Nitrogen frequently asked questions

A. What is Minnesota's wastewater nitrogen reduction and implementation strategy?

The strategy and an accompanying summary are posted on the Minnesota Pollution Control Agency's (MPCA's) Nitrogen in wastewater webpage.

Beginning	If	Then
Phase 1 - First National Pollutant Discharge Elimination System (NPDES) permits cycle beginning April 1, 2024	Facilities with high total nitrogen (TN) effluent concentrations (see Minnesota Wastewater Nitrogen Reduction and Implementation Strategy Summary - Tables 2 and 3)	Nitrogen management plan development and implementation
	Facilities discharging upstream of Index of Biological Integrity (IBI) impairments linked to nitrate stressors (information available from MPCA)	Enhanced nitrogen management plan development and implementation
	Facilities participating in TN optimization incentive and achieving a 15 mg/L 12-month moving average TN concentration during phase 1	If applicable, 10 mg/L State Discharge Restriction (SDR) deferred to phase 3
	New, expanded or significantly upgraded facilities	Designed for denitrification
	New, expanded or significantly upgraded with reasonable potential to cause or contribute to exceedance of drinking Water Quality Standards (WQS) or nitrate stressed IBI impairments	Designed and constructed to meet nitrogen WQBELs
	Discharge has reasonable potential to cause or contribute to exceedance of existing nitrate standards for Class 1 waters	10 mg/L TN Water Quality-Based Effluent Limit (WQBEL)
	Discharge contains nitrogen and total maximum daily loads (TMDLs) developed for nitrate impaired waters or nitrate stressed IBI impairments	TMDL wasteload allocation
Phase 2 - First NPDES permit cycle following adoption of nitrate WQS and TN SDR	Low TN concentration facility (see Minnesota Wastewater Nitrogen Reduction and Implementation Strategy Summary - Tables 2 and 3)	Nitrogen management plan development and implementation
	Municipal major facility	10 mg/L TN SDR
	High TN concentration facility (see Minnesota Wastewater Nitrogen Reduction and Implementation Strategy Summary - Tables 2 and 3)	Nitrogen WQBELs
	Permits for all discharges which cause or have a reasonable potential to cause or contribute to exceedances of nitrate WQS or IBI impairments linked to excess nitrate will include nitrogen WQBELs.	
Phase 3 - Second NPDES permit cycle following adoption of nitrate WQS and TN SDR	Facilities that successfully optimized operations during phase 1	10 mg/L TN SDR

Glossary:

- *High concentration facilities – Facilities with effluent TN concentrations exceeding the thresholds in Table 3 of the Wastewater Nitrogen Reduction and Implementation Strategy: Class A, Class B and High Concentration Industrial facilities = 30 mg/L; Class C facilities = 35 mg/L; Low Concentration Industrial facilities = 5 mg/L.*
- *IBI – Index of Biological Integrity, a measure of the health of aquatic communities. Waterbodies that exceed the IBI biocriteria specified in Minn. R. 7050.0222 are considered impaired for fish or macroinvertebrate IBI.*
- *Optimization incentive – An opportunity for wastewater point sources to defer 10 mg/L TN effluent limits by one permit cycle if effluent TN reductions are achieved through optimization of facility operations during Phase 1. Participating facilities must demonstrate successful optimization by achieving a 12-month moving average effluent concentration ≤15 mg/L before the end of Phase 1.*
- *Reasonable potential – A wastewater permit development procedure to determine whether Water Quality-Based Effluent Limits should be applied for an effluent waste stream.*
- *SDR – State Discharge Restriction, a type of wastewater permit effluent limit specified in Minn. R. ch. 7053.*
- *Significantly upgraded – Wastewater treatment facility construction projects that include upgrades of biological treatment units.*
- *TN – Total Nitrogen, calculated as the sum of Total Kjeldahl Nitrogen and Nitrite plus Nitrate as N.*

B. How will facilities be impacted by implementation of the nitrogen reduction strategy during Phase 1 efforts?

- **How will this strategy impact facilities waiting for reissued permits without any construction, or upgrades planned?**
- **How will this strategy impact ongoing construction projects?**
- **How will this strategy impact future construction projects?**

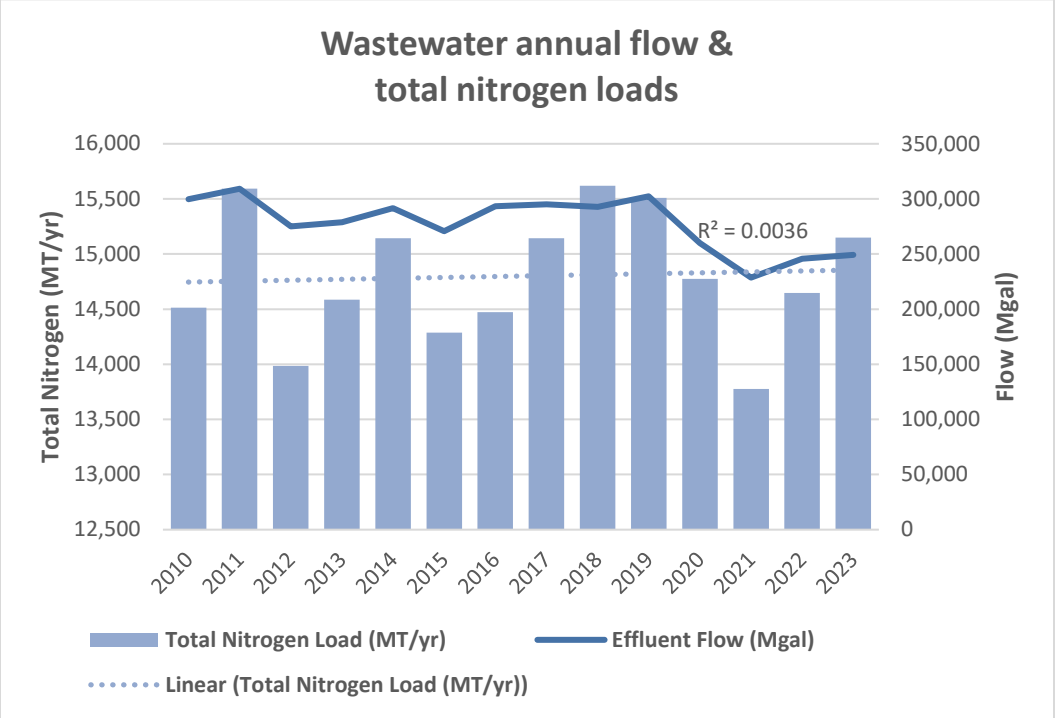
Nitrogen management plans – High total nitrogen concentration facilities will be required to develop and implement nitrogen management plans (NMPs) during Phase 1. All facilities discharging upstream of IBI impairments linked to excess nitrate will be required to develop and implement enhanced NMPs.

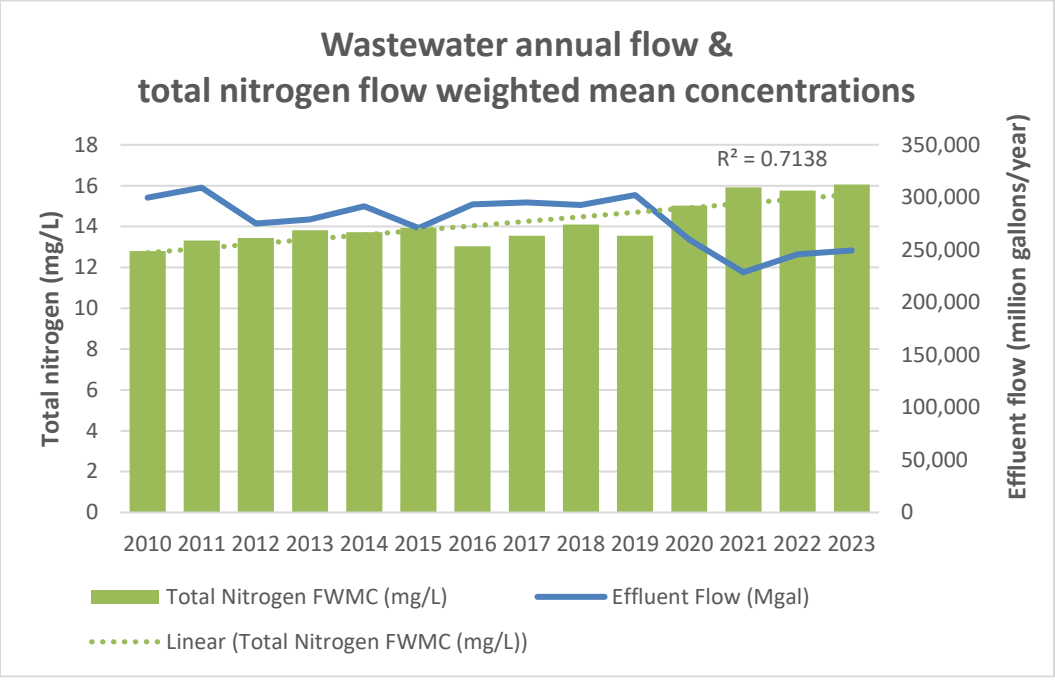
Construction - Ongoing construction projects that were initiated prior to April 1, 2024, these projects will not be impacted by inclusion of new limits at this point.

After April 1, 2024, any new or proposed construction projects will be subject to the "New, Expanding, and Significantly upgraded facilities" guidance which establishes requirements for the design, and in some cases construction of denitrification facilities and may result in the issued/reissued/major modified NPDES permit including a water quality-based effluent limit (WQBEL).

C. Nitrogen concentration trends over time and wastewater discharger's contributions and the MPCA's objectives to protect aquatic life under the Clean Water Act.

Effluent data collected via NPDES permits since 2010 has shown that while annual effluent nitrogen loads are variable and flow dependent, flow weighted mean concentrations have been increasing over time.





Effluent flow and total nitrogen data represent both industrial and municipal wastewater facilities.

Although contributions from Minnesota's wastewater treatment facilities account for less than 10% of these contributions during average flow years, they represent larger proportions during low flow years.

Statewide relative source contribution estimates by hydrologic year

Hydrologic Condition	Basin	Cropland Groundwater	Cropland Drainage	Cropland Runoff	Forest	Urban NPS	Septic	Feedlot	Atmospheric	Point Sources
Dry year	Mississippi	33%	25%	5%	4%	1%	4%	0.1%	10%	19%
	Winnipeg	32%	2%	5%	16%	0%	3%	0.04%	32%	10%
	Superior	7%	2%	2%	27%	1%	6%	0.0001%	12%	44%
Average year	Mississippi	31%	43%	5%	4%	1%	2%	0.1%	6%	9%
	Winnipeg	35%	7%	11%	19%	0%	2%	0.03%	21%	6%
	Superior	9%	5%	2%	38%	1%	4%	0.0001%	10%	31%
Wet year	Mississippi	29%	49%	5%	4%	1%	1%	0.1%	4%	6%
	Winnipeg	35%	11%	14%	19%	0%	1%	0.02%	15%	4%
	Superior	10%	6%	3%	44%	1%	3%	0.0001%	8%	24%

Source: Nitrogen in Minnesota Surface Waters (MPCA 2013)

The MPCA has multiple objectives to reducing the nutrient load to surface waters – protection of drinking water sources and aquatic life, as well as addressing downstream impacts and support of the Minnesota's Nutrient Reduction Strategy.

D. Why are limits based on total nitrogen (TN) instead of nitrate alone, especially considering that aquatic life and drinking water standards primarily focus on nitrate?

Existing drinking water standards and draft aquatic life water quality standards are based on nitrate. Nitrogen species in wastewater effluents include ammonia, nitrite, nitrate and organic nitrogen. Of these, ammonia and nitrite will rapidly decay to nitrate in aerobic receiving waters and dissolved organic nitrogen is understood to become bioavailable over time[1]. The proposed TN State Discharge Restriction (SDR) effluent limits for major municipal wastewater treatment facilities, high concentration minor municipal facilities and high concentration industrial dischargers are intended to minimize the impact of wastewater discharges on in-stream nitrate concentrations.

Additionally, the Gulf of Mexico Hypoxia Taskforce and the International Joint Commission have both adopted TN as a measure of nitrogen loads in the Mississippi River and the Red River Basins. In establishing downstream water quality objectives, Minnesota's Nutrient Reduction Strategy has also established nitrogen targets based on TN. Proposed TN SDR effluent limits are consistent with state and regional water quality objectives.

E. How will nitrogen limits be displayed in reissued permits going forward? As total nitrogen or as nitrite plus nitrate limits?

The formal WQBEL rulemaking effort will establish the analytes and limit types for nitrogen WQBELs that will be placed in limits. Typically, Minnesota's NPDES and SDS permits have included total nitrogen effluent limits to protect groundwater as a source of drinking water. Some industrial permits have included nitrite and nitrate effluent limits.

The proposed state discharge restriction (SDR) limit is being recommended to be a total nitrogen, 12-month moving average limit.

[1] Kaushal, S.S., Lewis, W.M. Fate and Transport of Organic Nitrogen in Minimally Disturbed Montane Streams of Colorado, USA. *Biogeochemistry* 74, 303–321 (2005). https://doi.org/10.1007/s10533-004-4723-5

F. What are some permitting approaches available to permittees and/or actions permittees can be taking now in preparation for future WQBEL and SDR limits?

Ahead of rulemaking completion and implementing WQBELs and SDR limits, permittees can do a few things. One of which is development and implementation of a nitrogen management plan. Another is facility optimization for nitrogen removal. Participation in the nitrogen optimization incentive during Phase 1 of the wastewater N reduction strategy may establish eligibility to defer an eventual TN effluent limit to Phase 3 (the second permit cycle after adoption of a TN SDR regulation). The MPCA has recently hired two new technical services staff who are available to meet with small facilities one on one to talk about potential optimization opportunities. The MPCA Engineers are also available to discuss potential plant optimization.

Post limit implementation, permittees have permitting tools available to meet limits. Compliance/constructions schedules are available. Water Quality Trading is also an existing option and can be done between point source dischargers (point to point) or a point and nonpoint sources. Trading is a great option especially when considering working with nonpoint sources of nitrogen in your area. The MPCA has a water quality trading team and a Water Quality Trading Program Coordinator who are available to answer any trading related questions you may have.

There are also potential funding opportunities through Clean Water Revolving Fund (CWRF) and Point Source Implementation Grant (PSIG) – there are certain eligibility requirements and available funding can change from year to year based on funding received from the legislature.