

Memorandum to the Council of Corporation of the Municipality of Temagami

Subject: ECOFIXE Project Progress Report - Temagami North Lagoon

Memo No: 2025-M-029

Date: February 13, 2025

Attachment: Appendix A –ECOFIXE - 2024 Progress Report prepared by OCWA

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Recommendation

BE IT RESOLVED THAT Council receives Memo 2025-M-029, as presented;

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Executive Summary

The ECOFIXE project has significantly improved the wastewater treatment capacity of the Temagami North Lagoon since the installation of BIOFIXE modules in 2022. The system has achieved notable reductions in Total Ammonia Nitrogen (TAN), Biochemical Oxygen Demand (BOD), and Total Suspended Solids (TSS), addressing key environmental compliance challenges and preparing the municipality for future population growth.

On May 9, 2024, the Council approved an amendment to the Environmental Compliance Approval (ECA) to extend the use of the BIOFIXE modules beyond the pilot phase. Formal submission to the Ministry of Environment, Conservation, and Parks (MECP) was delayed due to an engineering review. Completion of the amendment process is expected in early 2025. This project's scalability, cost-effectiveness, and low operational demands make it a sustainable solution for Temagami.

Overview of the ECOFIXE Technology

ECOFIXE is an innovative modular wastewater treatment solution developed by Technologies Ecofixe to enhance the capacity and efficiency of existing wastewater systems while minimizing costs and infrastructure requirements.

The system features biological reactors submerged in aerated lagoons or bioreactors, optimizing the removal of:

- **Biochemical Oxygen Demand (BOD):** Reducing organic substances that consume oxygen during decomposition.
- **Total Ammonia Nitrogen (TAN):** Reducing a toxic contaminant in wastewater that is harmful to aquatic life.
- **Total Suspended Solids (TSS):** Improving effluent clarity and ecosystem health.

Key features include a triple-use aeration system that aerates biomass, creates action zones for biomass colonization, and requires minimal maintenance. ECOFIXE performs efficiently in cold

weather and is adaptable for future expansion, making it ideal for small communities like Temagami.

Background

The ECOFIXE project was initiated to address key challenges at the Temagami North Lagoon Wastewater Treatment Plant (WWTP):

- **Ammonia Removal Challenges:** Difficulty treating TAN in cold water conditions.
- **Capacity Limitations:** Increasing demand pushed the existing lagoon near capacity.
- **Economic Constraints:** High costs associated with traditional infrastructure upgrades.

In July 2022, the Ontario Clean Water Agency (OCWA) and ECOFIXE Technologies installed three BIOFIXE modules and a 7.5 HP high-efficiency blower. Funded by **Innovative Solutions Canada**, the initiative aimed to enhance the lagoon's capacity and improve contaminant removal. The project was implemented as a pilot study and was scheduled to conclude on December 31, 2024.

On April 25, 2024, representatives from OCWA and ECOFIXE presented the project's outcomes and annual operational costs, estimated at \$8,000, to the Council. Following this, the Council approved the ECA amendment on May 9, 2024, allowing OCWA to proceed with steps to extend the use of the BIOFIXE modules.

Project Implementation and Scope

The ECOFIXE project at the Temagami North Lagoon includes several key components:

- **Sponsorship:** Funded by **Innovative Solutions Canada**.
- **Cost:** \$571,500 (inclusive of installation, training, and operational support).
- **Components:**
 - Three BIOFIXE modules.
 - One 7.5 HP blower.

- **Population Served:** Approximately 1,000 residents.
- **Daily Flow:** 390 m³/day.
- **Objective:** Year-round optimization of TAN treatment, especially under cold water conditions.

Progress Report

Since its implementation, the ECOFIXE system has delivered measurable improvements in wastewater treatment at the Temagami North Lagoon.

Performance Metrics

- **TAN Removal:** Achieved 92.5% average efficiency, even in cold weather.
- **BOD5 Reduction:** Demonstrated 93% average improvement.
- **TSS Reduction:** Averaged 90%, significantly enhancing effluent quality (though not a primary design goal).
- **Phosphorus (TP):** Preliminary data indicates potential for further reduction.

Operational Enhancements

- **Blower Upgrades:** In October 2024, three blowers were installed, improving aeration and system performance. A fourth blower awaits integration, contingent on ECA amendment approval.
- **System Resilience:** The system recovered effectively following an extreme rainfall event in spring 2024, with only temporary performance impacts.

Financial Overview

- **Capital Cost:** \$571,500.
- **Annual Operational Costs:** \$7,950 (electricity, maintenance, and filters).
- **ECA Amendment Costs:** Estimated \$15,000–\$20,000 for application preparation and engineering review.

Conclusion

The ECOFIXE project has significantly enhanced wastewater treatment at the Temagami North Lagoon. With substantial reductions in TAN, BOD, and TSS, the system offers a reliable, cost-effective, and environmentally sustainable solution. Completing the ECA amendment process and optimizing system operations will ensure long-term benefits for Temagami's wastewater management.

1. INTRODUCTION

In April 2022, the Temagami North wastewater treatment facility obtained approval from the Ministry of Environmental Conservation and Parks (MECP) to conduct a two-year pilot study, using Biofixe modules (provided by Technologies Ecofixe Inc.) to help with total ammonia nitrogen (TAN) and biochemical oxygen demand (BOD) removal within the first aerated lagoon (Cell No. 1). In June of 2022, three biofixe modules were located in Cell No. 1. The first two modules were positioned to remove BOD and the third module was positioned to remove TAN as shown in the picture below. Total phosphorus (TP) and total suspended solids (TSS) levels will also be looked at as additional performance measures.



Biochemical Oxygen Demand (BOD) refers to the amount of oxygen consumed by organic matter in a specific volume of water at a specific temperature over a 5 day period. High BOD in effluent means a large quantity of oxygen was needed to break down the organic matter and identifies a large amount of organic matter in the effluent indicating inadequate treatment.

Total Ammonia Nitrogen (TAN) refers to the total amount of nitrogen in the forms of Ammonium (NH_4) and Ammonia (NH_3). Ammonia is one of several forms of nitrogen that exist in aquatic environments and can cause direct toxic effects on aquatic life. High levels of ammonia can corrode and damage critical pieces of infrastructure.

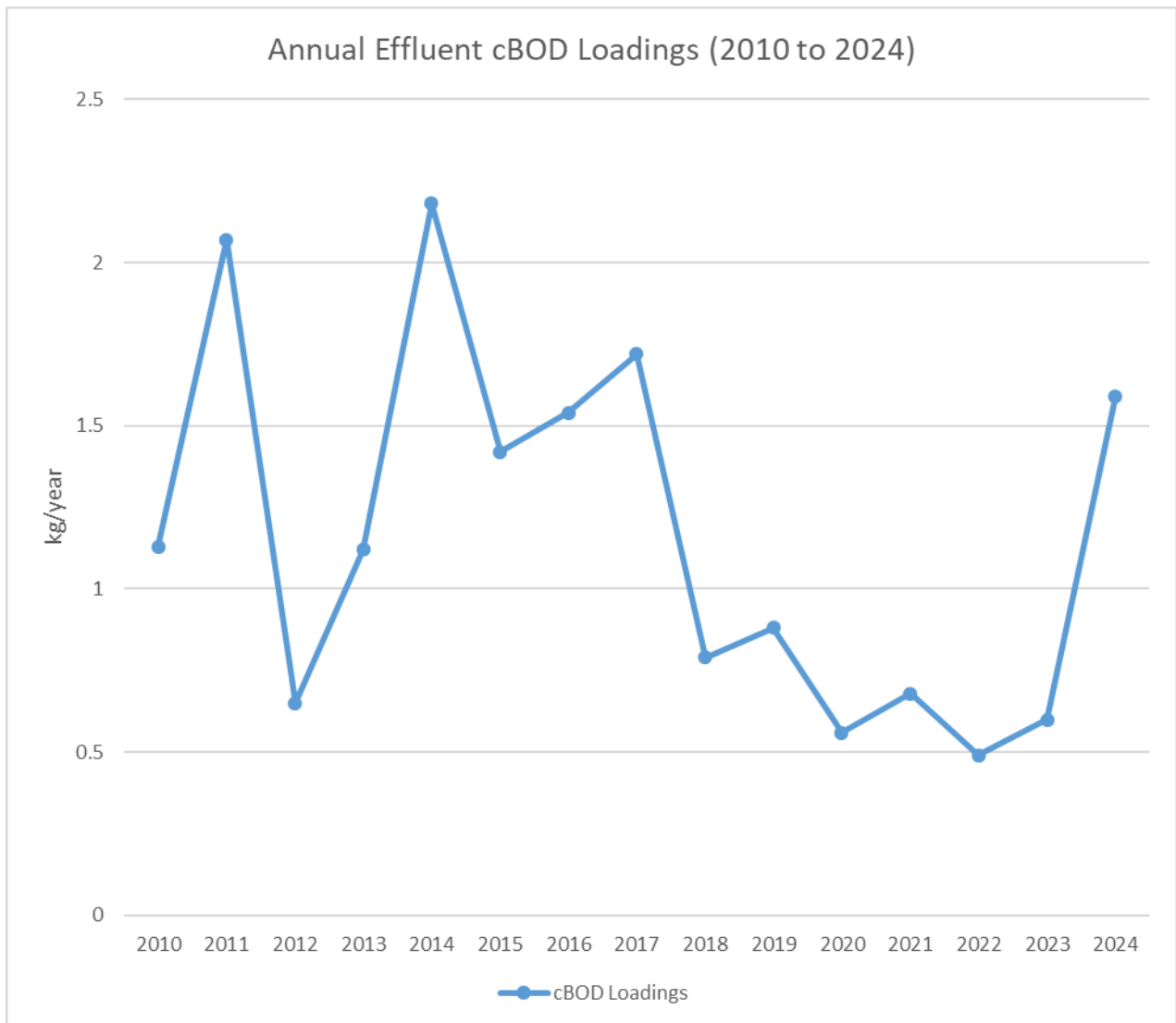
Total Phosphorus (TP) refers to a measure of all phosphorus found in a sample, whether it is dissolved or particulate. Phosphorus is an essential nutrient that contributes to plant productivity. TP is commonly used to determine the health of water bodies and excess TP can stimulate algae and weed growth that may cause fluctuations in dissolved oxygen in the receiving waters.

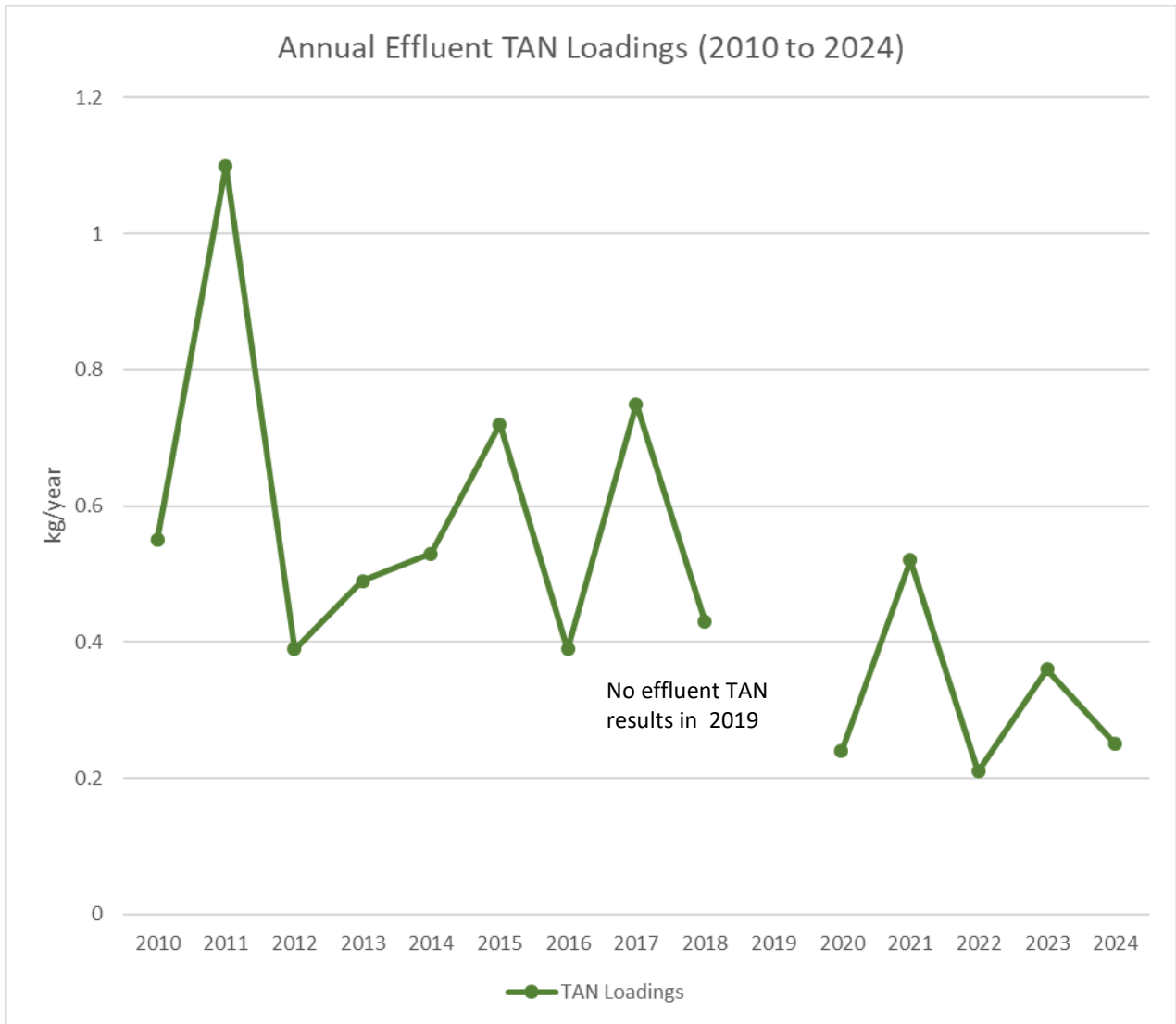
Total Suspended Solids (TSS) refers to the dry weight of suspended particles that are not dissolved in water and can be filtered. TSS is composed of settleable solids and non-settleable solids depending on the size, shape and weight of the solid particles. Settable solids are large sized particles that tend to settle more rapidly in a given period of time. High TSS may decrease water's natural dissolved oxygen levels and increase water temperature which may prevent organisms from surviving in the waters.

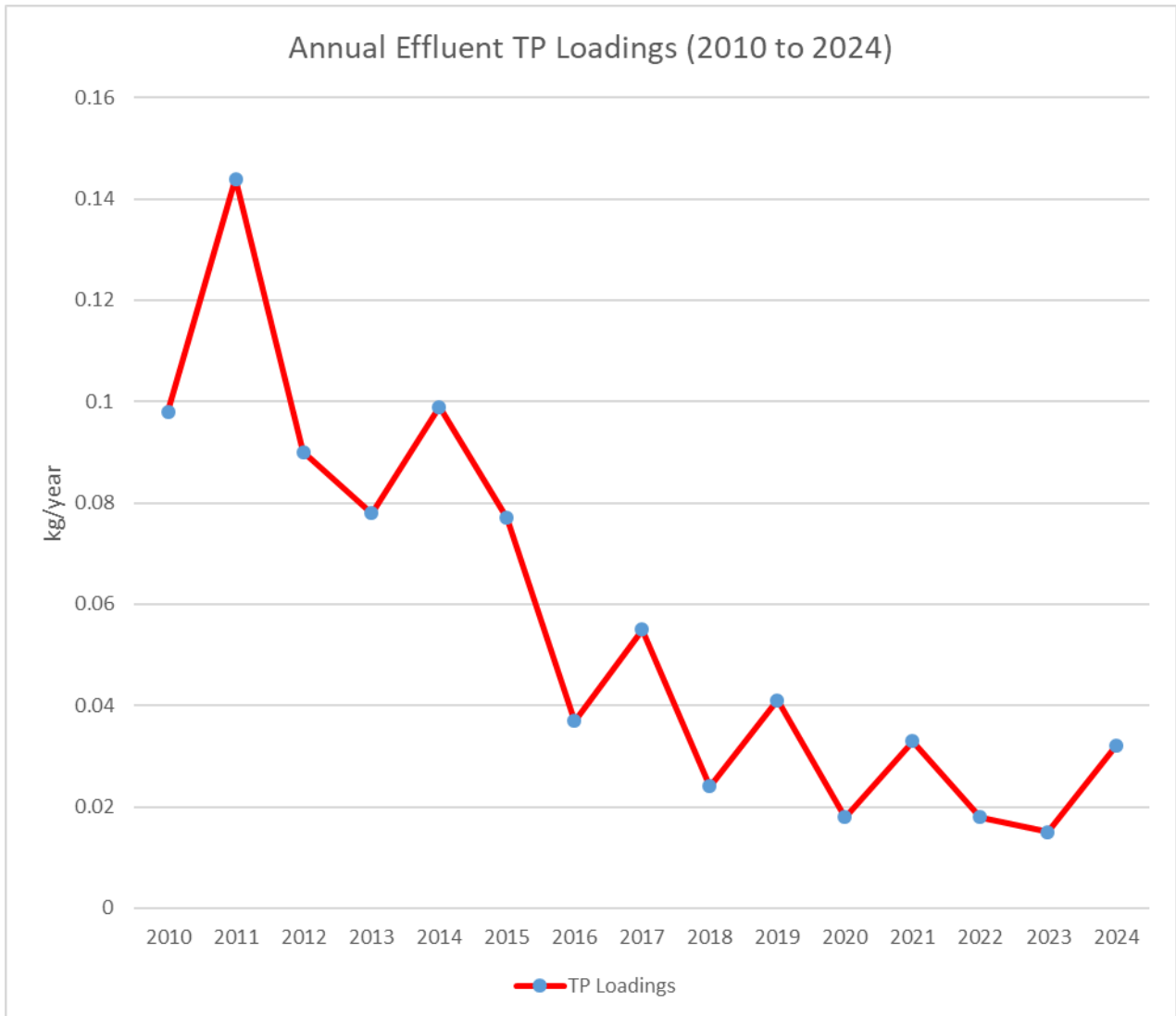
2. PERFORMANCE

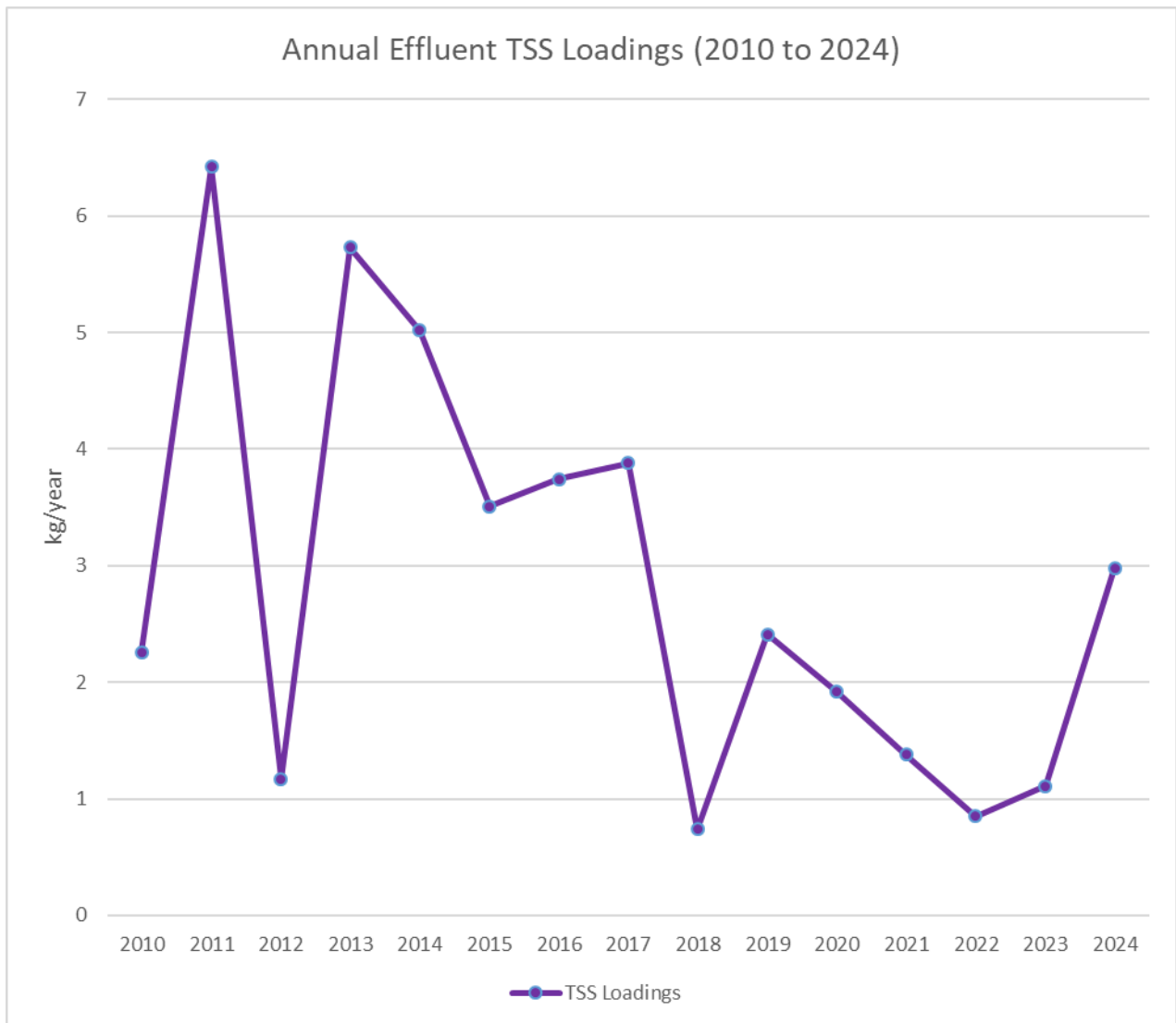
To show the overall performance of the Biofixe units, this report includes data covered from January 2010 to December 2024. The graphs below show the annual effluent loadings for cBOD, TAN, TP and TSS. The level of these parameters have improved over time through process optimization and with the recent installation of the Biofixe modules in July 2022. It should be noted that an extreme rainfall event in the Spring of 2024 resulted in extremely high flows passing through the lagoon causing high effluent loadings for cBOD, TP and TSS.

It should also be noted that three (3) original blowers were replaced and put into operation in October 2024. These new blowers have an increased capacity and will improve the lagoon’s aeration system as well as improve the Biofixe process. A fourth new blower that was provided to the Municipality as part of the pilot project is on-site, but not yet in service. Performance should continue to improve once all four blowers are operational.









3. DELIVERABLES

The MECP granted the Municipality of Temagami approval to install three (3) Biofixe modules in the Temagami North Lagoon as a pilot study. The study expired on December 31, 2024 which means that an amendment to the system’s Environmental Compliance Approval (ECA) is required to continue using the modules at the lagoon. OCWA’s Innovative, Technology and Alternate Delivery Group worked on the amendment application, but required an Engineering firm to sign-off that the new blower provided as part of the pilot project is sized correctly for the lagoon’s aeration system and Biofixe modules. There was some delay in retaining an Engineer and in turn is delaying the submission of the application to the MECP. OCWA has requested an extension for the application and a response is pending.

The Temagami Lagoon has three (3) existing blowers that were recently replaced as part of the UV project. The

blower building and electrical system was upgraded to provide increased capacity for the 3 new blowers which were under-serviced as well as the fourth blower provided with the Ecofixe project. The fourth blower cannot be put into operation until the ECA for the Temagami North Lagoon system has been amended to include the Biofixe modules and the blower. As stated above, OCWA has requested an extension for the application. OCWA's Innovative, Technology and Alternate Delivery Group does not foresee any issues with the MECP granting the extension and the application should be submitted early to mid 2025.

There will be a cost to prepare and submit the ECA application as well as a cost for the Engineering Firm to sign-off the documents for the fourth blower. OCWA will provide a formal proposal for the cost, but expects it to be between \$15,000 to \$20,000.

4. CONCLUSION

The Biofixe modules are operating well, providing good overall quality effluent with respect to the removal of BOD, TAN, TP and TSS. Once more data is available with all four blowers in operation, an assessment can be made to determine the system's optimal effectiveness.

OCWA is waiting for MECP approval to extend the December 31, 2024 deadline for the ECA amendment application which should be granted in early 2025.