



2023 ANNUAL WASTEWATER TREATMENT SYSTEM SUMMARY REPORT

Norwich Wastewater Treatment Plant

1. GENERAL INFORMATION

Oxford County (the County) prepares a report summarizing wastewater treatment operation and treated effluent discharge quality for every municipal wastewater treatment plant (WWTP) annually. The reports detail the latest effluent quality testing results and quantity statistics, and any non-compliance conditions that may have occurred for the previous year. They are available for review by the end of March on the County website at <http://www.oxfordcounty.ca/waterwastewater> or by contacting the Public Works Department.

All efforts have been made to ensure the information presented in this report is as accurate as possible.

If you have any questions or comments concerning the report, please contact the County at the address and phone number listed below or by email at wastewater@oxfordcounty.ca.

Wastewater Treatment Plant:	Norwich WWTP
Wastewater Treatment Plant Number:	110001480
Certificate of Approval (CofA):	1680-6F6QR5 (August 31, 2005)
Reporting Period:	January 1, 2023 – December 31, 2023

Wastewater Treatment Plant Owner & Contact Information:

Oxford County Public Works Department - Wastewater Services
P.O. Box 1614
21 Reeve Street
Woodstock, ON N4S 7Y3
Telephone: 519-539-9800
Toll Free: 866-537-7778
Email: wastewater@oxfordcounty.ca

1.1 System Description

The Norwich WWTP is a Class I facility as defined by Ontario Regulation (O.Reg.) 129/04. The Norwich WWTP is a lagoon wastewater treatment system serving the community of Norwich. The nominally separated wastewater collection system includes four (4) sewage pumping stations (SPS), 28.3 kilometers of sanitary gravity sewers, 4.5 kilometers of sanitary forcemain sewers and 0.6 kilometers of sanitary low pressure sewers. The wastewater is pumped from the collection system to a splitter box; then to either of two lagoon cells as determined by the operator. Typically the wastewater is directed to the North Cell which is operated in series with the South Cell, followed by filtering of the effluent through the sand filter beds performed for a period each day, as required. The lagoons may discharge year-round; however, the freezing period prevents discharge through the filter beds (normally December to April).

The system is maintained by licensed wastewater system operators and licensed mechanics that operate, monitor, and maintain the treatment equipment, in accordance with the regulations, and collect samples as required by the CofA. Alarms automatically notify operators in the event of failure of critical operational requirements.

The Norwich WWTP is located at Lot 7, Conc. 5, Norwich Township, Ontario, with the Facility description provided below.

Facility	Norwich WWTP
Design Capacity	1,530 m ³ /d
2023 Average Daily Flow	1,182 m ³ /d
2023 Maximum Daily Flow	6,288 m ³ /d
2023 Total Volume of Wastewater	430,824 m ³ /year

1.2 Major Expenses

In 2023, the Norwich WWTP had forecasted operating and maintenance expenditures of approximately \$539,000.

In addition to regular operational and maintenance expenditures, Capital Improvement Projects for the Town of Norwich were forecasted at \$493,000 which included improvements to the wastewater collection systems and the Norwich WWTP.

Capital Improvement Projects included:

- \$308,000 for sanitary sewer replacement
- \$132,000 for Norwich WWTP Class EA Study
- \$53,000 for the replacement of general operating equipment

Capital Improvement Projects for all systems included:

- \$1,799,000 to develop Countywide SCADA Master Plan for all wastewater systems
- \$70,000 to develop Countywide Wastewater Servicing Master Plan for all wastewater systems
- \$38,000 for Development Charges Technical Study

2. SUMMARY AND INTERPRETATION OF MONITORING DATA

2.1. Effluent Quality Assurance and Control Measures

Sampling Procedure

Influent samples are taken from the WWTP influent splitter box. The sampling frequency is once per week and samples are tested for Biochemical Oxygen Demand (BOD₅), Total Suspended Solids (TSS) monthly, Total Phosphorus (TP), and Total Kjeldahl Nitrogen (TKN) weekly.

Effluent samples are taken using a 24-hour composite sampler set to take a sample every 15 minutes for the duration of the discharge period. BOD₅, TKN and TSS are sampled at least monthly. TP, ammonia, pH, and temperature samples are taken three times per week. E. coli and dissolved oxygen (DO) are tested at least weekly.

Laboratory and Field Testing

Sample results that are used to determine the WWTP compliance are analyzed at a licensed laboratory. Laboratory analysis is performed by SGS Lakefield Research Ltd. on all samples for all parameters except for pH, temperature, and DO which are tested in the field during collection. Any information generated in-house is used in process control but is not included in this report.

2.2 WWTP Performance and Effluent Quality

Final Effluent Compliance Limits

Compliance limits are defined as the maximum effluent concentrations permitted for a given parameter set by the Ministry of Environment, Conservation and Parks (MECP). Compliance limits are detailed within each WWTP CofA. The limits are determined to prevent impairment to the receiving water body quality. The Owner is legally obligated to operate and maintain the treatment system to ensure the compliance limits are achieved.

The Norwich WWTP provided effective treatment in 2023, with 390 samples out of 407 meeting compliance, or 96% in compliance with all its regulatory limits for all effluent discharged from the WWTP.

In March, lagoon levels were full and discharge was required due to lack of storage capacity. A mild winter and reduced ice coverage resulted in an abnormal amount of algae present causing the TSS and BOD₅ to be higher than typically found in the effluent in March.

- The Total Suspended Solids Monthly Average Effluent Concentration was 31.5 mg/L, which was above the CofA Total Suspended Solids Monthly Average Effluent Concentration Limit of 10 mg/L
- The Total Suspended Solids Monthly Average Effluent Loading Concentration was 103.4 kg/d, which was above the CofA Total Suspended Solids Monthly Average Effluent Loading Concentration Limit of 23.7 kg/d
- The BOD Monthly Average Effluent Concentration was 17.5 mg/L, which was above the CofA BOD Monthly Average Effluent Concentration Limit of 10 mg/L.
- The BOD Monthly Average Effluent Loading Concentration was 57.4 kg/d, which was above the CofA BOD Monthly Average Effluent Loading Concentration Limit of 23.7 kg/d

On April 1 and 2, 2023, heavy rainfall in the area resulted in extremely high flow entering the WWTP.

- The influent flow total on April 1/2023 was 6,288 m³, which exceeded the CofA Daily Flow Limit through the plant of 5,160 m³/d
- The influent flow total on April 2/2023 was 6,221 m³, which exceeded the CofA Daily Flow Limit through the plant of 5,160 m³/d

During the month of April, a large rainfall event occurred which resulted in very high influents flows at the WWTP. This caused the primary lagoon to overflow to the receiver. In order to stop the overflow, an equalization valve between the lagoons was opened, which increased ammonia concentrations within the secondary lagoon. The WWTP effluent sand filter performance was hindered with high TAN concentrations/hydraulic loading combined with low ambient temperatures.

- The TAN Monthly Average Effluent Concentration was 5.9 mg/L, with a CofA TAN Monthly Average Effluent Concentration Limit of 3.0 mg/L (non-freezing period)
- The TAN Monthly Average Effluent Loading Concentration was 18.7 kg/d, with a CofA TAN Monthly Average Effluent Loading Concentration Limit of 11.8 kg/d
- The CofA TAN Daily Effluent Concentration of 5.0 mg/L was exceeded on the following dates:
 - April 3: 8.3 mg/L
 - April 4: 8.1 mg/L
 - April 5: 8.9 mg/L
 - April 11: 8.5 mg/L
 - April 12: 8.4 mg/L
 - April 13: 8.6 mg/L

- April 17: 6.3 mg/L
- April 19: 6.8 mg/L
- April 20: 6.7 mg/L

In May, a collected sample from May 5, 2023 was saved in the sample fridge at the Tillsonburg WWTP and was discarded instead of being sent to the lab for testing.

Effluent Total Phosphorus and Effluent TAN are required to be sampled three times per week. In the first week of May, effluent samples were collected on May 1, 3 and 5, 2023. The effluent sample collected on May 5, 2023 was mistakenly not shipped to the external laboratory for analysis, resulting in a non-compliance for sampling frequency. In order to prevent this from occurring again, procedures have been adjusted.

- A sample calendar has been created and will be completed for each sample day;
- Chain of custodies and sample bottles will be created before each sample is collected;
- Chain of custodies will be kept with samples that are refrigerated, awaiting shipment to the external laboratory; and
- All sample bottles will be counted and compared to chain of custodies prior to sealing sample coolers for shipment to the external laboratory.

All non-compliances were reported to the Ministry of Environment, Conservation and Parks (MECP) at the time of the event.

Influent Streams and Effluent Streams

The operator measures pH of both the influent and effluent streams. There was no single pH result for the effluent outside the discharge limit of 6 to 9.5 in 2023.

In 2023, chlorine was not used at the Norwich WWTP.

There were no single sample un-ionized ammonia effluent results or monthly average un-ionized ammonia effluent results above the CofA limits in 2023.

Influent Wastewater Characteristics (annual average)		
Parameter	Concentration (mg/L)	Loading (kg/d)
BOD ₅	236	279
Total Suspended Solids	270	319
Total Phosphorus	4.4	5.2
Total Kjeldahl Nitrogen	39	46

Graphs of discharge parameters versus effluent discharge limits are included in this report in Appendix A.

Effluent Parameter	Sample Frequency (when discharging)	CofA Effluent Limit (Monthly Average) (mg/L unless otherwise)	Monthly Average Result Min-Max (mg/L unless otherwise indicated)	Percentage Removal
Biochemical Oxygen Demand (BOD ₅)	monthly	10	2.0 – 17.5	92.6 – 99.2
Total Suspended Solids (TSS)	monthly	10	2.0 – 31.5	88.3 – 99.3
Total Phosphorus (TP) (non-freezing period)*	3/week	0.5	0.13 – 0.18	95.9 – 97.0
Total Phosphorus (TP) (freezing period)*	3/week	1	0.14 – 0.18	95.9 – 96.8
Total Ammonia Nitrogen (TAN) (non-freezing period)*	3/week	3	0.1 – 5.9	--
Total Ammonia Nitrogen (TAN) (freezing period)*	3/week	5	0.4 – 3.1	--
E. coli	weekly	200 colonies/100 mL (monthly Geometric Mean Density)	12 – 66 colonies/100 mL (monthly Geometric Mean Density)	--
Dissolved Oxygen (DO)	weekly	4.0	5.3 – 9.5	--
pH any single sample	3/week	6.0 - 9.5	6.7 – 7.7	--
Total Ammonia Nitrogen any single sample (non-freezing period)*	3/week	5.0	0.1 – 8.9	--
Total Ammonia Nitrogen any single sample (freezing period)*	3/week	8.0	0.1 – 3.6	--
Un-ionized Ammonia any single sample		0.2	0.001 – 0.026	--

* Freezing period means the period of time during which the water temperature of the receiving stream is equal to or below 5 degrees Celsius, normally from December 1 to April 30. In 2023, the temperature of the receiving stream was above 5 degrees Celsius from April 1 to November 29.

Influent wastewater characteristics and effluent discharge values are presented in the tables below.

2.3 Final Effluent Design Objectives

Final Effluent Design Objectives (objectives) are non-enforceable effluent quality values which the Owner is obligated to use best efforts to strive towards achieving on an ongoing basis. These objectives are to be used as a mechanism to trigger corrective action proactively, and voluntarily, before environmental impairment occurs and before the compliance limits are exceeded.

In 2023, the monthly objectives that were not met at the Norwich WWTP were:

- The monthly average concentration objective related to TSS (5 mg/L) for the month of March;
- The monthly average concentration objective related to TSS loading (11.8 kg/d) for the month of March;
- The monthly average concentration objective related to BOD₅ (5 mg/L) for the month of March;
- The monthly average concentration objective related to BOD₅ loading (11.8 kg/d) for the month of March;
- The monthly average concentration objective related to TAN (2 mg/L) for the month of April;
- The monthly average concentration objective related to TAN loading (7.1 kg/d) for the month of April;
- The monthly average concentration objective related to BOD₅ (5 mg/L) for the month of December; and
- The monthly average concentration objective related to BOD₅ loading (11.8 kg/d) for the month of December.

In March, warmer temperatures created larger concentrations of algae in the discharging lagoon. Discharge had to be initiated due to lack of storage capacity, which resulted in higher concentrations of BOD₅ and TSS in the effluent.

Large amounts of rain at the start of April, caused a plant overflow to occur. The discharge rate had to be increased to stop the overflow. This increased flow rate hydraulically overloaded the sand filters, reducing nitrification efficiency.

In December, a single effluent sample with a high concentration of BOD₅ (14 mg/L) was reported by the external laboratory. In response the discharge was stopped, and the secondary lagoon was recycled for five days to improve effluent quality.

As a strategy, Operations will make all efforts to maximize discharge each month in order to create larger storage capacity, while striving to meet objectives.

The following table presents the range of effluent discharge values vs. CofA Objectives.

Effluent Parameter	Sample Frequency (when discharging)	Monthly Average Objective Concentration (mg/L unless otherwise indicated)	Monthly Average Result Min-Max (mg/L unless otherwise indicated)
BOD ₅	monthly	5	2.0 – 17.5
TSS	monthly	5	2.0 – 31.5
TP (non-freezing period) *	3/week	0.3	0.13 – 0.18
TP (freezing period)*	3/week	0.8	0.14 – 0.18
Total Ammonia Nitrogen (non-freezing period) *	3/week	2	0.1 – 5.9
Total Ammonia Nitrogen (freezing period)*	3/week	4	0.4 – 3.1
E. coli	weekly	150 colonies/100 mL (monthly Geometric Mean Density)	12 – 66 colonies/100 mL (monthly Geometric Mean Density)

* Freezing period means the period of time during which the water temperature of the receiving stream is equal to or below 5 degrees Celsius, normally from December 1 to April 30. For 2023, the temperature of the receiving stream was above 5 degrees Celsius from April 1 to November 29.

Effluent monthly average concentration and monthly average loading objective exceedances in 2023 included the following:

Date	Parameter	Objective (mg/L unless otherwise indicated)	Result (mg/L unless otherwise indicated)
March 2023	TSS	5	31.5
March 2023	TSS loading	11.8 kg/d	103.4 kg/d
March 2023	BOD ₅	5	17.5
March 2023	BOD ₅ loading	11.8 kg/d	57.4 kg/d
April 2023	TAN	2	5.9
April 2023	TAN loading	7.1 kg/d	18.7 kg/d
December 2023	BOD ₅	5	8
December 2023	BOD ₅ loading	11.8 kg/d	18.1 kg/d

3. OVERFLOWS, BYPASSING, UPSETS, SPILLS, AND ABNORMAL CONDITIONS

On April 1, 2023, heavy precipitation in the area resulted in extremely high flow entering the Norwich Lagoon. The Operator arrived onsite at the WWTP and found the primary lagoon relieving through an overflow structure, draining to Otter Creek. At this time in the year, both the Primary and Secondary Lagoons were near capacity, and the spring discharge had just began the week prior. The operator adjusted the effluent discharge program, to allow for continuous discharge in an attempt to lower the Lagoon levels and stop the overflow. The operator ensured the equalization valve between both Lagoons was fully open, allowing both pond levels to decrease together. A large portable pump was used to transfer additional contents of the Primary Lagoon into the Secondary Lagoon. The overflow event occurred from approximately 7:00 am on April 1 until 8:00 am on April 5, 2023, with a total volume bypassed of 2,150 m³.

The overflow event was reported to the Spills Action Center and the MECP at the time of occurrence.

The planned capacity expansion of the Norwich WWTP, in combination with the implementation of a new Inflow & Infiltration (I&I) Reduction Program, will aim to reduce future overflow events.

There were no additional overflows, bypasses, or spills in 2023.

There were no complaints received in 2023.

4. MAINTENANCE OF WORKS

The operating and maintenance staff at the Norwich WWTP conducts regularly scheduled maintenance of the WWTP equipment. The Norwich WWTP utilizes a database, known as Cartegraph to issue work orders and maintain records for regular maintenance and repair at the Norwich WWTP.

5. MONITORING EQUIPMENT MAINTENANCE AND CALIBRATION

The calibration of flow meters was conducted by JBF Controls Ltd. in accordance with the requirements of the CofA. The records are kept on-site at the Norwich WWTP.

All other operational monitoring equipment is calibrated by staff and records are kept on-site at the Norwich WWTP.

6. INSPECTION, PILOTS, AND TRIALS

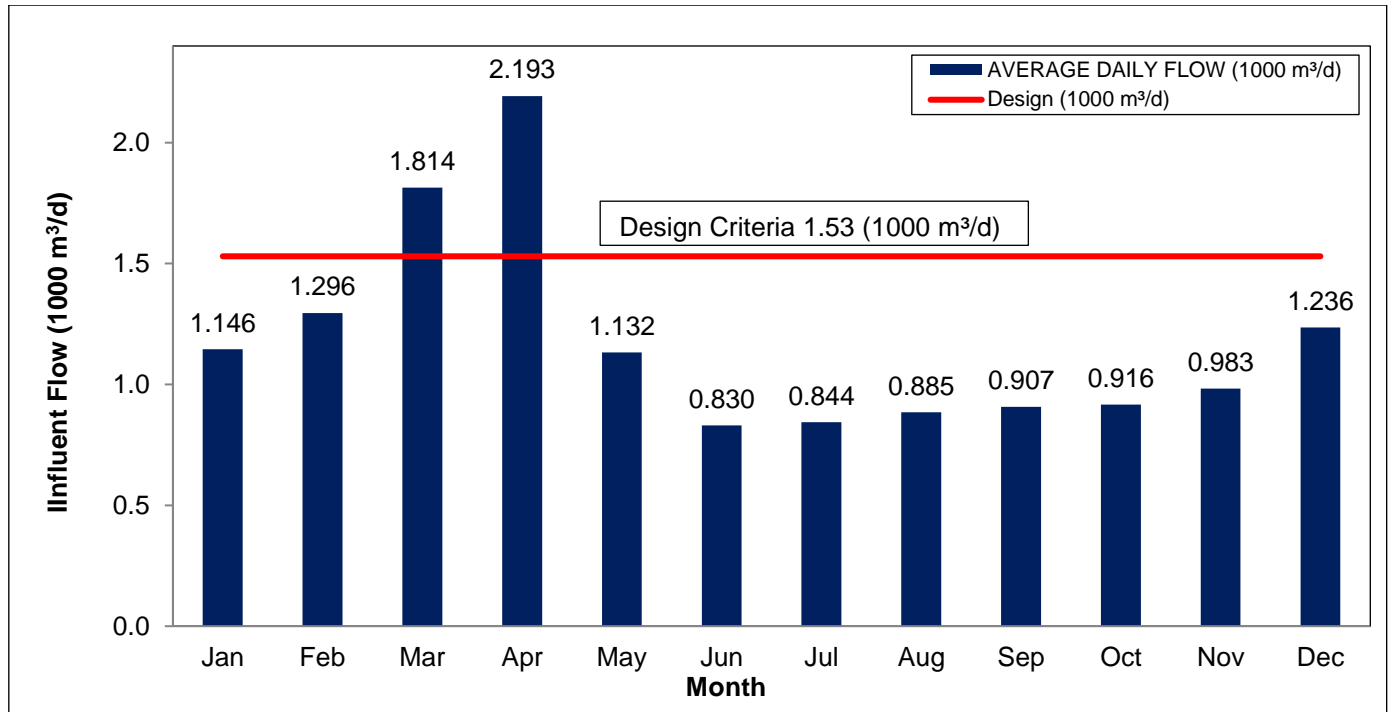
The MECP did not perform an inspection of the Norwich WWTP in 2023. The MECP inspections typically occur on a 3-year schedule.

Municipal Class Environmental Assessment Study

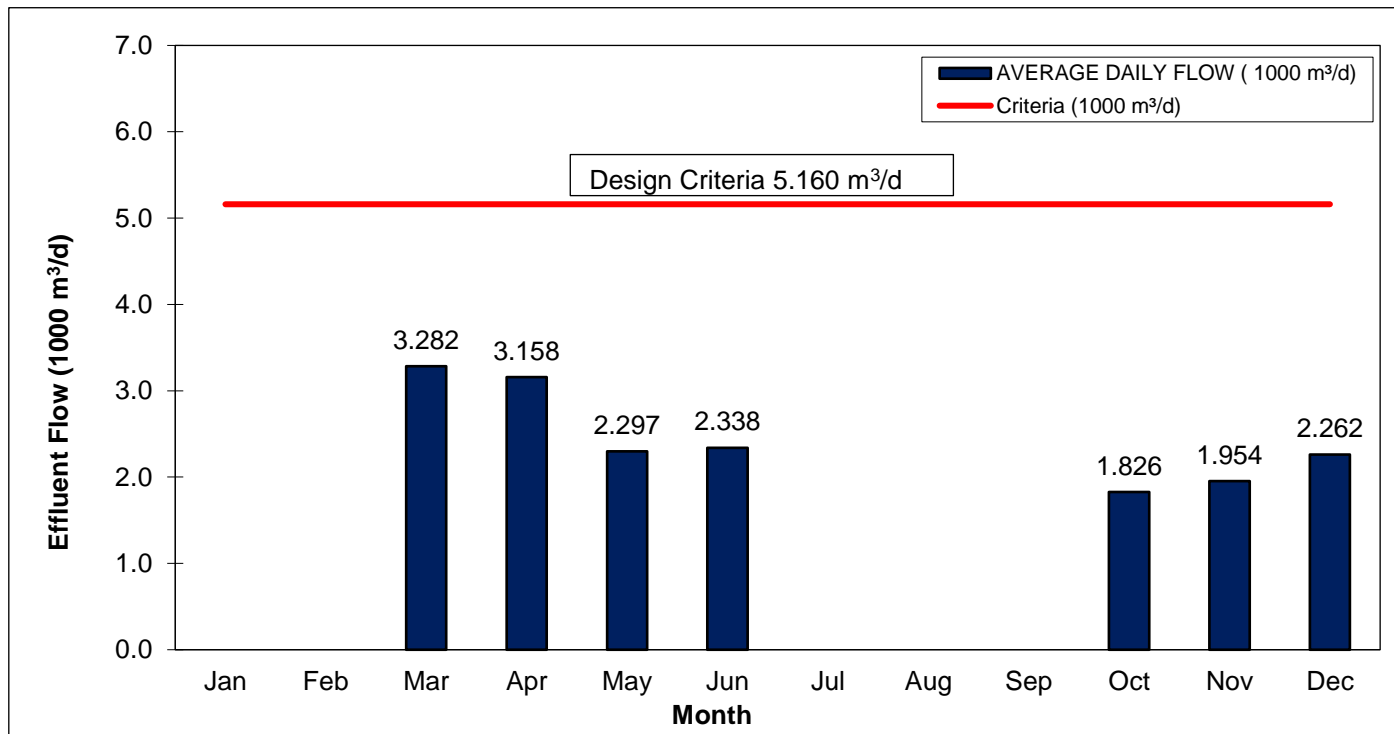
In response to approved future growth in the Township of Norwich, and associated projected increases in Norwich WWTP flow rates, the County re-initiated the Municipal Class EA Study for capacity expansion of the Norwich WWTP in December 2021. This Study continues into 2024, and will determine the most cost-effective, environmentally sound, and sustainable approach to expand the Norwich WWTP to meet the wastewater servicing needs of the community within the 25-year planning horizon. An Assimilative Capacity Study of the receiver is expected to be completed in 2024 which is the initial step in the Class EA Study.

APPENDIX A: GRAPHS OF 2023 DISCHARGE PARAMETERS VS. EFFLUENT DISCHARGE LIMITS

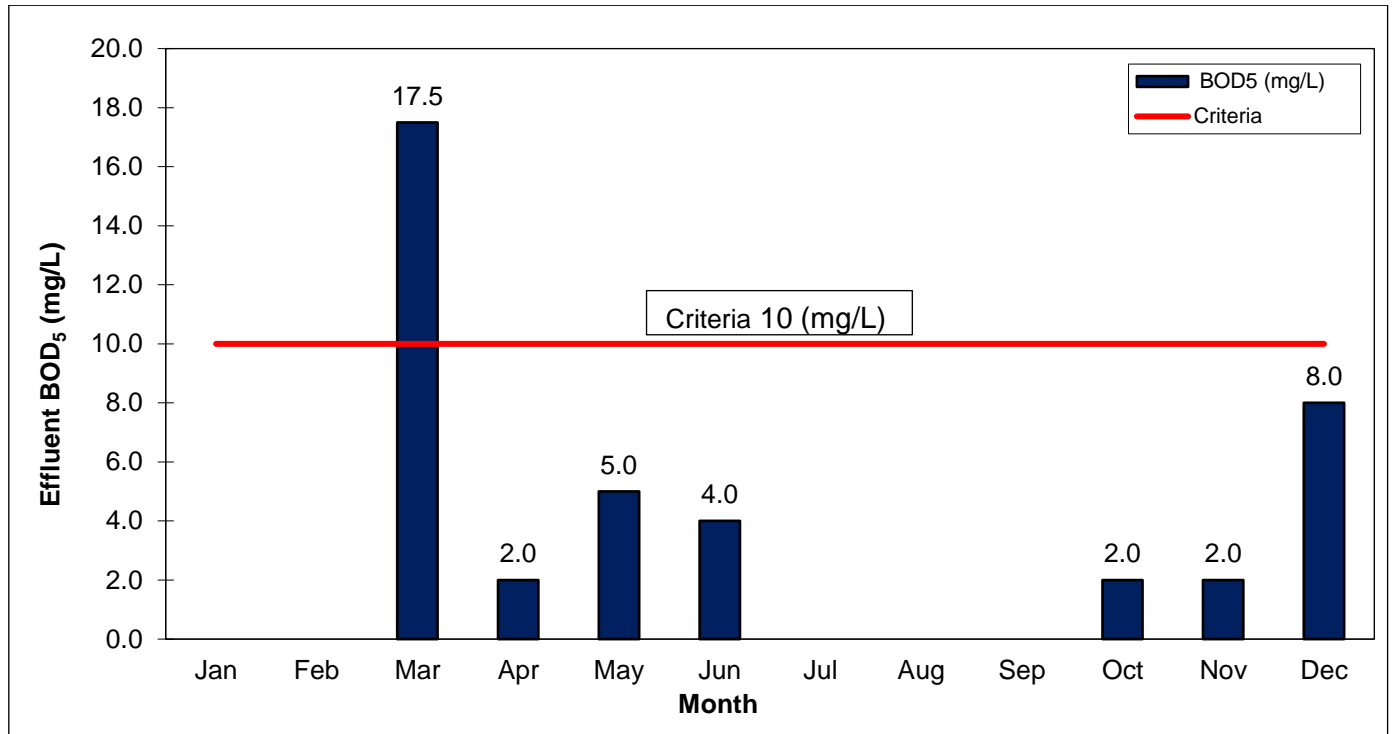
Norwich WWTP Influent, Monthly Average Daily Flow (1000 m³/d), 2023



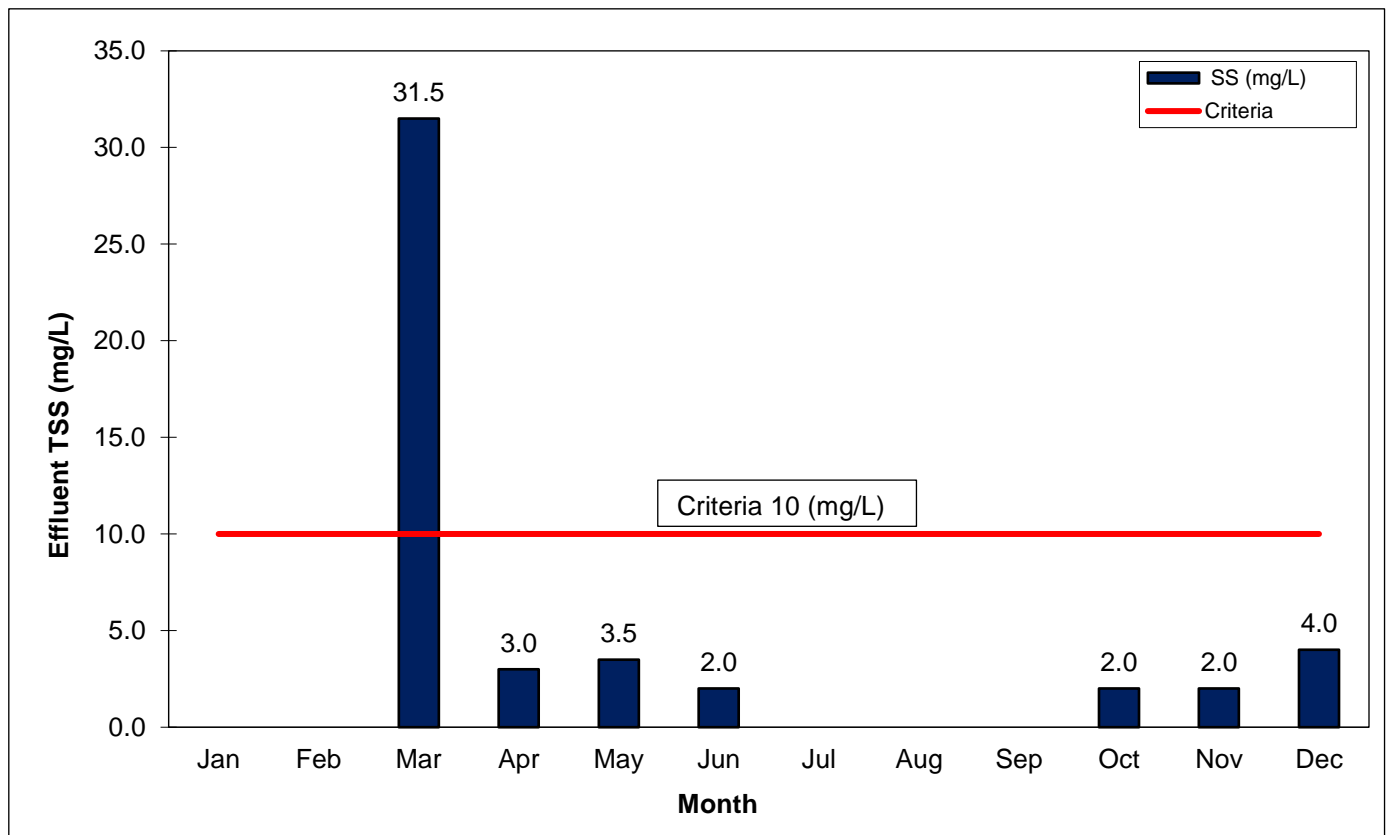
Norwich WWTP Effluent, Monthly Average Daily Flow (1000 m³/d), 2023



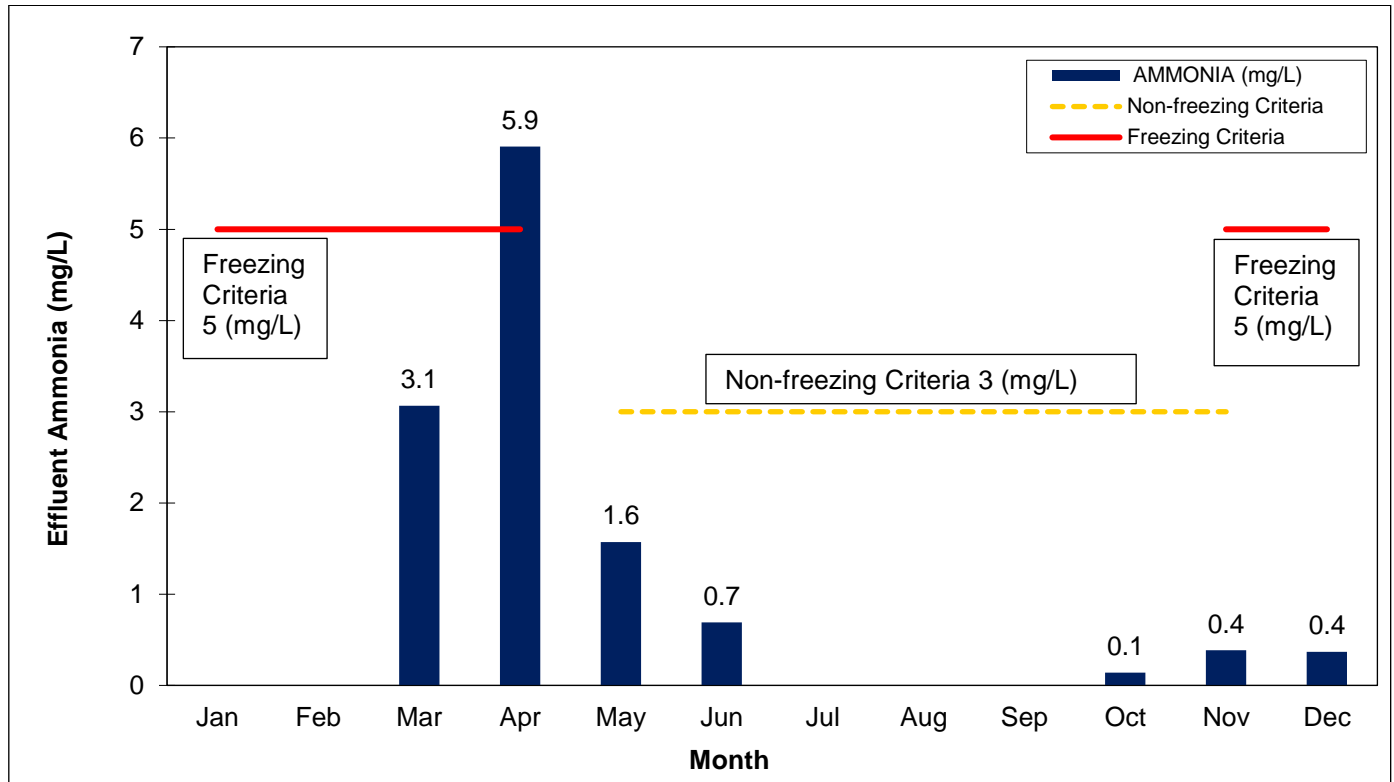
Norwich WWTP Effluent, Monthly Average BOD₅ (mg/L), 2023



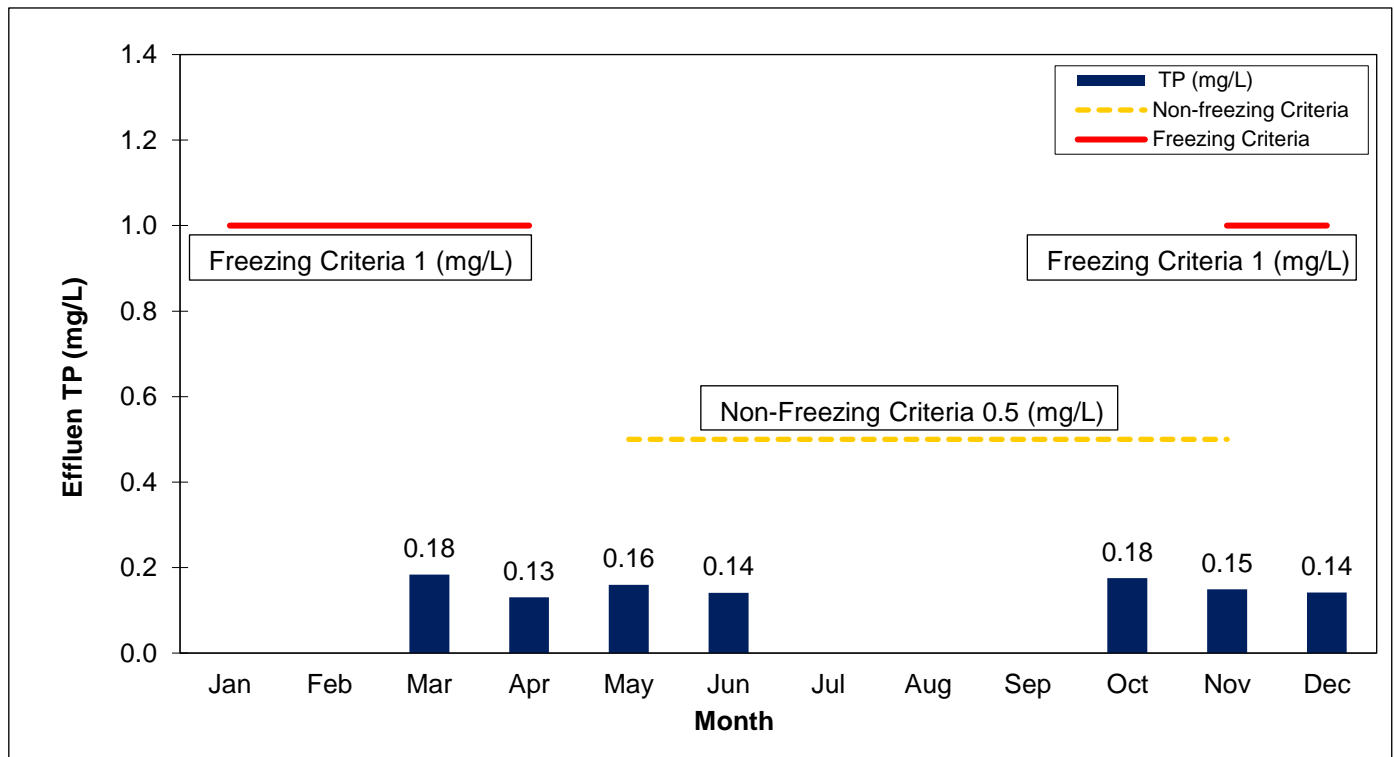
Norwich WWTP Effluent, Monthly Average TSS (mg/L), 2023



Norwich WWTP Effluent, Monthly Average Ammonia (mg/L), 2023



Norwich WWTP Effluent, Monthly Average Total Phosphorus (mg/L), 2023



Norwich WWTP Effluent, Monthly Geometric Mean Density E. coli (colonies/100 mL), 2023

