NUTRIENT REDUCTION GUIDE FOR MINNESOTA WASTEWATER TREATMENT FACILITY STAFF: UPSTREAM SITE ASSESSMENTS

INTRODUCTION

Nutrient pollution in wastewater can be a challenge for many wastewater treatment facilities. Treatment costs to meet nutrient permit levels can be significant for communities across Minnesota, with investments needed for chemicals, equipment, and operator time. The Minnesota Technical Assistance Program (MnTAP) has found that mitigating incoming nutrient loads upstream at their points of origin can be one strategy to minimize these costs and ensure a healthier environment for all. The goal of this guide is to provide wastewater operators and community leaders with a framework for identifying and addressing opportunities to reduce nutrient pollution at the source and save on treatment costs.

SOURCE REDUCTION BENEFITS MULTIPLE STAKEHOLDERS

The value of upstream source reduction assistance is in the potential opportunity for reduced nutrient water pollution. This opportunity has benefits for not only wastewater treatment staff, but also the businesses from which nutrients may be originating and the community as well. The primary benefits that each stakeholder can gain include:

- **Wastewater Treatment Facility:** reduced wastewater treatment load and operating costs; meeting permit limits
- **Businesses:** chemical costs or sewer fees savings; leaner operations; potentially improved bottom line
- **Community:** reduced treatment facility expenses; increased resiliency and longevity of wastewater infrastructure

These benefits are important to keep in mind as you connect with sites in your municipality and conduct on-site assessments. Conveying the value of nutrient source reduction to all parties and educating them on the positive impact of such efforts is a key component to achieve success.

Image courtesy of Tina Harrington, City of Royalton.

MnTAP
University of Minnesota
Driven to Discover℠
Environment and Natural Resources Trust Fund

PROCESS FOR CONDUCTING ASSISTANCE TO COMMUNITY SITES

Wastewater plant staff and community leaders may utilize a three-step approach that was modeled by MnTAP to assess sources of wastewater nutrient loading in their municipality. The steps are: 1.) Evaluate current state, 2.) Connect with sites, and 3.) Support implementation efforts. A simple outline to this process is shown in the diagram below:

This process is meant to serve as a framework to help guide wastewater facility staff efforts to find opportunities for nutrient reduction. Further elaboration of each step continues below.

1. EVALUATE CURRENT STATE

The purpose of this step is to review current information at your facility and create a plan for conducting assessments. It is likely that most operators are already close to completing step one; however, it is still beneficial to review current available information and identify unknowns. Knowing the context for your facility's needs may help inform your outreach strategy and efforts as you connect with sites in step two.

First, determine what the permissible nutrient limits are as defined on your permit and what your typical effluent discharge values have been. Comparing these limits with your influent is a good way to size up the level of opportunity that your community may have for reduction.

Assessing treatment costs is another piece of contextualizing the level of opportunity at your facility. Nutrients are another parameter that requires operator attention and can be challenging to remove efficiently. Expenses for energy or chemical (i.e., alum or ferric chloride) used to treat nutrients can indicate opportunity for cost savings from source reduction efforts.

Tracing nutrients upstream from the wastewater treatment facility may be straightforward or challenging. Sometimes there are significant industrial users that are monitored and have detailed records on their nitrogen and phosphorus discharges. In other cases, nutrient sources are largely unknown. It is helpful to conduct sample monitoring from individual lift stations in the municipality in order to identify certain areas in town to investigate further.

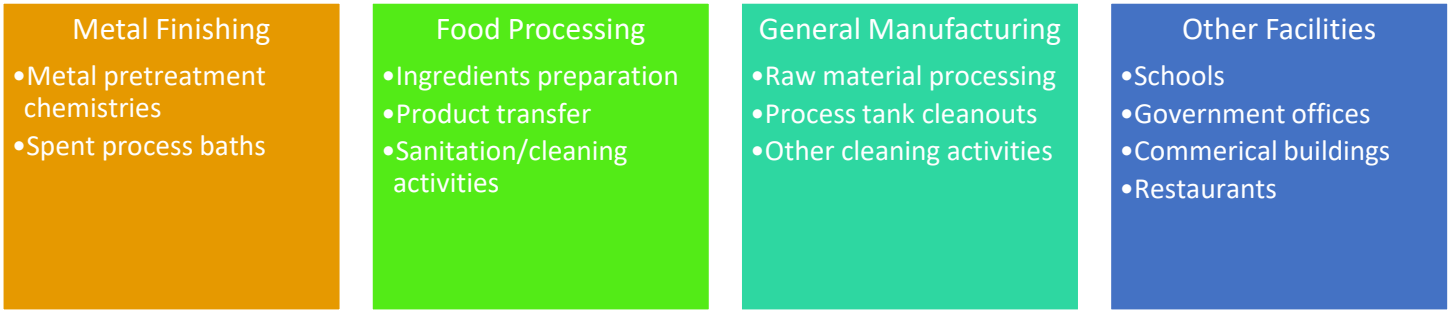
Knowing the permit limits, treatment costs, and nutrient loads helps to set a target for reduction. This information can guide your engagement and assessment process in the following step.

2. CONNECT WITH SITES

This step involves the identification and engagement of sites that are possible contributors to nutrient loading to your municipality's wastewater treatment facility. The outcomes from this step are to establish (or continue to build) relationships with sites in your community, learn about their processes and activities, and educate them on the value of nutrient source reduction. This step is also an appropriate time to consider contacting MnTAP to request additional support.

FACILITIES THAT MAY BE CONTRIBUTING NUTRIENTS

The nutrients that may be arriving at your facility typically originate from processes that involve cleaning, or from processes that involve organic materials such as food processing. In brief, the following diagram illustrates the types of facilities that you may encounter and likely activities that may be contributing nutrients.



APPROACHING SITES

When connecting with businesses and organizations in town, MnTAP suggests taking an "investigative partnership" approach. Businesses will be concerned about needing to make changes that could be costly or otherwise negatively impact their operations. With that in mind, seeking to have constructive and open discussion with the business about what can be achieved to reduce their wastewater load may offer a more productive way forward. An important caveat to this approach is that the operator does not initially anticipate that enforcement or other corrective actions will be necessary.

Start by introducing yourself and explaining that you are seeking to find potential sources of nutrients in order to better manage them at your wastewater facility. If the site is a manufacturer, seek to connect with a staff member that is involved in the process and has some oversight, such as a production manager or maintenance manager. The eventual desired outcome of this conversation is to be able to arrange a visit to the facility with the intent of observing their processes and arriving at possible solutions.

One way to make a business case for an organization is to highlight the cost savings potential that the site might have if they are able to minimize their wastewater bill and how that could improve their bottom line. These reductions are often the outcomes of process efficiency improvements, which could be a more attractive context for framing the effort.

The staff on site may also be members of the local community who are conscious of their facility's releases to the surrounding environment. Therefore, you might try appealing to the value of environmental stewardship by describing the benefits of nutrient reduction and the impact it can have on your local community and its water resources. Share what you are observing in your day to day treatment efforts. You can also use this opportunity to educate the client on the environmental impact of high nutrient levels in water – namely eutrophication, which causes decreased dissolved oxygen levels, fewer fish and wildlife, and lower quality water for human use, sport, and enjoyment.

CONDUCTING SITE VISITS

Once on site, you will be able to ask additional questions about specific operations and activities that are contributing to wastewater. As mentioned, cleaning and sanitation as well as product processing tend to be primary wastewater-generating activities. Ask to see some of these processes in action to observe how they may be contributing to the facility's wastewater and evaluate if there are feasible options to mitigate volume and/or strength. Request to see Safety Data Sheets for any cleaners or chemicals that are present and review them to determine if they contain phosphorus or nitrogen. MnTAP is able to work with businesses to research and identify possible alternatives that could then be tested at the facility to see if replacement of these products is feasible.

An effective strategy to engage with the facility is to co-create ideas and brainstorm together. If wastewater bills are a cost reduction priority for the facility, then there may already be some goals or solutions that have been discussed among staff. Asking questions tactfully about their procedures and understanding what they have done in the past to address waste will help build context around their current situation. Avoid putting the facility on the defensive; rather, seek to identify what can be changed or improved within their capacity.

Safety is imperative when visiting any facility. If you are on a facility tour, remember to consult with the site in advance to make sure appropriate personal protective equipment is available. Safety glasses, hearing protection, and steel toe shoes are all common PPE items that you may need. Review safety protocols with facility staff, follow your guide, and be mindful of your surroundings. You always have the option to request to exit the environment if you feel unsafe for any reason.

3. SUPPORT IMPLEMENTATION EFFORTS

Remember that effective communication is vital to the successful engagement of companies and accountability for completing agreed-upon actions. Towards the end of the visit (or in a timely follow up conversation), decide on what next steps to take. Make suggestions based on what you observed and discussed with your contact. The solutions with the highest likelihood of success are usually those that are low or no cost, reasonable procedural changes, and/or simple equipment upgrades that can help reduce waste or conserve resources. Ideas for these solutions can be found in the Additional Resources section of this document. MnTAP expertise can help research and propose solutions along with estimated cost savings and payback to help economically justify expenses to the site.

Continue to check in with sites to monitor progress towards implementation. Providing additional wastewater sampling and test results, if feasible, in one way to provide feedback for facility staff. Consider the need for connecting with other groups such as industry associations that can offer guidance or additional assistance. In addition, there may be other vendors (e.g chemical and/or equipment suppliers) that work with the facility who can offer technical expertise on specific processes.

PROVIDE FEEDBACK AND RECOGNITION OF COMPLETED ACTIONS

If a facility does manage to implement a solution, it is critical that feedback is provided to give them credit for their work and acknowledge any changes or improvements that you have observed. Companies may already have an idea of their progress internally if they are keeping track of their sewer bills; if they are seeing a reasonable decrease in fees, then it is likely they see their implemented changes as successful. However, it is always a good idea to touch base with sites to share

results and confirm that their actions are having an impact. It is also important to give praise to companies that have invested the time (and money!) to make changes and show your appreciation for their efforts. These gestures help to provide resolution to the work and can provide renewed energy for addressing additional wastewater challenges that may occur in the future.

Not every assessment will lead to an easy fix. Facilities may not be willing to make a change due to barriers such as high implementation cost, priority on production throughput, or lack of available manpower. Despite these challenges, there is still value in having conducted an assessment. Being able to consider potential options is useful to verify that sites are taking reasonable measures to manage wastewater and rule out any gross discharges of nutrients (or other wastewater constituents). An audit may also help wastewater staff determine to what extent permitting, industrial wastewater strength surcharges, or other regulatory actions may be required.

Ultimately, a collaborative investigation done in good faith with the goal of developing solutions is an excellent approach to fostering healthy relationships with your local businesses. Making a business case for reducing nutrients can encourage owners and managers to shift their perspective on how they operate, resulting in changes that will benefit your community and help preserve Minnesota's water resources.

ADDITIONAL RESOURCES

1. Phosphorus reduction factsheets and case studies: http://www.mntap.umn.edu/focusareas/water/phosphorus/
2. Wastewater reduction best practices and case studies for food processing facilities: http://www.mntap.umn.edu/industries/facility/food/wastewater/
3. MnTAP Upstream Nutrient Reduction project page: http://www.mntap.umn.edu/focusareas/water/nutrientreduction/
4. MnTAP Intern Program: http://www.mntap.umn.edu/interns/business/

CONTACT

If you would like to connect with MnTAP to collaborate on nutrient reduction assistance, please reach out to:

Daniel Chang
Associate Engineer
dwchang@umn.edu
612-624-0808

Matt Domski
Intern Program Manager
mdomski@umn.edu
612-624-5119

Funding for this project is provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR).

Images on page 1 & 5 courtesy of Tina Harrington, City of Royalton.