

General guidelines for the computation of the maximum authorized load for expansions of municipal wastewater treatment plants to satisfy antidegradation

This document informs Permittees and consultants on the method of “freezing” a pollutant load in an effort to avoid a full antidegradation review and assessment. MPCA wants to make the process transparent and available. Below are the possible scenarios of expanding an existing discharge. For instance, Scenario A references maximum pollutant load calculations if a facility that has ponds to treat waste (controlled) wants to expand and still treat its waste with ponds. Scenario B references maximum pollutant load calculations if a facility that has ponds wants to expand and treat its wastewater with a mechanical facility (continuous). Scenario C references a situation where the facility is a mechanical plant and wants to expand and treat wastewater with ponds and Scenario D references an expansion of a continuous discharge.

Notation

ADWDF _c	Current average dry weather design flow
ADWDF _f	Future average dry weather design flow
AWWDF _c	Current average wet weather design flow
AWWDF _f	Future average wet weather design flow
7Q ₁₀	Annual 7 day low flow with a 10 year recurrence
C _p	single measured concentration in a pond
C _c	Maximum of 4 sampled concentrations (1 sample per week) in a system with continuous discharge
C _e	Maximum effluent concentration of a parameter measured in a period of
C _a	Computed mass balanced based total ammonia concentration
C _L	Current concentration limit
A	Current secondary ponds area at mid depth
D	Secondary pond discharge rate, in general 0.5 ft/day

Glossary

Parameter	Pollutant
No monitored data, no limit	The facility is not monitoring the parameter, there are no data and there is no limit
Monitored data no limit	The facility is monitoring the parameter, the parameter has no limit
Existing concentration limit	The facility has a concentration limit for the parameter
Cl	Chloride
TDS	Total dissolved solids
TSS	Total suspended solids
CBOD ₅	Five day carbonaceous biochemical oxygen demand
Total NH ₃ as N	Total ammonia as nitrogen
SO ₄	Sulfate
Hg	Mercury
Salty parameters	Bicarbonate, hardness, Cl, SO ₄ , and TDS
P	Phosphorus
SUI	Significant industrial user

A. Existing controlled discharge to expanded controlled discharge

Table 1. Maximum authorized load for an expansion from a controlled discharge to a controlled discharge

Parameter	No monitored data no limit	Monitored data no limit	Existing concentration limit
CBOD ₅	---	---	$C_L \times A \times D \times \text{unit conversion factors}$
TSS ⁽⁰⁾	---	---	$C_L \times A \times D \times \text{unit conversion factors}$
Total NH ₃ , as N ⁽¹⁾	Not pollutant of concern.	Not pollutant of concern.	Not pollutant of concern.
Phosphorus	Consult P reviewer	Consult P reviewer	Consult P reviewer
Cl, TDS, hardness, bicarbonate	Take one sample of all the salty parameters in the effluent if discharge or secondary pond if no discharge ⁽²⁾ $C_p \times A \times D \times \text{unit conversion factors}$	---	----
Cl, TDS, hardness, bicarbonates. Linkage applies	---	Only for Cl: $C_e \times A \times D \times \text{unit conversion factors}$	Only for Cl: $C_L \times A \times D \times \text{unit conversion factors}$
Cl, TDS, hardness, bicarbonates. Linkage does not applies	----	$C_e \times A \times D \times \text{unit conversion factors}^{(3)}$	$C_L \times A \times D \times \text{unit conversion factors}^{(3)}$
SO ₄	No salty requirements and no wild rice downstream. Not of concern	$C_e \times A \times D \times \text{unit conversion factors}^{(4)}$	$C_L \times A \times D \times \text{unit conversion factors}^{(4)}$
Mercury, TSS mass cap	Controlled by TSS	Controlled by TSS	$C_L \times A \times D \times \text{unit conversion factors}$

Parameter	No monitored data no limit	Monitored data no limit	Existing concentration limit
Mercury, not TSS mass cap	If not TSS mass cap, then go through antideg.	$C_e \times A \times D \times$ unit conversion factors ⁽⁵⁾	$C_L \times A \times D \times$ unit conversion factors
Metals & priority pollutants of concern	Not pollutants of concern.	---- ⁽⁶⁾⁽⁷⁾	---- ⁽⁶⁾

Note: Check if there is a waste load allocation for any parameter

⁽⁰⁾If TSS mass cap is accepted, there is no need for mercury antidegradation review.

⁽¹⁾Review the facility; there are some unusual controlled ponds.

⁽²⁾Talk to S. Weiss. A single sample represents 6 months of holding time.

⁽³⁾The no linkage option is still under study, talk to S. Weiss before putting mass cap.

⁽⁴⁾Controversial. Talk to S. Weiss and C. Neuschler before putting the limit in the permit.

⁽⁵⁾If greater than WLA for Hg check with M. Graziani.

⁽⁶⁾There are few ponds that measure priority pollutants.

⁽⁷⁾If a facility receives waste from Significant Industrial Users (SIU), and the facility freezes the loads for the monitored parameters in the SIU agreements that the facility issues to each industrial user, and the City reports these loads in its WWTP NPDES permit, then the facility would not need to do an antidegradation review of these parameters.

Note: Continue monitoring the salty parameters even with a limit.

Note: Federal regulation requires facilities with an AWWDF greater than 0.1 mgd to monitor total ammonia. Minnesota NPDES wastewater permit nitrogen monitoring implementation plan requires facilities with an AWWDF smaller than 0.1 mgd to monitor TKN and NO_3+NO_2 .

B. Existing controlled discharge to continuous discharge

Table 2. Maximum authorized load for an expansion from a controlled discharge to a continuous discharge

Parameter	No monitored data no limit	Monitored data no limit	Existing concentration limit
CBOD ₅	---	---	$C_L \times AWWDF_c \times$ unit conversion factors
TSS ⁽⁰⁾	---	---	$C_L \times AWWDF_c \times$ unit conversion factors
Total NH ₃ , as N, If dilution ratio, 7Q ₁₀ :ADWDF >20:1 ⁽¹⁾	---	---	$C_L \times AWWDF_c \times$ unit conversion factors
Total NH ₃ , as N, If dilution ratio, 7Q ₁₀ :ADWDF <20:1 ⁽¹⁾	$C_a \times AWWDF_c \times$ unit conversion factors If accept either a total N limit of 7 mg/L or TP of 0.3 mg/L -> Controlled by tmt.	$C_a \times AWWDF_c \times$ unit conversion factors If accept either a total N limit of 7 mg/L or TP of 0.3 mg/L -> Controlled by tmt.	$C_L \times AWWDF_c \times$ unit conversion factors
Phosphorus	Consult P reviewer	Consult P reviewer	Consult P reviewer
Cl, TDS, hardness, bicarbonate	Take a sample of all the salty parameters in the effluent if discharge or secondary pond if no discharge ⁽²⁾ $C_p \times AWWDF_c \times$ unit conversion factors	---	---
Cl, TDS, hardness, bicarbonates. Linkage applies	---	Only for Cl, $C_e \times AWWDF_c \times$ unit conversion factors	Only for Cl: $C_L \times AWWDF_c \times$ unit conversion factors
Cl, TDS, hardness, bicarbonates. Linkage does not applies	---	$C_e \times AWWDF_c \times$ unit conversion factors ⁽³⁾	$C_L \times A \times D \times$ unit conversion factors ⁽³⁾

Parameter	No monitored data no limit	Monitored data no limit	Existing concentration limit
SO ₄	No salty requirements and no wild rice downstream. No concern	$C_e \times AWWDF_c \times \text{unit conversion factors}^{(4)}$	$C_L \times AWWDF_c \times \text{unit conversion factors}^{(4)}$
Mercury, TSS mass cap	Controlled by TSS	Controlled by TSS	$C_L \times AWWDF_c \times \text{unit conversion factors}$
Mercury, no TSS mass cap	If not TSS mass cap, then go through antideg.	$C_e \times AWWDF_c \times \text{unit conversion factors}^{(5)}$	$C_L \times AWWDF_c \times \text{unit conversion factors}$
Metals & priority pollutants of concern	Not pollutants of concern	---- (6)(7)	---- (6)

Note: Check if there is a waste load allocation for any parameter

⁽⁰⁾If TSS mass cap is accepted, there is no need for mercury antidegradation review.

⁽¹⁾Look at the facility, there are some unusual controlled ponds.

⁽²⁾Talk to S. Weiss. A single sample represents 6 months of holding time.

⁽³⁾The no linkage option is still under study, talk to S. Weiss before putting mass cap.

⁽⁴⁾Controversial. Talk to S. Weiss and C. Neuschler before putting the limit in the permit.

⁽⁵⁾If greater than WLA for Hg check with M. Graziani.

⁽⁶⁾There are only a few ponds that measure priority pollutants.

⁽⁷⁾If a facility receives waste from Significant Industrial Users (SIU), and the facility freezes the loads for the monitored parameters in the SIU agreements that the facility issues to each industrial user, and the City reports these loads in its WWTP NPDES permit, then the facility would not need to do an antidegradation review of these parameters.

Note: Facilities that are stabilization ponds with a controlled (where discharge is for short duration of several days during permitted pre-defined periods in the spring and fall) are required to monitor effluent only if salty waste streams are present.

Note: Federal regulation requires facilities with an AWWDF greater than 0.1 mgd to monitor total ammonia. Minnesota NPDES wastewater permit nitrogen monitoring implementation plan requires facilities with an AWWDF smaller than 0.1 mgd to monitor TKN and NO₃+NO₂.

Note: Continue monitoring the salty parameters even with a limit.

C. Existing continuous discharge to expanded controlled discharge

Table 3. Maximum authorized load for a continuous discharge to an expanding controlled discharge

Parameter	No monitored data no limit	Monitored data no limit	Existing concentration limit
CBOD ₅	---	---	$C_L \times AWWDF_c \times \text{unit conversion factors}$
TSS ⁽⁰⁾	---	---	$C_L \times AWWDF_c \times \text{unit conversion factors}$
Total NH ₃ , as N	Not pollutant of concern Controlled by tmt.	Not pollutant of concern Controlled by tmt	Take off limit. No pollutant of concern
Phosphorus	Consult P reviewer	Consult P reviewer	Consult P reviewer
Cl, TDS, hardness, bicarbonate	Take 4 samples in a month $C_c \times AWWDF_c \times \text{unit conversion factors}^{(1)}$	---	---
Cl, TDS, hardness, bicarbonates. Linkage applies	---	Only for Cl, $C_e \times AWWDF_c \times \text{unit conversion factors}$	Only for Cl: $C_L \times AWWDF_c \times \text{unit conversion factors}$
Cl, TDS, hardness, bicarbonates. Linkage does not applies	---	$C_e \times AWWDF_c \times \text{unit conversion factors}^{(2)}$	$C_L \times AWWDF_c \times \text{unit conversion factors}^{(1)}$
SO ₄	No salty requirements and no wild rice downstream. Not of concern	$C_e \times AWWDF_c \times \text{unit conversion factors}^{(3)}$	$C_L \times AWWDF_c \times \text{unit conversion factors}^{(2)}$

Parameter	No monitored data no limit	Monitored data no limit	Existing concentration limit
Mercury, TSS mass cap	Controlled by TSS	Controlled by TSS	$C_L \times AWWDF_c \times$ unit conversion factors
Mercury, no TSS mass cap	If not TSS mass cap, then go through antideg.	$C_e \times AWWDF_c \times$ unit conversion factors ⁽⁴⁾	$C_L \times AWWDF_c \times$ unit conversion factors
Metals & priority pollutants of concern	Not pollutants of concern.	BEWARE! ⁽⁴⁾⁽⁵⁾	BEWARE! ⁽⁵⁾⁽⁶⁾ $C_L \times AWWDF_c \times$ unit conversion factors

Note: Check if there is a waste load allocation for any parameter

⁽⁰⁾If TSS mass cap is accepted, there is no need for mercury antidegradation review.

⁽¹⁾Talk to S. Weiss.

⁽²⁾The no linkage option is still under study, talk to S. Weiss before putting mass cap.

⁽³⁾Controversial. Talk to S. Weiss and C. Neuschler before putting the limit in the permit.

⁽⁴⁾If greater than WLA for Hg check with M. Graziani.

⁽⁵⁾Due to the treatment technology, situations like this will rarely occur. Review on a case by case basis.

⁽⁶⁾If a facility receives waste from Significant Industrial Users (SIU), and the facility freezes the loads for the monitored parameters in the SIU agreements that the facility issues to each industrial user, and the City reports these loads in its WWTP NPDES permit, then the facility would not need to do an antidegradation review of these parameters.

Note: Federal regulation requires facilities with an AWWDF greater than 0.1 mgd to monitor total ammonia. Minnesota NPDES wastewater permit nitrogen monitoring implementation plan requires facilities with an AWWDF smaller than 0.1 mgd to monitor TKN and NO_3+NO_2 .

Note: Continue monitoring the salty parameters even with a limit.

D. Existing continuous discharge to expanded continuous discharge

Table 4. Maximum authorized load from a continuous discharge to an expanding continuous discharge

Parameter	No monitored data no limit	Monitored data no limit	Existing concentration limit
CBOD ₅	---	---	$C_L \times AWWDF_c \times$ unit conversion factors
TSS ⁽⁰⁾	---	---	$C_L \times AWWDF_c \times$ unit conversion factors
Total NH ₃ , as N, If dilution ratio, 7Q ₁₀ :ADWDF >20:1	---	---	$C_L \times AWWDF_c \times$ unit conversion factors
Total NH ₃ as N If dilution ratio, 7Q ₁₀ :ADWDF <20:1	$C_a \times AWWDF_c \times$ unit conversion factors If accept either a total N limit of 7 mg/L or a TP of 0.3 mg/L -> Controlled by tmt.	$C_a \times AWWDF_c \times$ unit conversion factors If accept either a total N limit of 7 mg/L or a TP of 0.3 mg/L -> Controlled by tmt.	$C_L \times AWWDF_c \times$ unit conversion factors
Phosphorus	Consult P reviewer	Consult P reviewer	Consult P reviewer
Cl, TDS, hardness, bicarbonate	Take 4 samples in a month $C_c \times AWWDF_c \times$ unit conversion factors ⁽¹⁾	---	---
Cl, TDS, hardness, bicarbonate. Linkage	---	Only for Cl, $C_e \times AWWDF_c \times$ unit conversion factors	Only for Cl: $C_L \times AWWDF_c \times$ unit conversion factors
Cl, TDS, hardness, bicarbonate No linkage	---	$C_e \times AWWDF_c \times$ unit conversion factors ⁽²⁾	$C_L \times AWWDF_c \times$ unit conversion factors ⁽²⁾

Parameter	No monitored data no limit	Monitored data no limit	Existing concentration limit
SO ₄	No salty requirements and no wild rice downstream. Not of concern	$C_e \times AWWDF_c \times \text{unit conversion factors}^{(3)}$	$C_L \times AWWDF_c \times \text{unit conversion factors}^{(3)}$
Mercury, TSS mass cap	Controlled by TSS	Controlled by TSS	$C_L \times AWWDF_c \times \text{unit conversion factors}$
Mercury, no TSS mass cap	If not TSS mass cap, then go through antideg. ⁽⁴⁾	$C_e \times AWWDF_c \times \text{unit conversion factors}^{(4)}$	$C_L \times AWWDF_c \times \text{unit conversion factors}$
Metals & priority pollutants of concern	Not pollutants of concern.	$C_e \times AWWDF_c \times \text{unit conversion factors}^{(5)}$	$C_L \times AWWDF_c \times \text{unit conversion factors}$

Note: Check if there is a waste load allocation for any parameter

⁽⁰⁾If TSS mass cap is accepted, there is no need for mercury antidegradation review.

⁽¹⁾Talk to S. Weiss.

⁽²⁾The no linkage option is still under study, talk to S. Weiss before putting mass cap.

⁽³⁾Controversial. Talk to S. Weiss and C. Neuschler before putting the limit in the permit.

⁽⁴⁾If greater than WLA for Hg check with M. Graziani.

⁽⁵⁾If a facility receives waste from Significant Industrial Users (SIU), and the facility freezes the loads for the monitored parameters in the SIU agreements that the facility issues to each industrial user, and the City reports these loads in its WWTP NPDES permit, then the facility would not need to do an antidegradation review of these parameters.

Note: Federal regulation requires facilities with an AWWDF greater than 0.1 mgd to monitor total ammonia. Minnesota NPDES wastewater permit nitrogen monitoring implementation plan requires facilities with an AWWDF smaller than 0.1 mgd to monitor TKN and NO₃+NO₂.

Note: Continue monitoring the salty parameters even with a limit.