2023 ANNUAL WASTEWATER TREATMENT SYSTEM SUMMARY REPORT

Woodstock 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: Woodstock WWTP
Wastewater Treatment Plant Number: 120000685
Environmental Compliance Approval (ECA): 5950-7XQKXS (December 18, 2009)
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 Woodstock WWTP is a Class IV rated treatment facility, as defined by Ontario Regulation (O.Reg.) 129/04, which provides wastewater treatment for residential, commercial, and industrial users in the City of Woodstock and for the communities of Embro and Innerkip. It also provides treatment for septic tank waste, hauled waste, and holding tank waste from within Oxford County. The Woodstock nominally separated wastewater collection system includes six (6) sewage pump stations (SPS), 274.4 kilometers of sanitary gravity sewers, 3.4 kilometers of sanitary forcemain sewers and 1.4 kilometers of sanitary low pressure sewers. The Embro and Innerkip wastewater collection systems together include eight (8) sewage pump stations, two odour control facilities, 19.5 kilometers of sanitary gravity sewers, 22.5 kilometers of sanitary forcemain sewers and 0.9 kilometers of sanitary low pressure sewers.

The Woodstock WWTP is a conventional activated sludge system consisting of primary and secondary treatment, with an outfall pipe to the Thames River.

A standby generator is available to run the entire Woodstock WWTP and onsite Thames Valley Lift Station in the event of a power failure. A secondary backup generator is available and dedicated to Thames Valley Lift Station in case of an emergency. The wastewater system is maintained by licensed wastewater treatment 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 ECA. Alarms automatically notify operators in the event of failure of critical operational requirements.

The Woodstock WWTP is located at 195 Admiral Street, Woodstock, Ontario, with the Facility description provided below.

Facility	Woodstock WWTP
Design Capacity	33,000 m^3/d
Design Capacity (Peak Flow)	66,000 m^3/d
2023 Average Daily Flow	23,149 m^3/d
2023 Maximum Daily Flow	91,479 m^3/d
2023 Total Volume of Wastewater	* 8,448,952 m^3/year
2023 Total Received Hauled Waste	26,889 m^3/year (8,892 m^3/year leachate)

* Included in this total is 212,999 m^3/year from the Embro & Innerkip wastewater collection systems

1.2 Major Expenses

In 2023, the Woodstock WWTP had forecasted operating and maintenance expenditures of approximately $5,647,000.

In 2023, Embro and Innerkip wastewater collection systems had forecasted operating and maintenance expenditures of approximately $464,000.

In addition to regular operational and maintenance expenditures, Capital Improvement Projects for Woodstock were forecasted at $6,804,000 which included improvements to the wastewater collection system (including Embro and Innerkip) and the Woodstock WWTP.

Capital Improvement Projects included:

- $2,935,000 Pattullo Industrial Park SPS & Servicing
- $2,458,000 City projects
- $599,000 Woodstock Linear R/R CR Project
- $303,000 for the replacement of general operating equipment
- $186,000 Lansdowne SPS
- $113,000 Woodstock North Trunk I&I Study
- $100,000 Lansdowne sewer extension
- $60,000 for sanitary sewer oversizing
- $35,000 for facilities upgrades
- $15,000 Innerkip Odour Control

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

Wastewater samples are collected on a weekly basis. Raw sewage samples are collected where the sewer trunks combine before entering the sewage works. An automatic composite sampler collects samples over a 24-hour period. Following primary treatment, a second 24-hour composite sample is collected. A third and final effluent 24-hour composite sample is collected following secondary treatment, disinfection and de-chlorination prior to the effluent discharge to the Thames River.

Laboratory and Field Testing

Laboratory analysis is performed by SGS Lakefield Research Ltd. on all samples that are reported for compliance except for pH, dissolved oxygen (DO), and temperature which are field collected. All other in-house testing is done for process control, the results of which are 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 ECA. 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 Woodstock WWTP provided effective treatment in 2023 with 789 samples out of 805 meeting compliance, or 98% compliance to its regulatory limits for all effluent discharged from the WWTP.

In October, a local food industry experienced issues with pre-treatment equipment, which resulted in the discharge of extremely high strength material into the sewer collection network, as a result the Woodstock WWTP experienced a week of very high organic loading (three to five times stronger than typically received). In response, return activated sludge concentrations were adjusted to control bacteria growth and provide proper retention time for treatment and the WWTP chlorine contact tank had to be taken offline and cleaned out. Sewer use by-law staff investigated and over strength charges were collected.

- The Total Suspended Solids Monthly Average Effluent Concentration was 16.8 mg/L in October, with an ECA Total Suspended Solids Monthly Average Effluent Concentration of 15.0 mg/L

The non-compliance was reported to the MECP at the time of the event.

Influent Streams and Effluent Streams

On a weekly basis (minimum), an 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 - 9.5 in 2023.

Operators test Total Residual Chlorine (TRC) in the treated effluent on a daily basis during the disinfection period. This exceeds the minimum regulated testing frequency of once per week. TRC results are reported as monthly or annual averages, which should not exceed 0.05 mg/L or 0.02 mg/L respectively. In 2023, the monthly average results at all times met the Monthly Average TRC limit and were less than 0.05 mg/L and, therefore, were in compliance. The Federal Government's P2 annual target for TRC of 0.02 mg/L was met in 2023.

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

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

Influent Wastewater Characteristics (annual average)		
Parameter	**Concentration (mg/L)**	**Loading (kg/d)**
$CBOD_5$	121	2,807
Total Suspended Solids	178	4,108
Total Phosphorus	3	69
Total Kjeldahl Nitrogen	23	537

Effluent Parameter	**Sample Frequency**	**ECA Effluent Limit (Monthly Average)** (milligram per liter unless otherwise indicated)	**Monthly Average Result Min. - Max.** (milligram per liter unless otherwise indicated)	**Percentage Removal**
$CBOD_5$ (May 01 to November 30)	weekly	15	2.3 – 6.8	94.4 – 98.1
$CBOD_5$ (December 01 to April 30)	weekly	20	3.0 – 6.4	94.7 – 97.5
TSS	weekly	15	3.3 – 16.8	90.6 – 98.1
TP	weekly	0.75	0.19 – 0.55	81.7 – 93.7
Total Ammonia Nitrogen (May 1 to November 30)	weekly	3	0.2 – 2.6	86.2 – 98.9
Total Ammonia Nitrogen (Dec. 1 to April 30)	weekly	5.0	0.1 – 1.4	92.6 – 99.5
TRC (May 1- October 31)	weekly	<0.05	0.01 – 0.02	--
E. coli (May 1 – October 31)	weekly	200 colonies/100 mL (monthly Geometric Mean Density)	8.4 – 119.9 colonies/100 mL (monthly Geometric Mean Density)	--
pH any single sample	weekly	6.0 – 9.5	6.7 – 8.3	--

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 late May, one of the aeration tank air supply lines had a large leak at a coupling, resulting in poor nitrification and higher effluent ammonia concentrations. The tank was lowered and a temporary repair was performed while parts were ordered. The permanent repair was completed at the beginning of August, replacing the coupler with a new unit.

At the end of June, the plant experienced a breakdown on the polymer mixing system required for the operation of the WWTP biosolids dewatering equipment. The WWTP dewatering equipment was offline for several days while awaiting the delivery of replacement parts. As a result, solids began to build up within the plant and impacted treatment performance. After the repair was completed, additional time was dedicated to biosolids dewatering to reduce the solids inventory.

In September, an increase of solids inventory in the WWTP was experienced, causing issues with nitrification. Additional time was dedicated to biosolids dewatering to lower the inventory.

A local food industry had issues with pre-treatment equipment in mid-October. As a result the WWTP experienced very high organic loading over a week, impacting treatment performance resulting in the inability to meet effluent objectives and ultimately a non-compliance. In response, Operators adjusted biomass concentrations and had to clean out a process tank.

The following table presents the range of effluent discharge values and the comparable ECA Objectives.

Effluent Parameter	**Sample Frequency**	**Monthly Average ECA Objective Concentration** (mg/L unless otherwise indicated)	**Monthly Average Result Min-Max** (mg/L unless otherwise indicated)
$CBOD_5$	weekly	12	2.3 – 6.8
TSS	weekly	12	3.3 – 16.8
TP	weekly	0.5	0.19 – 0.55
Total Ammonia Nitrogen (May 1 to November 30)	weekly	2.0	0.2 – 2.6
Total Ammonia Nitrogen (Dec. 1 to April 30)	weekly	3.0	0.1 – 1.4

Effluent Parameter	**Sample Frequency**	**Monthly Average ECA Objective Concentration** (mg/L unless otherwise indicated)	**Monthly Average Result Min-Max** (mg/L unless otherwise indicated)
E. coli (May 1 – October 31)	weekly	200 colonies/100 mL (monthly Geometric Mean Density)	8.4 – 119.9 colonies/100 mL (monthly Geometric Mean Density)
pH any single sample	weekly	6.0 - 8.5	6.7 – 8.3

Woodstock effluent monthly average concentrations that did not meet effluent objective concentrations in 2023 included the following:

Month	**Parameter**	**Objective (mg/L)**	**Result (mg/L)**
June 2023	TAN	2.0	2.6
October 2023	TSS	12	16.8
October 2023	TP	0.5	0.55

Woodstock effluent single samples that did not meet effluent objective concentrations in 2023 included the following:

Date	**Parameter**	**Objective** (mg/L unless otherwise indicated)	**Result** (mg/L unless otherwise indicated)
February 1, 2023	TAN	3.0	5.0
April 5, 2023	$CBOD_5$	12	24
April 5, 2023	TSS	12	21
May 30, 2023	TAN	2.0	4.4
June 9, 2023	TAN	2.0	15.7
June 12, 2023	TAN	2.0	3.0
June 13, 2023	TAN	2.0	4.1
June 28, 2023	TSS	12	17
June 28, 2023	TP	0.5	0.7
June 28, 2023	TAN	2.0	2.3
July 4, 2023	TSS	12	28

Date	Parameter	Objective (mg/L unless otherwise indicated)	Result (mg/L unless otherwise indicated)
July 4, 2023	TP	0.5	0.83
July 4, 2023	E. coli	200 colonies/100 mL	720 colonies/100 mL
July 14, 2023	TSS	12	13
August 3, 2023	TSS	12	14
August 3, 2023	TP	0.5	0.7
August 3, 2023	TAN	2.0	3.3
September 7, 2023	TAN	2.0	4.4
September 19, 2023	TAN	2.0	2.3
October 13, 2023	$CBOD_5$	12	17
October 13, 2023	TSS	12	90
October 13, 2023	TP	0.5	1.66
October 13, 2023	TAN	2.0	4.4
October 21, 2023	TSS	12	25

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

There were no overflows, bypassing, upsets, spills, complaints or abnormal conditions at the Woodstock WWTP in 2023.

4. MAINTENANCE OF WORKS

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

5. MONITORING EQUIPMENT MAINTENANCE AND CALIBRATION

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

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

6. BIOSOLIDS PROGRAM

Biosolids are anaerobically digested and dewatered at the Woodstock WWTP using two Alfa-Laval Centrifuges. The biosolids are then stored at the County Biosolids Centralized Storage Facility (BCSF) prior to land application. The sampling results and land application details are summarized in a separate Biosolids Annual report, available at: www.oxfordcounty.ca/Services-for-You/Water-Wastewater/Wastewater/Annual-reports.

7. INSPECTION, PILOTS, AND TRIALS

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

COVID-19 Study: Ontario Wastewater Surveillance Initiative

In 2023, the Woodstock WWTP continued participation in the Wastewater Surveillance Initiative. The study has been funded by Provincial investment, and includes the collaboration of 13 institutions, 34 Public Health Units and 117 Communities. The study captures more than 75 percent of Ontario's population, and involves the detection of the COVID-19 virus in wastewater samples. This provides Public Health Units with another tool to aide in tracing viral infection. In April, a new strategic sampling plan was brought forth to focus resources on community sites that provided reliable results and were representative of unique populations and geographic areas across Ontario. It was requested that the Woodstock WWTP increased influent sample collection from three times per week to four. Samples are tested by Western University, in London, Ontario. The results are provided to Southwestern Public Health, to help track the spread of the virus.

North Trunk Sewer Inflow and Infiltration Investigation

A study was initiated in the fall of 2021, to locate and reduce inflow and infiltration (I&I) within the City of Woodstock North Trunk Sewer catchment area. The County is actively pursuing ways of being sustainable, and have identified the older sections of the collection system are significant contributors of I&I. Reductions to I&I flow allow for increased sanitary sewer capacity within the existing wastewater system. This supports future development while minimizing or deferring future infrastructure capital upgrades and energy requirements of the downstream wastewater treatment plant. The study was finalized in December of 2023, completing a detailed investigation of areas exhibiting higher I&I responses. This study identified several mitigation strategies and developed recommendations to act as the basis for decision making of how to reduce/manage excessive wet weather flows from both public and private sources in order to improve sewer capacity and reduce the impacts on the WWTP.

Biogas Utilization Renewable Energy Approval Study

As part of the County's Renewable Energy Action Plan (2022-2032) and consistent with the 100% Renewable Energy Plan (2018), a Preliminary Engineering Study (PES) was completed at the Woodstock WWTP in 2022, looking at opportunities to more efficiently use biogas produced at the WWTP to significantly increase renewable energy utilization

and reduce greenhouse gas (GHG) emissions, energy consumption and operational costs. The PES evaluated several options and concluded that a biogas fueled, internal combustion Combined Heat and Power (CHP) system was the preferred option. A CHP system is capable of utilizing renewable energy from the biogas to cogenerate on-site heat and power, where the generated electricity would be used at the WWTP to offset electrical consumption required for internal electrical usage and thermal energy would be directed to the WWTP's radiant heating system to offset natural gas consumption required for both process and building heat usage as follows:

- **Future Potential Biogas Conversion to Energy** – The biogas CHP is expected to increase renewable energy utilization by approximately 2,800,000 ekWh/year which will be used on-site to reduce costs associated with consumption of energy from the electrical and natural gas distribution networks. This would improve the WWTP's renewable energy consumption mix from 23% to 62%.

- **Future Potential GHG Emission Reduction** – Optimization of the WWTP biogas production for on-site plant utilization by the CHP system is anticipated to reduce carbon dioxide emissions by approximately 254 tCO2e/year.

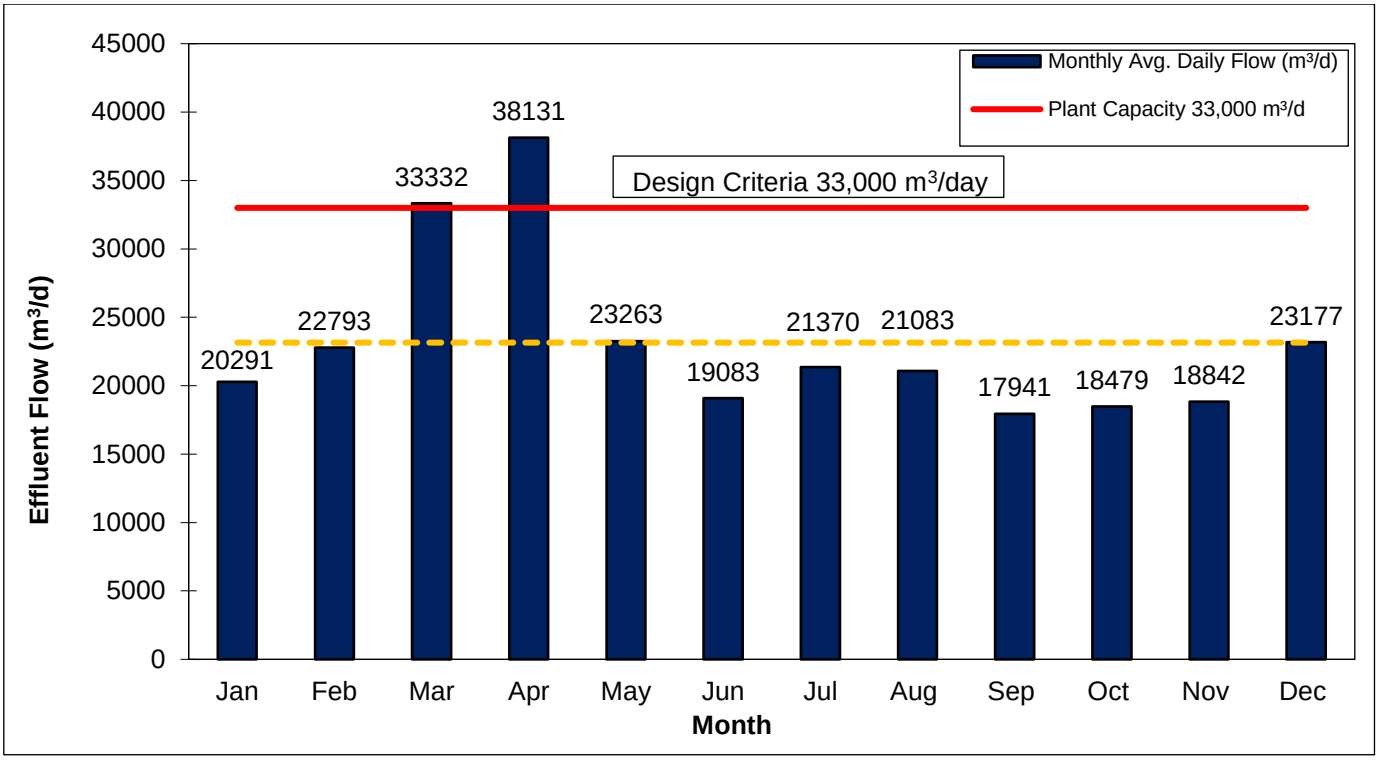
As per the County's 2022 Renewable Energy Action Plan (REAP) multi-year implementation plan, detailed design and Renewable Energy Approval (REA) studies for the CHP system were initiated in 2023, with final approvals and design work expected to be completed by Q3 of 2025.

Capital Improvement Projects and Energy Optimization

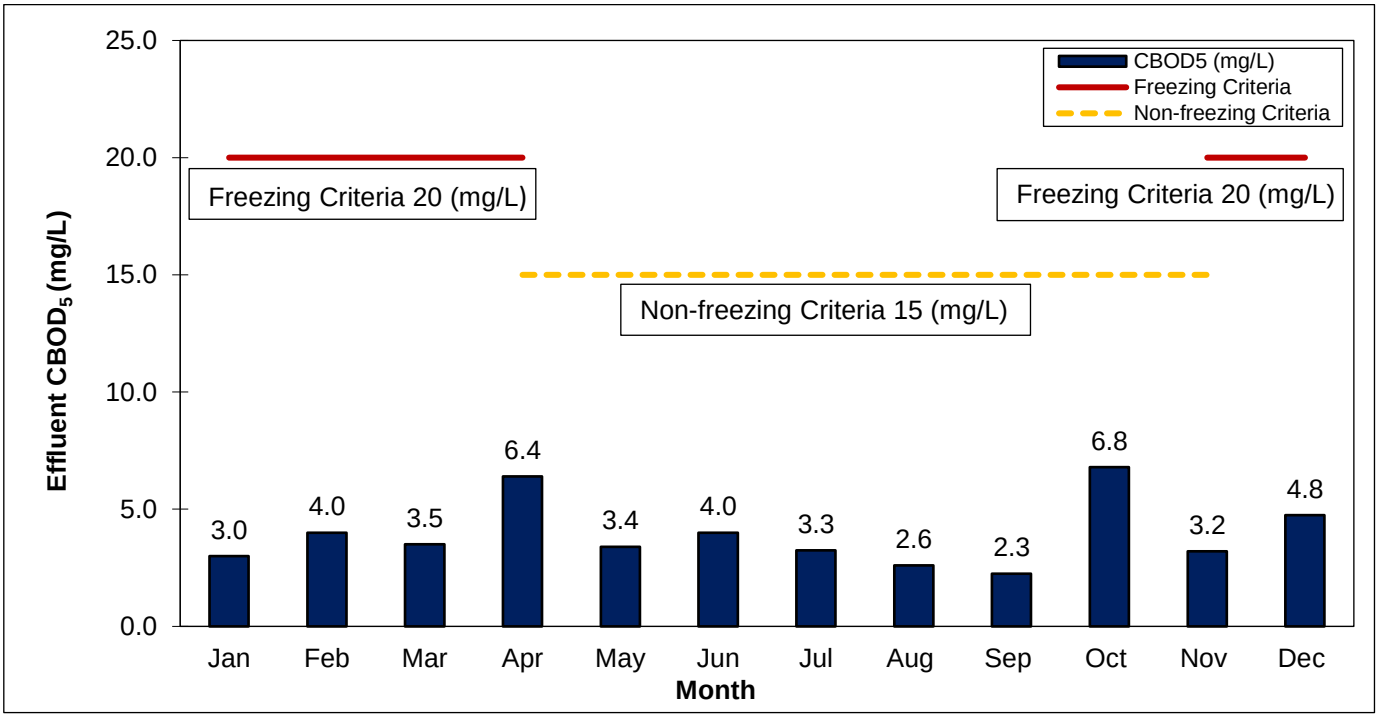
Capital Improvement Projects completed at the Woodstock WWTP in 2023 will result in additional energy and cost savings. The replacement of older equipment in 2023, with more efficient units has resulted in an annual electrical avoidance of 62,752 kWh per year, resulting in avoidances of 1.6 tCO2e per year in GHG emissions and $8,156 per year in energy costs.

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

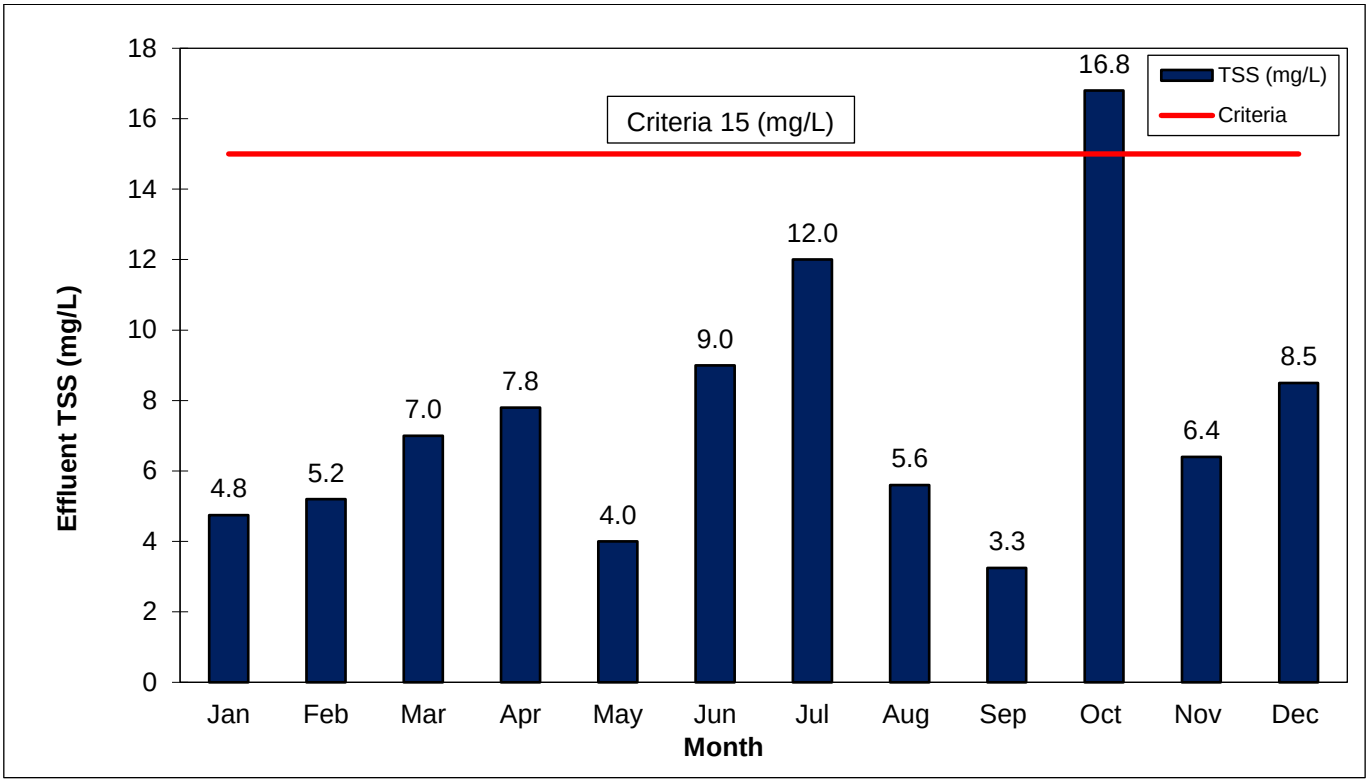
Woodstock WWTP Effluent, Monthly Average Daily Flow in Cubic Meters per Day, 2023



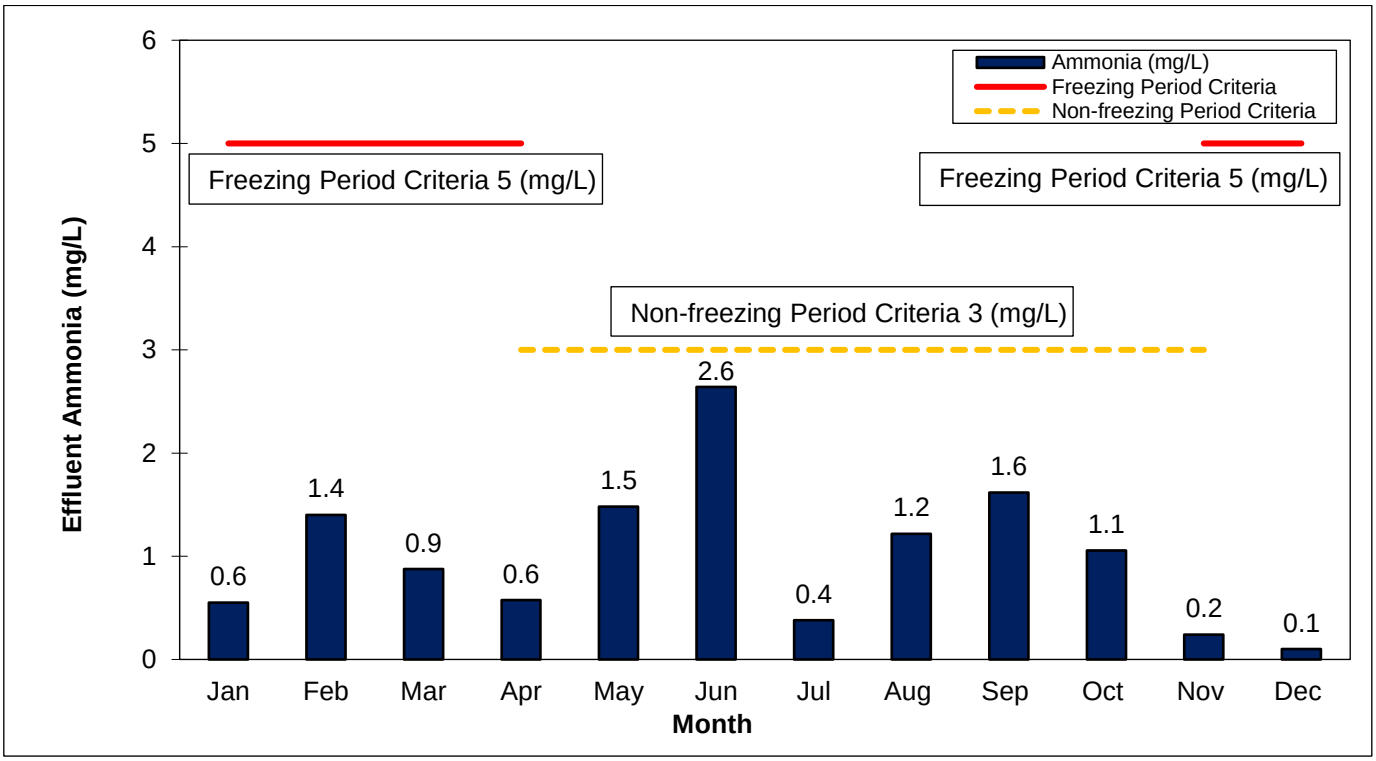
Woodstock WWTP Effluent, Monthly Average $CBOD_5$ (mg/L), 2023



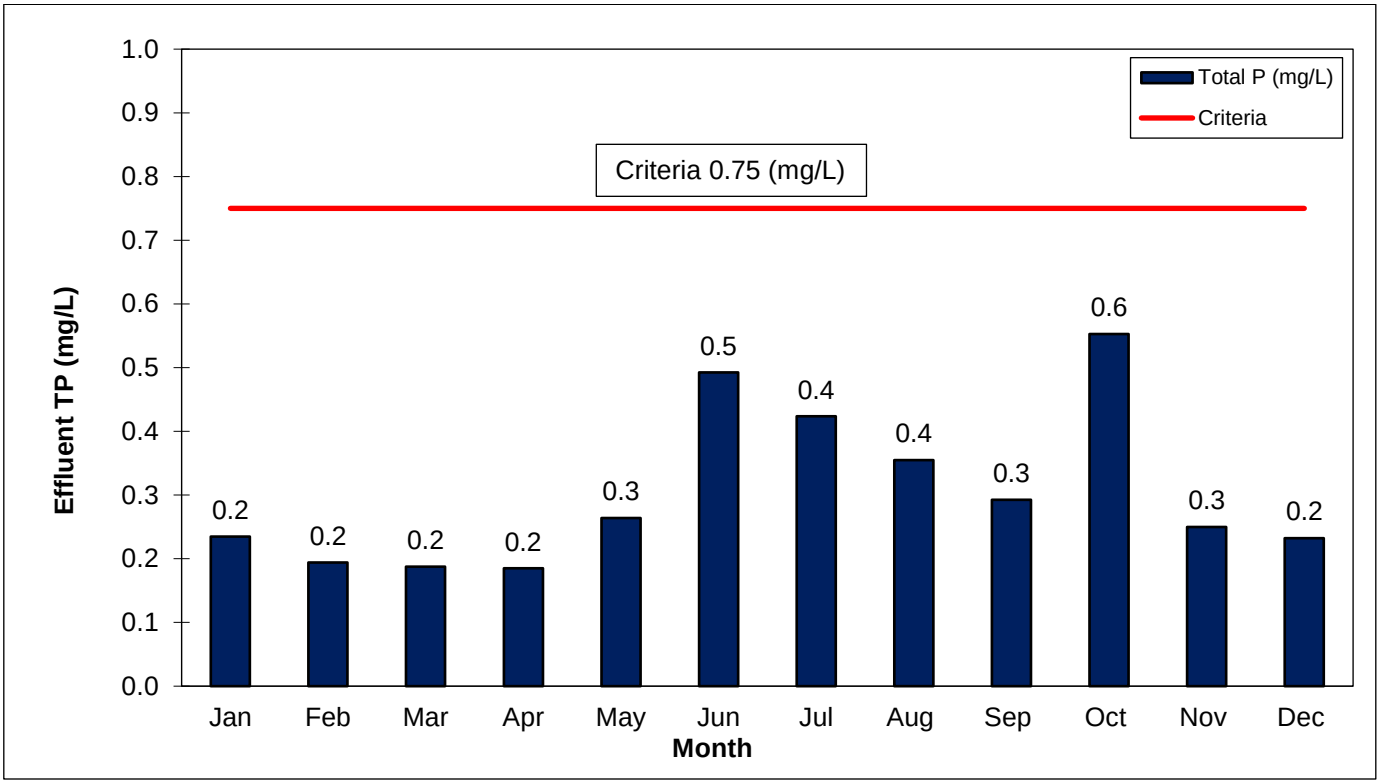
Woodstock WWTP Effluent, Monthly Average TSS (mg/L), 2023



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



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



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