total)
Boron (dissolved)	Iron (Dissolved)	Nickel (dissolved)	Zinc (total)
Cadmium (dissolved)	Lead (total)		

Samples of the effluent are tested in June and December of each year by an external laboratory (see Appendix D for test reports). The average concentrations of the metals reported over the past ten years are summarised in Tables 14 and 15.

The Total Aluminum concentration after October 2020 due to the discontinuation of Chemically Enhanced Primary Treatment (CEPT) and the use Aluminum Sulphate in the wastewater treatment process.

Table 14. Historical Trends: Effluent Total Metal Concentrations

Total Metals	Units	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Aluminum	µg/L	2,095	2,160	2,260	2,980	2,780	3,110	1,770	14.4	16.1	19.4
Arsenic	µg/L	0.85	0.70	1.06	0.50	0.49	0.76	0.44	0.49	0.47	0.44
Chromium	µg/L	3.65	0.88	1.35	2.00	2.25	3.27	<1.9	0.39	<1.2	<1.0
Lead	µg/L	1.7	1.4	1.1	1.1	0.9	1.9	<0.74	<0.22	<0.29	0.33
Mercury	µg/L	0.02	<0.02	<0.016	<0.017	<0.032	<0.012	<0.015	<0.020	<0.027	<0.029
Molybdenum	µg/L	1	0.95	<1.1	<1.0	1.1	1.515	1.9	<1.3	<1.5	<1.0
Selenium	µg/L	1.3	<0.7	0.31	0.27	0.34	<0.40	<0.31	0.12	0.15	0.15
Silver	µg/L	0.14	0.065	0.077	0.076	0.132	0.120	<0.049	<0.020	<0.024	<0.020
Tin	µg/L	1.08	0.80	<5.0	<5.0	<5.0	3.20	<2.9	<5.0	<5.0	<5.0
Zinc	µg/L	42	53.5	48.6	51.7	45.25	117.5	75.5	31.1	30.6	32.1

Table 12. Historical Trends: Effluent Dissolved Metal Concentrations

Dissolved Metals	Units	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Barium	µg/L	8.5	62.7	208.5	235.0	246.0	174.4	<4.4	5.1	3.6	4.6
Boron	µg/L	192	161	184.5	217.5	240	178.5	178.5	183.5	203.5	218
Cadmium	µg/L	0.075	<0.03	0.067	0.0635	0.0355	0.0825	0.0475	<0.017	<0.014	<0.080
Cobalt	µg/L	0.52	0.51	<0.50	0.42	0.45	0.64	0.61	0.39	0.54	0.35
Copper	µg/L	66	24.15	44	10.6	8.67	11.00	7.96	8.69	14.0	12.3
Iron	µg/L	2480	449	427	346	418	306	194	91	126	90.0
Manganese	µg/L	91.5	79.0	80.1	68.3	72.9	85.5	39.1	36.2	55.9	32.7
Nickel	µg/L	2.6	2.3	2.0	1.9	2.3	3.7	3.3	1.4	2.0	2.1

5.7 Volatile and Semi-Volatile Compounds

The Permit requires effluent be tested for these volatile and semi-volatile compounds every six months:

Benzene	Ethylbenzene	1,1,1-Trichloroethane
Di(2-ethylhexyl)phthalate	Methyl chloride	1,1,2-Trichloroethane
Chloroform	Napthalene	Trichloroethylene
Dichlorobromoethane	PCBs	Toluene
Dichloromethane	Tetrachloroethylene	Total Phenols
Di-n-butyl phthalate		

Samples of the effluent are tested in June and December of each by an external laboratory (see Appendix D for test reports). The average concentrations of the volatile and semi-volatile compounds reported over the past ten years are summarised in Table 16. 2023 data are consistent with historical data.

Table 16. Historical Trends: Effluent Semi Volatile and Volatile Compounds

Parameter	Units	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Benzene	µg/L	<0.5	<0.5	<0.40	<0.52	<0.40	<0.5	<0.5	<0.40	<0.40	<0.40
Di(2-ethylhexyl) phthalate	µg/L	1.7	1.6	<10	<7.0	<5.2	<6.3	<2.4	<6.0	<2.0	<2.0
Chloroform	µg/L	3.5	1.5	2.75	4	3.25	4.0	2.8	2.5	2.9	3.2
Dichlorobromomethane	µg/L	<1	<1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dichloromethane	µg/L	<1	<1	<2.0	<2.0	<2.0	<2.5	<2.5	<2.0	<2.0	<1.8
Di-N-Butyl Phthalate	µg/L	<0.2	0.52	<10	<6.0	<5.0	<6.3	<1	<6.0	<2.0	<2.0
Ethylbenzene	µg/L	<0.5	<0.5	<0.40	<0.40	<0.40	<0.70	<0.70	<0.40	<0.40	<0.40
Methyl Chloride	µg/L	<1	<1	<1.0	<1.0	<1.0	<6.2	<4.5	<1.0	<1.0	<1.0
PCBs	µg/L	<0.010	<0.009	<0.28	<0.53	<0.15	<0.050	<0.050	<0.050	<0.050	<0.50
Tetrachloroethylene	µg/L	<1	<1	<0.50	<0.50	<0.50	<0.075	<0.80	<0.50	<0.50	<0.50
Toluene	µg/L	0.9	<0.7	<0.52	<0.64	0.54	1.545	<0.80	<0.40	<0.40	<0.40
Total Phenols	mg/L	0.020	0.015	0.024	0.032	0.044	0.020	0.497	<0.0027	<0.0015	<0.0016
1,1, 1-Trichloroethane	µg/L	<1	<1	<0.50	<0.50	<0.50	<0.075	<0.75	<0.50	<0.50	<0.50
1,1, 2-Trichloroethane	µg/L	<1	<1	<0.50	<0.50	<0.50	<1.0	<0.75	<0.50	<0.50	<0.50
Trichloroethylene	µg/L	<1	<1	<0.50	<0.50	<0.50	<0.075	<075	<0.50	<0.50	<0.50
Naphthalene	µg/L	<0.06	0.07	<0.10	<0.10	<0.10	<2.6	<2.6	<0.10	<0.10	<0.10

6) Biosolids

6.1 Biosolids Production

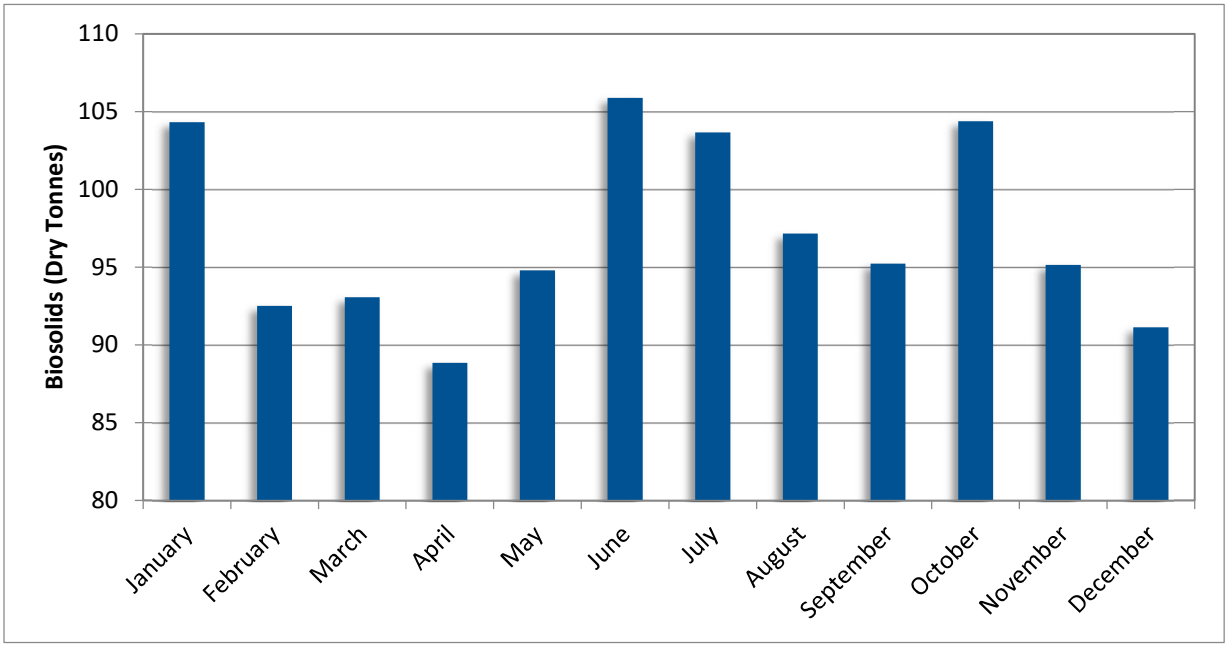
GNPCC produces Class B Biosolids. The average monthly production of biosolids in 2023 is summarized in Table 17 and graphed in Figure 11.

Percentage Solids (%) of the centrifuged biosolids decreased after October with secondary treatment. This trend is due to the consistency of the secondary sludge which retains moisture and tends to be more difficult to dewater.

Table 13. 2023 Biosolids Production

Month	Trucked Biosolids (Dry Tonnes)	Trucked Biosolids (Wet Tonnes)	% Solids (Pressed Solids)
January	104.3	537.02	19.4%
February	92.5	485.32	19.1%
March	93.1	485.25	19.2%
April	88.8	475.06	18.7%
May	94.8	503.65	18.8%
June	105.9	526.17	20.1%
July	103.7	478.81	21.7%
August	97.2	432.56	22.5%
September	95.2	429.44	22.2%
October	104.4	485.44	21.5%
November	95.1	439.62	21.6%
December	91.1	437.42	20.8%
Average	**97.2**	**476.31**	**20.5%**
Total	**1,174.3**	**5,715.8**	

Figure 11. 2023 Monthly Biosolids Production (Trucked Dry Tonnes)



6.1.1 Historical Trends

Historical average polymer usage, total trucked solids (wet tonnes and dry tonnes) and yearly average percent solids reported for biosolids produced over previous years are summarized in Table 18 and

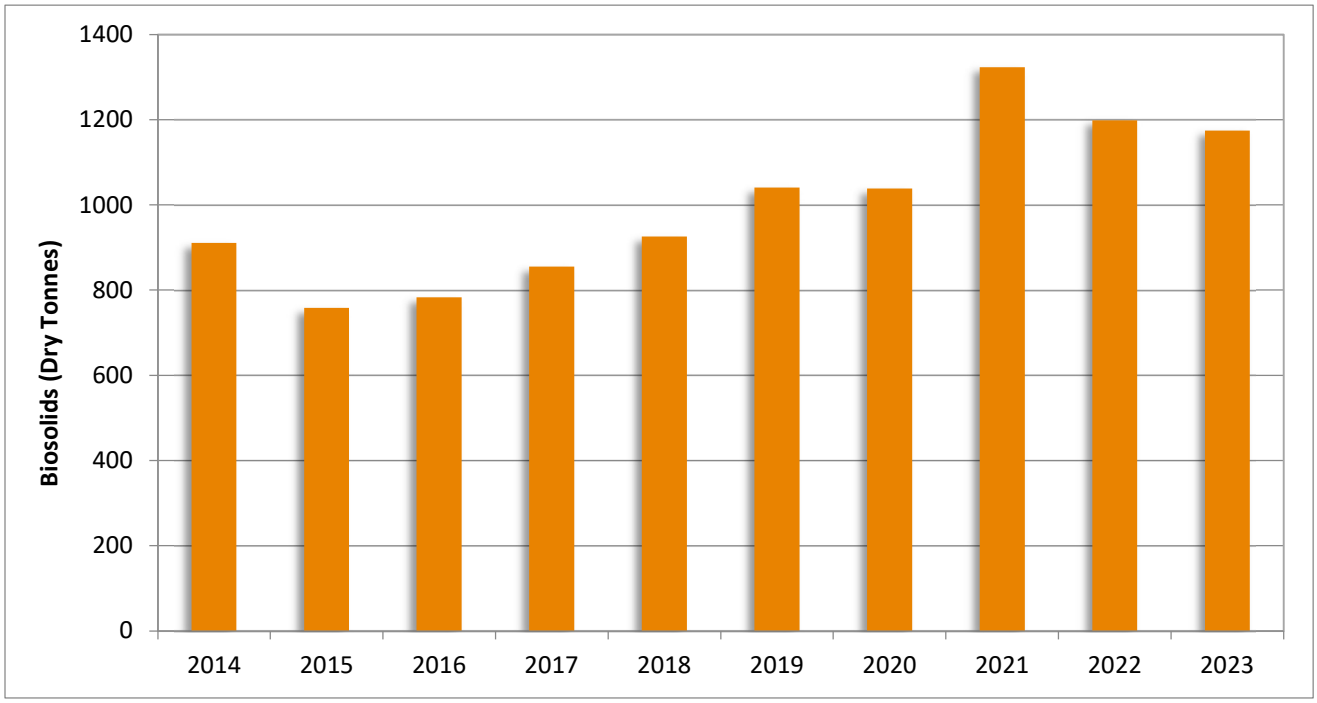
graphed in Figure 12. Biosolids production and polymer use increased after October 2020 when the secondary process was in operation.

Monthly biosolids production increased after October 2020 with the secondary treatment process.

Table 14. Historical Trends: Biosolids Production

Year	Polymer Usage (Kg/year)	Trucked Biosolids (Dry Tonnes/year)	Trucked Biosolids (Wet Tonnes/year)	% Solids (Average Pressed Solids)
2014	9,741.7	910.82	3,544.47	25.7%
2015	8,816.7	758.28	3,087.21	24.6%
2016	10,537.5	783.34	3,094.13	25.3%
2017	10,800.0	854.86	3,337.46	25.6%
2018	12,925.0	926.13	3,657.78	25.3%
2019	18,422.2	1,040.48	4,337.13	24.0%
2020	22,429.1	1,038.66	4,360.87	23.8%
2021	42,379.7	1,323.26	6,271.83	21.1%
2022	40,407.8	1,198.66	5,897.07	20.3%
2023	49,044.1	1,174.29	5,715.76	20.5%

Figure 12. Historical Trends: Biosolids Production per Year (Trucked Dry Tonnes)



6.2 Biosolids Analysis

The Permit requires quarterly testing of the biosolids for the following parameters:

Total Solids	Arsenic*	Copper*	Nickel*
Volatile Suspended Solids	Cadmium*	Lead*	Phosphorus
Moisture	Chromium*	Mercury*	Selenium*
Total Kjeldahl Nitrogen	Cobalt*	Molybdenum*	Zinc*
PCBs			

*Monitoring required by the *Organic Matter Recycling Regulation* (OMRR).

Samples of the biosolids are typically tested quarterly by an external laboratory. Average concentrations of these parameters reported in previous years are summarised in Table 19.

2023 data are consistent with historical data.

All 2023 samples from GNPCC met the Class B regulatory limits for metals in the Organic Matter Recycling Regulation (OMRR).

Table 19. Historical Trends: Biosolids General Parameters

Parameter	Units	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	OMRR Limit (Class B)
Total Solids	%	25.9	24.7	32.7	26.1	27.5	24.5	23.1	21.6	20.3	21.0	-
Volatile Solids	%	65.1	69.3	67.275	64.05	64.575	67.9	70	74.4	76.775	77.7	-
Moisture	%	74.1	75	75	75	73	76	76	78	80	79	-
Total Kjeldahl Nitrogen	% dry weight	4.71	6.90	8.23	9.33	5.23	5.31	5.40	7.03	7.98	6.93	-
Phosphorus	µg/g	29,150	26,700	24,800	29,500	30,000	23,500	27,500	23,700	18,700	18,200	-
PCB's	µg/g	<2.6	<0.05	<12	<15	<4.4	<8.5	<4.1	<1.6	<2.7	<3.2	
Arsenic	µg/g	3.3	3.2	3.2	3.4	2.8	2.4	2.7	2.5	2.3	2.33	**75**
Cadmium	µg/g	2.67	2.17	2.62	2.43	1.73	2.10	1.98	1.31	1.52	1.52	**20**
Chromium	µg/g	49.8	33.8	26.4	30.6	34.5	29.1	30.9	32.0	23.2	25.0	**1,060**
Cobalt	µg/g	3.00	3.43	3.27	3.84	3.39	2.86	2.68	3.12	2.87	3.40	**150**
Copper	µg/g	980	1095	797	618	525	457	478	559	575	653	**2,200**
Iron	µg/g	-	-	30,000	38,700	35,100	28,000	31,000	42,100	28,500	25,600	**-**
Lead	µg/g	37	34	33	32	29	24	23	24	25	25.9	**500**
Mercury	µg/g	1.89	1.46	1.80	1.55	1.76	1.29	1.47	0.89	0.80	0.856	**15**
Molybdenum	µg/g	6.58	6.78	6.63	7.46	6.55	6.09	6.37	7.76	7.57	8.06	**20**
Nickel	µg/g	16.8	17.2	16.3	18.4	18.0	16.1	15.3	13.9	12.0	14.2	**180**
Potassium	µg/g	-	-	892	1,010	985	891	920	925	927	870	**-**
Selenium	µg/g	3.90	4.95	4.32	4.96	4.50	3.65	3.93	4.76	5.01	5.48	**14**
Zinc	µg/g	903	991	972	1,050	980	824	871	912	928	972	**1,850**

6.3 Fecal Coliforms

Twelve discrete samples of biosolids were sent to an external laboratory in 2023 for fecal coliform analysis (see Appendix D for test reports). The geometric mean of the biosolids fecal coliform results in 2023 was 13,000 MPN/g dry biosolids. For Class B biosolids, OMRR requires a fecal coliform level of <2,000,000 MPN per gram of total solids (dry weight basis) to be met for the geometric mean of seven discrete samples, once per year or every 1,000 tonnes of dry weight, whichever comes first. Biosolids from GNPCC in 2023 met these requirements. Note, sampling in this report was conducted by the RDN to meet permit conditions. SYLVIS Environmental conducts a separate sampling program which is used for the Land Application Plan to meet OMRR requirements (see Appendix G).

A reduction in fecal coliform levels has been observed since the commission of the secondary treatment process. 2023 fecal coliform results are summarised in Table 20.

Table 20. 2023 Biosolids Fecal Coliforms Concentrations

Date	Fecal Coliforms (MPN/g dry)	External Laboratory
12-Jan-23	13,000	Bureau Veritas
08-Feb-23	17,000	Bureau Veritas
08-Mar-23	12,000	Bureau Veritas
12-Apr-23	9,000	Bureau Veritas
10-May-23	6,900	Bureau Veritas
07-Jun-23	71,000	Bureau Veritas
12-Jul-23	11,000	Bureau Veritas
09-Aug-23	21,000	Bureau Veritas
06-Sep-23	22,000	Bureau Veritas
11-Oct-23	6,000	Bureau Veritas
08-Nov-23	26,000	Bureau Veritas
05-Dec-23	3,700	Bureau Veritas
Geometric Mean	**13,000**	

6.4 Stabilization and Dewatering

Biosolids at GNPCC are stabilized by anaerobic digesters. The sludge collected from the bottom of the sedimentation tanks is pumped via gravity thickeners and heat exchangers to two digesters. The sludge is held in the tanks during which time it is decomposed and stabilized by biological processes. Once digested, the stabilized sludge is dewatered through a centrifuge resulting in biosolids with a moist soil-like consistency. Pathogen reduction is achieved in the anaerobic digesters to create Class B biosolids (according to parameters identifies in OMRR). Stabilization and Dewatering process data are presented in Tables 21 and 22.

Table 21. 2023 Stabilization Process Data

Stabilization Process		
Total Mass of Sludge Delivered for Stabilization	2,955	Tonnes (dry)
% of TSS as VSS in Sludge Feed	75.7	%
Mass of Biosolids Remaining after Stabilization	1637.9	Tonnes (dry)

Table 22. 2023 Dewatering Process Data

Dewatering Process		
Volume of Biosolids delivered for dewatering	101,332	m^3
% solids in biosolids dewatering feed	1.62	%
Average Volatile Solids Reduction	60.87	%
% solids in dewatered biosolids	20.5	%
Polymer dosage to aid dewatering	0.484	kg/m^3

6.5 Biosolids Management

In 2023, RDN biosolids were beneficially managed in two programs:

- Forest Fertilization
- Soil Fabrication.

6.5.1 Forest Fertilization

Forest fertilization occurs on private forested land located southwest of Nanaimo. The land is owned by TimberWest and managed by Mosaic Forest Management (Mosaic). Forest fertilization is the biosolids management option for GNPCC biosolids.

Biosolids were land applied in a forest fertilization project managed by SYLVIS Environmental (SYLVIS). SYLVIS's 2023 Biosolids Management Summary, attached in Appendix G (Section 4 page 6), provides a summary and interpretation of the effects of biosolids applications on the receiving environment.

6.5.2 Soil Fabrication

Soil fabrication operates in partnership with Harmac Pacific (Harmac). At the Harmac kraft mill site in Nanaimo, RDN biosolids from FCPCC, Harmac wood waste, and mineral soil are blended to fabricate soil.

6.5.3 Excellence in Biosolids Award

In 2019, the RDN won the Northwest Biosolids 'Excellence in Biosolids' Award for the second time. This award recognizes significant contributions to the development and implementation of cost-effective and environmentally beneficial biosolids management practices. The RDN won this award previously in 2013.

7) Process Control Monitoring

7.1 Biogas Production

A by-product of the anaerobic sludge digestion process is biogas which consists mostly of methane gas. Gas production is recorded daily at GNPCC. The average daily biogas production rate in 2023 was 4,5682 m^3/day. The total volume produced in 2023 was approximately 1,708,832 m^3. Of the total produced, 413,109 m^3 (24.17% of total production) was used as fuel for the boilers to heat operations and wastewater treatment process water and for cogeneration. The remaining 1,289,677 m^3 (75.47 % of total production) was wasted (flared).

7.1.1 Historical Trends

Historical biogas production, usage and waste rates reported over previous years are summarized in Tables 23 and 24. Biogas production rates seem to have gradually increased except for 2012, which is lower than other years as use, and flared amounts were based on only 10 months of data collection. The trend towards increased biogas production is attributed to the installation of Digester #3 after 2013.

The cogeneration system was commissioned in mid-2012. Refer to Cogeneration section for details on the Cogeneration Facility project. The cogeneration system has been offline since 2018. Servicing was completed on the cogeneration system in 2022, however.

Table 23. Historical Trends: Biogas Production

Year	Average Daily Biogas Production (m^3/day)	Total Biogas Production (m^3)	Average Daily Biogas Wasted (m^3/day)	Total Biogas Wasted (m^3)	Average Daily Biogas Useage (m^3/day)	Biogas Useage Cogen (total)	Biogas Useage Boiler (m^3)	Total Biogas Used Total (m^3)
2014	3,601	1,297,475	1,834	661,897	1,768	336,477	299,101	635,578
2015	4,040	1,458,586	2,209	797,449	1,831	478,766	182,371	661,137
2016	3,942	1,407,176	2,578	920,357	1,364	191,697	295,122	486,819
2017	4,090	1,492,730	2,471	902,057	1,618	285,450	305,224	590,674
2018	3,950	1,441,721	2,780	1,014,539	1,170	90,601	336,581	427,181
2019	3,746	1,367,432	2,742	1,000,857	1,004	1,765	364,811	366,575
2020	3,976	1,451,406	2,884	1,052,755	1,092	3,231	395,421	398,651
2021	4,491	1,639,123	3,212	1,172,274	1,279	2,254	464,595	466,849
2022	4,512	1,646,897	3,243	1,183,649	1,269	11,118	452,131	463,249
2023	4,682	1,708,832	3,533	1,289,667	1,148	6,056	413,109	419,165

Table 24. Historical Trends: Percentage Biogas Consumption and Wasting

Year	% Biogas Wasted	% Biogas Used (Boiler)	% Biogas Used (Cogen)
2014	50.92%	23.05%	25.93%
2015	54.67%	12.50%	32.82%
2016	65.40%	20.97%	13.62%
2017	60.43%	20.45%	19.12%
2018	70.37%	23.35%	6.28%
2019	73.19%	26.68%	0.13%
2020	72.53%	27.24%	0.22%
2021	71.52%	28.34%	0.14%
2022	71.87%	27.45%	0.68%
2023	75.47%	24.17%	0.35%

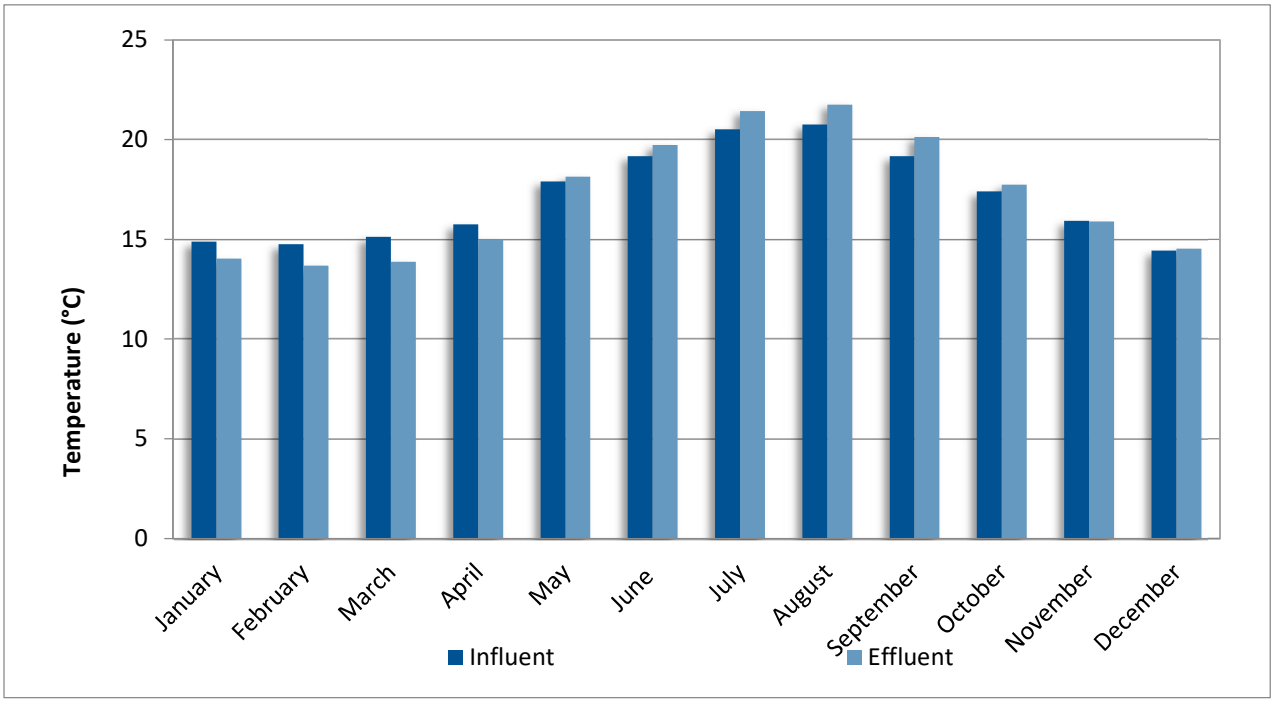
7.2 Temperature

RDN staff conduct temperature testing of the influent and effluent daily. Temperature monitoring data for GNPCC from 2023 is presented in Appendix B. The average temperature data for each month are summarized in Table 25 and graphed in Figure 13.

Table 25. 2023 Influent & Effluent Temperatures

Month	Average Temperature (°C)	
	Influent	Effluent
January	14.9	14.0
February	14.8	13.7
March	15.1	13.9
April	15.8	15.0
May	17.9	18.1
June	19.2	19.7
July	20.5	21.4
August	20.8	21.8
September	19.2	20.1
October	17.4	17.7
November	15.9	15.9
December	14.4	14.5
Average	**17.2**	**17.2**

Figure 9. 2023 Influent & Effluent Monthly Average Temperature



7.2.1 Historical Trends

Historical average temperatures for influent and effluent reported over the past ten years are summarized in Table 26. 2023 data are consistent with historical data.

Table 15. Historical Trends: Influent & Effluent Average Temperature

Year	Average Temperature (°C)	
	Influent	Effluent
2014	15.3	15.2
2015	16.5	16.3
2016	16.5	16.0
2017	15.7	15.3
2018	15.7	15.7
2019	15.7	15.8
2020	15.5	15.7
2021	16.5	16.9
2022	16.7	16.9
2023	17.2	17.2

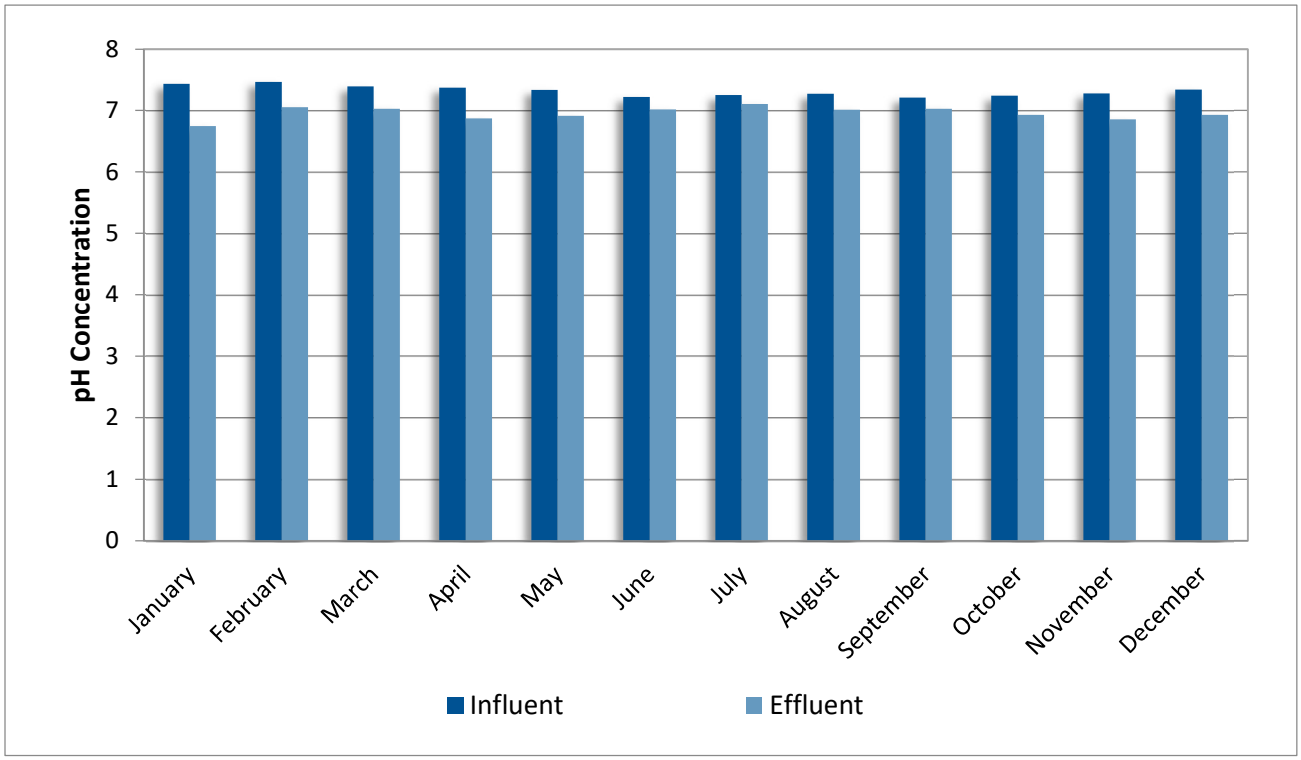
7.3 pH

RDN conducts pH testing of the influent weekly, and the effluent daily. The pH monitoring data for GNPCC from 2023 is presented in Appendix B. The average pH concentrations for each month are summarized in Table 27 and graphed in Figure 14.

Table 16. 2023 Influent & Effluent Average pH Concentration

Month	Average pH	
	Influent	Effluent
January	7.43	6.74
February	7.46	7.05
March	7.39	7.03
April	7.37	6.87
May	7.33	6.91
June	7.22	7.02
July	7.25	7.11
August	7.27	7.01
September	7.21	7.03
October	7.24	6.93
November	7.28	6.86
December	7.34	6.93
Average	**7.32**	**6.96**

Figure 10. 2023 Influent & Effluent Monthly Average pH Concentration



7.3.1 Historical Trends

Historical average influent and effluent pH concentration reported over the past ten years are summarized in Table 28. 2023 data are consistent with historical data.

Table 17. Historical Trends: Influent & Effluent pH Concentration

Year	Average pH	
	Influent	Effluent
2014	7.18	7.02
2015	7.18	7.04
2016	7.30	7.18
2017	7.30	7.16
2018	7.25	7.08
2019	7.28	7.09
2020	7.38	7.13
2021	7.42	7.00
2022	7.32	7.01
2023	7.32	6.96

7.4 Volatile Solids in the Thickeners and Digesters

The construction and commissioning of two gravity thickeners at GNPCC was completed in 2008. Prior to the addition of the gravity thickeners, sludge was held in the primary sedimentation tanks to thicken to approximately 3-4%, with the aid of alum sulphate (coagulant). From there the sludge was conveyed to the digesters for stabilization.

With the addition of the gravity thickeners, the sludge from the primary sedimentation tanks is conveyed to the gravity thickeners at a lower percent solid and thickened to approximately 5% solids before conveyance to the digesters for stabilization. There are several advantages to this; sludge is held in the primary sedimentation tanks for less time; less chemicals are required in the sedimentation tanks to keep the sludge coagulated; it maintains the effluent total suspended solids within permitted limits for discharge; and the higher percent solids reduces the volume loading on the digesters.

The average total solids and volatile solids in the sludge from the thickeners and the digesters as well as the average percent volatile solids reduction are summarized in Table 28. The volatile solids reduction increased after 2015 due to Digester #3 functioning well and thickened primary sludge entering the digesters in a stable solids level (refer to Table 29).

In 2023, the digestion process at GNPCC achieved a 60.9% reduction in volatile solids. This is a slight reduction to previous years due to increased sludge loading from the secondary process. Secondary sludge is also more difficult to breakdown (fewer volatile solids) than primary solids.

Table 18. Historical Trends: Sludge Volatile Solids Reduction

Year	Average Solids in Sludge from Thickeners (%)	Average Volatile Solids in Sludge from Thickeners (%)	Average Solids in Digested Sludge (%)	Average Volatile Solids in Digested Sludge (%)	Average Reduction in Volatile Solids in Digesters (%)
2014	3.5	80.3	1.7	64.6	54.6
2015	4.7	86.8	1.7	63.7	74.8
2016	4.6	86.6	1.8	65.1	72.3
2017	4.6	86.3	1.7	64.4	68.4
2018	4.4	86.2	1.7	63.1	67.0
2019	4.1	85.9	1.6	65.7	65.5
2020	4.0	86.4	1.3	67.3	65.7
2021	4.1	88.9	1.6	72.7	58.8
2022	4.3	90.4	1.6	75.1	61.5
2023	4.6	90.7	1.6	76.2	60.9

8) Resource Consumption

8.1 Chemical Consumption

Table 30 summarizes the consumption and costs of chemicals used in the treatment process and at the pump stations for the Southern Communities in 2023.

The total cost of chemicals purchased at GNPCC in 2023 was consistent to usage in 2022. Pricing for many chemicals increased in 2020-2023 due to ongoing market trends and supply chain issues.

The dewatering polymer increase after secondary treatment to dewater the secondary sludge in the secondary treatment process. The dewatering polymer was also changed to Wes-Floc 6816 A which is more effective dewatering the secondary sludge. With the secondary treatment process, dewatering polymer was changed from Zetag 7557 to Wes-Floc 6816 A, and the thickening polymer used in 2022 was Wes-Floc 7610 A supplied by Alumichem Canada Ltd.

In 2023, GNPCC conducted dewatering polymer trials. The dewatering polymer was switched to Wes-Floc 6614 A in December 2023 following an RFP process.

Table 30. 2023 Chemical Consumption

Chemical 2023	Consumption	Units	Cost	Use
Wes-Floc 6816 A / 6614 A	49,044	kg	$451,434	Dewatering Polymer
Wes-Floc 7510 A	18,566	kg	$106,518	DAFT Polymer
Ferrous Chloride	177,586	kg	$100,336	Odour Control
Defomer	-	-	$15,928	Defoamer
Other Chemicals	-	-	$19,546	Various
TOTAL			**$693,762**	

* Used at Chase River Pump Station

8.1.1 Historical Trends

Historical annual costs of chemicals consumed in over previous years are summarized in Table 31. A reduction in ferrous chloride consumption occurred in 2010-2011 due to issues with availability and delivery of this product. Ferric chloride was used temporarily in 2011 to bridge the gap until ferrous chloride procurement issues got resolved.

The use of Aluminum Sulphate and Superfloc A-1883 has been discontinued since October 2020 with the secondary treatment process. Dewatering polymer was changed from Zetag 7557 to Wes-Floc 6816 A to treat secondary sludge. Dewatering polymer was switched to Wes-Floc 6614 A in December 2023. Wes-Floc 7510 A was used as the thickening polymer.

Table 19. Historical Trends: Chemical Consumption

Year	Dewatering Polymer	Kemira Superfloc A-1883RS	DAFT Polymer	Ferrous Chloride	Aluminum Sulphate	Secondary Polymer	Defoamer	Odour Control	Other	Total Cost
2014	$80,369	$41,323		$36,978	$328,853					$487,522
2015	$72,738	$17,521		$58,562	$243,620					$392,440
2016	$86,934	$18,616		$58,346	$271,384					$435,280
2017	$89,100	$25,906		$51,131	$279,749					$445,887
2018	$106,631	$39,421		$52,163	$320,279					$518,494
2019	$146,456	$40,180		$66,054	$394,943				$8,660	$656,293
2020	$178,311	$27,664		$50,978	$316,817	$27,332	$7,448	$2,065	$4,696	$615,311
2021	$326,666	-	$115,622	$48,392	-	-	$13,087	$6,628	$873	$511,268
2022	$349,169	-	$106,292	$52,389	-	-	$10,618		$24,500	$542,968
2023	$451,434	-	$106,518	$100,336	-	-	$10,618		$24,500	$693,406

8.2 Electrical Consumption

Historical annual electrical consumption and costs are summarized in Table 32 and graphed in Figure 15. In general, electrical consumption increases in years where there are major construction projects. Additionally, although not directly measured, the increased reliance on mechanical mixing in the digesters accounts for increases in electrical consumption in recent years, the pumps that do this mixing use substantial electricity.

Due to a connection issue that prevented BC Hydro from reading GNPCC's electrical meter in the secondary upgrade, the RDN did not receive invoices. Electrical consumption and cost in 2020 and 2021 were estimated based on metered consumption data from BC Hydro from July 22, 2021, to present.

No consumption information or invoices were received for 2020. 2020 consumption and invoicing were based on the 2021 trend, and commissioning of secondary treatment in October 2020.

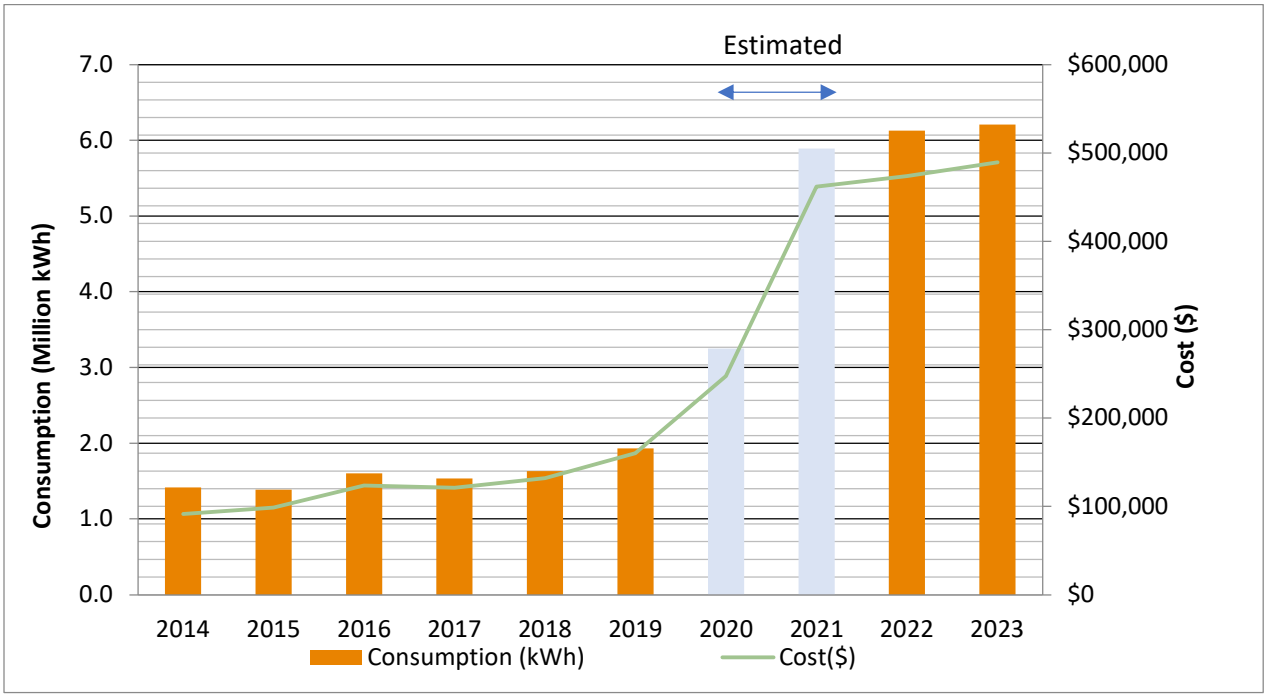
Electricity consumption at GNPCC increased after 2020 to the bioreactors and process equipment installed in the secondary upgrade. The increase in electricity use was mitigated by the installation of turbo-blowers which are more efficient assisted by a BC Hydro energy efficiency grant.

Table 20. Historical Trends: GNPCC Electrical Consumption

Year	Consumption (kWh)	Cost ($)
2014	1,416,600	$91,633
2015	1,386,000	$98,382
2016	1,602,000	$123,425
2017	1,533,600	$121,043
2018	1,631,700	$131,851
2019	1,931,400	$159,954
2020	3,252,043*	$247,216 *
2021	5,893,329*	$461,730 *
2022	6,127,665	$473,888
2023	6,209,011	$489,531

Note: Electrical consumption at the treatment plant only (pump stations are excluded).
* No electricity invoices were received for 2020. 2021 use was metered after July 22, 2021. Annual consumption and cost were estimated for both 2020 and 2021.
* Electricity costs do not include tax.

Figure 11. Historical Trends: GNPCC Electrical Consumption and Costs (Treatment Plant Only)



8.3 Water Consumption

The estimated water consumption at GNPCC for 2023 was estimated to be 110,735 m^3. Water consumption increased in 2020 and early- 2021 due to the commission of secondary treatment and filling of tanks to commissioning.

The increased water use in 2023 is attributed to increased dilution water used in the dewatering process in 2023. A new dewatering polymer is anticipated to reduce dilution water needed.

Historical treatment plant water consumption (pump stations excluded) is summarized in Table 33.

Table 21. Historical Trends: GNPCC Water Consumption

Year	Water Consumption (m^3)
2014	53,914
2015	35,061
2016	35,994
2017	64,871
2018	70,852
2019	77,738
2020	105,500
2021	118,810
2022	93,706
2023	111,281

9) Cogeneration

In 2005, Wastewater Services applied to the Federation of Canadian Municipalities (FCM) for a Green Municipal Fund grant to install a cogeneration system at GNPCC. A cogeneration system would convert wasted digester biogas into electricity to be used in treatment plant operations. It is estimated that a cogeneration system using 100% of wasted gas could produce enough electricity to satisfy 90-100% of the present electrical requirements of the plant. A cogeneration system would eliminate the emissions currently flared to the environment and result in electrical cost savings to GNPCC. FCM awarded Wastewater Services this grant in the summer of 2006. This grant money was only to be used for a field test, and not the full-scale implementation of a cogeneration system. Thus, Wastewater Services applied for another grant under the Gas Tax Program Incentive Fund to install a full-scale, permanent cogeneration system, including the construction of a cogeneration building to house the associated generators. The grant was awarded in July 2008.

Construction of the GNPCC Cogeneration Facility was commissioned in September 2012, producing methane gas to run the generator. All cogenerated electricity is sold to BC Hydro.

The cogeneration system was offline since 2019 because the system's gas skid was inoperable, and operator resources were taken up by the secondary upgrade. The RDN communicated with BC Hydro in May 2019 that the cogeneration facility would not be operated until after the upgrade is completed to optimize resources. The RDN is currently in discussions with BC Hydro about upgrades to the system.

The cogeneration system was run between June 15 and 20 in 2022 for a recommissioning test.

Table 34 contains a summary of the energy generated by the cogeneration unit and the revenue obtained from selling this electricity to BC Hydro.

Table 22. Historical Cogeneration Unit Electricity Production and Revenue Generated

Year	Eligible Energy (MWh)	Revenue ($)
Sept to Dec 2012	48.6	$5,826
2013	144.5	$15,672
2014	499.9	$54,926
2015	732.5	$72,399
2016	236.2	$24,044
2017	448.5	$50,429
2018	135.5	$13,583
2019	0.0	$0
2020	0.0	$0
2021	0.0	$0
2022	0.0	$0
2023	0.0	$0
Total	**2,246**	**$236,880**

10) Odour

Three odour concerns were received in 2023 for GNPCC, Pump Stations, and Interceptor. See Appendix E for individual incident reports. Table 35 quantifies the monthly odour concerns received in 2023.

Table 23. 2023 Odour Concerns

Month	Odour Concerns	
	GNPCC	Pump Stations and Interceptor
January	0	0
February	0	0
March	0	0
April	0	0
May	1	0
June	0	0
July	0	0
August	0	2
September	0	0
October	0	0
November	0	0
December	0	0
Total	**1**	**2**

In 2023, GNPCC operations received three odour concerns in total (see summary below):

One was from near GNPCC:

- A concern was received on May 2, 2023, from an individual who lives near GNPCC. This was attributed to secondary clarifier being pumped down for maintenance. The odour concern was resolved once the maintenance was completed.

Two were from locations near Wellington Pump Station:

- Two concerns were received in August during the hot weather months of reports of odours coming from Welling pump station. Operators added odour modifier to the wet well to mitigate odours during the hot weather events.

10.1 Historical Trends

The number of odour concerns reported in the past ten years are summarized in Table 36.

Table 24. Historical Trends: GNPCC and Pump Stations – Number of Odour Concerns

Year	Odour Concerns
2014	8
2015	9
2016	6
2017	11
2018	6
2019	6
2020	8
2021	10
2022	6
2023	3

10.2 Odour Episode

An odour episode is a disruption in the regular operation of the treatment plant or operations that may cause odour. The other concerns were due to regular function however improvements. One odour episode was identified in the odour records:

- Odours were associated with maintenance on the secondary clarifiers.

The odour concerns received near Wellington pump station were attributed to the regular function of the wastewater system and the impact of warm weather events on those systems. The design of the Wellington pump station upgrades will include odour control system improvements.

Several of the plant processes resulting in odour concerns have recently been installed in the secondary upgrade and optimizations with the odour control systems on these new processes are ongoing.

11) Septage Receiving

Septage and Pump and Haul are received at the Chase River Pump Station (CRPS) Septage Receiving Site. The total combined volume of Septage and Pump and Haul discharged in 2023 was 2,552,461 Imperial gallons (11,604 m^3).

Please note this volume does not include sludge from the Duke Point Pollution Control Centre (DPPCC) wastewater treatment process which undergoes further treatment at GNPCC. This volume is tabulated in the 2023 DPPCC Annual Report.

11.1 Historical Trends

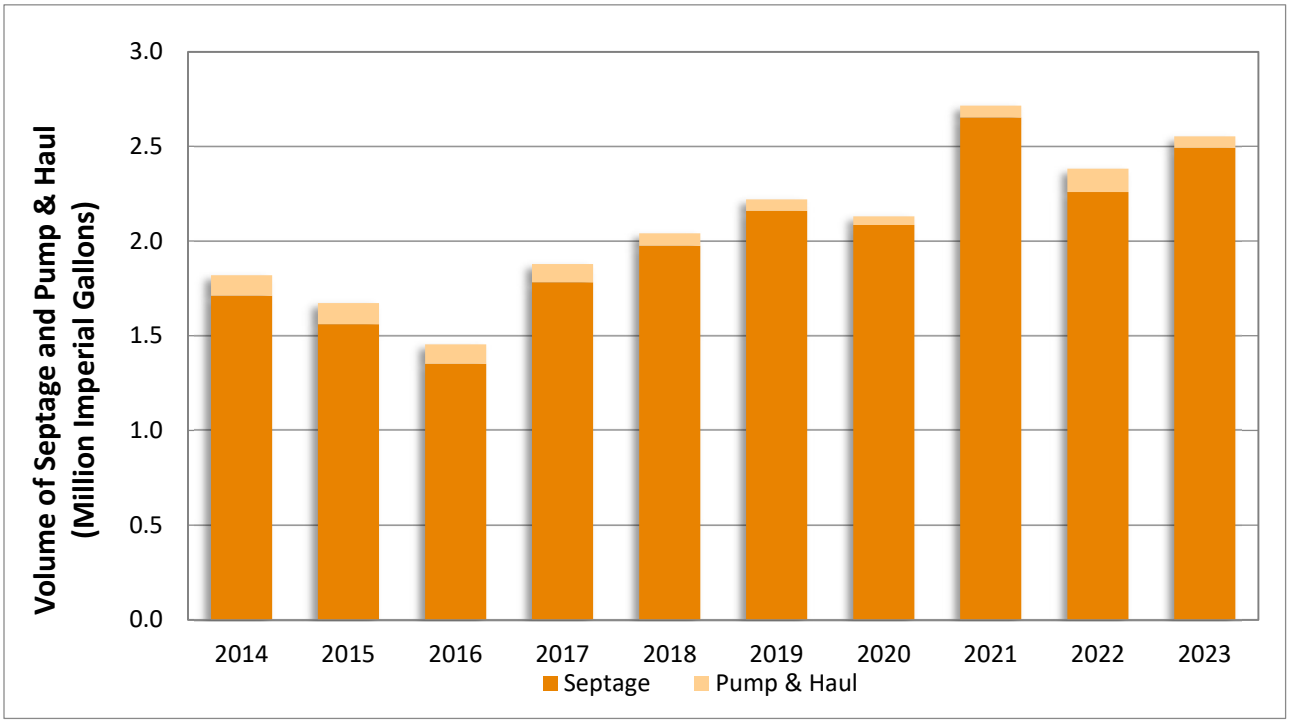
The volumes of septage and pump & haul discharged previous years are summarized in Table 37 and graphed in Figure 16.

At Chase River pump station, several policies were implemented over the last several years to improve tracking of septage deliveries including locking out the rock trap, and auditing pump and haul and reduced loads. It is worth noting that there has been a large amount of annual variability in the amount of septage and pump & haul discharged at CRPS.

Table 37. Historical Trends: Septage and Pump & Haul discharged at Chase River Pump Station

Year	Total Septage (Imperial gallons)	Total Pump & Haul (Imperial gallons)	Combined Total (Imperial gallons)	Combined Total (m^3)
2014	1,711,490	108,560	1,820,050	8,274
2015	1,560,351	112,584	1,672,935	7,605
2016	1,351,493	103,382	1,454,875	6,614
2017	1,782,232	96,982	1,879,214	8,543
2018	1,974,861	66,036	2,040,897	9,278
2019	2,159,556	60,480	2,220,036	10,092
2020	2,084,085	46,637	2,130,722	9,686
2021	2,652,432	62,791	2,715,223	12,344
2022	2,259,010	122,408	2,381,418	10,826
2023	2,492,843	59,618	2,552,461	11,604

Figure 12. Annual Volume of Septage and Pump & Haul Discharged at CRPS (GNPCC)



11.2 Septage Testing

Septage from CRPS used to be tested quarterly for a series of parameters. In December 2013, the monitoring program discontinued because:

- Sampling of septage is not required for any regulatory authorities as it enters the main waste stream where the final effluent is tested before being discharged to the receiving environment.
- Sufficient historical data created a reference and determined that septage had a negligible impact on overall effluent quality.
- A random sampling program that targets haulers directly may better detect the discharge of unauthorized waste.

In 2019, the RDN implemented a new sampling protocol for testing septage discharged by haulers at CRPS. One hauler per quarter were randomly selected, their discharge was tested for a variety of parameters, and results were compared to the Trucked Liquid Waste Rates and Regulations Bylaw No. 1732.

The random septage sampling program has not occurred since 2020, however. Sampling safety issues and bylaw limit review will need to be resolved before this program is resumed.

12) Contributory Population and Remaining Plant Capacity

The estimated population serviced in 2023 was 106,181 with a projected annual growth rate of approximately 1.97%. The population figure incorporates the 2021 Census data. In 2023, the average daily flow was 33,547 m^3/day and the maximum daily flow was 95,847 m^3/day.

The capacity of GNPCC has increased with the installation of a Digester #3 and Sedimentation Tank #4 in 2013. The secondary treatment upgrade will also increase plant capacity. The design capacity of the secondary upgrade was an average annual flow of 46,000 m^3/day and a maximum daily flow of 126,000 m^3/day. The secondary upgrade was designed to provide treatment for service population of 120,000.

The RDN continues to install new equipment and upgrade existing technology to ensure the future carrying capacity of the treatment plant is adequate and permit levels are not exceeded.

13) Environmental Incidents

Records are maintained regarding any environmental incidents that are associated with the RDN's wastewater infrastructure and treatment facilities.

In 2023, no environmental incidents were recorded for GNPCC.

14) Facility Upgrades and Major Projects

14.1 Upgrades and Repairs Completed in 2023

- Ventilation Status Monitoring
- Wet Well Cleaning: Departure Bay Pump Station

14.2 Studies and Projects Completed in 2023

- VIU Odour monitoring study.
- Emerging Substances of Concern Study.
- Facility Condition Assessment.
- Wellington Pump Station Ventilation and Capacity Increase Engineering Design
- Partnership agreement between GNPCC and BC Centre for Disease Control (BC CDC) for monitoring of Covid-19 in wastewater influent.
- WSBC Process Safety Management Initiative.
- Grit and Sed Tank Coating and Condition Assessment.

14.3 Upgrades and Repairs Planned for 2024

- Northshore manhole repairs.
- Centrifuge #1 Rotating Assembly Rebuild
- Basement MCC Replacement Upgrade.
- Departure Bay Pump Station Upgrade – Detailed Design
- Wellington Pump Station Upgrade – Detailed Design.

14.4 Studies and Projects Planned for 2024

- Grit Piping Design
- VIU Odour monitoring study
- Receiving Environment Monitoring Program
- ISO14001:2015 Surveillance Audit
- GNPCC Biosolids PFAS testing pilot project
- Covid-19 monitoring with BC CDC.

15) Resource Recovery

15.1 Biosolids Reuse

Since 1999, RDN biosolids have been beneficially used in agriculture, landfill closures, mine reclamation, and forest fertilization. Biosolids management in 2023 is discussed in Section 6.5.

15.2 Effluent Reuse

GNPCC can reuse effluent in operational processes for diluting polymer, which decreases the demand for potable water from the community's supply. In 2023, effluent was used as process water. Potable water was used as wash down water due to the disinfection capacity of the effluent reuse system.

15.3 Solid Waste Recycling

Wastewater Services has a general recycling program at the treatment plant, initiated as part of the department's ISO 14001 Environmental Management System, and continues to recycle waste oils, paints, and paint thinners.

15.4 Cogeneration

Cogeneration is discussed in Section 9.

16) Education Programs

16.1 Source Control

Source Control Bylaw No. 1730 approved by the RDN Board in 2015 regulates the discharge of waste into any sewer or drain connected to a sewage facility operated by the RDN. The bylaw provides a process for issuing Waste Discharge Permits and a new fee structure based on waste strength and volume. The bylaw applies to discharges in municipal collection systems. The Bylaw also contains prohibited waste items and new provisions for fees and enforcement.

The Trucked Liquid Waste Rates and Regulations Bylaw No. 1732 approved by the RDN Board in 2017 includes source control provisions including an expanded schedule of prohibited wastes and a new a schedule of restricted wastes. It also includes enforcement tools.

16.2 Water Conservation

The RDN has a water conservation and outreach program called Team WaterSmart for municipalities in the region and electoral areas.

The RDN's Board also recently approved a new Water Conservation Plan in 2020. This plan was completed in collaboration with water conservation planning work done by the City of Nanaimo, District of Lantzville, and other member municipalities.

16.3 Open House

The RDN held an open house at GNPCC on May 6, 2023. Open Houses are occasionally offered to provide the public with an opportunity to tour the facilities, learn about recent upgrades, browse information, and ask questions.

16.4 SepticSmart

SepticSmart is an RDN educational program that provides information on septic system operation and maintenance. It aims to prolong the life of functioning systems in the region. The SepticSmart program includes an information package, annual workshops, and a rebate program. Two SepticSmart workshops were held in 2023. More information on the SepticSmart Program is available at: https://www.rdn.bc.ca/septicsmart.

In 2014, the RDN launched the SepticSmart program to: 1) make it easier for residents to manage septic system maintenance, 2) promote long-term maintenance habits, and 3) maximize the longevity of existing onsite systems. The SepticSmart rebate program was offered in 2023. To date, more than $365,000 in rebates have been issued to homeowners towards septic tank repairs and maintenance as part of this program.

16.5 Liquid Waste Management Plan

The RDN Liquid Waste Management Plan (LWMP) is a 20-year plan to support sustainable wastewater management in the region. This plan authorizes the RDN to find community-driven and cost-effective solutions to protect public health and achieve a standard level of wastewater treatment over a

reasonable timeframe. The BC Minister of the Environment approved the RDN's LWMP in October 2014. An annual report on LWMP implementation will be submitted under separate cover in June.

In December 2023, the RDN submitted a request to the Province of BC for an LWMP Amendment.

16.6 Website

The RDN's Wastewater Services department website www.rdn.bc.ca/wastewater-services is regularly updated and provides education material related to wastewater treatment, environmental management, pollution prevention and septic system maintenance (the SepticSmart program).

The Get Involved portion of the RDN website is an online public engagement space that hosts outreach information specific to the regional projects. In 2023, the following GNPCC projects were highlighted on the Get Involved page:

- Chase River Pump Station and Haliburton Street Sanitary Sewer Forcemain Upgrades
- North Slope Interceptor Erosion Protection Works
- Liquid Waste Management Plan Amendment.

17) Conclusions

Table 38 provides a summary of the 2023 GNPCC permit monitoring data:

Table 25. GNPCC Summary of Compliance

Summary of Compliance	Permit	2023	Permit Exceedances
Maximum Daily Flow	80,870 m^3/day	95,897 m^3/day	2
Average Daily Flow	40,950 m^3/day	33,547 m^3/day	0
Average Daily $cBOD_5$	130 mg/L	7.97 mg/L	0
Average Daily TSS	130 mg/L	8.52 mg/L	0

17.1 Flows

Daily flow monitoring data for GNPCC for 2023 are presented in Appendix B. The total flow discharged from GNPCC in 2023 was 12,244,604 m^3, at an average annual flow of 33,547 m^3/day. There were two maximum daily flow non-compliances. Details of the non-compliances are reported in Section 4.1 of this report and in Appendix C.

17.2 Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)

The influent and effluent average $cBOD_5$ concentration for 2023 was 262 mg/L and 7.97 mg/L, respectively. The average removal efficiency was 96.7%. There were no $cBOD_5$ non-compliances in 2023, where the maximum permitted $cBOD_5$ concentration was exceeded.

17.3 Total Suspended Solids (TSS)

The influent and effluent average TSS concentration was 543 mg/L and 8.52 mg/L, respectively. The average TSS removal efficiency in 2023 was approximately 98.1%.

There were no TSS non-compliances in 2023 where the maximum permitted TSS concentration was exceeded.

17.4 Ammonia Nitrogen and Toxicity

The average ammonia nitrogen concentration in the effluent for 2023 was 20.0 mg/L and the average toxicity (LC_{50}) of the effluent for 2023 was determined to be >100% (non-acutely toxic).

2023 effluent ammonia levels were reduced in comparison to results prior to primary treatment due to the ammonia nitrification occurring in the secondary treatment process.

17.5 General Parameters, Metals, Volatile and Semi-Volatile Compounds

Results reported for 2023 for all general parameters, metals, volatile and semi-volatile compounds were all consistent with historical data. Several parameters showed reductions after the secondary wastewater treatment process was commissioned in 2020.

17.6 Biosolids Quality

The biosolids generated by the GNPCC in 2023 contained concentrations of metals and fecal coliforms which met the standards for Class B biosolids given in Schedules 3 and 4 of the OMRR. Biosolids are currently being land applied in a Forest Fertilization and a Soil Fabrication program.

Appendix A – Waste Management Permit No. PE00338 & Amendments

Province of
British Columbia

MINISTRY OF
ENVIRONMENT,
LANDS AND PARKS

BC Environment

Vancouver Island Region
Environmental Protection
2569 Kenworth Road
Nanaimo, British Columbia
V9T 4P7
Telephone: (604) 751-3100
Fax: (604) 755-2473

REGISTERED MAIL

Date: JUN 0 2 1994

File: PE00338

Regional District of Nanaimo
6300 Hammond Bay Road
PO Box 40
Lantzville BC V0R 2H0

Dear Permittee:

Enclosed is a copy of amended Permit No. PE00338 issued under the provisions of the Waste Management Act. Your attention is respectfully directed to the terms and conditions outlined in the Permit.

The Ministry of Environment, Lands and Parks has established the policy that secondary treatment is the minimum level of treatment required for municipal sewage discharges to surface waters. This policy will apply to existing discharges with no or primary treatment, in stages, taking into account the assimilative capacity of the receiving environment, the ability to finance the upgraded sewage treatment facilities, population growth and public input to the waste planning process. Liquid Waste Management Plans (LWMPs) may be used to determine the schedule for upgrading to secondary treatment. The Regional District of Nanaimo has indicated its intention to develop a LWMP for School District 68. Please note the requirements of Section 4.1 of the Permit and, if necessary, contact this office for further discussion on this matter.

Section 3.3 of the Permit requires the Permittee to undertake a receiving environment monitoring program. L.J. Erickson, P.Bio., of this office should be consulted during development of the program.

Section 1.1.1 of the permit specifies average and maximum discharge rates which correspond to the present population served and the design capacity of the treatment works. Section 4.4 of the Permit states that the Permittee may be required to undertake an infiltration and inflow control program.

This Permit does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority shall rest with the Permittee.

The Permittee shall ensure that any discharge under this Permit meets the requirements of other regulatory agencies including, but not restricted to, Environment Canada and the Department of Fisheries and Oceans (Canada).

. . . 2

ACL 94/5/31
01-Jun-94

An annual Permit fee will be determined according to the Waste Management Permit Fees Regulation.

This Permit may be appealed by persons who consider themselves aggrieved by this decision in accordance with Part 5 of the Waste Management Act. Written notice of intent to appeal must be received by the Regional Waste Manager within twenty-one (21) days.

The administration of this Permit will be carried out by staff from our Regional Office located at 2569 Kenworth Road, Nanaimo, British Columbia, V9T 4P7 (telephone 751-3100). Plans, data, and reports pertinent to the Permit are to be submitted to the Environmental Protection office at this address.

Yours truly,

G.E. Oldham, P.Eng.
Regional Waste Manager
Vancouver Island Region

Enclosure

ACL 94/5/31
01-6-94

PROVINCE OF
BRITISH COLUMBIA

Environmental Protection
2569 Kenworth Road
Nanaimo
British Columbia, V9T 4P7
Telephone: (604) 751-3100

MINISTRY OF ENVIRONMENT,
LANDS AND PARKS

PERMIT
PE00338

Under the Provisions of the Waste Management Act

Regional District of Nanaimo

6300 Hammond Bay Road

PO Box 40

Lantzville, British Columbia

V0R 2H0

is authorized to discharge effluent from a municipal sewage treatment plant located in Nanaimo, British Columbia to the Strait of Georgia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the Waste Management Act and may result in prosecution.

1. AUTHORIZED DISCHARGES

1.1 The discharge of effluent to which this Section is applicable is from a municipal sewage treatment plant as shown on the attached Site Plan A. The B.C. Environment reference number (S.E.A.M. site number) for this discharge is E100008.

1.1.1 The rate at which effluent may be discharged is:

Average - $27{,}730 \times (1.0417)^{(\text{calendar year} - 1994)}$ m^3/d
to a maximum of 40,950 m^3/d

Maximum Daily - 80,870 m^3/d

1.1.2 The characteristics of the discharge shall not exceed:

5-Day Biochemical Oxygen Demand - 130 mg/L
Total Suspended Solids - 130 mg/L

G.E. Oldham, P. Eng.
Regional Waste Manager

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1.1.3 The works authorized are a headworks channel, screening facilities, grit and scum removal facilities, primary sedimentation facilities, sludge digestion facilities, sludge dewatering facilities, an outfall extending 2,030 m from mean low water to a minimum depth of 70 m below mean low water, diffuser, and related appurtenances approximately located as shown on the attached Site Plan A.

1.1.4 The works authorized must be complete and in operation on and from the date of this amended Permit.

1.1.5 The location of the works authorized, excepting the outfall and diffuser, is Lot 1, Plan 26263, District Lot 51, Wellington Land District.

1.1.6 The location of the point of discharge is the Strait of Georgia approximately as shown on the attached Site Plan A.

2. GENERAL REQUIREMENTS

2.1 Maintenance Of Works

The Permittee shall inspect the pollution control works regularly and maintain them in good working order. Notify the Regional Waste Manager of any malfunction of these works.

2.2 Emergency Procedures

In the event of an emergency or condition beyond the control of the Permittee which prevents continuing operation of the approved method of pollution control, the Permittee shall immediately notify the Regional Waste Manager and take appropriate remedial action.

2.3 Bypasses

The discharge of effluent which has bypassed the designated treatment works is prohibited unless the consent of the Regional Waste Manager is obtained and confirmed in writing.

2.4 Process Modifications

The Permittee shall notify the Regional Waste Manager prior to implementing changes to any process that may affect the quality and/or quantity of the discharge.

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2.5 Posting of Outfall

The Permittee shall erect a sign along the alignment of the outfall above high water mark. The sign shall identify the nature of the works. The wording and size of the sign requires the consent of the Regional Waste Manager.

2.6 Disinfection

Although disinfection of the effluent is not required at this time, suitable provisions should be made to include disinfection facilities in the future. If disinfection is by chlorination, dechlorination facilities will also be required.

2.7 Sludge Wasting and Disposal

Sludge wasted from the treatment plant shall be disposed of to a site and in a manner authorized by the Regional Waste Manager.

2.8 Outfall Inspection

The Permittee shall conduct a dye test on the outfall line (or inspect by another method approved by the Regional Waste Manager) every five years or as may otherwise be required by the Regional Waste Manager.

2.9 Facility Classification

The Permittee shall classify the wastewater treatment facility authorized in Section 1 (the facility) and the classification shall be maintained with the "British Columbia Water and Wastewater Operators Certification Program Society" (BCWWOCPS). The Permittee shall submit an application to classify the facility to BCWWOCPS by October 31, 1994.

2.10 Operator Certification

If the facility is classified by the BCWWOCPS (the Program) at Level II or higher, the Permittee shall ensure that all operators of the facility shall be certified by the Program to a Class I level, at a minimum, by December 1, 1994.

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Operators in Training

The Permittee shall ensure that all operators in training (OIT) working at the facility classified by the BCWWOCPS at Level II or higher shall be required to successfully pass an OIT examination within three (3) months of commencement of employment at the facility. The OIT certificate shall be valid for fifteen (15) months from the date of issue. Prior to the expiry date of the OIT certificate, but not sooner than twelve (12) months from the date when the OIT commenced facility operation, the OIT shall successfully complete a Class I certification examination in order to continue to operate at the facility.

Chief Operator: Level II or Higher

If the facility is classified by the BCWWOCPS at level II or higher, the Permittee shall designate at least one operator to be the "Chief Operator" of the facility by December 1, 1996. The "Chief Operator" shall be certified at a Class II level, at a minimum.

After December 1, 1996, no person shall have "Direct Responsible Charge", as defined by the BCWWOCPS, of a municipal wastewater treatment facility classified at Level II or higher unless they possess a valid operator's certificate not more than one level below the classification level of the facility.

Chief Operator: Level III and IV

If the facility is classified by the BCWWOCPS at level III, the Permittee shall designate a "Chief Operator", certified at a Class III level by December 1, 1998.

If the facility is classified by the BCWWOCPS at Level IV, the Permittee shall designate a "Chief Operator" certified at a Class IV level by December 1, 1998.

3. MONITORING AND REPORTING REQUIREMENTS

3.1 Discharge Monitoring

3.1.1 Flow Measurement

Provide and maintain a suitable flow measuring device and record once per day the effluent volume discharged over the preceding 24-hour period.

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3.1.2 Sampling and Analysis

The Permittee shall install, provide, and maintain suitable sampling facilities and obtain composite samples and analyses of the effluent as follows:

Contaminant	Frequency
5-Day Biochemical Oxygen Demand	Daily
Total Suspended Solids	Daily
Ammonia Nitrogen	Quarterly
Toxicity	Quarterly

The following contaminants at a frequency of once every six months:

pH,	Cyanide (total),	Tetrachloroethylene,
Alkalinity,	Fluoride (dissolved),	Trichloroethane,
Chloride,	Iron (dissolved),	Trichloroethylene,
Nitrogen (total kjeldahl),	Lead (total),	
Oil and Grease,	Manganese(dissolved),	Benzene,
Phosphorous (total),	Mercury (total),	Ethylbenzene,
Sulphate (dissolved),	Molybdenum (total),	Toluene,
Sulphide (dissolved),	Nickel (dissolved),	
	Selenium (total),	Phenols,
Aluminum (total),	Silver (total),	Total Organic Carbon,
Arsenic (total),	Tin (total),	
Barium (dissolved),	Zinc (total),	2-EthylHexyl Phthalate,
Boron (dissolved),		Di-N-Butyl Phthalate,
Cadmium (dissolved),	Chloroform,	
Chromium (total),	Dichlorobromo-methane,	Naphthalene,
Cobalt (dissolved),	Dichloromethane,	
Copper (dissolved),	Methylene Chloride,	Polychlorinated Biphenyls.

Samples shall be composited in proportion to effluent flow over 24 hours. All sampling facilities, locations, techniques and equipment require the consent of the Regional Waste Manager.

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3.2 Biosolids Monitoring

The Permittee shall obtain a representative sample of the treated biosolids once every quarter and obtain analyses of the sample for the following:

Total Solids,	Arsenic,	Molybdenum,
Moisture,	Cadmium,	Nickel,
Volatile Suspended	Chromium,	Phosphorous,
Solids,	Cobalt,	Selenium,
Polychlorinated	Copper,	Zinc.
Biphenyls,	Lead,	
Total Kjeldahl Nitrogen,	Mercury,	

3.3 Monitoring of the Receiving Environment

The Permittee shall monitor the receiving water quality and carry out chemical, physical and biological studies on the receiving environment as required by the Regional Waste Manager.

The Permittee shall submit a proposed receiving environment monitoring program to the Regional Waste Manager by October 31, 1994 for approval. The program should be established in consultation with the Regional Waste Manager. Based on the results of this monitoring program, the receiving environment monitoring requirements may be extended or altered by the Regional Waste Manager. The approved program shall commence by January 1, 1995.

3.4 Monitoring Procedures

3.4.1 Sampling And Analytical Procedures

Sampling and flow measurement shall be carried out in accordance with the procedures described in "Field Criteria for Sampling Effluents and Receiving Waters", April 1989, or by suitable alternative procedures as authorized by the Regional Waste Manager.

Analyses are to be carried out in accordance with procedures described in "A Laboratory Manual for the Chemical Analysis of Waters, Wastewaters, Sediments and Biological Materials, (1976 edition including updates)", April 1989, or by suitable alternative procedures as authorized by the Regional Waste Manager.

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Copies of the above manuals are available from the Environmental Protection Division, Ministry of Environment, Lands and Parks, 777 Broughton Street, Victoria, British Columbia, V8V 1X4, at a cost of $20.00 and $70.00 respectively, and are also available for inspection at all Environmental Protection offices.

Proper care should be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination, breakage, etc.

3.4.2 Toxicity

Analyses for determining the toxicity of liquid effluents to fish shall be carried out in accordance with the procedures described in the "Provincial Guidelines and Laboratory Proeedures for Measuring Acute Lethal Toxicity of Liquid Effluents to Fish" November 1982. The Regional Waste Manager will advise the Permittee which method of measurement for expressing lethal toxicity shall be used. The method of sampling and the method of bioassay will be determined by the Regional Waste Manager.

Copies of the above manual are available from the Environmental Protection Division, 777 Broughton Street, Victoria, British Columbia, V8V 1X4, at a cost of $5.00, and are also available for inspection at all Environmental Protection offices.

3.5 Reporting

Maintain data of analyses and flow measurements, collected under Sections 3.1 through 3.3, for inspection and every quarter submit the data, suitably tabulated in a machine readable format, for entry in the Ministry of Environment, Lands and Parks computer database, to the Regional Waste Manager for the previous quarter. All reports shall be submitted within 31 days of the end of each quarter. The first report is to be submitted by October 31, 1994. Based on the results of the monitoring program, the Permittee monitoring requirements may be extended or altered by the Regional Waste Manager.

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3.6 Annual Report

The Permittee shall submit an annual report which shall include a summary and interpretation of the data submitted under Section 3.5, an interpretation of the effects of the effluent and biosolids discharges on the receiving environment, and a summary of treatment plant operations, for the preceding calendar year. In addition, the Regional Waste Manager may require that the annual report include summaries and progress reports of the matters identified in Sections 4.2 through 4.8, and any 5Rs (Reduce, Reuse, Recycle, Recover, Residual) activities, for the preceding calendar year. The annual report shall be submitted within 60 days of the end of each calendar year and shall be made available by the Regional District of Nanaimo to the public upon request. The first annual report shall be submitted by February 28, 1995.

4. ADDITIONAL REQUIREMENTS

4.1 Liquid Waste Management Plan

The Regional District of Nanaimo has indicated its intention to develop a Liquid Waste Management Plan for School District 68. Accordingly, the Permittee shall submit a proposed schedule for the development of a Liquid Waste Management Plan to the Regional Waste Manager by October 31, 1994 for approval. The Plan shall be developed in accordance with ministry guidelines and shall include, but not be limited to, a schedule to upgrade the discharge to secondary treatment, an infiltration and inflow control program, a source control program, a stormwater management program, a biosolids management program, and an odour control program. All aspects of the Plan shall be to the satisfaction of the Regional Waste Manager.

4.2 Effluent Upgrading

The Permittee may be required to submit a schedule, for upgrading of the discharge to secondary treatment, to the Regional Waste Manager for approval. Based on receiving environment monitoring data and/or other information obtained in connection with this discharge, the Permittee may be required to provide additional treatment facilities and/or upgrade the discharge to secondary treatment.

4.3 Land Requirements

The Permittee shall secure and hold in reserve sufficient land to allow for future expansion and upgrading of the sewage treatment facilities to secondary treatment.

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4.4 Infiltration and Inflow Control Program

The Permittee may be required to develop, submit to the Regional Waste Manager for approval, and implement an identification, remediation, and control program to reduce the quantity of infiltration and inflow into the sewage collection system.

4.5 Source Control Program

The Permittee may be required to implement a source control program and/or develop a sewer use bylaw to control the quantity and quality of wastes discharged into the sewer system.

4.6 Stormwater Management Program

The Permittee may be required to develop, submit to the Regional Waste Manager for approval, and implement a stormwater management program.

4.7 Biosolids Management Program

The Permittee may be required to develop, submit to the Regional Waste Manager for approval, and implement a biosolids management program.

4.8 Odour

Should objectionable odours attributable to the operation of the treatment plant occur, the Regional Waste Manager may require steps to be taken or works to be provided to reduce the odours to acceptable levels.

G.E. Oldham, P. Eng.
Regional Waste Manager

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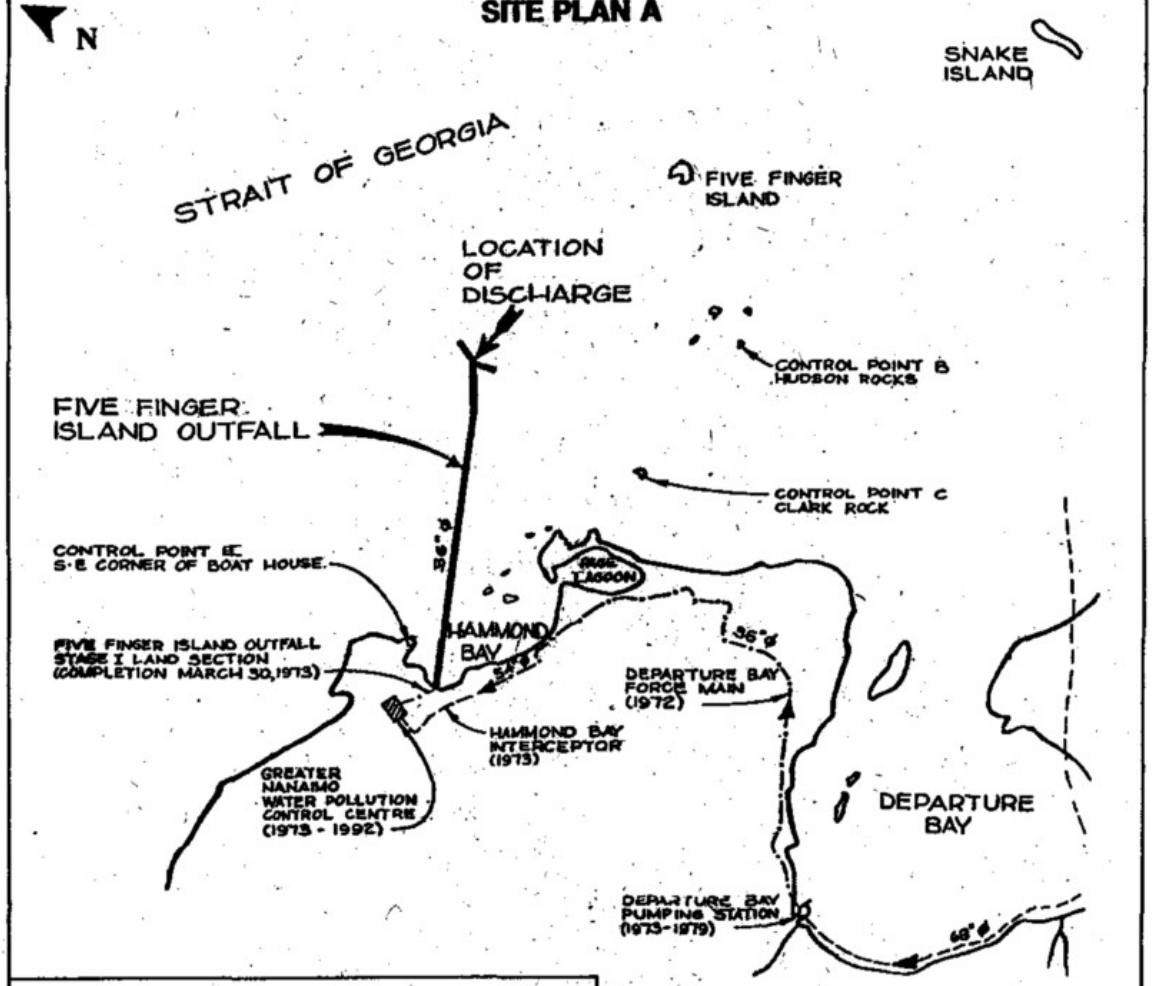
PROVINCE OF
BRITISH COLUMBIA

Environmental Protection

SITE PLAN A



Location Map

Scale: 1:36,000

Permit No.: PE00338

Date: JUN 0 2 1994

G.E. Oldham, P.Eng.
Regional Waste Manager

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Province of
British Columbia

MINISTRY OF
ENVIRONMENT,
LANDS AND PARKS

BC Environment

Vancouver Island Region
Environmental Protection
2569 Kenworth Road
Nanaimo, British Columbia
V9T 4P7
Telephone: (604) 751-3100
Fax: (604) 755-2473

Date: AUG 11 1994

File: PE00338

REGISTERED MAIL

Regional District of Nanaimo
6300 Hammond Bay Road
PO Box 40
Lantzville BC V0R 2H0

ATTENTION: W. R. Colclough, AScT
Director of Operational Services

Dear W. R. Colclough:

Re: Notice of Correction to Waste Management Permit No. PE00338, presently in the name of Regional District of Nanaimo

Further to recent related correspondence, we provide the following:

1. Section 1.1.1 of the permit has been corrected to specify a maximum daily effluent discharge rate of 80 870 m^3/day which corresponds to the maximum day design capacity of the treatment works.

   Please remove and destroy the original page in your permit package and replace it with the revised version enclosed.

2. Pursuant to Section 2.8 of the permit, your request to conduct video inspection of the outfall in lieu of dye testing is approved.

3. Your concerns regarding Sections 4.4 and 4.6 of the permit are noted. It is expected that a Liquid Waste Management Plan for School District 68 would address these items.

   Infiltration and inflow into the sewer collection system is a serious concern, and we remain supportive of efforts to address it.

. . . 2

Thank you for meeting with us. We understand that you have chosen not to proceed with your appeal, dated June 22, 1994, of the subject permit.

If you have any questions regarding the above, please contact A. C. Leuschen, Environmental Protection Officer, at 751-3100.

Yours truly,

G. E. Oldham, P.Eng.
Regional Waste Manager
Vancouver Island Region

GEO/acl/mg

encl.

BRITISH COLUMBIA

September 12, 2019

Tracking Number: 385715
Authorization Number: 338

REGIONAL DISTRICT OF NANAIMO
6300 HAMMOND BAY RD.
NANAIMO, BC V9T 6N2

Dear REGIONAL DISTRICT OF NANAIMO,

Re: Your application for an amendment to a Permit under the Environmental Management Act

Pursuant to Section 14(4) of the *Environmental Management* Act, Permit 338 is hereby amended as follows:

Adding the following to **Section 1.1.3**:

"After September 8, 2019, the works authorized are screening facility, grit and scum removal systems, primary sedimentation tanks, secondary treatment bioreactors, secondary clarifiers, sludge thickening systems, sludge digestion systems, sludge dewatering facility, an outfall extending 2,030m from mean low water to a minimum depth of 70m below mean low water, diffusers, and related appurtenances approximately located as shown in the attached Site Plan A."

All other terms and conditions of Permit 338 remain in effect.

This permit does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the permittee. This permit is issued pursuant to the provisions of the Environmental Management Act to ensure compliance with Section 120(3) of that statute, which makes it an offence to discharge waste, from a prescribed industry or activity, without proper authorization. It is also the responsibility of the permittee to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties,and comply with other applicable legislation that may be in force.

This decision may be appealed to the Environmental Appeal Board in accordance with Part 8 of the Environmental Management Act. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

Ministry of Environment and Climate Change Strategy

Environmental Protection Division 2080-A Labieux Rd Nanaimo, B.C. V9T 6J9

Authorizations - South Region
Telephone: (250) 751-3100
Facsimile: (250) 751-3103

Administration of this permit will be carried out by staff from the Environmental Protection Division's Regional Operations Branch. Plans, data and reports pertinent to the permit are to be submitted by email or electronic transfer to the Director, designated Officer, or as further instructed.

Yours truly,

Bryan Vroom
for Director, Environmental Management Act

Appendix B – Internal Flow Monitoring and Laboratory Raw Data (Permit Data)

2023 Total Flows (Cubic Metres)												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	40,341	34,295	35,941	29,192	25,713	27,116	25,365	27,471	27,367	27,823	36,911	35,935
2	39,493	33,186	38,366	30,299	33,131	26,519	25,656	27,591	26,377	31,573	43,207	36,621
3	37,076	33,438	39,132	30,136	30,498	26,348	27,450	27,448	25,878	29,297	41,760	39,948
4	35,957	34,191	49,803	29,396	30,644	27,534	27,553	27,127	28,162	28,370	51,451	76,992
5	35,194	34,697	46,549	30,204	36,002	26,945	26,978	26,521	27,348	28,826	46,533	60,118
6	35,164	35,513	45,105	34,787	32,050	26,848	26,925	26,084	27,673	28,585	46,317	50,046
7	39,763	38,615	41,091	32,080	30,996	26,757	26,659	27,722	27,664	27,870	41,301	42,976
8	50,600	36,063	38,758	34,956	30,852	26,719	25,748	28,771	27,140	28,004	39,257	38,916
9	54,173	38,008	36,518	40,526	29,844	28,399	26,688	28,288	27,174	30,602	37,651	52,917
10	49,737	35,560	35,108	37,383	29,063	30,153	27,039	27,446	28,436	32,074	44,219	53,400
11	45,848	34,227	33,499	34,380	28,951	28,088	26,385	27,226	28,198	29,810	48,470	44,982
12	95,897	34,227	35,727	33,546	28,581	29,364	26,731	26,952	28,225	24,027	44,582	41,085
13	82,588	33,153	34,650	32,668	27,794	27,569	27,003	27,646	28,052	29,333	42,792	40,950
14	60,958	32,031	33,745	31,345	28,459	27,450	26,729	28,417	27,503	29,751	38,658	42,502
15	53,687	31,796	32,942	31,837	28,166	27,108	26,023	27,490	27,838	31,237	36,983	45,749
16	53,737	32,620	32,352	33,859	28,015	27,221	26,784	27,809	26,850	32,407	35,047	41,048
17	50,823	32,050	32,192	37,080	31,196	26,431	27,028	27,104	28,362	37,403	34,257	40,170
18	48,681	31,532	31,241	33,885	28,423	27,108	25,290	27,129	28,087	61,923	33,721	40,321
19	43,027	30,761	31,683	33,028	28,348	28,486	27,014	26,211	30,428	43,155	32,887	42,312
20	39,734	31,820	32,124	36,236	26,547	27,959	28,159	27,882	27,987	36,264	32,697	42,724
21	40,247	31,611	31,402	34,328	26,618	27,732	21,844	28,031	28,019	33,970	33,278	42,193
22	38,393	31,872	31,174	34,630	28,446	27,466	25,892	27,652	27,563	33,170	32,091	39,770
23	37,291	31,826	32,080	34,899	27,919	26,915	27,031	27,628	27,950	31,858	31,706	37,323
24	37,002	31,346	30,884	33,008	27,964	26,342	34,330	28,539	29,789	62,085	31,313	36,380
25	37,291	31,589	30,001	31,744	27,700	27,253	28,203	27,200	31,537	63,051	30,302	52,099
26	34,673	33,864	31,467	32,627	27,482	27,126	27,347	26,622	30,745	43,895	31,231	53,685
27	34,169	33,934	30,869	31,458	26,719	27,328	26,907	27,410	29,718	38,403	30,547	48,070
28	32,847	35,616	30,113	30,539	27,691	27,098	27,378	28,001	30,310	35,818	30,374	48,590
29	33,006		29,811	29,824	27,898	27,456	26,160	28,149	28,569	34,778	30,733	45,246
30	32,048		29,664	31,297	27,048	27,226	27,108	26,816	27,967	34,189	30,988	41,822
31	32,909		30,293		27,407		27,351	28,338		31,408		39,611
Total:	**1,382,354**	**939,441**	**1,074,284**	**991,177**	**896,165**	**822,064**	**832,758**	**852,721**	**846,916**	**1,090,959**	**1,121,264**	**1,394,501**
Average:	**44,592**	**33,551**	**34,654**	**33,039**	**28,909**	**27,402**	**26,863**	**27,507**	**28,231**	**35,192**	**37,375**	**44,984**
Minimum:	**32,048**	**30,761**	**29,664**	**29,192**	**25,713**	**26,342**	**21,844**	**26,084**	**25,878**	**24,027**	**30,302**	**35,935**

Non-compliant days are highlighted in yellow.
Maximum daily flow: 80,870 m^3/day

2023 Influent 5-day Biochemical Oxygen Demand (BOD_5) (mg/L)												
Day	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1								329				
2					270							
3	292									296		
4				342			386					
5												138
6						230						
7		210	NR								NR	
8								331				
9					352							
10	127									274		
11				218		230	338					
12									272			138
13						348						
14		264	193								255	
15			237					286				
16					NR							
17	145									271		
18				280			NR					
19									288			
20						246						
21		268	250								314	
22								244				
23					345							
24	197											
25				222			284					
26			174						246			168
27						276						
28		316	261								374	
29								262				
30					304							
31	232											
Average:	**199**	**265**	**223**	**266**	**318**	**266**	**336**	**290**	**269**	**280**	**314**	**148**

Non-compliant days are highlighted yellow,

2023 Effluent 5-day Biochemical Oxygen Demand (BOD_5) (mg/L)

Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	4.32	10.40	8.58	6.27	10.00	7.64	6.36	7.99	7.05	8.69	7.09	9.8
2	5.44	8.20	6.95	6.05	8.37	7.36	6.33	6.88	6.43	10.30	6.66	7.7
3	5.84	9.38	7.45	7.39	8.69	6.83	7.89	7.03	6.48	8.41	5.81	8.6
4	6.57	8.35	9.10	7.80	9.70	8.24	7.57	7.12	6.07	7.59	6.85	9.6
5	6.42	7.38	6.92	5.30	9.10	8.12	8.79	7.11	5.49	8.17	6.29	5.9
6	7.45	6.75	7.81	5.51	9.29	7.89	7.49	8.99	4.06	9.67	5.89	5.1
7	8.23	5.84	4.74	6.25	7.93	7.21	9.51	9.45	5.14	10.60	6.74	6.38
8	8.82	6.01	8.27	5.02	5.96	8.09	NT	9.27	5.81	9.95	6.84	8.07
9	7.79	4.99	7.85	5.67	8.81	8.23	12.20	8.49	6.22	9.01	7.32	7.63
10	8.25	6.07	8.79	5.16	10.30	8.95	9.75	7.43	4.75	9.18	8.42	8.35
11	8.13	6.33	9.81	5.25	8.07	8.99	11.80	8.16	7.09	8.15	7.36	7.71
12	5.44	7.15	7.25	5.59	11.10	9.99	9.09	7.97	10.30	7.23	7.61	6.68
13	6.25	8.16	8.26	5.64	11.90	10.10	9.48	8.66	9.96	7.16	6.73	8.44
14	5.76	9.62	7.23	7.06	14.20	8.33	10.80	8.98	11.50	6.87	7.03	9.60
15	5.69	7.78	6.52	6.29	12.30	8.41	9.02	8.22	12.70	6.13	5.41	6.80
16	5.20	7.61	8.20	7.21	10.40	7.96	10.20	10.60	12.40	6.47	6.23	7.30
17	5.42	8.11	8.07	7.70	9.77	7.37	7.05	8.84	12.40	10.50	6.09	10.10
18	5.62	8.50	8.38	6.47	11.90	7.21	5.46	7.77	11.50	9.50	5.85	6.59
19	5.33	6.67	8.36	7.09	10.20	6.41	9.79	7.34	11.50	8.29	6.57	9.61
20	6.17	6.13	7.81	7.59	9.09	10.50	7.70	9.41	10.60	7.31	8.19	11.10
21	7.18	9.39	8.93	6.31	9.55	9.67	7.93	11.10	9.99	7.71	6.17	10.30
22	7.83	8.24	7.01	6.08	7.80	10.20	7.35	8.04	8.81	7.63	6.21	8.34
23	8.09	7.37	7.44	4.88	8.25	10.90	6.97	7.77	7.03	6.31	8.62	8.50
24	10.00	9.45	6.46	7.44	8.80	12.60	9.45	9.57	5.04	6.56	8.83	11.10
25	9.77	4.90	8.57	7.49	7.65	10.50	8.91	8.37	6.29	6.47	8.85	9.56
26	10.50	8.66	7.72	7.98	7.02	10.20	8.01	7.84	6.47	5.09	10.40	8.47
27	11.60	8.51	7.74	8.35	6.75	8.97	8.65	8.30	5.38	4.92	8.34	7.17
28	11.50	8.34	6.68	8.65	7.55	7.81	8.55	8.73	5.55	5.65	9.55	9.10
29	12.00		4.24	9.06	8.41	8.66	8.43	7.73	5.79	6.23	10.90	6.79
30	10.70		5.50	8.46	7.93	7.01	8.34	7.67	7.81	6.64	9.81	9.62
31	10.20		4.48		9.31		7.63	7.78		6.33		9.75
Average	**7.66**	**7.65**	**7.46**	**6.70**	**9.23**	**8.68**	**8.55**	**8.34**	**7.85**	**7.70**	**7.42**	**8.38**
Non compliance	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

GNPCC Maximum BOD_5: 130 mg/L
Non-compliant days are highlighted in yellow.
NT – No testing competed.

2023 Influent Total Suspended Solids (TSS) (mg/L)												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	1140				507			710		490		
2	783			917	413		1380			397		
3	650			477			790		600	390		410
4				543		607	967		367			273
5		287	193			857						177
6		377	210			373		587			377	
7		470	300		467			493			320	
8	237				433			717		677	340	
9	210			475	417		487			463		
10	267			320			837		530	433		190
11				370		1130	870		630			274
12		300				503			530		277	263
13		297	463			680		530			607	
14		390	543		790			470			447	
15	197		380		570			563		527		
16	343			383	603		580			720		
17	233			427			800		360	447		320
18				460		493	1010		483			417
19		433	437			230			597		356	303
20		640	383			597		617			783	
21		710	770		550			1230			587	
22	650				570			497		370		
23	377			570	1080		983			620		
24	353			487			797		363	323		
25				380		1330	773		693			
26		330	317			453			530		1200	220
27		380	393			677		740			488	
28		303	617		673			577			670	
29	367				797			417		513		
30	443			700	530		753			877		
31	427						1580			670		
Average:	**445**	**410**	**417**	**501**	**600**	**661**	**901**	**627**	**517**	**528**	**538**	**285**

2023 Effluent Total Suspended Solids (TSS) (mg/L)												
Day	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	4.14	8.88	9.00	8.80	13.60	8.67	8.42	4.70	5.80	11.90	5.40	5.40
2	5.00	8.88	8.86	9.00	9.50	8.33	8.50	6.60	6.90	12.30	6.40	6.40
3	6.50	8.50	8.00	8.80	7.62	9.34	7.66	5.60	4.70	10.34	6.80	6.80
4	6.75	9.71	8.40	7.40	8.88	7.66	9.50	4.90	4.10	11.20	6.20	6.20
5	7.86	8.00	9.28	7.00	9.50	8.50	6.84	6.80	3.80	10.50	4.90	4.90
6	9.86	6.86	8.86	3.80	9.62	8.16	6.50	5.25	4.40	15.80	5.70	5.70
7	7.57	6.90	10.00	6.38	9.50	9.34	5.88	6.50	4.20	13.40	6.60	6.60
8	6.86	7.10	10.20	9.00	7.75	8.00	NT	6.88	5.40	15.40	6.10	6.10
9	6.86	6.40	10.40	6.62	8.28	8.84	10.02	6.12	5.70	13.80	7.30	7.30
10	6.57	7.00	9.20	5.75	11.10	8.80	8.67	7.62	6.20	13.60	8.30	8.30
11	7.14	8.60	11.60	6.00	14.20	8.75	9.16	6.70	5.80	12.60	5.80	5.80
12	7.00	7.60	10.30	7.25	14.60	8.83	9.98	7.20	7.60	10.60	7.10	7.10
13	5.60	8.10	8.00	6.00	16.00	10.34	9.00	7.20	11.00	9.40	6.90	6.90
14	7.00	8.90	9.66	8.42	16.00	9.33	9.20	6.10	10.80	12.80	6.30	6.30
15	6.10	9.62	9.40	8.00	17.40	8.33	8.60	7.90	11.60	11.80	5.90	5.90
16	5.71	9.00	11.00	7.12	11.80	6.84	11.80	6.20	11.90	10.50	6.40	6.40
17	6.10	8.00	11.00	7.75	7.60	7.00	8.66	6.40	12.50	10.40	6.30	6.30
18	6.57	9.00	12.40	7.42	12.80	8.00	11.50	6.00	15.50	8.66	6.10	6.10
19	8.20	9.12	12.00	8.72	11.00	8.34	8.84	7.00	13.80	11.00	6.60	6.60
20	9.10	8.75	11.00	8.12	9.80	11.70	10.16	7.10	12.20	11.00	6.80	6.80
21	11.00	9.62	10.20	6.57	10.20	14.50	9.86	5.80	12.40	11.40	6.40	6.40
22	11.40	10.50	11.00	8.62	8.60	16.70	4.20	6.00	8.60	8.20	6.80	6.80
23	11.70	11.40	10.20	7.88	10.00	14.40	5.80	6.30	10.20	7.80	7.60	7.60
24	12.00	10.00	10.40	7.00	10.26	12.40	9.40	6.50	8.80	9.60	9.50	9.50
25	12.30	9.20	9.80	8.12	9.66	11.50	9.62	5.60	7.30	6.60	7.66	7.66
26	15.00	9.25	12.40	9.38	9.98	11.30	7.86	4.80	9.88	6.50	8.60	8.60
27	13.70	9.25	9.80	9.12	7.80	8.50	8.25	5.20	8.25	5.40	7.50	7.50
28	10.60	8.57	8.20	8.12	9.82	9.00	6.50	5.90	8.25	4.34	9.00	9.00
29	10.80		8.40	8.35	11.00	7.16	6.25	6.40	10.00	5.62	8.62	8.62
30	11.70		7.60	9.00	9.16	6.84	6.50	5.80	11.20	6.12	8.75	8.75
31	10.30		7.60		9.80		6.70	6.20		5.70		
Average:	**8.61**	**8.67**	**9.81**	**7.65**	**10.74**	**9.5**	**8.33**	**6.23**	**8.63**	**10.14**	**6.94**	**6.94**
Non-Compliance	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Non-compliant days are highlighted yellow.
GNPCC Maximum TSS: 130 mg/L
NT- No testing completed.

2023 Influent Temperature												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1		15.3	13.2		16.6			20.8			17.4	
2	14.6				16.7			20.7		18.7		
3	13.8			16.3	16.8		20.3			17.9		
4	18.1			16.3			21.2		20.5	18.1		15.7
5				16.5		18.6	20.3		20.4			14.1
6		15.3	15.8			18.9			19.3			15.1
7		14.9	14.6			19.9		20.4			15.7	
8		14.1	14.5		17.5			20.9			16.7	
9	14.8				17.7			18.7			16.4	
10	13.2			14.1	17.5		20.3			18.2		
11	11.3			16.1			20.3		19.7	17.3		14.1
12				15.1		20.1	20.4		19.5			14.5
13		15.0				19.4			19.7		16.2	13.9
14		14.4	13.6			18.0		22.4			15.8	
15		14.6	13.9		19.5			21.7			16.6	
16	15.1		13.6		19.8			21.4		18.3		
17	15.6			15.7	19.0		21.2			18.4		
18	16.4			15.1			20.7		19.5	17.0		14.8
19						18.6	20.6		19.4			14.4
20		14.4	15.9			17.7			18.0		15.3	13.9
21		15.2	16.1			18.4		20.7			15.0	
22		14.0	15.3		17.6			20.5			14.8	
23	15.3							20.7		17.8		
24	15.4			15.6	18.8		20.7			17.7		
25				16.4			19.4		18.2	15.6		
26				16.1		20.3	21.1		18.0			
27		14.6	18.8			20.1			17.8		15.1	13.8
28		15.3	15.9			20.1		21.2			16.1	
			15.4		18.3			20.6			16.0	
29	16.0				17.5			19.9		15.0		
30	14.0				17.4		20.3			16.3		
31												
Average	14.9	14.8	15.1	15.8	17.9	19.2	20.5	20.8	19.2	17.4	15.9	14.4

2023 Effluent Temperature												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	13.5	13.2	12.8	14.1	16.5	19.0	20.9	21.6	20.8	18.4	17.5	15.0
2	14.0	14.0	14.6	14.8	16.2	19.0	20.4	21.4	21.6	18.9	17.0	14.6
3	13.4	13.8	14.2	16.0	17.0	19.0	20.8	21.8	21.4	18.8	16.6	13.9
4	17.8	14.4	13.0	15.8	17.2	18.8	21.6	22.0	20.9	18.8	16.6	15.2
5	14.2	14.2	12.9	15.7	16.2	18.3	20.8	22.5	21.2	19.1	16.5	14.5
6	14.4	14.4	13.8	14.8	15.8	19.6	21.4	22.2	20.4	19.0	16.5	14.4
7	14.2	13.6	12.8	14.6	16.8	20.4	21.0	22.0	20.5	18.8	16.4	14.4
8	14.2	13.2	13.2	14.2	17.0	20.4	21.1	21.8	20.9	18.8	15.6	14.6
9	13.8	13.8	14.5	14.0	17.2	19.9	21.0	21.4	21.0	19.4	16.0	13.7
10	13.4	13.6	13.4	14.4	17.4	18.6	21.1	21.7	21.6	18.7	16.0	13.9
11	14.4	13.9	13.3	15.0	17.6	19.4	21.0	22.2	21.2	18.3	16.2	14.3
12	13.7	15.2	13.0	14.4	17.8	20.4	21.1	21.6	20.7	18.2	15.8	14.4
13	13.4	13.6	13.8	14.6	18.8	20.0	21.4	22.2	20.3	17.6	16.2	13.9
14	13.4	12.6	13.4	14.6	18.6	18.6	21.7	22.9	20.5	18.5	16.0	13.8
15	13.6	13.6	13.6	14.5	19.8	19.2	22.2	22.2	20.4	18.4	16.6	14.6
16	13.8	13.6	14.2	13.9	19.9	19.7	22.0	22.3	20.6	18.6	15.4	14.4
17	14.1	13.8	14.0	15.2	19.6	19.8	21.9	22.5	20.2	18.6	15.7	14.4
18	13.6	13.8	13.6	14.5	19.2	19.0	21.5	21.0	19.9	17.8	15.2	15.2
19	13.8	14.0	13.6	14.0	18.8	19.1	21.9	21.1	20.0	18.2	15.6	15.4
20	14.9	14.0	14.4	14.6	18.8	18.9	22.0	21.4	19.2	17.6	15.8	15.0
21	14.2	14.6	14.8	14.9	19.0	19.0	21.9	21.1	19.5	17.2	15.6	15.2
22	14.3	12.4	14.3	14.0	18.2	20.0	23.5	21.4	19.8	17.2	14.9	15.0
23	15.2	14.8	14.0	15.2	17.4	20.6	22.4	21.4	20.0	17.3	15.4	14.0
24	15.4	12.6	14.0	15.8	19.4	20.0	20.2	21.0	18.8	16.4	15.4	13.8
25	13.2	12.8	14.7	15.8	19.2	20.2	20.2	21.8	19.3	15.7	15.0	16.0
26	14.0	12.8	13.5	15.0	19.8	21.0	21.6	21.8	19.0	15.4	14.8	14.4
27	14.1	13.6	14.9	15.9	19.0	21.2	21.6	22.0	19.0	15.6	15.8	14.3
28	14.0	13.2	14.6	16.0	18.8	21.0	21.8	22.1	18.8	16.0	15.3	14.8
29	12.7		14.6	16.5	18.9	20.9	21.6	21.6	18.2	16.4	16.2	14.8
30	13.4		14.6	17.2	18.3	21.0	21.2	21.6	18.3	16.1	15.2	14.6
31	13.2		14.2		18.2		21.6	21.0		16.4		14.0
Average	**14.0**	**13.7**	**13.9**	**15.0**	**18.1**	**19.7**	**21.4**	**21.8**	**20.1**	**17.7**	**15.9**	**14.5**

2023 Influent pH												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1		7.46	7.45		7.34			7.30			7.31	
2	7.48				7.42			7.25		7.27		
3	7.43			7.30	7.29		7.39			7.18		
4	7.42			7.51			7.20		7.24	7.26		7.23
5				7.36		7.31	7.18		7.22			7.38
6		7.38	7.42			7.30			7.18			7.37
7		7.50	7.42			7.11		7.35			7.36	
8		7.45	7.45		7.26			7.23			7.16	
9	7.47				7.36			7.46			7.41	
10	7.47			7.30	7.38		7.05			7.12		
11	7.58			7.35			7.23		7.27	7.21		7.36
12				7.41		7.27	7.16		7.10			7.37
13		7.31				7.32			7.18		7.21	7.30
14		7.42	7.30			7.31		7.20			7.17	
15		7.46	7.38		7.41			7.28			7.31	
16	7.40		7.42		7.23			7.16		7.19		
17	7.43			7.43	7.28		7.42			7.19		
18	7.49			7.31			7.21		7.25	7.18		7.33
19						7.22	7.17		7.20			7.25
20		7.64	7.41			6.83			7.18		7.29	7.42
21		7.46	7.42			7.11		7.25			7.20	
22		7.37	7.39		7.40			7.29			7.39	
23	7.37							7.29		7.16		
24	7.38			7.27	7.30		7.30			7.31		
25				7.27			7.22		7.26	7.31		
26				7.56		7.35	7.28		7.20			
27		7.54	7.42			7.17			7.24		7.31	7.36
28		7.58	7.28			7.36		7.14			7.27	
29			7.35		7.36			7.33			7.19	
30	7.36				7.37			7.30		7.35		
31	7.32				7.27		7.46			7.37		
Average	**7.43**	**7.46**	**7.39**	**7.37**	**7.33**	**7.22**	**7.25**	**7.27**	**7.21**	**7.24**	**7.28**	**7.34**

2023 Effluent pH												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	6.87	7.01	7.14	7.08	6.94	6.82	6.96	7.06	7.04	7.04	6.78	7.03
2	6.94	6.97	7.10	7.06	6.80	6.76	6.93	7.08	6.93	7.04	6.87	7.06
3	6.98	7.01	7.06	6.98	6.68	6.86	6.90	6.96	6.98	7.00	6.82	7.01
4	6.99	7.08	7.04	7.02	6.82	6.84	6.96	7.06	6.86	6.96	6.75	7.00
5	6.90	7.14	6.86	6.98	6.87	7.02	7.06	7.14	6.96	6.85	6.68	6.86
6	6.86	7.08	6.97	7.02	6.95	6.95	6.96	7.18	6.88	6.86	6.80	6.76
7	6.76	7.15	6.86	7.03	7.00	6.90	7.01	7.03	6.95	6.88	6.82	6.70
8	6.75	7.08	7.01	7.08	7.02	6.90	7.10	7.16	6.78	6.90	6.76	6.92
9	6.73	7.04	7.00	7.02	7.05	6.90	7.01	7.14	6.88	6.92	6.79	6.94
10	6.78	6.99	6.92	6.84	7.05	6.96	7.15	7.22	6.94	6.90	6.76	6.90
11	6.66	6.94	6.97	6.78	7.08	6.99	7.14	7.14	6.91	6.99	6.86	6.81
12	6.60	6.99	7.03	6.86	7.05	7.02	7.10	7.06	6.94	7.04	6.73	6.94
13	6.80	7.00	7.04	6.82	7.12	7.04	7.21	7.08	6.99	7.14	6.74	6.98
14	6.60	7.04	6.94	6.90	6.99	7.16	7.19	6.97	7.04	7.12	6.84	6.98
15	6.38	7.04	7.04	6.89	7.04	7.16	7.18	7.04	7.02	7.14	6.74	6.99
16	6.58	7.03	7.06	6.92	6.95	7.10	7.22	6.99	7.16	7.18	6.81	6.94
17	6.60	7.08	7.06	7.02	6.94	7.26	7.10	7.01	7.22	7.00	6.80	7.00
18	6.64	6.99	7.10	6.98	6.90	7.36	6.98	6.94	7.30	6.96	6.84	6.78
19	6.57	7.02	7.13	7.00	6.98	7.25	7.02	6.96	7.20	6.80	6.95	6.91
20	6.53	7.10	7.00	6.99	6.91	7.08	7.06	6.90	7.28	6.84	6.89	6.88
21	6.58	7.12	7.02	6.94	6.87	7.04	7.18	7.12	7.08	7.00	6.92	6.92
22	6.66	7.14	7.02	6.84	6.91	6.98	7.38	6.96	7.10	7.04	6.94	6.92
23	6.66	7.04	6.95	6.74	6.95	6.94	7.27	6.99	7.10	6.96	6.92	6.94
24	6.72	7.08	7.06	6.64	6.85	7.04	7.28	6.85	7.20	6.89	6.90	7.02
25	6.80	7.00	7.06	6.64	6.85	7.09	7.00	6.92	7.14	6.83	6.98	6.98
26	6.74	7.06	7.06	6.46	6.81	7.06	7.13	6.80	7.02	6.58	6.96	6.98
27	6.80	7.14	7.06	6.64	6.76	7.02	7.18	6.80	7.06	6.66	6.98	6.96
28	6.88	7.10	7.12	6.66	6.76	7.05	7.12	6.95	6.98	6.79	6.96	6.86
29	6.84		7.08	6.60	6.84	6.96	7.20	6.88	6.93	6.83	7.00	6.87
30	6.91		7.10	6.76	6.76	7.00	7.19	6.95	6.89	6.84	7.06	6.98
31	6.98		7.02		6.78		7.12	7.04		6.82		7.02
Average	**6.74**	**7.05**	**7.03**	**6.87**	**6.91**	**7.02**	**7.11**	**7.01**	**7.03**	**6.93**	**6.86**	**6.93**

2023 Effluent Ammonia (Total N as mg/L)												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	14.2	20.4	24.3	26.0	15.0	15.4	19.0	26.8	20.5	23.6	17.2	26.2
2	15.2	20.4	21.4	23.2	16.0	16.4	17.8	27.8	21.0	25.2	17.6	23.0
3	16.2	20.6	22.2	22.4	16.2	18.1	13.2	26.9	19.0	22.2	14.0	20.3
4	13.6	20.2	20.8	23.6	17.5	19.2	22.6	25.4	23.2	23.2	14.0	17.6
5	16.6	19.8	16.5	23.8	19.0	20.0	20.2	28.2	22.9	18.2	10.8	13.2
6	15.7	18.8	17.0	24.4	18.0	16.8	19.2	26.2	21.8	23.0	14.0	12.7
7	14.5	20.6	17.4	22.6	19.1	19.7	21.6	25.6	23.4	17.8	13.4	16.0
8	13.2	19.0	21.0	21.6	21.2	18.8	NT	27.8	18.9	18.9	13.5	20.2
9	9.7	18.0	21.2	18.8	23.4	20.9	21.2	29.6	21.4	23.0	14.2	20.2
10	9.6	16.4	20.4	16.5	22.4	23.2	22.9	28.8	21.3	24.4	16.8	13.4
11	9.5	17.4	23.6	14.8	22.5	20.2	21.0	27.0	21.2	22.7	14.8	15.4
12	11.6	18.6	24.3	15.6	24.4	20.6	22.4	24.2	21.2	25.6	12.0	17.2
13	8.4	19.5	21.0	17.6	21.2	24.2	28.5	23.7	23.6	24.5	12.0	19.4
14	5.8	20.8	22.0	17.0	19.4	27.8	28.6	19.4	27.0	27.2	11.6	19.2
15	7.5	22.1	24.1	15.2	20.4	28.2	27.2	17.6	24.7	30.0	13.1	19.3
16	7.5	23.4	24.0	18.4	19.4	0.0	29.6	19.8	28.0	28.0	16.3	18.1
17	7.7	22.4	25.0	19.4	18.0	33.8	26.6	19.0	26.0	22.4	17.0	17.0
18	8.3	19.6	28.1	21.0	22.6	34.0	25.4	19.2	30.0	17.2	21.0	19.2
19	9.6	21.6	25.3	21.7	19.8	30.8	27.4	17.2	31.8	14.0	18.0	19.5
20	10.7	21.9	23.5	20.0	18.2	23.2	29.3	20.4	27.4	15.6	18.2	18.8
21	11.7	19.4	25.7	16.8	17.8	23.8	35.7	19.8	27.8	17.2	17.8	19.3
22	10.8	21.8	24.8	13.6	19.4	22.6	28.6	17.8	27.6	19.6	0.0	20.2
23	10.8	23.8	23.7	11.8	17.4	22.2	25.2	16.7	29.9	17.2	23.2	20.9
24	12.8	21.2	26.6	12.0	16.6	20.6	27.1	17.1	30.2	19.3	19.8	19.6
25	13.6	23.2	28.9	9.0	16.8	22.8	24.6	17.2	28.3	11.0	22.8	NT
26	12.6	22.0	25.5	11.5	15.1	22.7	28.8	13.5	28.2	10.4	21.4	17.4
27	14.2	20.2	26.9	13.8	14.8	20.8	26.4	18.7	24.6	13.2	20.6	18.0
28	14.0	22.4	28.0	11.4	15.0	18.8	29.4	18.4	19.4	17.4	21.2	18.5
29	16.8		27.2	13.8	14.4	17.2	28.2	19.0	20.6	16.4	22.0	22.2
30	16.8		26.8	15.8	14.2	20.4	26.3	18.6	22.4	15.0	25.0	NT
31	17.9		26.8		14.8		25.3	23.6		17.9		19.8
Average	**12.2**	**20.6**	**23.7**	**17.8**	**18.4**	**21.4**	**25.0**	**22.0**	**24.4**	**20.0**	**16.4**	**18.7**

** Tested by both the Hach TNT and ISE methodology in 2023.
NT- No test completed

2023 Un-ionized Ammonia (Total N as mg/L)												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	0.036	0.069	0.143	0.110	0.044	0.0416	0.0608	0.172	0.082	0.080	0.0260	0.084
2	0.030	0.088	0.079	0.125	0.037	0.0377	0.0605	0.150	0.057	0.101	0.033	0.058
3	0.081	0.066	0.071	0.121	0.036	0.0579	0.0964	0.145	0.070	0.089	0.024	0.069
4	0.034	0.065	0.067	0.101	0.047	0.0710	0.1220	0.137	0.109	0.086	0.020	0.046
5	0.033	0.085	0.061	0.121	0.048	0.0860	0.0869	0.152	0.066	0.049	0.021	0.030
6	0.030	0.070	0.058	0.098	0.049	0.0790	0.0826	0.1340	0.074	0.062	0.024	0.022
7	0.023	0.062	0.051	0.090	0.065	0.0591	0.0864	0.138	0.068	0.039	0.021	0.030
8	0.032	0.082	0.099	0.069	0.085	0.0752	0.0000	0.178	0.049	0.051	0.022	0.050
9	0.019	0.061	0.068	0.064	0.094	0.0560	0.0912	0.201	0.062	0.078	0.021	0.054
10	0.019	0.049	0.065	0.045	0.100	0.0928	0.1080	0.196	0.079	0.071	0.029	0.027
11	0.018	0.056	0.087	0.047	0.076	0.0808	0.1130	0.159	0.068	0.061	0.025	0.034
12	0.023	0.060	0.078	0.039	0.098	0.0968	0.1210	0.123	0.100	0.110	0.020	0.038
13	0.027	0.092	0.071	0.065	0.085	0.1230	0.1820	0.121	0.080	0.098	0.023	0.048
14	0.006	0.112	0.075	0.063	0.056	0.1310	0.1460	0.099	0.127	0.120	0.024	0.048
15	0.011	0.223	0.082	0.049	0.069	0.1440	0.1470	0.090	0.110	0.162	0.025	0.052
16	0.013	0.100	0.100	0.074	0.066	0.0000	0.2160	0.085	0.120	0.132	0.038	0.040
17	0.013	0.072	0.100	0.062	0.058	0.2160	0.1360	0.089	0.302	0.090	0.027	0.049
18	0.012	0.078	0.110	0.061	0.072	0.2010	0.1190	0.071	0.177	0.059	0.052	0.044
19	0.013	0.086	0.137	0.063	0.079	0.1660	0.1620	0.074	0.140	0.032	0.049	0.053
20	0.015	0.103	0.100	0.054	0.058	0.0860	0.2870	0.069	0.120	0.034	0.053	0.041
21	0.020	0.083	0.110	0.042	0.066	0.0952	0.3030	0.107	0.130	0.038	0.052	0.044
22	0.023	0.087	0.099	0.023	0.083	0.084	0.1940	0.071	0.150	0.063	0.000	0.040
23	0.022	0.100	0.076	0.024	0.070	0.071	0.1180	0.048	0.160	0.040	0.063	0.052
24	0.024	0.078	0.110	0.023	0.056	0.076	0.1380	0.058	0.205	0.056	0.040	0.100
25	0.027	0.093	0.110	0.010	0.067	0.098	0.1250	0.059	0.170	0.032	0.057	0.000
26	0.034	0.112	0.120	0.017	0.048	0.107	0.1700	0.036	0.120	0.016	0.069	0.038
27	0.028	0.065	0.172	0.024	0.034	0.098	0.1430	0.060	0.098	0.018	0.0660	0.049
28	0.032	0.083	0.120	0.018	0.045	0.075	0.1590	0.079	0.062	0.030	0.085	0.043
29	0.054		0.128	0.028	0.039	0.055	0.1330	0.070	0.089	0.031	0.075	0.060
30	0.045		0.120	0.036	0.038	0.082	0.1680	0.060	0.090	0.024	0.080	NT
31	0.054		0.110		0.040		0.1620	0.076		0.038		0.054
Average	**0.027**	**0.085**	**0.096**	**0.059**	**0.062**	**0.091**	**0.137**	**0.107**	**0.111**	**0.064**	**0.039**	**0.047**

** Tested by both the Hach TNT and ISE methodology in 2023.
NT – No test completed.

Appendix C – Permit Non-Conformance Reports

Permit Non-Conformances

Date of Non-compliance	Describe the Issue	What was the Immediate Resolution?	Describe the Suspected Cause or Solution	Investigation Results
GNPCC FLOW (x3)				
January 12, 2023	The flow rate for January 12, 2023 at GNPCC is recorded at 95897 m3/d which exceeds the permit (limit = 80,870 m3/day).	The chief operator/ Superintendent/ process engineer were informed via email		While the ground is saturated, above normal wet weather triggered the flow permit limit. This will be addressed in the new Operational Certificate that will be issues in the coming weeks for GNPCC. The requirements as per the new OC have incorporated these bypasses and the plant is allowed 35 days in a calendar year to bypass the flows in exceedance of 60,000 m3/day
January 13, 2023	Flow rate for January 13, 2023 was recorded as 82588 m^3/d which is above the flow permit.	Chief operator/Superintendent/Senior operator and process engineer were informed via email.		While the ground is saturated, above normal wet weather triggered the flow permit limit. This will be addressed in the new Operational Certificate that will be issues in the coming weeks for GNPCC. The requirements as per the new OC have incorporated these bypasses and the plant is allowed 35 days in a calendar year to bypass the flows in exceedance of 60,000 m3/day
GNPCC SAMPLING(x1)				
July 8, 2023	No final effluent composite sample was collected on 2023 July 8. Due to this, the daily TSS and cBOD analysis requirements could not be met.	WWS Sup't, Process Engineer and GNPCC Chief Operator were notified of the non-conformance. Lab Technician analyzed the final effluent grab sample for all routine parameters to show that the effluent quality was not in question that day.	Sampler was not turned on in the morning of July 8th and the issue was not discovered until the morning of July 9th. Operations staff will create a sampler check sheet that will be located in the final effluent sampler shed. Operations staff will provide a time stamp and initial when they check the sampler as part of morning and evening rounds.	A sampler check sheet is being filled out diligently by the operators. The duties of an operator related to the sampler operation and checks is being taught to new hires and operators new to the plant.

Appendix D – External Laboratory Test Results

2023 GNPCC EFFLUENT								
Parameter	Units	28-Feb-23	08-May-23	07-Jun-23	28-Aug-23	15-Nov-23	04-Dec-23	Year End
pH*	pH units	7.2	7.0	-	7.1	6.9	-	7.1
Survival Rate (Rainbow Trout)*	%	>100	>100	-	>100	>100	-	>100%
Dissolved Chloride	mg/L	-	-	140	-	-	150	145
Total Kjeldahl Nitrogen / TKN	mg/L	-	-	16.2	-	-	13.7	15.0
Oil and Grease (total)	mg/L	-	-	<1.0	-	-	1.5	<1.3
Dissolved Sulphate	mg/L	-	-	31	-	-	36	34
Nitrate (as N)	mg/L	-	-	9.49	-	-	4.34	6.92
Nitrite (as N)	mg/L	-	-	2.30	-	-	1.04	1.67
Sulphide (total)	mg/L	-	-	0.022	-	-	<0.0018	<0.012
Cyanide (total)	mg/L	-	-	0.00183	-	-	0.00138	0.00161
Fluoride	mg/L	-	-	0.053	-	-	<0.050	<0.052
Total Organic Carbon / TOC	mg/L	-	-	14	-	-	17	16
Total Phenols	mg/L	-	-	<0.0015	-	-	0.0017	<0.0016
Polychlorinated Biphenyls / PCBs	ug/L	-	-	<0.050	-	-	<0.050	<0.050
METALS Scan by ICP								
Aluminum (total)	ug/L	-	-	9.7	-	-	29.1	19.4
Arsenic (total)	ug/L	-	-	0.43	-	-	0.45	0.44
Barium (dissolved)	ug/L	-	-	1.4	-	-	7.8	4.6
Boron (dissolved)	ug/L	-	-	219	-	-	217	218.0
Cadmium (dissolved)	ug/L	-	-	<0.010	-	-	0.15	<0.080
Chromium (total)	ug/L	-	-	<1.0	-	-	<1.0	<1.0
Cobalt (dissolved)	ug/L	-	-	0.40	-	-	0.29	0.35
Copper (dissolved)	ug/L	-	-	17.0	-	-	7.56	12.3
Iron (dissolved)	ug/L	-	-	113	-	-	66.9	90.0
Lead (total)	ug/L	-	-	0.25	-	-	0.40	0.33
Manganese (dissolved)	ug/L	-	-	22.3	-	-	43.0	32.7
Mercury (total)	ug/L	-	-	<0.0019	-	-	<0.038	<0.020
Selenium (total)	ug/L	-	-	0.14	-	-	0.15	0.15
Molybdenum (total)	ug/L	-	-	<1.0	-	-	<1.0	<1.0
Nickel (dissolved)	ug/L	-	-	2.5	-	-	1.6	2.1
Silver (total)	ug/L	-	-	<0.020	-	-	<0.020	<0.020
Tin (total)	ug/L	-	-	<5.0	-	-	<5.0	<5.0
Zinc (total)	ug/L	-	-	28.6	-	-	35.5	32.1
VOC Scan								
Chloroform	ug/L	-	-	2.9	-	-	3.5	3.2
Dichloromethane	ug/L	-	-	<2.0	-	-	<2.6	<2.3
Chloromethane	ug/L	-	-	<1.0	-	-	<1.0	<1.0
Tetrachloroethylene	ug/L	-	-	<0.50	-	-	<0.50	<0.50
1,1,1-Trichloroethane	ug/L	-	-	<0.50	-	-	<0.50	<0.50
1,1,2-Trichloroethane	ug/L	-	-	<0.50	-	-	<0.50	<0.50
Trichloroethylene	ug/L	-	-	<0.50	-	-	<0.50	<0.50
Benzene	ug/L	-	-	<0.40	-	-	<0.40	<0.40
Ethylbenzene	ug/L	-	-	<0.40	-	-	<0.40	<0.40
Toluene	ug/L	-	-	<0.40	-	-	<0.40	<0.40
Naphthalene	ug/L	-	-	<0.10	-	-	<0.10	<0.10
Phthalate Esters								
Di(2-ethylhexyl)phthalate	ug/L	-	-	<2.0	-	-	<2.0	<2.0
Di-n-Butylphthalate	ug/L	-	-	<2.0	-	-	<2.0	<2.0

2023 GNPCC INFLUENT		
Parameter	Unit	11-Jun-23
pH	pH Units	-
Alkalinity (total, as CaCO3)	mg/L	-
Ammonia	mg/L	-
Chloride	mg/L	170
Total Kjeldahl Nitrogen / TKN	mg/L	57.4
Oil and Grease (total)	mg/L	26
Sulphate	mg/L	31
Fluoride	mg/L	<0.050
Nirate (plus Nitrite) (N)	mg/L	<0.020
Total Organic Carbon / TOC	mg/L	120
Phosphorus (total)	mg/L	-
Sulphide (total)	mg/L	0.43
Cyanide (total)	mg/L	0.026
Polychlorinated Biphenyls / PCBs	ug/L	<5.0
Total Phenols*	mg/L	0.022
METALS Scan by ICP		
Aluminum (total)	ug/L	266
Arsenic (total)	ug/L	0.68
Barium (dissolved)	ug/L	52.1
Boron (dissolved)	ug/L	287
Cadmium (dissolved)	ug/L	0.172
Chromium (total)	ug/L	3.1
Cobalt (dissolved)	ug/L	0.48
Copper (dissolved)	ug/L	23.8
Iron (dissolved)	ug/L	999
Lead (total)	ug/L	2.67
Manganese (dissolved)	ug/L	50.3
Mercury (total)	ug/L	<0.038
Molybdenum (total)	ug/L	1.4
Nickel (dissolved)	ug/L	2.2
Selenium (total)	ug/L	0.51
Silver (total)	ug/L	0.270
Tin (total)	ug/L	<0.50
Zinc (total)	ug/L	158
VOC Scan		
Chloroform	ug/L	3.8
Dichloromethane	ug/L	<2.0
Chloromethane	ug/L	<1.0
Tetrachloroethylene	ug/L	<0.50
1,1,1-Trichloroethane	ug/L	<0.50
1,1,2-Trichloroethane	ug/L	<0.50
Trichloroethylene	ug/L	<0.50
Benzene	ug/L	<0.40
Toluene	ug/L	0.64
Ethylbenzene	ug/L	<0.40
Naphthalene	ug/L	<0.10
Phthalate Esters		
Di(2-ethylhexyl)phthalate	ug/L	<20
Di-n-Butylphthalate	ug/L	<20

2023 GNPCC BIOSOLIDS														OMRR Regulatory Limits (Class B Biosolids)
Parameter	Unit	12-Jan-23	08-Feb-23	08-Mar-23	12-Apr-23	10-May-23	07-Jun-23	12-Jul-23	09-Aug-23	06-Sep-23	11-Oct-23	08-Nov-23	05-Dec-23	Average *	
Fecal coliforms	MPN/g	13,000	17,000	12,000	9,000	6,900	71,000	11,000	21,000	22,000	6,000	26,000	3,700	**13,000**	**2,000,000**
Percent Moisture	%	82	81	80	81	81	80	79	77	77	78	77	79	**79**	-
Total Solids	%	-	-	19.9	-	-	19.7	-	-	22.7	-	-	21.8	**21.0**	-
Volatile Solids	%	-	-	79.4	-	-	79.4	-	-	75.5	-	-	76.4	**77.7**	-
Total Kjeldahl Nitrogen / TKN	%	-		9.9			7.4			5.0			5.4	**6.9**	-
Phosphorus nw (total)	mg/kg	-	-	16,500	-	-	16,300	-	-	19,500	-	-	20,400	**18,200**	-
Polychlorinated Biphenyls / PCBs	mg/kg	-	-	<5.0	-	-	<1.0	-	-	<4.4	-	-	<2.4	**<3.2**	-
Arsenic nw (total)	mg/kg	-	-	2.46	-	-	2.23	-	-	2.28	-	-	2.33	**2.33**	**75**
Cadmium nw (total)	mg/kg	-	-	1.69	-	-	1.59	-	-	1.34	-	-	1.46	**1.52**	**20**
Chromium nw (total)	mg/kg	-	-	21.8	-	-	22.2	-	-	27.5	-	-	28.5	**25.0**	**1,060**
Cobalt nw (total)	mg/kg	-	-	3.74	-	-	2.94	-	-	2.85	-	-	4.06	**3.40**	**150**
Copper nw (total)	mg/kg	-	-	647	-	-	656	-	-	679	-	-	628	**653**	**2,200**
Iron nw (total)	mg/kg	-	-	13,600	-	-	18,800	-	-	33,600	-	-	36,400	**25,600**	-
Lead nw (total)	mg/kg	-	-	29.2	-	-	22.9	-	-	26.7	-	-	24.8	**25.9**	**500**
Mercury nw (total)	mg/kg	-	-	0.909	-	-	0.782	-	-	0.929	-	-	0.802	**0.856**	**15**
Molybdenum nw (total)	mg/kg	-	-	9.11	-	-	8.24	-	-	7.22	-	-	7.68	**8.06**	**20**
Nickel nw (total)	mg/kg	-	-	15.0	-	-	12.8	-	-	14.0	-	-	14.8	**14.2**	**180**
Potassium nw (total)	mg/kg	-	-	1090	-	-	838	-	-	692	-	-	859	**870**	-
Selenium nw (total)	mg/kg	-	-	5.76	-	-	5.74	-	-	5.08	-	-	5.33	**5.48**	**14**
Zinc nw (total)	mg/kg	-	-	926	-	-	980	-	-	982	-	-	1000	**972**	**1,850**

* Note – Geometric Mean presented in this column for Fecal coliforms nw (dry weight) (MPN / PA)

Appendix E – Odour Concern Reports

Odour Complaints

Date of Occurrence	Location	Incident Description	Extent of damage (if applicable)	Preventative Measures Identified	Conclusion for this Environmental Incident
GNPCC - Odour (x1)					
2-May-23	[redacted] Hammond Bay Rd	Resident just South of GNPCC is "smelling an odour from the waste treatment plant"		Attempted to call resident; [redacted] will not work "can't be completed as dialed". Resident lives just south of GNPCC. Investigated possible source; SC#2 is being pumped down for maintenance and is the most likely source. Continue with pump out and cleanup ASAP to mitigate. Operator also visited residence to talk to complainant, but no one was home.	Actions taken by GNPCC Operations was sufficient, and the reason for the temporary odor is correct as the Clarifiers were being cleaned. No further action is required as the odor source is no longer present.

Wellington Pump Station - Odour (x2)					
1-Aug-23	Wellington Pump Station	Neighbor living on Fillinger Crescent reported strong sewer smell around the pump station.		Operator went to site to investigate, confirmed that wetwell fans are working. Added Odour modifier and hosed the Wetwell.	Warmer temps and low pressure contributed to odors at WPS, which is normal for the time of year. OPs are installing a scent all odor modifier to help mitigate odors until the weather changes.
9-Aug-23	Wellington Pump Station	Neighbor beside WPS experiencing odour issues...."worst in the 22 yrs we have lived here" "can't sit on deck and have to have windows closed at night"		[redacted] attended site. Odour seems to have dissipated but still detectable by nose. Operators will apply Scentall to wetwell to try and mask odours through the remaining hot months.	I also contacted [redacted] via email, and put him in touch with [redacted] ([redacted] email to [redacted] is below: Hi [redacted]. My name is [redacted], I am the Chief Operator at the Greater Nanaimo Pollution Control Center. Thank you for reporting the odor at the Wellington Pump Station. Just a quick update. I had an operator go down to the pump station today, odours were detectable but seemed to have dispersed a bit by mid day. Definitely still odour present however. We are going to try using an odour modifier product called Scentall to try and mask the odor for the remaining warm weather months. They will apply it daily in the wetwell when the station check is completed , hopefully this helps to mitigate the odours you are experiencing in the short term. Feel free to call me at the plant if you have any questions or have any other odours or concerns to report. Thank you. Regards, [redacted] Chief Operator, GNPCC

Appendix F – 2023 Biosolids Management Summary and Compliance Report

Regional District of Nanaimo

2023 Biosolids Management Summary Report

February 2024

Prepared for:

Regional District of Nanaimo
6300 Hammond Bay Road
Nanaimo, BC
V9T 6N2

Prepared by:

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SYLVIS DOCUMENT #1671-24

SYLVIS

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1 PROGRAM OVERVIEW

The Regional District of Nanaimo (RDN) operates two wastewater treatment plants that produce municipal biosolids:

1. Greater Nanaimo Pollution Control Centre (GNPCC) - Class B biosolids
2. French Creek Pollution Control Centre (FCPCC) - Class A biosolids

This report provides a summary management of GNPCC biosolids. In 2023, GNPCC biosolids were managed at one site in the Nanaimo area: private forest lands off Nanaimo River Road (Blackjack) managed by Mosaic Forest Management (Mosaic).

At Blackjack, Class B GNPCC biosolids were used by SYLVIS in a forest fertilization and reclamation program. The objectives of biosolids forest fertilization were to increase soil quality and tree growth, and for reclamation to return a logging camp to productive forest and habitat. Since the GNPCC biosolids management program was transitioned to Blackjack in 2021, over 11,000 wt have been managed at this site through forest fertilization and reclamation.

A total of 5,717 wet tonnes (wt) of biosolids were produced from the GNPCC in 2023 (Table 1, Appendix One), all which were delivered to Blackjack (Table 2, Appendix One). Total GNPCC biosolids production in 2023 was greater than the five-year average annual production though consistent with the increased production following the implementation of secondary treatment operations at the GNPCC (Table 1).

2 REGULATORY AUTHORIZATION

RDN biosolids were managed at Blackjack under the *2022 Blackjack – Forest Fertilization & Reclamation Land Application Plan* (SYLVIS document #1525-22) associated with Authorization #111152 valid April 24, 2022 to April 23, 2023 and under the 2023 Blackjack – *Forest Fertilization & Restoration Land Application Plan* (SYLVIS document #1602-23) associated with Authorization #111628 valid April 23, 2023 to April 22, 2024.

3 2023 BIOSOLIDS MANAGEMENT

3.1 BIOSOLIDS MANAGEMENT SUMMARY

In 2023, all GNPCC biosolids were managed at Blackjack on Nanaimo River Road in Nanaimo, British Columbia (BC). Contractual tasks under the 2021-2026 contract relating to biosolids quality monitoring, biosolids delivery coordination, site safety, environmental monitoring, public engagement, First Nations communications, sustainability activities, and reporting were completed in 2023 are summarized in Table 3 (Appendix One).

3.2 BIOSOLIDS TRANSPORTATION

Biosolids produced at GNPCC are scaled at the plant and tonnages are provided by the RDN. In 2023, all biosolids produced at the GNPCC (5,717 wt) were transported by DBL Disposal to

Blackjack (Table 2). Monthly tonnage delivered to this site in 2023 is shown in Figure 1 (Appendix One).

3.3 BIOSOLIDS STORAGE

One large storage site exists at Blackjack consisting of an asphalt base with lock blocks delineating three sides of the stockpiles (Photograph 1, Appendix Three). All biosolids delivered to Blackjack in 2023 were stored at this site, with the exception of biosolids used for reclamation which were stockpiled within the reclamation area. Biosolids storage conformed to OMRR requirements for Vancouver Island where biosolids are required to be covered from October 1 to March 31 of every year. At the end of 2023, 200 wt remained in storage site at Blackjack in preparation for fertilization in 2024 (Table 2).

3.4 2023 PRE-APPLICATION MEASURES

At Blackjack, site inspections were carried out by a SYLVIS Qualified Professional or designate prior to biosolids forest fertilization and reclamation. During site inspections, water features and other sensitive site features were identified, mapped, and appropriate setback distances were determined. Pre-application soil samples were collected in order to determine an appropriate agronomic rate for biosolids applications. Groundwater depth was assessed using a soil auger or visually in road cuts and was confirmed to be in excess of 1 metre (m) prior to commencing biosolids applications.

3.5 BIOSOLIDS LAND APPLICATION

In 2023, a total of 5,667 wt of GNPCC biosolids were applied Blackjack (Table 2, Appendix One; Figure 1, Figure 2, Appendix Two). At the end of 2023, 200 wt (all from GNPCC) remained in storage site at Blackjack in preparation for fertilization in 2024 (Table 2).

Biosolids (5,365 wt) were land-applied to 64.2 hectares (ha) of forested lands for forest fertilization. Biosolids were land-applied in forested areas using a side-discharge spreader equipped with a hydraulic fan which propels the biosolids up to 30 m into forest stands (Photograph 2). Forest fertilization biosolids applications occurred throughout 2023 except during periods of extreme weather (i.e., snowfall, heavy rainfall, heat waves) or when the ground was snow-covered; land application operations were suspended during these times. For example, biosolids land applications did not occur for two weeks of December when periods of snowfall or snow cover occurred. All biosolids applications adhered to a 30-m setback distance from permanent water features and identified ephemeral water features.

Forest fertilization application rates were specific to the individual fertilization units based on pre-application soil sampling and nutrient requirements of the trees, understory vegetation, and soils. The biosolids application rate for forested land averaged 17.1 dry tonnes per ha (dt/ha) which does not exceed the lower of the maximum agronomic application rates specified in the LAPs for forest fertilization (32 dry tonnes per ha).

Biosolids (302 wt) were land-applied to 1.0 ha disturbed land for reclamation at Blackjack in late-October to early-November 2023. Reclamation areas were applied with biosolids and wood waste at the ratio and volumes specified in the applicable LAP using a front-end wheel loader to evenly

disperse the feedstocks across the soil surface (Photograph 3). The biosolids and wood waste were then incorporated into the soil during December 2023 by Mosaic using a bulldozer. The average application rate (59.6 dt/ha) does not exceed the reclamation application rate specified in the LAP applicable at the time of applications (143 dt/ha). All biosolids applications adhered to a 30-m setback distance from permanent water features and identified ephemeral water features.

3.6 BIOSOLIDS QUALITY

The OMRR requires that a set of seven discrete samples be collected for fecal coliform analysis and one sample for trace elements annually or for every 1,000 dry tonnes of biosolids applied, whichever comes first. Biosolids quality was characterized throughout 2023 to ensure biosolids met quality requirements for trace element concentrations, foreign matter, and pathogen reduction set forth in the OMRR.

In 2023, 1,172 dt of biosolids were produced by the GNPCC. Three composite samples, each composed of eight equal-volume subsamples, were collected by SYLVIS at the GNPCC. Composite samples were analyzed for physical parameters, nutrients, and trace elements (Table 4, Appendix One). All RDN biosolids samples collected in 2023 met the OMRR Class B criteria for trace elements concentrations.

SYLVIS collected 14 fecal samples from the GNPCC, the geometric mean of the sampling sets was 26,200 MPN/g (Table 4), meeting OMRR Class B criterion of 2,000,000 MPN/g.

3.7 SOIL MONITORING

Soil monitoring was conducted in prior to applications in forest fertilization areas and potential reclamation areas at Blackjack in 2023. Soil samples, each comprised of 15 sub-samples from the top 15 cm for forest fertilization and the top 30 cm for reclamation areas, were collected by SYLVIS. Soil trace element concentrations were below applicable OMRR soil criteria for this site. Further details on soil sampling and nutrient concentrations can be found in the LAP.

3.8 REGULATORY COMPLIANCE

A Qualified Professional Certification was provided to Mosaic for biosolids applied at Blackjack under Authorization #111152. Authorization #111628 remains active until April 22, 2024; a Qualified Professional Certification will be authored upon completion of the Authorization term.

3.9 CARBON ACCOUNTING RELATED TO BIOSOLIDS MANAGEMENT

The management of 5,717 wt GNPCC biosolids at Blackjack in 2023 resulted in -1,476 t/CO2e of net emissions (emissions and emissions removals), of which transport represents +57 t CO2e GHG emissions.

This carbon emissions estimate considers biosolids transport, biosolids storage, land application, soil carbon sequestration, and soil nitrous oxide emissions. Carbon sequestration related to tree growth is accounted for separately by Mosaic and vehicle (i.e., pickup truck) emissions related to project operations are accounted for externally by SYLVIS.

4 SUMMARY AND INTERPRETATION OF THE EFFECTS OF BIOSOLIDS DISCHARGES ON RECEIVING ENVIRONMENT

The objectives of biosolids forest fertilization at Blackjack are to increase soil quality and tree growth while remaining compliant with the OMRR. Biosolids fertilization has increased organic matter content and available nutrients (e.g., phosphorus) in the surface horizon. These enriched soils store more carbon and enable accelerated tree growth, which has been documented at this site and other biosolids forest fertilization sites. It has been observed[1] at the previous TimberWest Properties site on Doumont Road that deer browsing of trees is increased in biosolids-fertilized areas. Other biosolids fertilization sites in BC have documented similar results with improved wildlife habitat from biosolids applications on grasslands[2].

In addition, the objectives of reclamation activities at Blackjack were to return disturbed lands, including landings and camps, to productive forest through the fabrication of a viable soil to increase soil nutrients, tilth, and organic matter. Post-application soil sampling occurred during 2023 for reclamation areas applied at Blackjack in 2022. Soil analyses indicated increases in organic matter and soil nutrients while trace elements were within regulatory limits; data can be provided upon request.

Water sampling upstream and downstream of biosolids applications were completed by Mosaic in January, February, April, and May. No adverse impacts from biosolids were seen; data can be provided upon request.

5 CONCLUSION

RDN's GNPCC biosolids were managed at Blackjack in 2023; 5,717 wt were delivered and 5,667 wt were applied onsite (Table 2). All biosolids land application activities at Blackjack occurred as specified in the applicable LAPs and according to management requirements included in the OMRR. Since transitioning the biosolids management program to Blackjack in 2021, over 11,000 wt of GNPCC biosolids have been managed onsite while being set up to become a successful long-term management site.

SYLVIS looks forward to continuing this productive relationship and providing biosolids management services and support to the RDN throughout 2024.

[1] Danjou, B. 2014. Effect of Biosolid on Vegetation Development Within Two Douglas-fir Plantations: Third Year Progress Report - DRAFT. Vancouver Island University, Nanaimo, B.C.
[2] Meineke, J., Doyle, F. I., Oukil, L., & Hodges, K. E. (2023). Small mammal responses to biosolids on grazed rangelands in British Columbia. *Restoration Ecology*, e14063.

APPENDIX ONE – TABLES

Table 1: Historical management of Regional District of Nanaimo's Greater Nanaimo Pollution Control Centre biosolids at the TimberWest Properties and Blackjack from 2014 to 2023.

Year	TimberWest Properties	Blackjack	Total Production
2014	4,812 wt	-	4,812 wt
2015	4,383 wt	-	4,383 wt
2016	4,263 wt	-	4,263 wt
2017	3,662 wt	-	3,662 wt
2018	4,802 wt	-	4,802 wt
2019	4,871 wt	-	4,871 wt
2020	3,773 wt	-	3,773 wt
2021	5,060 wt	317 wt	5,377 wt
2022	802 wt	5,095 wt	5,897 wt
2023	-	5,717 wt	5,717 wt
Total	**36,428 wt**	**11,129 wt**	**47,557 wt**

Table 2: Regional District of Nanaimo's Greater Nanaimo Pollution Control Centre Class B biosolids management summary - 2023.

Site	**Blackjack** (wt)
Storage from 2022	150
Delivered	5,717
Land applied at site	5,667
Storage to 2024	200

Table 3: Summary of SYLVIS 2023 deliverables as outlined in the RDN-SYLVIS 2021-2026 Agreement for GNPCC biosolids management.

Task or Activity	Description
Biosolids Quality	RDN biosolids quality was monitored throughout 2023 through the collection of three full suite samples and 14 fecal coliform samples.
Biosolids Quantity	5,717 tonnes of RDN biosolids were transported to the Blackjack site by DBL Disposal in 2023. 5,667 tonnes of biosolids were land-applied in 2023. 200 tonnes remained stored at Blackjack at the end of 2023.
Biosolids Transportation & Delivery Coordination	The RDN coordinated biosolids deliveries with DBL and SYLVIS throughout 2023.
Contingency Plan & Management	A Contingency Plan was written for the 2021-2026 biosolids management contract and the following contingency sites were available for use in 2023: TimberWest Properties, Harmac, Hamm Road, 155-A Pit, and Haslam Pit. No contingency management was required in 2023.
Storage of Biosolids	Biosolids were stored at the main storage site at Blackjack and covered with tarps from October 1 to March 31 as per OMRR requirements.
Invoicing	Biosolids deliveries were invoiced on a monthly basis.
Environmental Incidents	No environmental incidents occurred in 2023.
Site Safety	One safety incident occurred at Blackjack in 2023. SYLVIS maintained COR and BC Forest SAFE safety accreditations in 2023.
Complaints Management	There were no complaints received about the biosolids forest fertilization program in 2023.
Odour Management Plan	The program Odour Management Plan was adhered to in 2023.
Communications Plan & Engagement	The program Communications Plan was adhered to in 2023. Five inquires were received from the public regarding biosolids storage requirements, potential impacts to wild game and plant harvesting, potential impacts on water quality, and information requests regarding proposed addition of another biosolids generator in the Blackjack program. The RDN was included on all stakeholder responses. First Nations engagement was carried out with the Snuneymuxw First Nation for the Blackjack site through Mosaic during 2023. The Snuneymuxw First Nation reached out regarding concerns of potential impacts to wild game and plant harvesting (included above).
Annual Reporting	Qualified Professional Certification of Compliance report, fulfilling the regulatory requirement for written certification under OMRR Section 5(3), were provided to the RDN and Mosaic for land applications at Blackjack under Authorization #111152.
Biosolids Beneficial Use	Two biosolids Land Application Plans for Authorizations #111152 and #111628 were submitted to the Ministry of Environment and Climate Change on May 6, 2022 and April 28, 2023, respectively, for Blackjack. 5,667 tonnes of biosolids were land-applied to 64.2 ha of forest and 1.04 ha of disturbed land.
Review of Biosolids Technology & Management Advancements	A review was completed of emerging biosolids treatment technologies and management strategies across BC and Canada. A summary is provided in Appendix Four.

Table 4: Regional District of Nanaimo – Greater Nanaimo Pollution Control Centre biosolids quality summary - 2023.

Parameter	GNPCC	Regulatory Criteria[a]	Units
Available Nutrients, Physical Properties, Acidity			
Total Nitrogen - TKN	60,229	-	µg/g
Ammonia + Ammonium- N (available)	7,697	-	µg/g
Nitrate - N	<5	-	µg/g
Phosphorus (available)	1,480	-	µg/g
Potassium (available)	2,522	-	µg/g
Organic Matter	67.6	-	%
Total Solids	20.5	-	%
pH	6.9	-	pH
Electrical Conductivity	4.3	-	dS/m
Trace Elements			
Arsenic	1.3	75	µg/g
Cadmium	1.4	20	µg/g
Chromium	38	1,060	µg/g
Cobalt	3.0	150	µg/g
Copper	620	2,200	µg/g
Lead	26	500	µg/g
Mercury	0.55	15	µg/g
Molybdenum	7.2	20	µg/g
Nickel	14	180	µg/g
Selenium	5.4	14	µg/g
Zinc	880	1,850	µg/g
Microbiological Analysis - Fecal Coliforms			
Fecal Coliforms	26,200[b]	2,000,000	MPN/g

Note: Values are the mean of three composite samples, each composed of eight equal-volume subsamples collected during 2023 by SYLVIS Environmental and analyzed by Element Laboratories. All analyses based on dry weight.

a Class B trace element criteria specified in Schedule 4 and microbiological criteria in Schedule 3 of the BC *Organic Matter Recycling Regulation*.

b Value is the geometric mean of 14 samples collected by SYLVIS throughout 2023.

APPENDIX TWO – FIGURES

Figure 1: Tonnage of Regional District of Nanaimo – Greater Nanaimo Pollution Control Centre (GNPCC) dewatered biosolids delivered and applied at Blackjack by month in 2023.

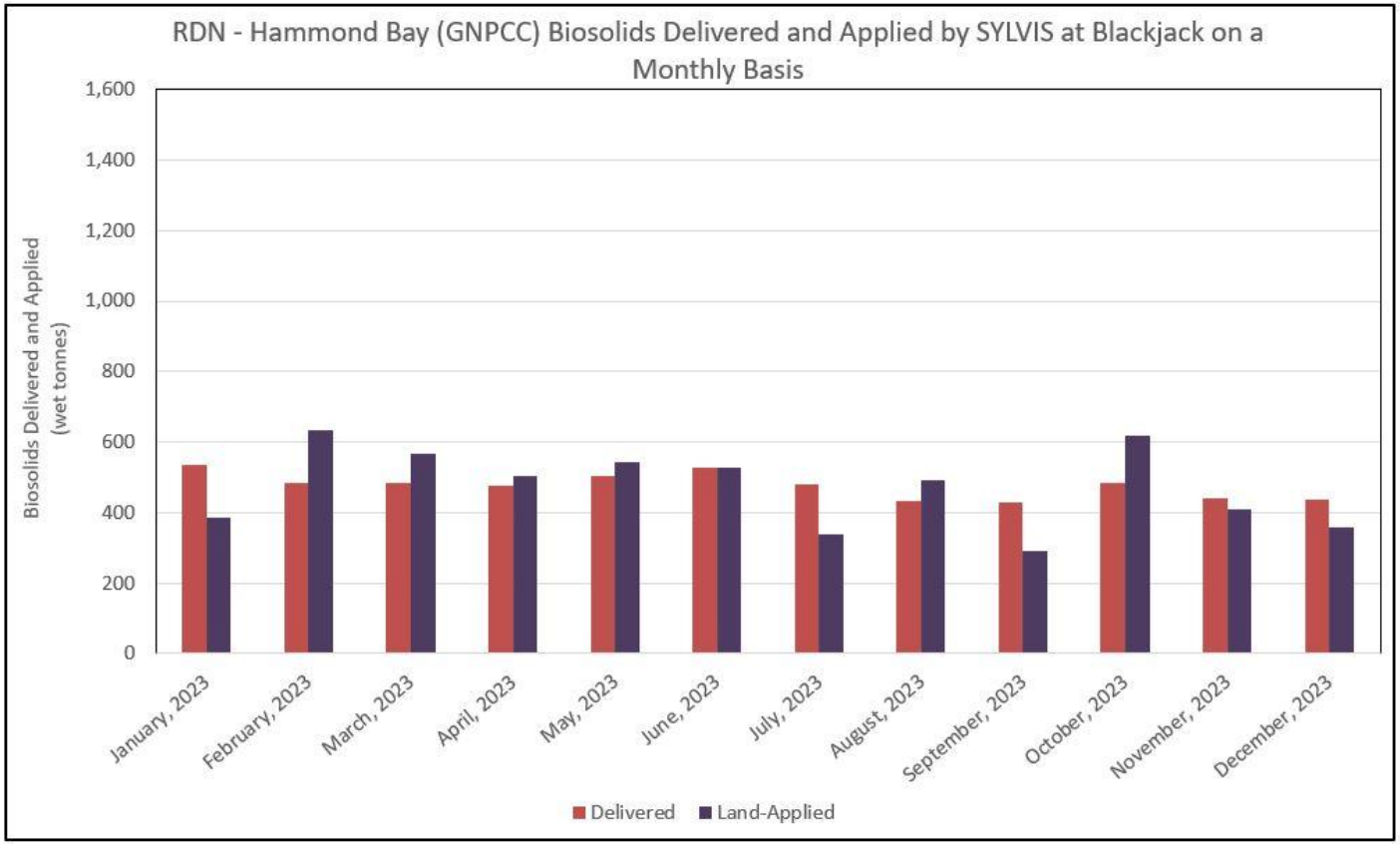
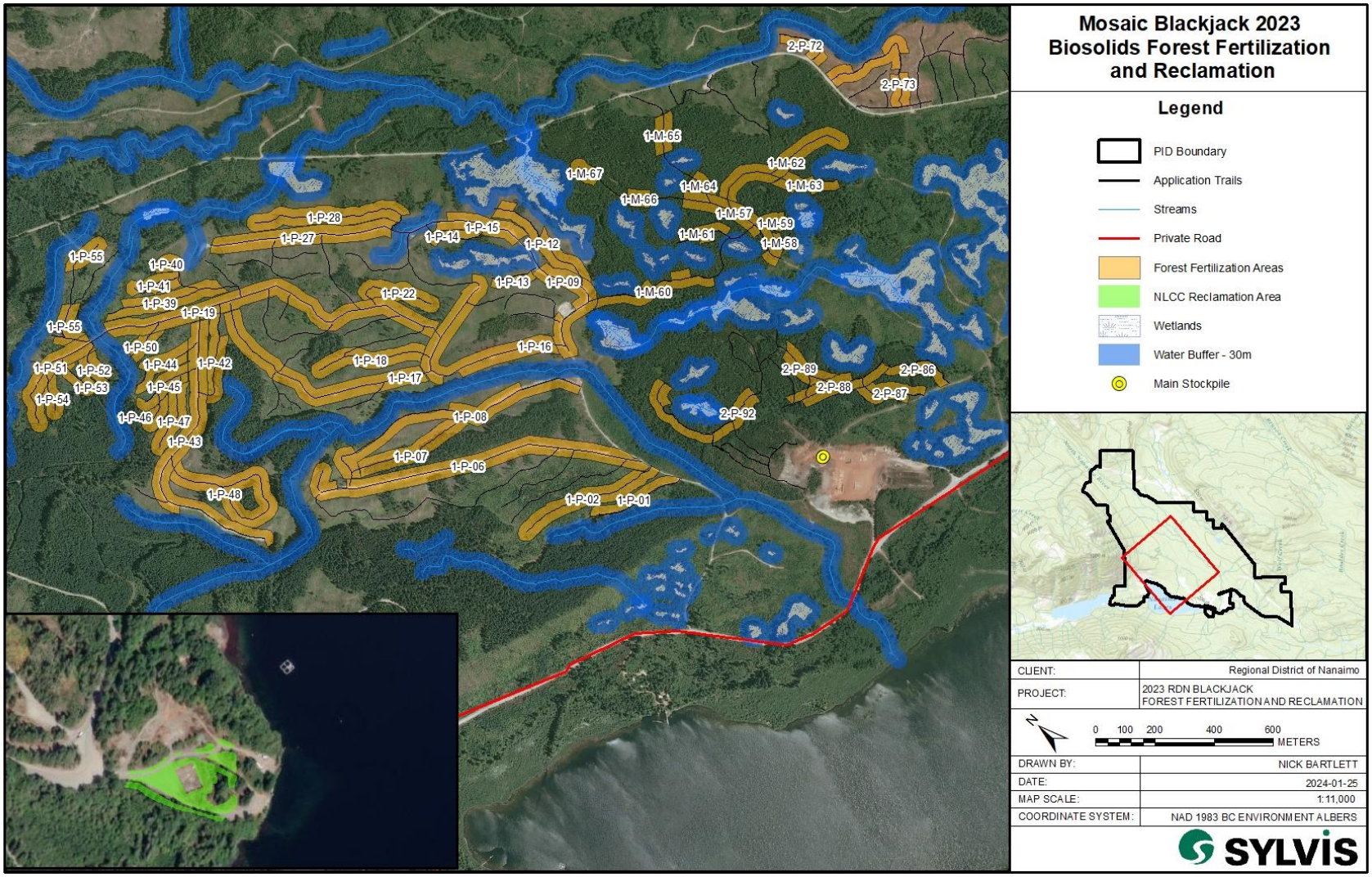
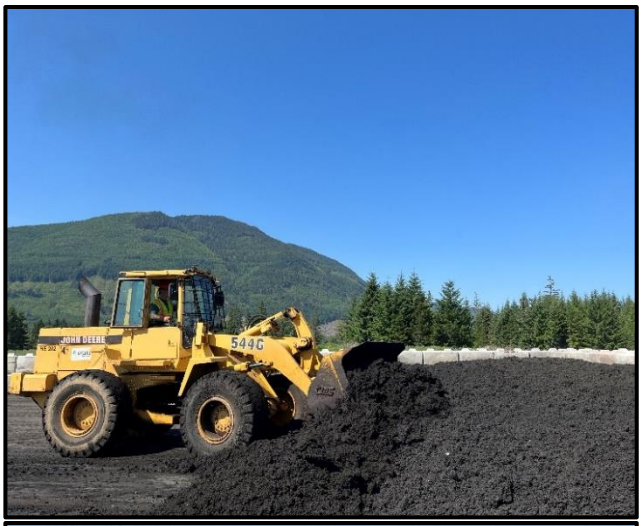


Figure 2: Blackjack application areas fertilized with Regional District of Nanaimo biosolids in 2023.



APPENDIX THREE – PHOTOGRAPHS



Photograph 1: Biosolids consolidation at the Blackjack main storage site. (June 2023)

Photograph 2: Forest fertilization using biosolids onto a juvenile forest block. (August 2023)

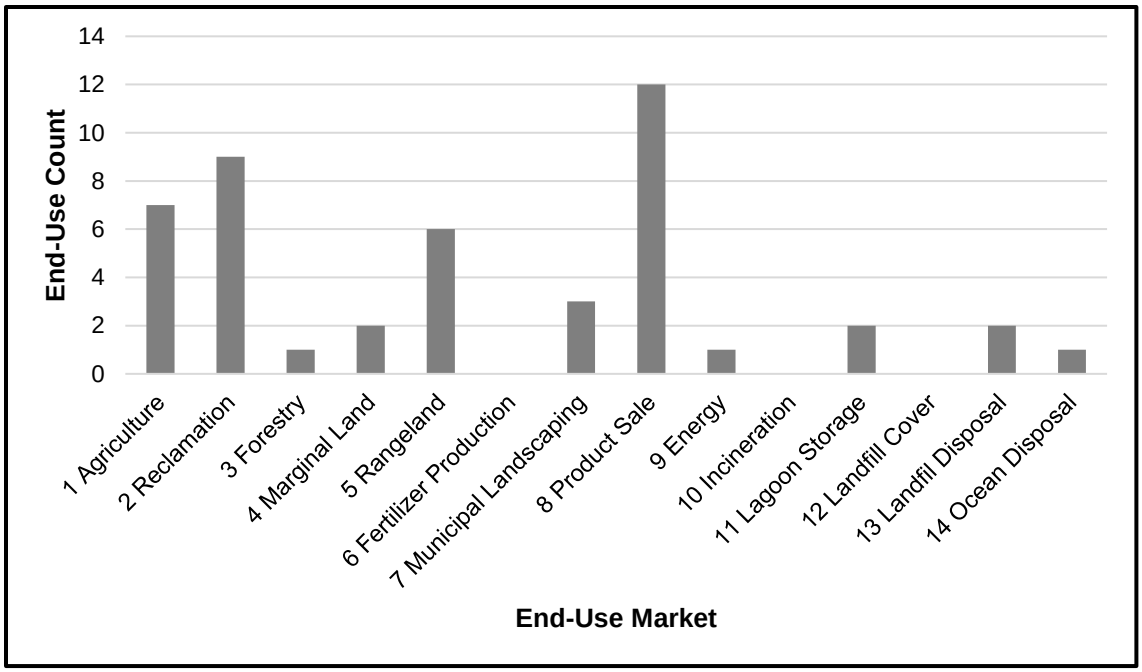
Photograph 3: Biosolids and Hog being applied to reclamation areas at Blackjack. (October 2023)

APPENDIX FOUR – REVIEW OF BIOSOLIDS TECHNOLOGY IMPROVEMENTS & MANAGEMENT ADVANCEMENTS

The RDN is interested in understanding how biosolids are managed in other jurisdictions across Canada and in keeping up-to-date on emerging treatment technologies. A high-level review of improvements in biosolids processing technologies and management programs across Canada was conducted and is summarized below.

Fourteen biosolids management methods and uses were found across BC and Canada. Biosolids management by 38 municipalities in British Columbia are presented in Figure B 1. Reported values are counts of municipalities and are not based on the tonnage of biosolids managed; if a municipality manages biosolids through multiple methods then each method is presented as an individual result.

Figure B 1: Biosolids products and markets in British Columbia.

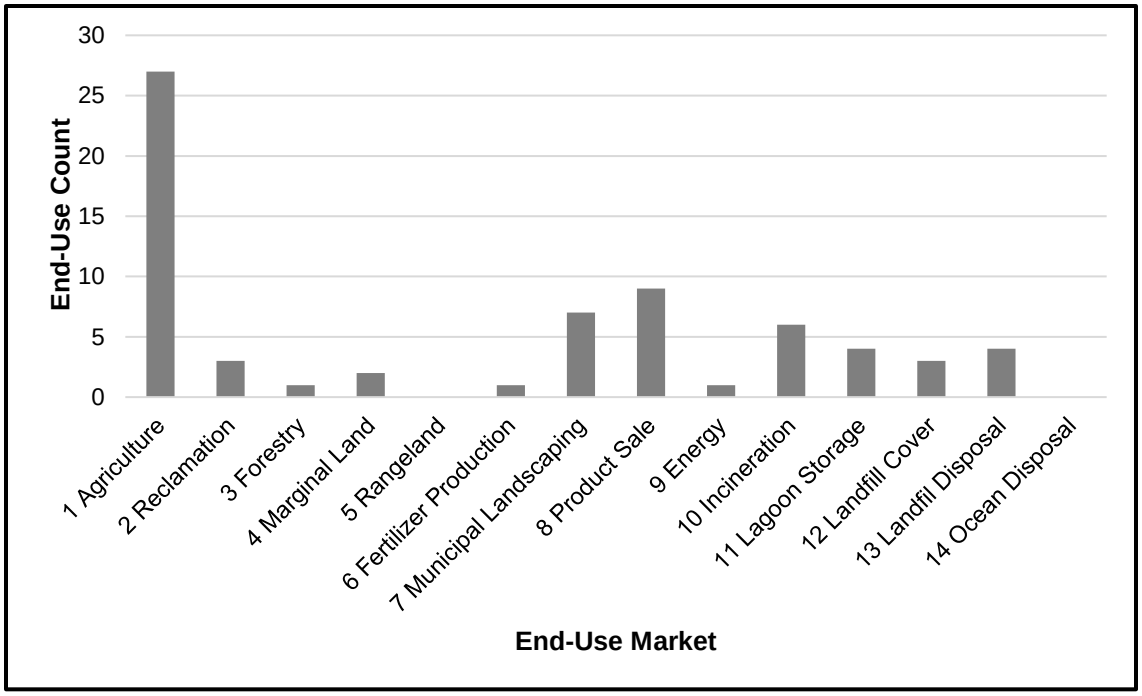


Most BC municipalities are managing biosolids and biosolids-derived products in land application markets (end-use markets 1-8). Numerous small biosolids generators are managed in large composting facilities which produce compost for sale or for use in mine reclamation. The RDN's current management programs using biosolids in forest fertilization in similar to land application processes in other BC jurisdictions, and the distribution of soils fabricated using biosolids (biosolids growing medium, BGM) aligns with many other BC municipalities.

SYLVIS also conducted a high-level review of biosolids management across the rest of Canada. Basic management information for the most populous city or cities in each province or territory was gathered using information readily available through internet research. Biosolids management by 69 Canadian municipalities outside of BC are presented in Figure B 2. Similar to

the figure above, counts represent municipalities and are not based on tonnage produced; if a municipality manages biosolids through multiple methods then each method has been included as an individual result.

Figure B 2: Biosolids products and markets in Canada outside of British Columbia.



Similar to BC, most municipalities are managing biosolids and biosolids-derived products in land application markets (markets 1-8). According to the limited data gathered, the RDN's forest fertilization project is one of two forest fertilization projects in the country, while the BGM project is one of three similar projects.

Currently there are numerous innovative wastewater solids treatment technologies under development in the world. Many of these technologies can replace digestion at a wastewater treatment plant but can also accept digested biosolids. A selection of these technologies is presented in the following table.

Table A 1: Example innovative wastewater solids processing technologies.

Technology	Acronym	Product
heat drying	-	dried Class A biosolids
pyrolysis	-	biochar
gasification	-	renewable natural gas (RNG)
hydrothermal liquefaction	HTL	biocrude, hydrochar
super critical water oxidation	SCWO	CO_2, inert ash
thermal hydrolysis	-	Class A biosolids

Some of these technologies have been implemented in Canada, but others have not. A non-exhaustive list of innovative technologies implemented and planned at Canadian sites is presented in the following table.

Table A 2: Canadian examples of innovative wastewater solids processing technologies.

Technology	Location	Feedstock	End-Use Market	Stage	Timeline
Lystek - thermal hydrolysis	Ontario, Saskatchewan	digested biosolids	agriculture	commissioned & under construction	2002 - 2024
N-Viro alkaline stabilization	Alberta, Nova Scotia, Prince Edward Island, Ontario	biosolids	agriculture, fertilizer	commissioned	-
heat drying	Metro Vancouver	biosolids	agriculture, fertilizer	-	2033
hydrothermal liquefaction (HTL)	Metro Vancouver	biosolids	unknown	design	-
pyrolysis	Ontario, Quebec, CRD	biosolids	syngas, biochar	under development, under consideration	-
gasification	CRD	biosolids	unknown	potential future option	-

The Lystek thermal hydrolysis process produces a number of products including a liquid Class A biosolids which is appropriate for use in agricultural regions but is less suited to Vancouver Island. The N-Viro alkaline stabilization process uses a considerable amount of lime to stabilize wastewater solids. Heat drying can reduce the mass of wet biosolids by 90% or more, reducing transport costs, but is expensive to implement and operate. Other thermal conditioning and treatment technologies for biosolids (pyrolysis, gasification, HTL) are less mature and are not currently implemented, even at pilot scale, in Canada though some pilots are planned.

The RDN's current approach of anaerobic digestion and centrifuge-dewatering, while not innovative, is reliable and predictable. RDN's forest fertilization program is relatively uncommon at the national scale and represents an innovative end-use of the RDN's biosolids. RDN's BGM production aligns with the second most common biosolids management use across Canada . The findings of this section are based on limited research and investigation; should the RDN wish to understand more about how its program compares to other biosolids management programs, both in Canada and elsewhere, SYLVIS would be pleased to carry this out under a separate scope of work.

Appendix H – GNPCC Annual Status Form (ASF)

Annual Compliance Status Form

AUTHORIZATION NUMBER: 338

AUTHORIZATION TYPE: Effluent, Permit

LEGAL AUTHORIZATION HOLDER NAME: Regional District of Nanaimo

PERIOD OF COMPLIANCE STATUS ASSESSMENT: 2023-01-01 to 2023-12-31

AUTHORIZED PERSON NAME: Adrian Limpus, Engineering Technologist - Wastewater Services

AUTHORIZED PERSON SIGNATURE: adrian limpus

SIGNATURE DATE: February 29, 2024

I understand that it is an offense to mislead a government official, and I declare that all of the information presented is accurate and true.
I have been given the authority by the authorization holder to sign this form.

AUTHORIZATION CLAUSE NUMBER	AUTHORIZATION CLAUSE DESCRIPTION	COMPLIANT? (Yes/No/ND)	RATIONALE FOR YOUR COMPLIANCE DETERMINATION	LOCATION OF SUPPORTING INFORMATION IN ANNUAL REPORT
1.1.1	The discharge of effluent to which this Section is applicable is from a municipal sewage treatment plant as shown on the attached Site Plan A. The B.C. Environment reference number (S.E.A.M. site number) for this discharge is E100008. 1.1.1 The rate at which effluent may be discharged is: Average - 27,730 X (1.0417)(calendar year-1994) m^3/d to a maximum of 40,950 m^3/d; Maximum Daily - 80,870 m^3/d.	No	GNPCC hadtwo non-compliances of the maximum daily flow permit limit of 80,870 m3/day in 2023 (January 12 - 95,857 m^3/day, January 13 - 82,588 m^3/day). All of the non-compliances occurred during significant precipiation and/or during snowfall melt events. These non-conformances are believed to be attributed to inflow and infiltration (I&I) entering into the sanitary collection system. As part of the LWMP process, the RDN is working collaboratively with the City of Nanaimo and the District of Lantzville to reduce I&I in the sanitary sewer collection system.	Section 4 - Flow Monitoring , Appendix B - Internal Flow Monitoring and Laboratory Data (Permit Data), and Appendix C - Permit Non-conformance reports.
1.1.1	The discharge of effluent to which this Section is applicable is from a municipal sewage treatment plant as shown on the attached Site Plan A. The B.C. Environment reference number (S.E.A.M. site number) for this discharge is E100008. 1.1.1 The rate at which effluent may be discharged is: Average - 27,730 X (1.0417)(calendar year-1994) m^3/d to a maximum of 40,950 m^3/d; Maximum Daily - 80,870 m^3/day.	Yes	The average daily discharge for the facility to be 33,547 m^3/day for 2023 which was below the maximum allowable average annual discharge of 40,950 m^3/d.	Section 4 - Flow Monitoring and Appendix B - Internal Flow Monitoring and Laboratory Data (Permit Data)
1.1.2	The discharge of effluent to which this Section is applicable is from a municipal sewage treatment plant as shown on the attached Site Plan A. The B.C. Environment reference number (S.E.A.M. site number) for this discharge is E100008. 1.1.2 The characteristics of the discharge shall not exceed: 5-Day Biochemical Oxygen Demand - Total Suspended Solids - 130 mg/L, 130 mg/L	Yes	There were no BOD or TSS non-compliances in 2023	Section 5 .1 - Carbonaceous Biochemical Oxygen Demand and Section 5.2 - Total Suspended Solids
1.1.3	The discharge of effluent to which this Section is applicable is from a municipal sewage treatment plant as shown on the attached Site Plan A. The B.C. Environment reference number (S.E.A.M. site number) for this discharge is E100008. 1.1.3 After September 8, 2019, the works authorized are screening facility, grit and scum removal systems, primary sedimentation tanks, secondary treatment bioreactors,secondary clarifiers, sludge thickening systems, sludge digestion systems, sludgedewatering facility, an outfall extending 2,030 m from mean low water to a minimum depth of 70 m below mean low water, diffusers,	Yes	The authorized works are described as per the September 8, 2019 permit amendment.	Section 1 - Introduction
2.1	The Permittee shall inspect the pollution control works regularly and maintain them in good working order. Notify the Regional Waste Manager of any malfunction of these works.	Yes	On-site operators perform daily inspections and preventative maintenance on the pollution control works. There were no submitted notification reports of any malfunction of the works during the inspection period covered by this report.	
2.2	In the event of an emergency or condition beyond the control of the Permittee which prevents continuing operation of the approved method of pollution control, the Permittee shall immediately notify the Regional Waste Manager and take appropriate remedial action.	Yes	There were no reported emergency events or conditions beyond the control of the Permittee which prevented the continuing operation of the approved method of pollution control during the inspection period; therefore, compliance with this requirement was not applicable.	Section 13 - Environmental Incidents
2.3	The discharge of effluent which has bypassed the designated treatment works is prohibited unless the consent of the Regional Waste Manager is obtained and confirmed in writing.	Yes	No flow was discharged which bypassed the designated treatment works.	Section 13 - Environmental Incidents

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2.4	The Permittee shall notify the Regional Waste Manager prior to implementing changes to any process that may affect the quality and/or quantity of the discharge.	Yes	There were no changes to the treatment process in 2023. Secondary treatment was commissioned in October 2020. The RDN notified the BC Ministry of the Environment of this change as part of the permit amendment process.	Section 1 - Introduction
2.5	The Permittee shall erect a sign along the alignment of the outfall above high water mark. The sign shall identify the nature of the works. The wording and size of the sign requires the consent of the Regional Waste Manager.	Yes	An outfall sign reading "OUTFALL, 2100m LONG, 73 m DEEP" was installed on the shore along the alignment of the outfall line.	See 2022 GNPCC Outfall Inspection Report by GreatPacific Consulting Ltd.
2.7	Sludge wasted from the treatment plant shall be disposed of to a site and in a manner authorized by the Regional Waste Manager.	Yes	Biosolids generated by GNPCC in 2023 met Class B standards for biosolids in Schedule 3 and 4 of the Organic Matter Recycling Regulation (OMRR). Biosolids are currently being land applied in a Forest Fertilization program. The Annual Report also includes the 2023 Biosolids Management Summary from SYLVIS Environmental which includes a summary and interpretation of the effects of biosolids discharges on the receiving environment (Appendix F Section 4)	Appendix F (see Section 4 for a summary and interpretation of effects of biosolids discharged into the receiving environment).
2.8	The Permittee shall conduct a dye test on the outfall line (or inspect by another method approved by the Regional Waste Manager) every five years or as may otherwise be required by the Regional Waste Manager.	Yes	In November 2022, an outfall inspection was conducted and described in the Condition Inspection Report - Five Fingers Outfall prepared by Great Pacific Consulting, which will be submitted under separate cover to the Ministry. The inspection utilized a Remote Operated Vehicle (ROV) to record all notable features and components as it traveled along the entire exposed marine section of the pipe. A Ministry letter dated August 11, 1994 approves inspection "by another method" wherein Section 2. of the letter states, "Pursuant to Section 2.8 of the permit, your request to conduct video inspection of the outfall line in lieu of dye testing is approved".	Section 3.6 - Outfall Inspection
2.9	The Permittee shall classify the wastewater treatment facility authorized in Section 1 (the facility) and the classification shall be maintained with the "British Columbia Water and Wastewater Operators Certification Program Society" (BCWWOCPS). The Permittee shall submit an application to classify the facility to BCWWOCPS by October 31, 1994.	Yes	The Environmental Operators Certification Program (EOCP) database, which has since replaced the BCWWOCPS, confirms that the Facility is classified as a Level IV Municipal Waste Water Treatment (MWWT) system with the following facility details: Facility Number: 8 Classification Number: 103951, expiring on June 22, 2023.	EOCP Database

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2.10	If the facility is classified by the BCWWOCPS (the Program) at Level II or higher, the Permittee shall ensure that all operators of the facility shall be certified by the Program to a Class I level, at a minimum, by December 1, 1994. Operators in Training: The Permittee shall ensure that all operators in training (OIT) working at the facility classified by the BCWWOCPS at Level II or higher shall be required to successfully pass an OIT examination within three (3) months of commencement of employment at the facility. The OIT certificate shall be valid for fifteen (15) months from the date of issue. Prior to the expiry date of the OIT certificate, but not sooner than twelve (12) months from the date when the OIT commenced facility operation, the OIT shall successfully complete a Class I certification examination in order to continue to operate at the facility. Chief Operator: Level II or Higher: If the facility is classified by the BCWWOCPS at level II or higher, the Permittee shall designate at least one operator to be the "Chief Operator" of the facility by December 1, 1996. The "Chief Operator" shall be certified at a Class II level, at a minimum. After December 1, 1996, no person shall have "Direct Responsible Charge", as defined by the BCWWOCPS; of a municipal wastewater treatment facility classified at Level II or higher unless they possess a valid operator's certificate not more than one level below the classification level of the facility. Chief Operator: Level III and IV:If the facility is classified by the BCWWOCPS at level III, the Permittee shall designate a "Chief Operator", certified at a Class III level by December 1, 1998. If the facility is classified by the BCWWOCPS at Level IV, the Permittee shall designate a "Chief Operator" certified at a Class IV level by December 1, 1998.	Yes	The EOCP database confirms the facility "Has Required Operator" and lists multiple operators of the Facility in employ with the RDN. There are two designated Chief Operators (both certified MWWT IV) listed in good standing and several certified MWWT II and MWWT III operators within the EOCP database, which satisfies the requirements of this section.	EOCP Database
3.1.1	Provide and maintain a suitable flow measuring device and record once per day the effluent volume discharged over the preceding 24-hour period.	Yes	Quarterly data reports from flow measured from a Parshall Flume were submitted by the RDN include daily records of effluent volume discharged over the preceding 24-hour period.	Section 4 - Flow Monitoring
3.1.2	The Permittee shall install, provide, and maintain suitable sampling facilities and obtain composite samples and analyses of the effluent as follows: See PDF file "1994_06_02 338 - Section 3.1.2".	Yes	GNPCC is performing daily composite analysis for 5-Day Biochemical Oxygen Demand (cBOD5) and Total Suspended Solids (TSS), weekly composite sampling for Ammonia and quarterly grab samples for Toxicity(LC50). Comprehensive analysis of composite samples for all the remaining contaminants listed inthis section were conducted once every six months (June 7 2023 and December 4, 2023) as required by this section. Results are presented in Appendix D of the 2023 GNPCC Annual Report.	Section 5.1 5-Day Carbonaceous Biochemical Oxygen Demand (cBOD5), 5.2 Total Suspended Solids, Section 5.5 Other General Parameters, and Appendix D - External Laboratory Test Results.
3.2	The Permittee shall obtain a representative sample of the treated biosolids once every quarter and obtain analyses of the sample for the following: Total Solids, Moisture, Volatile Suspended Solids, Polychlorinated Biphenyls, Total Kjeldahl Nitrogen, Arsenic, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Phosphorous, Selenium, Zinc.	Yes	Quarterly sampling of treated biosolids were completed in 2023. Samples were sent to Bureau Veritas for analysis which is an accredited lab.	Section 6.2 - Biosolids Analysis and Appendix D - External Laboratory Test Results

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3.3	The Permittee shall monitor the receiving water quality and carry out chemical, physical and biological studies on the receiving environment as required by the Regional Waste Manager. The Permittee shall submit a proposed receiving environment monitoring program to the Regional Waste Manager by October 31, 1994 for approval. The program should be established in consultation with the Regional Waste Manager. Based on the results of this monitoring program, the receiving environment monitoring requirements may be extended or altered by the Regional Waste Manager. The approved program shall commence by January 1, 1995.	Yes	The RDN Receiving Environment Monitoring Final Report (2017-2019) prepared by G3 Consulting was submitted to the Ministry on December 20, 2019. The RDN completed monitoring in 2020. The RDN submitted the 2020 REM report to the Ministry on December 17, 2020. The REM program is currently under review.	RDN Receiving Environment Monitoring Report was submitted to Ministry in 2020 under separate cover.
3.4	Sampling and flow measurement shall be carried out in accordance with the procedures described in "Field Criteria for Sampling Effluents and Receiving Waters", April 1989, or by suitable alternative procedures as authorized by the Regional Waste Manager. Analyses are to be carried out in accordance with procedures described in "A Laboratory Manual for the Chemical Analysis of Waters, Wastewaters, Sediments and Biological Materials, (1976 edition including updates)", April 1989, or by suitable alternative procedures as authorized by the Regional Waste Manager. Copies of the above manuals are available from the Environmental Protection Division, Ministry of Environment, Lands and Parks, 777 Broughton Street, Victoria, British Columbia, V8V 1X4, at a cost of $20.00 and $70.00 respectively, and are also available for inspection at all Environmental Protection offices. Proper care should be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination, breakage, etc.	Yes	Flow was measured in 2023 by a Parshall Flume installed in the secondary upgrade. Flow measurements are totalized by GNPCC's SCADA system. Samples were obtained via automatic (composite) sampler that was used to withdraw effluent samples on a flow-proportioned basis over a 24-hour period which remained functional over the entire period.	Section 4 - Flow Monitoring
3.4.2	Analyses for determining the toxicity of liquid effluents to fish shall be carried out in accordance with the procedures described in the "Provincial Guidelines and Laboratory Procedures for Measuring Acute Lethal Toxicity of Liquid Effluents to Fish" November 1982. The Regional Waste Manager will advise the Permittee which method ofmeasurement for expressing lethal toxicity shall be used. The method of sampling and the method of bioassay will be determined by the Regional Waste Manager.	Yes	Toxicity analysis is carried out as a an LC_{50} 96-hour test (bioassay) . Samples were taken quarterly in 2023 and sent to Bureau Veritas which is an accredited lab. Toxicity test results are included as Appendix D in the Annual Report.	Section 5.3 Ammonia and Toxicity

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3.5	3.5: Maintain data of analyses and flow measurements, collected under Sections 3.1 through 3.3, for inspection and every quarter submit the data, suitably tabulated in a machine readable format, for entry in the Ministry of Environment, Lands and Parks computer database, to the Regional Waste Manager for the previous quarter. All reports shall be submitted within 31 days of the end of each quarter. The first report is to be submitted by October 31, 1994. Based on the results of the monitoring program, the Permittee monitoring requirements may be extended or altered by the Regional Waste Manager.	Yes	Quarterly reports containing data and flow measurements were submitted to the Ministry throughout 2023 via the environmental reporting portal.	
3.6	The Permittee shall submit an annual report which shall include a summary and interpretation of the data submitted under Section 3.5, an interpretation of the effects of the effluent and biosolids discharges on the receiving environment, and a summary of treatment plant operations, for the preceding calendar year. In addition, the Regional Waste Manager may require that the annual report include summaries and progress reports of the matters identified in Sections 4.2 through 4.8, and any 5Rs (Reduce, Reuse, Recycle, Recover, Residual) activities, for the preceding calendar year. The annual report shall be submitted within 60 days of the end of each calendar year and shall be made available by the Regional District of Nanaimo to the public upon request. The first annual report shall be submitted by February 28, 1995.	Yes	The 2023 Annual Report was submitted to the Ministry on February 29, 2024 with the Annual Status Form (ASF) within the required 60 days of the end of each calendar year. The Receiving Environment Monitoring Final Report (2017-2019) was submitted as a separate document on December 20, 2019. The RDN submitted the 2020 REM report to the Ministry on December 17, 2020.	2023 GNPCC Annual Report and Annual Status Form. Section 3.5 Receiving Environment Monitoring.
4.1	The Regional District of Nanaimo has indicated its intention to develop a Liquid Waste Management Plan. Accordingly, the Permittee shall submit a proposed schedule for the development of a Liquid Waste Management Plan to the Regional Waste Manager by October 31, 1994 for approval. The Plan shall be developed in accordance with ministry guidelines and shall include, but not be limited to, a schedule to upgrade the discharge to secondary treatment, an infiltration and inflow control program, a source control program, a stormwater management program, a biosolids management program, and an odour control program. All aspects of the Plan shall be to the satisfaction of the Regional Waste Manager.	Yes	The Annual Report confirms that the RDN has a Liquid Waste Management Plan (LWMP). A Ministry letter dated October 30, 2014 confirms the Minister approval for an amended LWMP submitted in January 2014.	Section 16.5 Liquid Waste Management Plan
4.2	The Permittee may be required to submit a schedule, for upgrading of the discharge to secondary treatment, to the Regional Waste Manager for approval. Based on receiving environment monitoring data and/or other information obtained in connection with this discharge, the Permittee may be required to provide additional treatment facilities and/or upgrade the discharge to secondary treatment.	Yes	Secondary treatment achieved substantial completion in October 2020. A schedule for the upgrading of the discharge to secondary treatment was submitted as part of the approvals required for this project.	Section 1 - Introduction

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