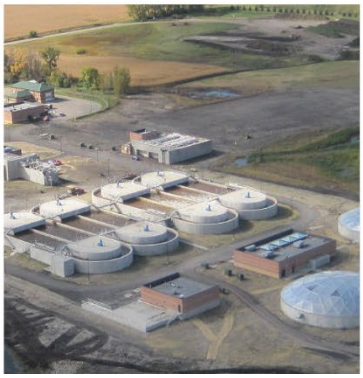
Pollutant Trading

March 2025

Water Quality Trading Guidance

A guide for the implementation of water quality trading alternatives to achieve watershed protection and regulatory flexibility.



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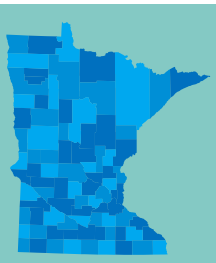

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November 2021 updates include additional trading permits listed in Table 1 and clarifying language in Appendix C.

July 2022 updates include revised language pertaining to stormwater trades, addition of a Stormwater Section 3.2, and the addition of Appendix E.

March 2025 updates include adding clarifications to Baseline section 4.2 and multiple pollutant crediting to Section 4.7 .

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Disclaimer

The Minnesota Pollution Control Agency is publishing this document to assist regulated parties and the affected community by describing how it intends to implement "water quality trading" in Minnesota at this time. This document is not enforceable, and will not be cited by the MPCA in support of any action. Water quality trading is governed by the Clean Water Act, U.S. Environmental Protection Agency implementing regulations, the Minnesota Water Pollution Control Act, and Minnesota Rules governing water quality permitting and establishing Minnesota water quality standards. This document is not a substitute for those provisions, regulations, or rules. As described in this document, the MPCA will implement water quality trading through permits. Provisions governing trading included in those permits will be subject to public comment and appellate review, and may differ significantly from the descriptions provided in this document upon issuance.

Contents

Acronyms and abbreviations

(Please refer to the Glossary for definitions.)

BMPs	Best Management Practices
BWSR	Board of Water and Soil Resources
$CBOD_5$	Carbonaceous Oxygen Demand
CFR	Code of Federal Regulations
CSW	Construction Stormwater
CWA	Clean Water Act
DMR	Discharge Monitoring Report
EPA	U.S. Environmental Protection Agency
ISW	Industrial Stormwater
MCL	Minimum Control Level
MPCA	Minnesota Pollution Control Agency
MS4	Municipal Separate Storm Sewer Systems
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
NRCS	Natural Resources Conservation Service
O&M	Operation & Maintenance
PE	Professional Engineer
P-NP	Point-Nonpoint
SWCD	Soil and Water Conservation District
SWPPP	Stormwater Pollution Prevention Plan/Program
TBEL	Technology Based Effluent Limit
TMDL	Total Maximum Daily Load
WLA	Wasteload Allocation
WQBEL	Water Quality Based Effluent Limit
WRAPS	Watershed Restoration and Protection Strategy
WWTP	Wastewater Treatment Plant

1. Introduction

This document describes how the Minnesota Pollution Control Agency (MPCA) intends to support and continue to implement "water quality trading" to improve water quality in Minnesota.

Water quality trading is a market-based approach for the protection and restoration of water resources that works in conjunction with existing voluntary, regulatory, and financial assistance programs. There is increased demand – both in Minnesota and nationwide – for the development of more flexible and cost-effective methods of reducing pollutant loads to water bodies, and a recognition of the need to encourage pollution reduction practices by nonpoint sources. Water quality trading can meet this demand and need.

Even though there has long been significant interest in water quality trading, application in Minnesota to date has been limited. This document captures how trading has been implemented in Minnesota since 1997 and is intended to describe how MPCA, regulated parties, and nonpoint source parties can participate in water quality trading in the future.

The terms "trade" and "offset" may be used interchangeably throughout this document.

1.1 Purpose of water quality trading

The MPCA supports water quality trading because it can promote the following purposes:

1. Improve water quality by reducing pollutant loads in a cost-effective manner that maximizes public investments by providing viable and cost-effective alternatives for meeting water quality standards.
2. Provide viable and cost-effective alternatives for new and expanding discharges resulting from growth in order to maintain levels of water quality that support all designated uses before and after the development of total maximum daily loads (TMDLs).
3. Provide prudent and feasible alternatives for new and expanding National Pollutant Discharge Elimination System (NPDES)-permitted activities in accordance with antidegradation regulations.
4. Establish economic incentives for pollutant reductions from point and nonpoint sources (NPS) within a watershed.
5. Achieve greater environmental benefits than those realized under existing regulatory programs.
6. Secure long-term improvements in water quality through the purchase or retirement of pollutant credits.
7. Encourage watershed approaches that achieve multiple environmental and economic benefits, such as water quality improvement, wetland and wildlife habitat restoration, carbon sequestration and greenhouse gas emission reduction.

1.2 Authority for water quality trading in Minnesota

The Clean Water Act (CWA) provides authority for U.S. Environmental Protection Agency (EPA) and delegated states, and tribes to develop water quality trading programs, as described in EPA's *Water Quality Trading Policy* (EPA 2003) and *Water Quality Trading Policy to Promote Market-Based Mechanisms for Improving Water Quality (2019)*. Trading is authorized in Minn. Stat. § 115.03, subd. 10 and Minn. R. ch. 7050.0250 to 7050.0280 for the purpose of achieving compliance with water quality standards.

Minn. Stat. (a) § 115.03, subd. 10:
(a) The Pollution Control Agency may issue or amend permits to authorize pollutant discharges to a receiving water and may authorize reductions in loading from other sources to the same receiving water, if together the changes achieve a net decrease in the pollutant loading to the receiving water. A point source participating in a water quality offset authorized by this subdivision must have pollutant load reduction requirements for the traded pollutants based on water quality based effluent limits or wasteload allocations in place prior to the offset. The pollutant load reduction requirements in place prior to the offset must meet the requirements of this chapter and Minnesota Rules, parts 7050.0150, subpart 8; 7053.0205; and 7053.0215, including, but not limited to, requirements related to pollutant form, spatial loading, and temporal loading. The agency must require significant offset ratios for offsets between permitted sources and nonpermitted sources and must demonstrate how nonpermitted source offset credits make progress toward ensuring attainment of water quality standards. The agreement of a source to participate in an offset is voluntary. The agency shall track the pollutant offsets or "trades" implemented under this subdivision.

(b) The legislature intends this subdivision to confirm and clarify the authority of the Pollution Control Agency to issue the authorized permits under prior law. The subdivision must not be construed as a legislative interpretation within the meaning of Section 645.16, clause (8), or otherwise as the legislature's intent that the agency did not have authority to issue such a permit under prior law.

2. Questions and answers about water quality trading

Q1 What is water quality trading?

A1 Water quality trading reduces problem pollutants (e.g., total phosphorus or total suspended solids) in rivers and lakes by allowing a point source discharger to enter into agreements under which the point source "offsets" its pollution load by obtaining reductions in a pollutant load discharged by another point source operation or a nonpoint source or sources in the same watershed. The MPCA must establish specific conditions governing trading in the point source discharger's NPDES permit or in a general permit that covers the point source discharger.

Generally, water quality trading will occur to:

- Offset existing discharges to a CWA §303(d)-impaired water body prior to or following the development of an EPA-approved TMDL or similar watershed analysis needed to support trades—Section 4.5 provides more criteria on pre-TMDL trades with existing discharges. Point sources must ensure the discharge and trade are consistent with the TMDL and water quality standards.
- Offset new or expanding point source discharges to a §303(d)-impaired water body with or without an EPA-approved TMDL—Point sources must ensure their discharges and trades do not cause or contribute to violations of water quality standards and are consistent with the requirements of 40 CFR 122.4(i).

Q2 How does the MPCA ensure that trades result in water quality protection?

A2 The MPCA requires that trades result in pollutant reductions that are:

- **Equivalent** to the point source discharge in their water quality impact. Equivalence refers to the substitution of NPS reductions of point source pollutant loads, accounting for factors such as differences in time, place, and pollutant form and the sensitivity of the receiving water.

- **Additional** to NPS reductions that would be likely to occur in the absence of a trade. Additionality requires that NPS load reductions that are credited to a point source in a point source-NPS trade would not have occurred otherwise.
- **Accountable,** so that the NPS measures will be implemented and maintained to achieve their intended result on water quality. Accountability refers to the need to ensure that a P-NPS trade satisfies the above criteria of equivalence and additionality, and that terms of the trade agreements are being lived up to.

Trading must be consistent with Minn. Stat. § 115.03, subd. 10 (including the "net decrease" requirement), specified rules in chapter 7053, and must ensure that progress is made to achieving or maintaining water quality standards in Minn. R. ch. 7050. In addition, a trade must comply with applicable federal, state and local laws, ordinances and regulations.

Trades that would allow discharges in excess of applicable Technology Based Effluent Limits (TBELs) or Minimum Control Levels (MCLs) are prohibited.

Q3 Are there additional circumstances when trading would not be allowed?

A3 In certain circumstances the use of credits would be contrary to law or sound public policy or undermine existing regulatory requirements. The MPCA will not approve a permit including trading where:

- Offsets would cause or contribute to violations of water quality standards. This includes situations involving offsets that would result in exceedance of water quality standards in localized reaches, i.e., "hot spots", as a consequence of the difference in the physical location between the respective sources.
- Offsets are being proposed as a substitute for required secondary treatment, other state discharge limits established by rule, or technology-based requirements.
- Offsets would lead to impairment of a designated use.
- Offsets would result in the degradation of water quality below the established baseline.

Generally, implementation of a trade must result in water quality conditions that are at least as protective of standards and classified uses as would be the case through the implementation of current requirements. Trades and offsets cannot result in "backsliding" relative to the attainment and maintenance of water quality objectives. Of particular concern is the need to avoid situations where a discharge may continue to contribute to a water quality impairment because the water quality benefits derived from credit generating pollutant load reductions are not realized until some distance downstream from the original pollutant discharge source.

The MPCA generally will not approve the trade of credits for persistent bioaccumulative toxic pollutants. However, the MPCA does not establish an outright prohibition upon the trade of all toxics. Trades involving certain toxics, such as chloride, may be of significant benefit to the aquatic environment.

Q4 Who can participate in water quality trading?

A4 Trading may occur between two point source dischargers (point-point trading) or a point source discharger and a NPS discharger (point-nonpoint trading). Before a wastewater treatment facility can participate in trading, MPCA will propose a draft permit that will establish conditions (including trade ratios) under which MPCA proposes to approve trading through its permits. The proposed draft permit will include a trading plan that MPCA believes ensures consistency with applicable Minnesota laws and water quality standards and TMDL wasteload allocations (WLA),

CWA provisions and EPA regulations. Interested person will have an opportunity to comment on the proposed permit. In proposing the trading permit, MPCA will publish a technical support document identifying the models or studies that support the proposed ratio.

For regulated stormwater trading, permittees will work in cooperation with MPCA to develop a trading plan that will become an attachment to their Stormwater Pollution Prevention Plan (SWPPP).

Q5 Are there pollutants the MPCA recommends for trading?

A5 The MPCA anticipates proposals for trades to reduce impacts from phosphorus, nitrogenous compounds, total suspended solids, salinity, or oxygen depleting pollutants. The MPCA may authorize such pollutants to be traded on a specific pollutant basis or a cross-pollutant basis. For example, the MPCA may authorize reduction of upstream nutrient levels in order to affect downstream biochemical oxygen demand or to improve depressed in-stream dissolved oxygen levels. Prior to proposing a permit allowing such cross-pollutant trades, MPCA will require demonstration of the correlation between pollutant levels and the water quality effects as well as the correlation between the discharged pollutant and the benefits of best management practices (BMP) implementation. The unit of credit should be tied to the unit of pollutant in a permit and allocations in a TMDL. The MPCA supports trades involving other pollutants, such as five-day carbonaceous oxygen demand ($CBOD_5$), on a case-by-case basis where sufficient information exists to establish and correlate water quality improvements from implementing BMPs or technological measures.

Q6 Why would dischargers want to trade?

A6 Trading can save dischargers money because buying needed credits can cost far less than the cost of building new infrastructure or rehabbing existing infrastructure. Trading can also provide opportunities for dischargers to work in collaboration with other businesses or municipalities on projects that provide multiple benefits for the community - watershed improvement, enhanced recreational opportunities and aquatic habitat protection - than would be realized if dischargers were to spend funds exclusively on building or rehabbing facilities.

Q7 What are the benefits of water quality trading?

A7 Trading provides an incentive to reduce pollutants beyond current limits, helps to achieve water quality standards more quickly, and fosters technological innovation while maintaining an emphasis on water quality improvement. The potential exists, in some watersheds, to realize cost savings through water quality trading. For NPS in particular, trading may result in financial benefits.

Depending on the credit-generation methods, credit trading can provide additional benefits for the seller such as restored wildlife habitat, wetland creation, stream bank stabilization, and carbon sequestration.

Q8 What is a 'net environmental benefit' in water quality trading?

A8 Trading must result in permitted or actual pollutant load reductions beyond legally required levels. Credit buyers are required to secure additional reductions beyond those that would be achieved through conventional approaches. A NPS credit generating projects may also create ancillary benefits such as stream/riparian restoration, wildlife habitat and carbon sequestration.

Q9 What are the keys to successful water quality trading?

A9 Compliance monitoring, performance tracking, and enforceability are the keys to successful water quality trading. Water quality trading plans must ensure that credit generating practices are routinely monitored or inspected to ensure pollutant reductions continue to occur as expected. Transparency, which includes clearly articulated permit conditions, trading plan details and public participation, is a critical component for successful water quality trading.

Q10 Is water quality trading an option for all dischargers?

A10 Trading may not be available to all dischargers. For example, trading cannot be used if the point source's discharge would create localized areas of impact (pollution hotspots). Trading may not always provide the greatest opportunity for water quality improvement in some watersheds, so it should be considered together with other approaches. Trading may not always be the cheapest alternative for a source, but its flexibility and scalability might still be appealing.

In addition, not all pollutant parameters are tradeable. Bacteria, such as fecal coliform and Escherichia coli, have the potential to threaten public health and will not be considered for trading. The MPCA does not support trading of persistent bioaccumulative toxic pollutants at this time, however, pilot projects may be considered on a case-by-case basis.

Q11 How are Permittees granted the ability to trade?

A11 Trades for wastewater dischargers are approved through permits. The discharger's NPDES permit must include a trading plan providing detail (or incorporating the detail from an MPCA-approved watershed trading plan) on how trades will be conducted.

Once a trading plan has been developed and approved by the MPCA, trades for stormwater permittees are incorporated into their SWPPP and may affect the compliance schedule.

The *Water Quality Toolkit for Permit Writers* (EPA 2007) and *Water Quality Trading Assessment Handbook* (EPA 2004) provide additional information and how trading is incorporated into permits.

Q12 How is the geographic scope of a trade determined?

A12 The geographic scope of a trade will be determined on a site-by-site basis depending on the nature of the pollutant and site-specific constraints. Water quality trading will generally occur based on pollutant impacts within a single stream segment, a defined watershed, or a defined area for which a TMDL is being developed or has been approved or other MPCA approved area. The proposed practice must benefit the water body of concern. Establishing trading areas that coincide with watershed or TMDL boundaries helps ensure that water quality standards are maintained or achieved throughout the trading area and contiguous waters.

It will be generally assumed that the geographic areas established under the following regulatory instruments will be considered adequate for trading purposes.

1. A plan developed to achieve water quality standards as part of a TMDL.
2. A watershed effluent limit memorandum and corresponding permit.
3. An approved watershed management plan.
4. A watershed-based stormwater management program or a stormwater pollution prevention initiative approved by the MPCA.

Q13 How does it work and who can participate?

A13 Businesses, wastewater treatment facilities, urban stormwater systems, agricultural operations, and other sources of water pollutants face a wide range of pollution control costs. Sources facing high pollution-control costs can save money by cooperating with sources with much lower pollutant-reduction costs to reduce their discharges so there is a net decrease in the pollutant loading to shared downstream waters. Trading plans may be established for the generation of "credits" that can be bought and sold in trading markets.

The MPCA is interested in exploring the trading potential for various pollutants, particularly nutrients, sediment, and temperature, and cross-pollutant trading opportunities. (For example, watershed-based phosphorus reductions to address in-stream dissolved oxygen deficiency by reducing the algal loads in the watershed.) Other areas of interest include reducing excess flows, which can contribute to stream bank erosion, and options for other tradable pollutants. Any sectors whose activities influence Minnesota's surface water quality and quantity may participate in trading. These include individuals, companies, public advocacy groups and governmental entities whose interests involve point source discharges, urban, construction, industrial and agricultural stormwater sources, agricultural drainage management, and others.

Q14 What is point-point trading?

A14 A point source may voluntarily apply to have a permit effluent limit reduced below its water quality-based effluent limit by a particular amount for a particular period of time. This voluntary reduction creates a credit that may be sold to another point source, whose permitted effluent limit would be increased by a proportional amount[1]. The MPCA retains full enforcement authority under the NPDES program in the event that the point source's effluent limit is exceeded.

The MPCA supports intra-plant trading (trading between different outfalls within a facility or plant) that involves generating and using credits between multiple outfalls that discharge to the same receiving water. The MPCA will treat intra-plant trading like a point-point trade.

Q15 What is point-nonpoint trading?

A15 A NPS may voluntarily reduce its discharge of pollutants and credits can be generated when approved BMPs are installed and the resulting pollutant reductions are measured or calculated. Credit generating projects must be documented according to BMP requirements, and verified by a third party. Credits are then adjusted for any relevant impact equivalence factors, baseline requirements and trading ratios. The BMP approval is discussed further in Section 5. The process for generating and tracking credits and the role of third parties are discussed in Section 6. The point source retains full responsibility for third-party verification for the quantity and delivery of the credits it purchases from a NPS and uses to meet its effluent limits.

Q16 Can trading occur in impaired waters?

A16 Yes, it can. Trading is encouraged in impaired waters as it can provide a more cost-effective means of reducing pollutant loadings or accelerate the reduction of pollutant loadings, with resulting progress toward the goal of bringing the water body into attainment with the water quality standard for the parameter being traded.

1 The amount by which the buyer's effluent limit increases is not equal to the amount by which the seller's effluent limit is decreased because trades must account for credit equivalence, uncertainty and retirement to ensure a net water quality improvement.

Water quality trading does not affect the MPCA's obligation to develop a TMDL for impaired waters. Section 303(d)(1)(C) of the CWA requires the development of TMDLs for waters for which technology-based effluent limitations and other required controls are not stringent enough to achieve applicable water quality standards (See also 40 CFR 130.7(b)(1)).

Q17 Can trading occur in impaired waters prior to EPA approval of a TMDL?

A17 Yes. Trading may be conducted in impaired waters prior to the completion or approval of a TMDL when a trade is projected to help achieve progress toward attaining water quality standards. This is called pre-TMDL trading. The trades can consist of either:

- Individual trades that achieve a measured or calculated net reduction in loading of the pollutant in question; or
- Watershed-scale trading programs that reduce loadings to a level under a specified cap that is set based on baseline information on pollutant sources and loadings.

The MPCA anticipates demand for pre-TMDL trades or offsets will be greatest where parties are seeking permits for new or expanding discharges upstream of waters that are impaired.

Q18 What happens to pre-TMDL trades after EPA approval of a TMDL?

A18 The MPCA anticipates that water quality trading may continue to occur, but any pre-TMDL water quality trades or offset may need to be adjusted when the permit on which they are based is reissued, to ensure that the trades are consistent with the approved TMDL.

It is the MPCA's intention that approved TMDLs will include WLAs for all NPDES permitted sources in the TMDL project watershed, authorized to discharge the pollutant of concern. As a result, following TMDL approval, NPDES permit holders involved in pre-TMDL trades or offsets may not be required to maintain water quality credits that were developed to offset new or expanded discharges upstream of impaired water bodies.

Trades in impaired waters for which a TMDL has been approved must be consistent with the assumptions and requirements upon which the TMDL was established. Where a TMDL has been approved, the applicable point source WLA or NPS load allocation should inform the baselines for generating credits.

Following TMDL approval, any trading agreements made before the TMDL that are inconsistent with TMDL requirements, including generated credits, will have to be modified. The MPCA encourages parties involved in pre-TMDL trading to contact MPCA early in the TMDL development process to ensure that future revisions to trading agreements do not create disincentives for early action.

3. Steps for developing water quality trading plans in Minnesota

3.1 Wastewater

Before it approves a permit incorporating trades or offsets, the MPCA needs sufficient information to ensure compliance with state and federal laws.

Before publishing a proposed WWTP permit incorporating trading, MPCA will work with stakeholders and interested persons to develop a "trading plan." A trading plan details the information needed to develop a viable trade. The proposed trading plan may need to be modified based on feedback received during the NPDES permit public comment period. The MPCA may also use individual plans developed independently between willing buyers and sellers to develop a proposed permit if those plans are supported by robust data.

The MPCA believes that the following information should be developed for each wastewater trading plan, and the following steps should be taken to ensure trades are consistent with state and federal requirements (Figure 1):

Figure 1. Steps to developing pollutant trading plan for wastewater.

Step 1. In order to trade, the MPCA and the parties need to have an understanding of the current condition of the water body and how it is being affected by point and NPS pollution in the applicable watershed. This information would likely come from a TMDL or similar watershed scale analysis.

Step 2. Where sufficient information exists, trading participants must identify which pollutants are viable for trading, and the demand for trading due to the need for point source investment to meet water quality standards or to offset increased pollutant discharges from proposed new or expanded discharges. All proposed trades must reduce pollutant loads beyond current requirements, create net environmental benefits and contribute to meeting water quality standards.

Step 3. Where multiple credit buyers exist in a watershed, the MPCA will work with interested parties to develop a trading plan. A TMDLs or Watershed Restoration and Protection Strategy (WRAPS), if they exist, may provide guidance for trading in a watershed or may contain requirements that should be incorporated into a trading plan. See Section 4 for the elements a trading plan must identify in order to be approved by the MPCA.

Step 4. Public comment and input are critical precursors for successful trading. To ensure legality, the MPCA will promulgate trading proposals as part of proposed permits, which also ensures that the public has an opportunity to comment on the proposal. After MPCA approves the final trading plan for the specific watershed or discharge, the trading plan will be filed as an attachment to the permit.

Step 5. Issuance of the final permit. An individual or general NPDES permit is the mechanism that translates general trading authorization into a set of enforceable conditions based on the MPCA-approved watershed or individual permit trading plan. For existing permits, the MPCA may modify the permit to address the trading proposal or address the trading proposal upon reissuance.

Once incorporated into the discharge permit, trading can then commence between the discharger and a NPS or another point source, under the conditions of the permit and consistent with the trading plan for the specific watershed. These conditions include the timely filing of all required trade execution and confirmation documents.

3.2 Stormwater

Completed Total Maximum Daily Loads (TMDLs) result in wasteload allocations (WLAs) for permitted MS4s. If permittees have a TMDL WLA that they would have difficulty attaining by implementing BMPs within their MS4, water quality trading could assist permittees in meeting a WLA through the purchase of credits. Crediting in-lake or shoreline work within an MS4s own jurisdiction, could also generate trading credits and assist in meeting a WLA. Credited trades require an Agency approved trading plan.

Trading will supplement, not supplant, any other permit requirements.

Before it approves a trade or offset, the MPCA needs sufficient information to ensure compliance with state and federal laws. In order to propose a trade or offset the MS4 permittee would provide documentation to the Agency demonstrating progress (implemented BMPs) toward achieving applicable WLAs consistent with their current MS4 compliance schedule.

Once an MS4 permittee expresses interest in developing a trading project, MPCA will work with stakeholders and interested persons to develop a "trading plan." A trading plan details the information needed to develop a viable trade. The MPCA may also use individual plans developed independently between willing buyers and sellers if those plans are supported by robust data.

The MPCA believes that the following information should be developed for each trading plan, and the following steps should be taken to ensure trades are consistent with state and federal requirements (Figure 2):

Figure 2. Steps to developing pollutant trading plan for stormwater.

Step 1. In order to trade, the MPCA and the parties need to have an understanding of the current condition of the water body and how it is being affected by point and NPS pollution in the applicable watershed. This information would likely come from a TMDL or similar watershed scale analysis.

Step 2. Where sufficient information exists, trading participants must identify which pollutants are viable for trading, and the demand for trading due to the need for point source investment to meet water quality standards, applicable WLAs, or to offset increased pollutant discharges. All proposed trades must reduce pollutant loads beyond current requirements, create net environmental benefits and contribute to meeting water quality standards.

Step 3. Once a permittee expresses interest, the MPCA will work with interested parties to develop a trading plan. A TMDLs or Watershed Restoration and Protection Strategy (WRAPS), if they exist, may provide guidance for trading in a watershed or may contain requirements that should be incorporated into a trading plan. See Section 4 for the elements a trading plan must identify in order to be approved

by the MPCA. Submittal of a trading plan for agency review and approval will be considered a modification of the SWPPP under part 24 of the MS4 General Permit, and may require a public notice. Demonstrated progress towards meeting compliance schedules is required for participation in water quality trading.

Step 4. After MPCA approves the final trading plan for the specific watershed or discharge, the trading plan will be filed as an attachment to the SWPPP.

For discharges covered by general Municipal Separate Storm Sewer Systems (MS4), Industrial Stormwater (ISW) or Construction Stormwater (CSW) NPDES permits, water quality trading plans must be incorporated in MPCA-approved Stormwater Pollution Prevention Plans or Programs (SWPPPs).

Once incorporated into the modified SWPPP, trading can then commence between the discharger and a NPS or another point source, consistent with the trading plan for the specific watershed. These conditions include the timely filing of all required trade execution and confirmation documents.

See *Appendix B: First steps to the point-nonpoint pollutant trading documentation process* for additional details that should be considered before beginning a trading project.

4. Trading plan components

This section describes the components of a water quality trading plan.

The major components of water quality trading are *trading parties* (buyers and sellers) and *credits* (the value of the pollutant reduction being bought and sold). Additionally, *ratios* are used to address uncertainty and ensure net water quality benefit. All trading activity must be documented and the documents provided to MPCA (and/or its designated trade administrator or agency partner). Both point and NPS may create marketable credits, which are proportional to pollutant load reductions beyond a specified baseline that, at a minimum, reflects what the source is required to achieve under existing law.

4.1 Project eligibility for credits

While both point sources and NPS may create pollutant reductions, the credit value generated by those pollutant reductions is variable. The effect of the pollutant reduction measured or estimated at the location of the water body of concern determines the credit value. Credits at the water body of concern may need to account for factors such as edge of field delivery, watershed attenuation, critical period or stream flow characteristics, BMP performance uncertainty and/or trading program policy choices. Pollutant reductions may also need to be adjusted to meet baseline requirements.

Credits can be generated in a number of ways by a variety of entities. Credit generation can occur at the source as pollution prevention, at the discharge point with treatment technologies and processes, through NPS control using treatment technologies or structural and nonstructural BMPs, or through hydrologic management techniques. Credits can only be generated by actions that exceed legal and regulatory requirements. For example, the pollutant reductions achieved by fixing a failing septic system do not generate any tradable credits because failing septic systems are illegal.

The following list is intended to provide examples that have potential to generate credits that would be approved in a permit-based trading plan. It is not intended as an all-inclusive list:

- Installation or modification of water pollution control equipment.
- Operational changes and/or the modification of a process or process equipment.
- Implementation of pollution prevention or minimization programs.
- Implementation of NPS BMPs.
- Participation in the Minnesota Ag Water Quality Certification Program.

- Implementation of stormwater controls or management practices beyond regulatory requirements.
- Restoration or creation and maintenance of wetlands.
- Habitat restoration in receiving waters.
- Modification of water diversion, delivery, and storage activities that result in pollutant load reductions.
- Work to control erosion by bank stabilization.
- Projects to divert agricultural drainage from surface waters.
- Other pollution controls or management practices approved by the MPCA.

Several factors must be taken into account in determining the credit value of a pollutant reduction at a particular location:

- Credit generating activities must benefit the target water body.
- Credits used for antidegradation purposes must be generated adjacent to or upstream of the location of the buyer's discharge.
- The geographic extent of the trading watershed must be established in order to determine the eligible trading area.
- Credits are denominated in relation to their value at the target water body. Due to watershed assimilation, pollutant load reductions obtained further from the target water body may result in lesser credit valuation than pollutant load reductions that occur closer to the target water body.
- Credit valuations are necessarily dependent on pollutant types, watershed dynamics, hydrologic conditions and water quality standard specific considerations.
- Credit valuation will need to be determined on a trade or offset specific basis and must be calculated prior to the application of a trade ratio for each transaction.
- *Approved BMPs* – For a BMP type to be eligible, it must be approved by MPCA as part of a trading plan. The process for incorporating BMPs into trading plans is described in Section 5.
- *Projects need to be consistent with other laws and in good standing* – To generate a credit, in addition to meeting baseline, a project should comply with all applicable federal, state and local regulations necessary to implement the project.
- *Project BMPs pollutant reductions must be quantified in a verifiable way* – While pollutant reductions from WWTPs must be directly measured, credits produced by stormwater and NPS practices can be quantified using BMP efficiency rates as identified in a trading plan, MPCA-approved modeling, and/or direct measurement. This quantification will require clear documentation of pre-project conditions and a consistent methodology for measuring or estimating post-project conditions.
- *Projects must account for risk and uncertainty* – Pollutant reductions may be directly measured, or based on BMP efficiency rates or MPCA-approved modeling. When estimating site-level reductions with efficiency rates or modeling it may be necessary to account for uncertainty in model inputs or assumptions. It may also be important to adjust the reduction amount to account for risk of delayed implementation results, decreased effectiveness, or nonperformance.
- *Projects need to demonstrate consistency with baseline requirements* – See Section 4.2.
- *Publicly funded credit generating practices (BMPs and wastewater treatment facilities) can generate water quality trading credits subject to the funding agency's restrictions.*

- *Credits must be from BMPs installed after a baseline year* – Trading plans need to define a baseline year after which credits can be created. The baseline year should be as current as possible and tied to the watershed analysis (e.g., a watershed modeling time series, TMDL or antidegradation analysis) used to support trading. Baseline years specified in trading plans can be updated from time to time. Trading plans may include options for limited *look-back* periods to bring in otherwise ineligible early action projects[2], typically no more than 2 years before a TMDL is approved by EPA. Any *look-back* credits must have clear and complete pre-project site condition information.

4.2 Baselines

Trading baselines are thresholds that must be met before buying or selling credits. Credits can be established by sources delivering pollutant reductions in excess of specified baseline levels. Credits can be used by NPDES regulated sources that have attained a specified MCL.

For point source sellers the baseline is represented as the most stringent numeric effluent limitation (Water Quality Based Effluent Limit (WQBEL) or WLA) for the pollutant in question in their NPDES permit. Therefore, a point source can only sell credits if it reduces its discharge below its effluent limit or associated WLA. In practice, the MPCA will modify a wastewater seller's NPDES permit to reflect a downwards adjustment of the effluent limit for the relevant pollutant for the duration of the trade. A stormwater seller's SWPPP will have to demonstrate pollutant reductions in excess of those required to achieve TMDL specified WLAs.

Nonpoint source credit generating sites must be in compliance with all applicable federal, state and local regulations including but not limited to setbacks, buffer, soil loss, and shoreland regulations. See Appendix C for additional eligibility criteria information for agricultural operations. Once these eligibility criteria have been satisfied, the credit generation baseline is the site specific pollutant loading for existing land uses prior to BMP implementation. For many practices, nonpoint baselines are established by incorporating field collected data into water quality models and/or calculations to estimate pre-BMP pollutant loading rates.

For point source buyers, the baseline is represented by the MCL, which defines the minimum acceptable level of performance required to participate in water quality trading. For wastewater buyers, the MCL is demonstrated compliance with TBELs, minimum secondary treatment requirements specified in Minn. R. 7053.0215, or reasonable and appropriate performance standards based on Best Professional Judgment. For stormwater buyers, MCL is demonstrated progress toward achieving applicable WLAs consistent with the permittees current MS4 compliance schedule or demonstrated compliance with applicable industrial or construction stormwater SWPPPs.

In implementing a trade, it is necessary to establish an appropriate pollutant loading baseline. Baselines should be established using the most accurate, representative and reliable information, including flow data, discharge and loading data.

4.2.1. Credit generation baselines (seller's baselines)

The NPDES permitted sources subject to relevant numeric WLAs, water quality-based effluent limitations or operational requirements (including stormwater BMPs required for compliance with TMDL WLAs) must demonstrate compliance with permit requirements or compliance schedule in order to be eligible to generate water quality trading credits. Monitoring data and actual measurements of load

[2] *Such as for credits generated by producers who have become certified through the Minnesota Agricultural Water Quality Certification Program.*

reductions achieved in practice from changes in land use, pollution control facilities and implementation of BMPs should be used where required by the permit.

The NPDES permitted sources not subject to relevant numeric WLAs, water quality-based effluent limitations or operational requirements (including stormwater BMPs required for compliance with TMDL WLAs) must demonstrate compliance with MCL requirements in order to be eligible to generate water quality trading credits. If unavailable at the time when a trade is proposed, MCL requirements will be established on a site-specific basis. Monitoring data and actual measurements of load reductions achieved in practice from changes in land use, pollution control facilities and implementation of BMPs may be used to determine MCL requirements.

The credit generation baselines for all sources not subject to NPDES permit regulations should be determined by using information and data representative of the three-year period preceding the date that a change is made to generate the discharge or load reduction associated with the trade. A different time period that is more representative of historical operations and provides more accurate and reliable actual discharge or existing loading data may be employed, if first approved by the MPCA.

Baselines for agricultural, industrial, urban and residential stormwater run-off should be calculated by using the meteorological information and precipitation data for a representative period of time. This information and data should be obtained from the nearest national weather service station unless a different location or source is approved by the MPCA.

The point source baseline for generating credits shall be the most protective of the following:

- Effluent limitation established by an applicable requirement including a state discharge restriction or antidegradation-based effluent limit.
- Water quality-based effluent limitation established by an applicable requirement.
- WLA specified under a total maximum daily load.
- WLA specified in a watershed effluent limit analysis approved by the MPCA.
- WLA determined by the MPCA to be consistent with water quality standards and specified in a Watershed Restoration and Protection Strategy or similar such document.

The baseline for unpermitted NPSs seeking to generate credits should be the most stringent of the following:

1. Unpermitted sources that are not subject to an applicable requirement in a TMDL, WRAPS, or other watershed protection and/or restoration report, including an effluent limit analysis, approved by the MPCA:
   - For agricultural operations, the pollutant specific loading from existing land uses established by a registered engineer or other qualified person based on reasonable and appropriate practices in that area.
   - For non-agricultural operations, the pollutant-specific loading associated with existing land uses and reasonable and appropriate BMPs, if any.
2. Unpermitted sources subject to an applicable requirement in a TMDL, WRAPS, or other watershed protection and/or restoration report, including an effluent limit analysis, approved by the MPCA:
   - The most protective of the following site-specific pollutant specific cap and loading allocation:
     - In a TMDL.
     - The BMPs determined by the MPCA to be consistent with water quality standards and specified in a WRAPS or similar such document.
     - In a watershed effluent limit analysis approved by the MPCA.

4.2.2 Credit use baselines (buyer's baselines)

The NPDES permitted sources must demonstrate compliance with MCL requirements in order to be eligible to use water quality trading credits to meet applicable WQBELs or WLAs. If unavailable at the time when a trade is proposed, the MPCA will establish MCL requirements in NPDES permits on a site-specific basis. The MPCA will consider generally accepted practices and achievable effluent limit levels for similar sources to inform MCL development.

4.3 Quantifying pollutant reductions for water quality credits

Pollutant reductions can be quantified in several ways to generate water quality credits. Quantification includes measurement of the pollutant reduced at the end of a pipe (point source), or a measurement or an estimate of the pollutant reduced at the edge of a field or at the point of delivery to a waterway (NPS), and includes adjustments for pollutant delivery and attenuation through the watershed. It is important to note that credits are quantified based on the benefits derived from the pollutant load reductions at the water body of concern. Credit quantification must account for fate and transport mechanisms for the specific pollutant over the distance between the location of the credit generating discharge or BMP and the water body of concern. The temporal variability of the pollutant discharged by the pollutant selected reduction method and the temporal characteristics of the water quality standard must also be taken into account. To become part of a permitted trading plan the credit quantification approach must be scientifically defensible, accurate, repeatable, and transparent. The MPCA will review quantification methods for new types of BMPs as permit amendments (Section 5).

For all projects, quantification should be based on pre-project and post-project conditions. The BMP guidelines specified in a trading plan should articulate the information and documentation needed to accurately quantify pollutant reductions in a way that can be reviewed during the verification process.

4.4 Units of trade

Trading projects or proposals must specify a clearly defined unit of trade. A mass-based credit (e.g., pounds, kilograms, etc.) will generally be the most appropriate, especially where mass-based loading targets or caps have been established by an individual or general permit, TMDL or watershed-based water quality management plan. However, the units of trade may be tailored to reflect the relationship between the pollutant and the impairment.

4.5 Duration of credits

In order to provide flexibility and to promote the initiation and continuation of sustainable water quality trading projects, MPCA-approved water quality credits shall remain viable as long as the trade or offset agreement remains in effect and the credit generating pollution controls or management practices are functioning as expected, although trade agreements and credit value may need to be adjusted to reflect the ratios and baseline requirements that apply at a future point in time. BMPs provide benefits for varying amounts of time and may need to be replaced as part of a long-term credit management strategy. It may also be the case that a practice will take time to become established and produce fewer credits prior to establishment. The duration of credit concept provides both credit users and credit generators with certainty that investments in water quality trades will yield predictable outcomes.

4.6 Trade ratios

The trading plan approved in the permit must identify trade ratios. Trade ratios are numeric values used to adjust the credit obligation of a buyer based on various forms of uncertainty and to retire a portion of the trade pollutant load for water quality benefit. Ratios are applied to account for uncertainty—in terms of both measurement error and project performance— and to ensure that trades result in a net

environmental benefit. Table 1 contains default trade ratios for Minnesota. Relatively low ratios for trades between wastewater point sources may be used to reflect the relatively low uncertainty that exists for these types of monitored discharges. Higher ratios for credits generated by NPS pollutant load reduction projects may be used to reflect the higher uncertainty associated with these types of unmonitored discharges.

Reduced trade ratios may be considered for projects that demonstrate greater certainty. Conversely, increased trade ratios will be considered for projects that present greater uncertainty.

Table 1. Trade ratios in Minnesota

Default Trade Ratios		Credits Users (Buyers)
		NPDES Permittees
Credit Generators (Sellers)	Wastewater NPDES	1.1:1.0
	Stormwater NPDES	2.1:1.0
	Nonpoint Source	2.6:1.0

Modifications to these ratios can be considered on a case-by-case basis, taking into account the following factors:

- Degree of technical and logistical uncertainty associated with the credit generating method.
- Whether the credits are estimated or measured. Generally, measured values will be more reliable than estimated values; uncertainty is greater when the estimated method is used.

The MPCA would consider trading plans that establish a watershed-specific “reserve” pool of credits to compensate for unanticipated shortfalls in the quantities of credits actually generated. Having such a pool in place may be a suitable mechanism for managing uncertainty, could justify reduced uncertainty and therefore, provide justification for the use of reduced trade ratios.

In situations where different forms or types of a pollutant are involved in a trade, the trading plan must establish a translation factor or environmental indicator. Translations can make it possible to trade more than one form of pollutant or pollution by defining the ratio at which the two forms may be exchanged with an equal effect on water quality. For example, reductions in upstream nutrient levels can improve downstream dissolved oxygen levels or biochemical oxygen demand. Use of translation ratios requires a demonstration of supporting data and analysis regarding how pollutants behave under specific watershed conditions.

4.7 Credit characteristics

Once a pollutant reduction has been converted into a credit, the MPCA anticipates that the following aspects should be defined:

- *Credit life* – Period from the date a credit becomes usable by a Permittee for compliance purposes through the date the credit expires and is no longer valid. Credit life depends upon the type of BMP and pollution reduction generated.
- *Credit projects can be renewed* – If projects are continuing to function and are properly maintained, the pollutant reductions from projects could be renewed to generate credits in subsequent compliance cycles (although the reduction calculations may need to be adjusted to reflect the ratios and baseline requirements that apply at that future point in time).
- *Credits can be released in phases* – Most BMPs, once implemented, will start generating water quality improvements immediately. For BMPs that take time to mature (e.g., restored wetlands or riparian planting), credits may be released in phases, or a ratio can be used to account for time lag.
- *Limitations on the sale of credits* – An approved trading plan should establish restrictions on sales of pollutant credits. Obviously, a pollutant reduction credit may not be sold to more than one NPDES permitted buyer. For example, pollutant load reductions resulting from the installation of a BMP may generate 100 pounds worth of phosphorus credits for a downstream water body. Those 100 pounds worth of phosphorus credits cannot simultaneously be sold to multiple NPDES permitted buyers. The credits can be broken up and sold separately in smaller lots, for example in two 50 pounds transactions to two separate buyers. Credits can be sold sequentially, for example 100 pounds to buyer A for a period of time, then the same 100 pounds to buyer B for a subsequent period of time. But the same 100 pounds cannot be sold concurrently to multiple buyers. Where credit-generating activities address more than one pollutant, a trading plan may address how these credits are sold.
- *Multiple pollutant crediting* – BMPs installed for the purpose of generating pollutant load reduction credits may generate more than one pollutant reduction credit. Pollutants eligible for trade include those listed in Section 2 of this Guidance: phosphorus, nitrogen, total suspended solids, salinity, oxygen depleting pollutants and potentially other pollutants. Trade ratios may vary per pollutant.
- *Credit Stacking* – BMPs installed for the purpose of generating pollutant load reduction credits for the NPDES permit market may provide additional ecological benefits that may be saleable in other credit markets. For example, reestablishment of vegetated buffers may generate pollutant load reduction credits but may also create wildlife habitat which may have monetary value in other ecosystems services markets. Similarly, BMPs may result in carbon sequestration, reestablish wetlands, reduced stream temperature and therefore improved cold water fisheries. The MPCA does not anticipate that its permits will restrict credit generators from selling these additional ecological benefits into other credit markets.

4.8 Antidegradation and antibacksliding

Antidegradation

The purpose of the antidegradation provisions in Minnesota Rules (Minn. R. 7050.0250 through 7050.0335) is to achieve and maintain the highest possible quality in surface waters of the state. Antidegradation provisions are a decision-making process the MPCA uses to determine whether and to what extent water quality may be lowered by a proposed project. The antidegradation review process is conducted when a proposed project is expected to result in an increase in loading or other causes of degradation to downstream waters.

Permitted activities that may result in an increase in pollutant loading or other causes of degradation to a downstream water are subject to antidegradation review. For antidegradation review purposes, the MPCA will evaluate water quality trading proposals which create additional capacity for proposed net increases in pollutant loading in accordance with Minn. R. 7050.0250 to 7050.0330. In such cases, the MPCA will consider the overall reduction in loading to the segment that would result from the trade in its antidegradation decision.

Antibacksliding

The MPCA believes that the antibacksliding provisions of Section 303(d)(4) of the CWA will generally be satisfied where a point source increases its discharge through the use of credits in accordance with alternate or variable WQBELs contained in an NPDES permit, in a manner consistent with provisions for trading under a TMDL, or consistent with the provisions for pre-TMDL trading (including in a watershed plan). These antibacksliding provisions will also generally be satisfied where a point source generates pollution reduction credits by reducing its discharge below a WQBEL that implements a TMDL, or is otherwise established to meet water quality standards, and it later decides to discontinue generating credits, provided that the total pollutant load to the receiving water is not increased, or is otherwise consistent with antidegradation policy.

4.9 Credit planning

All credit-generating projects need to prepare a credit project design and management plan for review and approval by the MPCA and/or the designated watershed credit management entity as part of the permitting process. This should be prepared by a qualified professional[3] who can select and properly design appropriate BMPs (Section 5) to improve water quality at a specific location.

Landowners developing BMP projects for water quality trading are encouraged to work with the Minnesota Department of Agriculture's Minnesota Agricultural Water Quality Certification Program, the Board of Water and Soil Resources (BWSR), local Soil and Water Conservation District (SWCD) or Natural Resource Conservation Service (NRCS) staff, but they also may choose to develop a private project plan. A project plan should meet the following requirements:

- Designed with the goal of improving water quality.
- Meet all applicable laws and regulations (e.g., wetlands and stream channel alteration), credit characteristics, trading ratios and baseline requirements.
- Outline specific restoration goals.
- Describe the proposed BMPs, their relevant efficiencies and quality standards (see BWSR, NRCS, etc. publications) for each BMP and the BMP implementation plan.
- Describe the BMP monitoring and maintenance plan and how it will ensure the BMPs remain viable and support water quality standards during the project's life.

Whether the project plan addresses resource issues other than water quality is up to the landowner and/or project planners.

4.10 Project stewardship

Contractual legal and financial safeguards may be required to protect the project for a minimum time period (e.g. 1 year for cover crops, 5 years for nonstructural BMPs, and 20 years for structural BMPs).

[3] A qualified professional could be any of the following: an NRCS-certified planner or an NRCS employee, a certified crop advisor, or a professional services provider. Some BMPs, such as constructed wetlands, will require consulting with other experts as well. Some BMPs on the list may specify the type of expert that must be consulted in the project's design, installation, and maintenance requirements.

Such stewardship time commitments recognize the balance between maintaining operational flexibility for landowners and the need for point source buyers' certainty with respect to facility planning and permit compliance.

Various types of legal documents have been utilized, and other tools may be developed in the future, to satisfy permit conditions with respect to trading and offsets. These include leases, deed restrictions, and easements that protect the BMPs as they operate for the life of the project. Demonstration of the credit seller's or credit buyer's technical and financial capability to operate and maintain BMPs for the duration of the credit life may also be desirable. Financial protections may include maintenance funds, performance bonds, restricted accounts, insurance and financial certification.

5. Approval for credit-generating BMPs and quantification methods

5.1 Approved BMPs in a trading plan

After development of the trading plan, the plan should be submitted to the MPCA so that it can be included as part of a permit or SWPPP. To comply with the Water Trading Statute and other applicable authority, certain information must be included, including procedures quantifying credits and monitoring and maintenance requirements.

The MPCA has a list of approved BMPs and quantification methods that have been included with previous permits (See *Appendix D: NPDES/SDS Attachment: Trading Summary and Crediting Calculations)*. Each type of BMP proposed for inclusion in a trading plan that is not part of the approved BMP list must be supported by a BMP package that should include the following information:

- A description of the BMP and how it works; where the BMP should be applied (e.g., appropriate site conditions).
- Potential ancillary benefits.
- Frequency and intensity of ongoing monitoring requirements.
- Design, installation, operation, and frequency and intensity of ongoing maintenance requirements.
- A method for verification of and quantifying credits, including any appropriate BMP efficiency and uncertainty (variability).
- Substantiating information for proposed credit quantification/calculation methods (e.g., background and technical documentation, protocol for applying the method, estimation of method accuracy, sensitivity, and uncertainty).

Proposed BMP packages must be approved by MPCA for inclusion in SWPPPs or proposed permits. As part of the permitting process proposed trading plans and BMP packages may be modified. All BMPs proposed for inclusion on the approved BMP list must meet applicable industry-accepted practices.

5.2 Approval for a new BMP and quantification method

The MPCA anticipates that trading plans may need to be modified during the term of the permit, or upon permit reissuance. Permit modifications may be minor or may require formal re-notice, depending on the significance of the change. For example, if a new type of BMP is proposed, a major amendment may be required so that adequate detail can be added to the permit regarding the new type of BMP. New types of BMPs and the associated methods to quantify credits can be developed and added to the MPCA's list of approved BMPs by following the steps outlined below. Practices and associated quantification methods approved by MPCA may be added to a BMP list at any time after their approval.

5.2.1 Step 1: Prepare and submit proposed BMP package

New practices or improved design, measurement, or quantification methods may be submitted for inclusion on the MPCA's BMP list. A BMP package (described in Section 5.1) must be submitted to MPCA and/or the verification entity for each BMP or quantification method proposed.

5.2.2 Step 2: Initial screening of BMP proposal

For new or modified practices, MPCA and/or the verification entity will perform an initial screening of the package for completeness. Additional technical experts may be engaged to review any proposed quantification methods.

5.2.3 Step 3: Review process and criteria for BMP consideration

This section describes the recommended process of reviewing new or modified BMPs. The MPCA and/or the verification entity reviews the package. If the proposed BMP is already included on the MPCA's approved BMP list, the MPCA reviews only the modifications portion of the BMP package and related supporting documentation for consideration on the BMP list. If the BMP is not already included, the MPCA can reject it, or proceed to add it to the BMP list if it is found acceptable. If the new or modified BMP is found acceptable, it is then eligible for inclusion in a trading plan. However, in order for the BMP to be included in a plan, credit cycle components (i.e. credit quantification, verification, registration, etc.) must be added to these BMP descriptions. If the proposed BMP involves new technology or methods for which data and experience are insufficient to support credit quantification, the BMP is initially approved only if the BMP can be directly measured and if the monitoring is scientifically credible. If the practice's measurements are too variable, it may only be allowed using modeling or BMP efficiency rates.

5.2.4 Step 4: MPCA concurrence, public notice and comment, and final decision

All types of BMPs, whether they are new, modified or on the existing approved list, will be reviewed by MPCA consistent with Section 5.1 as part of the review and approval of the trading plan.

The MPCA will conduct a public notice and comment period on the trading plan and the overall WWTP permit it is a part of, and will accept comments on the overall permit package. The MPCA may revise or remove any portion of the permit package based on public comments or in consultation with other technical experts. If the BMP portion is acceptable, the BMP and associated quantification method remain on the appropriate BMP lists for a trading plan. Approval of BMP packages will occur simultaneously with plan approval.

5.2.5 Step 5: BMP revision post approval

Revisions to BMPs, revisions to a quantification method, or a new quantification method for a BMP that has already been approved following the above process can be requested by MPCA after a plan is approved. BMP revisions may be triggered by the monitoring results or any other monitoring of the BMPs overall effectiveness and impact on environmental parameters, as well as research of the BMPs performance on the trade or other sites.

Previously approved and/or installed trading BMPs will continue to operate under the trading plan for which they were approved.

6. Process for generating and tracking credits

A credit generation and tracking system must be customized within trading plans once a Permittee has determined that trading is desirable. The steps described below are necessary for a trading plan to be approved by MPCA.

The MPCA may delegate portions or some functions of the management of program administration, verification, and registration/trade tracking. Administrative, verification, and tracking roles may be filled by one or more independent third parties.

6.1 Initial project site and BMP screening

Project site and BMP screening is used to confirm their viability. Screening occurs after a specific site has been identified and before an initial BMP design has been developed. A project site visit needs to be done to verify the existing conditions and discuss the proposed project and BMP(s). Following the site visit, the available project information is reviewed relative to the requirements in the trading plan. Project screening is conducted by the MPCA and/or the verification entity along with the proposer.

This step is a good way to minimize investing time and money on projects that are not eligible or not likely to generate saleable credits based on preliminary design calculations, and can provide information used to refine project design before implementation. Part of the initial screening is to discuss with the proposer the landowner's willingness to participate, legal agreement requirements, general permitting requirements and other federal, state and local requirements.

6.2 Technical review and approval

After initial project screening, the proposer will develop calculations for the value of the proposed BMPs. This may include soil sampling, field measurements etc. to determine/verify site-specific data. The proposer will also develop design documents for the proposed BMPs. The calculations and design documents will be reviewed by the MPCA and/or the verification entity.

6.3 Construction

After approval of the calculations and plans and specifications, construction will occur. Depending on the selected BMP(s), the proposer's designer will need to provide on-site construction inspection during times of significant construction. The MPCA and/or the verification entity may do on-site inspections during construction.

Upon completion of construction, the proposer will submit to the MPCA and/or the verification entity, a post-construction report including verification that the BMP(s) were installed according to plan, updates to credit calculations based on final construction numbers (length, size etc.) if applicable and photographs showing before and after construction.

6.4 Initial verification (post construction inspection)

Credit generating activities (e.g., NPS project, point source reduction in discharge below WQBELs) must be verified and registered before they can be used for compliance purposes. Verification review may be conducted by the MPCA and/or verification entity and include the following components:

- *Administrative review* – Confirm BMP eligibility (Section 4.1).
- *Technical review and approval* – Confirm that credits were quantified accurately. Final construction numbers may impact the final credit calculations (Section 6.2).
- *Project implementation* – Conduct a post-construction site visit to confirm that the BMP was installed consistent with approved design and construction criteria, and any BMPs expected as part of a baseline are in place (Section 6.3). From Discharge Monitoring Reports (DMRs), confirm the pollutant load reduction potential for point sources.

6.5 Certification and tracking

6.5.1 Certifying and issuing credits

Certification signifies that credits are ready to be issued. The certification process includes final confirmation that the necessary documentation is available, verification review is complete, and all aspects of the project are in place. Credits must be certified by approval by MPCA and/or the verification entity (for NPS credits). Upon submission of this information, MPCA or a designated tracking entity can register credits into the plan's administrative files/database. Attachments to credit registration documentation will likely include the project's post-construction verification report, certification, and other relevant information needed to register credits.

Trading parties must generate and maintain records substantiating pollutant reductions by credits and trades. These records must be made available to MPCA upon request. Buyers should retain copies of trading records on site for a minimum of five years after completing a trade contract.

6.5.2 Registering a trade

After registration, credits can be transferred from the project developer/seller to the buyer. Trades must be formally registered with MPCA. The credit buyer's, or, if applicable, credit generator's NPDES permit must authorize participation in water quality trading activity. Credit use is subject to ongoing credit verification for nonpoint source credits.

The registered trade documentation must be signed by both contractual parties and submitted to the MPCA and, if applicable, the tracking entity. The MPCA and/or the tracking entity will enter the information into a trade-tracking file/database.

6.6 On-going verification and credit tracking

Ongoing verification and credit tracking must occur on a cycle described in the trading plan and/or permit to confirm that projects are maintained and functioning as designed and constructed.

6.6.1 Verification of permitted facilities for point source credits

A permitted WWTP's capacity to generate credits will be verified by the MPCA based on a review of DMR data and permit conditions. A stormwater permittee's capacity to generate credits will be verified by the MPCA based on extensive monitoring and modeling which proves that a permittee has exceeded the reductions required for their own applicable WLA, and has sufficient credits available to sell to another permittee.

6.6.2 BMPs for nonpoint source credit

The Permittee will be required to conduct inspections of all BMPs on at least an annual basis. Operations and maintenance (O&M) of BMPs should be considered an integral part of meeting permit limits and treated the same as O&M of a wastewater treatment plant (WWTP). The BMP O&M should be included in the overall operations budget for a WWTP. In addition, the MPCA and/or the verification entity, may visit the BMP sites to verify the reduction mechanism, documentation of the BMP design, maintenance, and monitoring performance. The legal agreement between the proposer and the landowner should include the statement that the BMP site may be inspected by the MPCA and/or the verification entity, to verify a Permittee's compliance. Depending on the BMP and the facility being inspected, advance notification to the landowner may be necessary to gain access to conduct an inspection, especially if security issues are a concern. In some cases, such as inspecting many acres of cover crops, advance notification may not be practical. Permittees who purchased nonpoint source-generated credits remain responsible for ensuring BMPs are properly implemented and maintained and the credit amounts that

are traded are in fact produced. The MPCA will resolve any compliance matters or enforcement actions with the NPDES permit holder.

6.6.3 Annual reports

The MPCA requires Permittees participating in water quality trades to summarize all trade activity for the year as well as the performance of the associated credit-generating projects in an annual report. If an independent tracking entity exists, that entity will prepare and send a trade summary report to the Permittee and MPCA at intervals defined in a trading plan. Trading permits will include the following language:

The Permittee must monitor the effectiveness of the BMPs during the growing season at least annually and submit an annual report by February 28 of each year. The annual report must include the following:

1. Description of the site(s) inspected.
2. Photographic documentation that the BMPs are still in place and operating properly.
3. Certification that the active BMPs approved by the MPCA for trade credits remain active according to the MPCA approval.
4. If damage has occurred, photographic documentation of the damage.
5. Photographic documentation of the completed repair work.
6. If all repair work has not been completed, a schedule for completing the repair work.
7. Detailed description of the remaining repair work to be completed.
8. An estimate of the total cost for each BMP constructed and/or repaired in the previous year.
9. Potentially other requirements specific to the individual BMPs and/or permit requirements.

6.7 Trade tracking

The MPCA is ultimately responsible for tracking trades and the day-to-day oversight of trading. The MPCA may establish, in a trading plan, the designation of an independent third party tracking entity to assist with those tasks. Major functions of trade tracking include the following:

- Setting a submittal time for credit registration documents.
- Verifying trades meet program requirements.
- Tracking all trades in a central database and showing account balances of buyers and sellers.
- Reconciling all trades in the trading area to ensure credits are not used more than once or oversold.
- Making trading information and effluent limits available to regulatory agencies and the public.
- Producing trade summary reports.

By maintaining a trade-tracking database, the MPCA and/or the verification entity ensures that an accounting of all trades and credits is available to the public and environmental agencies. The database must be subject to sound data system and accounting principles with the ability to support outside review and audit.

The MPCA may partner with the Minnesota Department of Agriculture, the Board of Soil and Water Resources and the Department of Natural Resources for documentation of certain trades. Local trade organizations must submit trade information to MPCA for tracking purposes.

6.8 Adaptive management

Adaptive management is a systematic approach for improving natural resource management, with an emphasis on learning about management outcomes and incorporating what is learned into ongoing management (feedback loop). Adaptive management in water quality trading programs may focus on improving program operations, trade administration, quantification methods, and overall effectiveness. Water quality trading plans are expected to include adaptive management to improve the elements within them with new information over time.

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Glossary

Baseline	The pollutant-specific point source discharge or nonpoint source loading level below which reductions must be made to generate a credit.
Best management practices (BMP)	Methods, measures, or practices selected to reduce or eliminate the introduction of pollutants into receiving waters. The BMPs include, but are not limited to, structural and nonstructural controls and operation and maintenance procedures.
Best professional judgment	Conclusion and/or interpretation derived by a trained and/or technically competent individual by applying interpretation and synthesizing information.
Credit	A specific quantity of a pollutant that is available for a trade.
Cross-pollutant trading	The use of discharge or load reductions of one pollutant traded to achieve water quality goals for another pollutant. For example, reductions in total phosphorus may be used to achieve a dissolved oxygen standard.
Designated use	As defined in 40 CFR 131.3(f) and 40 CFR 131.10, designated uses are specified in water quality standards for each water body or segment whether or not they are being attained. As defined in Minn. R. ch. 7050.0140 designated uses include domestic consumption, aquatic life and recreation, industrial consumption, agriculture and wildlife, aesthetic enjoyment and navigation, other uses and protection of border waters and limited resource value waters.
Fully supporting	In compliance with water quality standards and within the range of biological reference conditions for all designated and exiting beneficial uses.
Habitat offset	An improvement to a habitat that results in a net benefit to aquatic life or other designated species. It may be equivalent to a pollutant reduction and may result in a credit to be used by a discharger.
Load allocation	The portion of a receiving water's pollutant loading capacity that is attributed to either one of its existing or future nonpoint sources of pollution or to natural background sources.
Minimum control level	The minimum level of treatment or management an NPDES permitted entity must provide on-site to be eligible to participate in water quality trades or offsets. Minimum control levels are technology-based effluent limits (TBELs) specified in wastewater permits or site specific BMPs specified in Stormwater Pollution Prevention Plans (SWPPPs) for regulated stormwater entities.
Monitoring	Periodic or continuous measurement or observation of the properties or conditions of some medium of interest, such as monitoring a water body, point source discharge or BMP.
Multiple pollutant crediting	Generating more than one pollutant load reduction credit from a single best management practice. This can include phosphorus, nitrogen, total suspended solids, dissolved oxygen, and potentially other pollutants.
National Pollutant Discharge Elimination System (NPDES)	National Pollutant Discharge Elimination System (NPDES) is a federal program established under the Clean Water Act (CWA). The NPDES permit always regulates a treatment and disposal system that discharges a specified amount of a pollutant into a surface water.
Nonpoint source	For the purposes of this guidance, nonpoint source means any pollutant source that is not subject to NPDES permit regulation.
Offsets	A reduction in the loading of a pollutant of concern from a source that is used to compensate for the loading of the pollutant of concern from a different point or nonpoint source.
Persistent bioaccumulative toxic pollutants	Chemicals that break down slowly in the environment accumulate in humans and other species and are toxic. Typically, they accumulate in fatty tissues and are slowly metabolized, often increasing in concentration within the food chain.

Point source	For the purposes of this guidance, point source means an NPDES/SDS permitted facility.
Pollutant	Generally, any anthropogenic substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems. This includes fertilizer runoff, pesticides, heavy metals, heat load caused by vegetation removal or bacteria introduced from human and animal wastes, among others.
Pollution	Human-caused changes in the environment that alter the functioning of natural processes and produce undesirable environmental and health effects. This includes human-induced alteration of the physical, biological, chemical, and radiological integrity of water and other media.
Project plan	Document detailing (a) how the proposed credit-generating action will be designed and installed to meet BMP guidelines, including a description of the proposed actions, installation practices, anticipated timelines, restoration goals, and anticipated threats to project performance; and (b) how the project developer plans to maintain/steward the practice or action for the duration of the project life, keep the practice or action consistent with BMP guidelines, and report on that progress.
Quantifiable	The amount, rate, and characteristics of a discharge reduction or increase or watershed improvement can be determined or measured through an accurate, reliable and replicable method, procedure or set of calculations established by an applicable requirement or approved by the MPCA.
Secondary treatment	Technology-based requirements for direct discharging publically owned treatment works. The corresponding effluent limitations are based on the expected performance of a combination of physical and biological processes typical for the treatment of pollutants in municipal sewage. The effluent limitations are expressed as a minimum level of effluent quality in terms of: $CBOD_5$, total suspended solids, and pH (except as provided by treatment equivalent to secondary treatment and other special considerations).
Site screening	Initial site-screening process through which a project developer receives confirmation that their proposed project is likely eligible to produce credits, based on the information available at that time.
State Disposal System (SDS)	State Disposal System (SDS) is a Minnesota program established under Minn. Stat. § 115. The SDS permit regulates water discharges to the ground surface or subsurface to protect groundwater.
Target water body	The water body that the trade will benefit.
Stormwater Pollution Prevention Plan or Program (SWPPP)	A site specific document designed to reduce the discharge or pollutants in stormwater. Construction Stormwater (CSW) and Industrial Stormwater (ISW) Permittees are required to develop and Stormwater Pollution Prevention Plans to manage stormwater runoff. Municipal Separate Stormwater Sewer System (MS4) Permittees are required to develop, implement and enforce Stormwater Pollution Prevention Programs to reduce the discharge or pollutants in stormwater to the Maximum Extent Practicable.
Technology based effluent limitation (TBEL)	An NPDES/SDS permit effluent limitation, standard, or prohibition promulgated by the Environmental Protection Agency at Code of Federal Regulations, title 40, parts 400 to 460, under sections 301 and 306 of the Clean Water Act, United States Code, title 33, sections 1311 and 1316.

Total maximum daily load (TMDL)	The maximum amount of a pollutant that can enter a water body and still allow that water body to meet and continue to meet water quality standards for that particular pollutant; it is the sum of the individual wasteload allocations for point sources and load allocations for NPS and natural background. It can also include a Margin of Safety. TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate measure that relates to the applicable water quality standard. TMDL may also refer to the plan for reaching the TMDL pollutant levels.
Trading Plan	A watershed based water quality trading program involving multiple sources and which may be managed by a third party such as a watershed credit exchange or brokerage. Also, water quality trading details and requirements specified in an NPDES permit or Stormwater Pollution Prevention Plan or Program (SWPPP)
Trade or trading	A mechanism for accomplishing and accounting for an offset of pollution, often through the purchase, sale, conveyance or other transfer of pollutant credits between NPDES/SDS regulated sources and/or between NPDES/SDS regulated sources and unregulated sources.
Trade ratio	A numeric value used to adjust available credits for a seller or credit obligation of a buyer based on uncertainty and to ensure a net environmental benefit. Ratios are applied to account for uncertainty in terms of measurement error and project performance. Ratios also ensure a net environmental benefit beyond what would be achieved through conventional approaches.
Trading area	A watershed or other hydrologically-connected geographic area, as defined within a water quality management plan adopted for a TMDL, trading plan. A trading area must encompass the location of the discharge to be offset, or its downstream point of impact, if applicable, and the trading project to be implemented.
Unregulated source	Any point or nonpoint source that is not subject to NPDES regulations or for which performance standards, effluent limitations, work practices and monitoring requirements have not been established by an applicable regulatory requirement.
Verification (project)	Process of confirming that a credit-generating project has completed certain elements that should help ensure the project provides the water quality benefits it promises. Specifically, confirmation that project site BMPs or credit-generating activities and credits conform to the applicable quality standards required by a program administrator or regulator. This process includes (1) an administrative review for the completeness and correctness of documentation; (2) technical review for the completeness and accuracy of quantification; and (3) confirmation of project implementation and/or performance.
Wasteload allocation	Portion of receiving water's load capacity that is allocated to one of its existing or future point sources of pollution.
Water body	Stream, river, lake, estuary, coastline, or other water feature, or portion thereof.
Water quality	Term used to describe the biological, chemical, and physical characteristics of water with respect to its suitability for a designated use.
Water quality-based effluent limitation (WQBEL)	An NPDES/SDS permit effluent limitation developed in accordance with 40 CFR 122.44(d) where TBELs are not sufficient to meet water quality standards. WQBELs must be derived from and comply with applicable water quality standards and must be consistent with assumptions and requirements of any EPA-approved TMDL wasteload allocation (WLA).
Water quality standards	State-adopted and U.S. Environmental Protection Agency-approved ambient standards for water bodies. The standards prescribe the use of the water body and establish the water quality criteria that must be met to protect designated uses (40 CFR 131.3(i)).

Appendix A. Water quality trading in Minnesota

Several water quality trading permits have been issued in Minnesota since 1997. The majority of trading permits have been issued to address pre-TMDL situations. Federal regulations (40 CFR §122.4) prohibit NPDES permit issuance for new and expanded discharges upstream of impaired waters. Water quality trading provides a permit issuance alternative by ensuring that permitted pollutant loads for new or expanded discharges are completely offset by actual or permitted pollutant load reductions by other sources upstream of the target water bodies. Pre-TMDL trades can be discontinued or modified following approval of TMDL WLAs for the discharges.

Water quality trades can also be developed to achieve TMDL required pollutant load reductions. A TMDLs establish watershed scale pollutant loading caps. Trading systems can be developed to assist existing sources to achieve required reductions or to establish temporary load reductions while existing sources design, finance, and construct facility upgrades in order to comply with permit effluent limits. A TMDL trading can also provide cost effective alternatives for new or expanded discharges in TMDL watersheds. Minnesota TMDLs do not typically set aside any reserve capacity pollutant loading for future growth. NPDES permits for new or expanded discharges in TMDL watersheds can only be issued if it is demonstrated that the discharges will not cause or contribute to violations of water quality standards and are consistent with the assumptions and requirements of existing TMDL WLAs. Since Minnesota TMDLs do not include reserve capacity for new and expanded discharges, options to offset pollutant loading through water quality trading are critically important for growth and economic development in TMDL watersheds.

Water quality trading also has potential to offer cost effective alternatives in accordance with antidegradation regulations. Minnesota's water quality standards include antidegradation provisions intended to ensure that water quality is not degraded. These regulations allow for loading offsets which create assimilative capacity for proposed net increases in permitted pollutant loading, as long as they occur adjacent to or upstream of the proposed discharge. To date, no antidegradation trades have been proposed and approved in Minnesota.

Table 1 describes the types of water quality trades that have been implemented in Minnesota from 1997 through 2020.

Table 1. Minnesota water quality trading permits 1997 - 2022

Year	Buyer	Trade Type	Credit Generation	Pollutant	Trades/Practices
1997	Rahr Malting Company	Pre-TMDL	Nonpoint source BMPs	CBOD	Riparian area revegetation Cattle exclusion Streambank stabilization
1999	Southern Minnesota Beet Sugar Cooperative	Pre-TMDL	Nonpoint source BMPs	Phosphorus	Cattle exclusion Filter strip Streambank stabilization Beet field cover crops
2008-2019	Minnesota River Basin General Phosphorus Permit	TMDL	Point sources	Phosphorus	132 seasonal point source trades
2008-2020	Pre-TMDL Phosphorus Trading	Pre-TMDL	Point Sources	Phosphorus	Five point source trades One still active in 2020
2015	City of Princeton WWTP	Pre-TMDL	Nonpoint source BMPs	Phosphorus	Streambank stabilization
2020	City of Oronoco WWTP	Pre-TMDL	Nonpoint source BMPs	Phosphorus	Streambank stabilization

Year	Buyer	Trade Type	Credit Generation	Pollutant	Trades/Practices
2021	City of Mankato	WQBEL	Nonpoint source BMPs	Phosphorus	To be determined*
2021	City of Hutchinson	WQBEL	Nonpoint source BMPs	Phosphorus	To be determined*
2022	City of Rochester	WQBEL	Nonpoint source BMPs	Phosphorus	To be determined*

*These are planning level trade permits that allow the Permittees to develop and implement trades in the future.

Appendix B. First steps to the point-nonpoint pollutant trading documentation process

First steps to the point-nonpoint pollutant trading documentation process

When developing a Point-Nonpoint (P-NP) pollutant trade, documentation of the existing conditions is critical in the development and calculation of the value of the trade. Documenting the existing conditions of the trade site cannot be done after changes have been made or construction has been started. Without adequate documentation, a best management practices (BMPs) pollutant reduction value cannot be determined and therefore cannot be approved for credit generation.

Before any changes are made to a potential trade site, the Permittee should contact the MPCA so that MPCA staff can be involved in determining the value of the trade. This document provides a brief listing of what needs to be completed before installation of a BMP.

The Permittee should work with MPCA staff early on to ensure a quality project and valid trading credits.

Steps in the P-NP trading process:

1. Establish parameter(s) of concern. The Permittee should work with MPCA staff to identify what parameter(s) have potential for trading. This should also include establishing a need for trading and timing/season.
2. Identify watershed. The 2.6:1 trade ratio assumes projects will be within the same watershed as the discharge.
3. Establish trade ratio. Trade ratios are established in part to account for uncertainty associated with BMP pollutant reduction effectiveness and equivalence. For previous wastewater P-NP trades, the trade ratio has been 2.6:1 meaning that for every pound of discharge, 2.6 pounds have to be removed from the watershed via pollutant trade. Greater trade ratios may be required for projects that result in a greater degree of uncertainty.
4. Identify trading-eligible BMPs. Trading-eligible BMPs that have been identified to date are listed below. Additional BMPs can be requested to be trading-eligible.
    1. **Soil erosion BMPs**, including sheet, rill and ephemeral gully erosion, gully erosion, stream, river, and ditch bank erosion.
    2. **Cattle exclusion,** separating cattle from waterways for protection against bank erosion and direct manure impacts.
    3. **Rotational grazing with cattle exclusion,** to enhance forages for pollutant reductions from filtering processes and plant nutrient uptake.
    4. **Critical area set aside,** of highly erodible land.
    5. **Wetland treatment systems,** for nutrient removal.
    6. **Alternative surface tile inlets,** which connect surface water ponding to subsurface tile.
    7. **Cover cropping,** to increase the residue cover for soil protection against erosion.
    8. **Storm sewer system retrofitting** to add BMPs to existing systems. BMPs cannot be tied to new development or re-development and cannot be in an area, which is subject to NPDES/SDS stormwater permitting requirements (MS4, ISW or CSW).
5. Locate potential projects and identify BMP(s) applicable to the site.
6. Determine rate of contribution to receiving water. For erosion projection BMPs, determination of erosion rates is critical. Erosion rates over a long period of time is preferred but sometimes difficult to determine. Old U.S. Army Corps of Engineer (USACE) maps, navigation maps, USGS maps, aerial photos etc. can be used to compare previous elevations and/or bank locations to the current

situation. Soil samples must be taken to determine the amount of pollutant per unit of soil. The BWSR website (https://bwsr.state.mn.us/water-quality-tools-and-models) has calculator spreadsheets that include generic pollutant rates based on soil types. These generic rates can be used to estimate rough reduction values but should not be used for determining final reduction values. Final reduction values must be based on soil testing data.

For other BMPs, the history of land use practices must be determined and documented.

Photos should be taken of the project site prior to beginning construction. Photos should also be taken during construction documenting key portions of the project.

Other miscellaneous items to discuss before the project(s) gets underway:

- The MPCA staff will likely inspect the BMP site(s) early in the planning stage, long before construction begins.
- Some BMPs may require a Professional Engineer (PE) signature. In the past, these have been BMPs that included a structural component.
- The Permittee shall retain an independent auditor to certify project completion. The auditor shall be a PE for engineered projects designed by a PE. For other BMPs, the auditor can be a PE or other professional with demonstrated expertise in the field.
- Temporary impacts during construction.
- Regular (annual) maintenance will be required, just like at a WWTP.
- Minnesota Department of Natural Resources, the USACE and other federal, state or local authorities may have restrictions that will have to be considered.
- Some BMPs can lose their effectiveness over time. Some may become more effective. This may depend on the type of BMP, its location and pollutant of concern.
- A legally binding contract between the Permittee and the landowner will have to be developed to clarify the details of the BMP. The contract will need to be submitted to the MPCA for review prior to signing by the Permittee and the landowner.
- Construction plans should be submitted to the MPCA for review prior to bidding.
- The NPDES permit must be reissued with trading language and trading attachments prior to approval of any trading credits. The NPDES permit will contain, at a minimum, a requirement for submittal of an annual report to provide the MPCA with an update on the status of the trades.
- Project cost and pollutant reduction cost in $/kg per BMP must be reported to MPCA on an annual basis.

Below is a condensed list of required submittals for BMP sites:

1. Site name
2. Site location
3. Identification of major and minor watersheds and map(s)
4. Presence of downstream lakes or wetlands
5. Landowner
6. Past five years land use and vegetative cover type
7. Proposed legal agreement
8. Plan view
9. Plans and specifications (as needed)
10. Operation and maintenance plans
11. Vegetation establishment and maintenance criteria

12. Costs
13. Pollutant of concern reduction estimates

Appendix C. Agricultural eligibility criteria for credit generation

For eligibility to generate water quality trading credits agricultural sites must demonstrate adherence to good farming practices by either of the following:

1) *Current and maintained status as a certified agricultural operation in the Minnesota Agricultural Water Quality Certification Program*. Practices implemented to obtain certification may be eligible to generate credits if:
   a. The practices were implemented within applicable projects' practice-eligibility timeframes.
   b. The practices were not implemented to meet regulatory requirements.
2) Achieving compliance with accepted agricultural practices and the regulations listed below. The BMPs implemented to achieve compliance with the following regulations are not eligible for credit generation unless noted.
   - Animal Feedlots (Minnesota Rules Chapter 7020).
   - Minnesota Wetlands Conservation Act (Minnesota Statutes Section 103G.221- 103G.2375).
   - Federal Insecticide, Fungicide, and Rodenticide Act and Minnesota Statutes (18B, 18C, 18D, 103H) regarding pesticide and fertilizer distribution, use, storage, handling and disposal.
   - Groundwater Protection (Minnesota Rules Chapter 1573).
   - Minnesota Buffer Law (Minnesota Statutes 103F.48)
   - Shoreland and Floodplain Management (Minnesota Rules Chapter 6120)
   - Federal Highly Erodible Land Conservation and Wetland Conservation regulations[4] (7 CFR, Part 12)
   - Demonstrated treatment of Ephemeral Practices_2018.

[4] *BMPs installed to satisfy these regulations may be eligible for credit generation.*

Appendix D. NPDES/SDS attachment: Trading summary and crediting calculations

The attachment beginning on the next page is attached to the WWTP permit and includes generic trading language as well as trading language specific to the Permittee, target water and pollutant(s) of concern.

The yellow highlighted portions of the attachment must be modified to reflect the specific situation. The version attached below may not be the most recent version of this document. The MPCA Trading Team should be contacted for the most recent version.

Appendix E. SWPPP attachment: Trading summary and crediting calculations

The attachment beginning on the next page is attached to the modified SWPPP and includes generic trading language as well as trading language specific to the Permittee, target water and pollutant(s) of concern.

The yellow highlighted portions of the attachment must be modified to reflect the specific situation. The version attached below may not be the most recent version of this document. The MPCA Trading Team should be contacted for the most recent version.

Attachment

PERMITTEE NAME Stormwater Trading Summary and Water Quality Trade Crediting Calculations

National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Permit
MNR040000
MS4NUMBER
DATE

Proposed changes to this SWPPP attachment shall follow the permit modification procedures outlined in the permit, including the public notice process. If the proposed modification of this SWPPP attachment may result in a positive or negative change to the PARAMETER OF CONCERN trade credits already approved by the Minnesota Pollution Control Agency (MPCA), the MPCA shall clearly identify the amount of this potential change in the public notice for the proposed modification.

Stormwater Trading Summary

Executive Summary

With the modification of the previously submitted SWPPP and compliance schedule, the MPCA authorizes the PERMITTEE NAME (Permittee) to offset its PARAMETER(S) OF CONCERN pollutant loading from its MS4 in an innovative manner that provides flexibility to the Permittee while ensuring a degree of water quality protection that is superior to that which would have resulted from a traditional stormwater treatment approach.

The combination of upstream nonpoint source (NPS) pollutant loading reductions and PARAMETER(S) OF CONCERN removal at the MS4 ensure a net PARAMETER(S) OF CONCERN loading reduction to the receiving water while providing additional water quality benefits. This compliance schedule modification meets the guidelines for pollutant reduction trading developed by the MPCA as well as the U.S. Environmental Protection Agency's (EPA) Water Quality Trading Policy.

This Stormwater Source Trading Summary document outlines the criteria that projects must meet to be approved by the MPCA. It should be noted that the Permittee should consider Operation and Maintenance (O & M) of the BMP no different than O & M of the Facility: a requirement to ensure proper results and life cycle.

Concept of Point - Nonpoint Source Trading

Point-Nonpoint source (P-NP) pollutant trading refers to the substitution of nonpoint source pollutant load reductions for point source pollutant load discharge requirements by a discharger permitted under a NPDES/SDS permit. To meet the Total Maximum Daily Load (TMDL) goals, the Permittee will implement stormwater BMPs and/or participate in water quality trading to meet pollutant reduction goals. The MPCA requires that such trades result in pollutant reductions that are:

- Equivalent to the point source discharge in their water quality impact. Equivalence refers to the physical substitution of nonpoint reductions traded for point source loads, taking into account all relevant factors, for example, differences in time, place and chemical form of point and nonpoint source loadings and the sensitivity of the receiving water. In this trade, it has been determined that sufficient safety factors for nonpoint BMPs are in place to meet this definition.

- Additional to NPS reductions that would be likely to occur in the absence of a trade. Additionality requires that nonpoint source load reductions that are credited to a point source in a P-NP trade would not have occurred otherwise, in the absence of P-NP trading. For example, in this trade, feedlot corrections or conservation tillage are not allowable trade credits because there is a regulatory program for feedlots and a cultural trend of adoption of conservation tillage already existing.

- Accountable so that the NPS measures proposed in the trade will be implemented and maintained to achieve their intended result on water quality. Accountability refers to the need to ensure that a P-NP trade satisfies the above criteria of equivalence and additionality, and that terms of the trade agreement are being met. Only nonpoint source BMPs verifiable by field inspections or other physical measures have been selected.

A framework for P-NP trading has been developed. In order to implement P-NP trades, the following definition of what constitutes a trade has been developed.

Trade: A trade is a direct reduction in NPS load which is applied against the point source load.

The Permittee will achieve PARAMETER OF CONCERN nonpoint source load reductions by completing projects that include nonpoint source reduction practices. The Permittee will work with the MPCA, its consultant and local land owners and oversee the selection of project sites for trading. The MPCA approval is required for all selected sites and the use of the pollutant reduction estimates.

Assumptions of Point-Nonpoint Source Trading

The P-NP trade proposal assumes many physical process restraints. The following is a list of conditions which selection of BMPs are based on:

1. In order to maintain and/or improve the quality of TARGET WATER BODY, BMPs must occur within the TARGET WATER BODY watershed.

2. Phosphorus will be treated as a conservative and persistent compound. The phosphorus entering the watershed at any location will be assumed to cycle downstream and exert a load on the lower portions of the watershed.

3. The Midwest Plan Service publication, which provides the manure estimates, reflects the current professional estimates of manure content for the parameters of phosphorus.

4. The Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) reflect the current professional expertise for projecting soil erosion rates from sheet, rill and ephemeral gullies. Local Natural Resource Conservation Service (NRCS) and Soil and Water Conservation Service Districts (SWCD) can determine the equation coefficients for sites in their respective areas.

5. Delivery ratios of sediment and phosphorus contents of soils are based on conservative professional estimates unless justification of higher rates can be provided.

6. As with any estimation process using average or conservative numbers, the use of several sites increases the probability that the averages or conservative estimates are reflective of the sites in the whole basin. When using several sites, the variance of a specific site below the estimated average value is accounted for by the excess of a different site in the population. The system developed has an overall safety factor of approximately two worked in to the conservative estimating process.

7. The choices of average or conservative values is constantly improving as the knowledge base of the nonpoint sciences improves and the number of research sites increases. As documentation increases and modifications to the following calculations are justified, this document may be updated to remain current. Previously approved trades will remain credited at the values previously agreed to; modifications will only apply to trade sites yet to be approved by the MPCA. Any modifications to this document will be completed through a permit modification.

8. Land locked areas and watershed divides within a larger BMP implementation area will be factored out of all pollutant reduction calculations by estimating only contributing acres associated with TARGET WATER BODY.

9. The Permittee shall receive credit for BMPs that have been funded by the Permittee and/or the landowner of the BMP site. In cases where cost sharing and/or grant funding occurs, the rules and agreements governing the BMPs funding may specify BMP credit generation eligibility, including the proportion of credit ownership between the funding entity and the Permittee.

Minimization of Associated Risks

The use of nonpoint source BMPs to trade for a point source discharge does pose some risk. The effectiveness of BMPs in reducing NPS loading depends on the type of BMP selected, its location on the landscape, and the quality of its design and maintenance. It also depends on weather. Most NPS BMPs are effective during normal storm events and may not operate during drought or extreme storms. Risks associated with BMP implementation will be reduced by conservative estimates of pollutant credit units. Specific examples include:

- In calculating phosphorus loading from soil erosion, conservative estimates of the soil phosphorus content are used. In the event that site-specific soil sampling justifies a higher phosphorus content, a safety factor of 0.75 may be used in the crediting calculations.

- A delivery ratio (DR) of 100 percent for NPS in the riparian zone will be used. However, a DR of 20 percent will be used for lands within one-quarter mile of the stream and a DR of 10 percent will be used for areas further away. These DRs are highly conservative on sites being targeted in this process.

- Land locked areas and watershed divides within larger project sites will be factored out of the pollutant credit calculations.

These factors are multiplicative in the equations used. The conservative nature of the numbers for phosphorus per ton and delivery ratios will result in underestimating the phosphorus reduced by at least a factor of two on "typical" sites ensuring that phosphorus reduction goals will be achieved.

To ensure the appropriate use of these ranges, site visits by MPCA staff may be coupled with communications with other organizations such as the SWCD during the selection process. To make a final selection of BMPs, it is necessary to go beyond the question of equivalence to address the criteria of additionality and accountability. Which combination of BMPs would result in pollutant reductions that probably would not have occurred in the absence of trading? Which BMPs most lend themselves to accountability? That is, for which ones would installation, effectiveness and maintenance be easiest to confirm? What type of BMP could be implemented through the fewest possible number of enforceable contracts with landowners?

Any currently regulated practice cannot be used in the trade as a permitting program would require the change anyway. Some BMPs, such as reduced tillage, are being widely adopted because they make economic sense, and further adoption is likely to occur with or without payments from a trade. Trading eligible BMPs that have been identified to date include:

1. **Soil Erosion BMPs:** including sheet, rill and ephemeral gully erosion, gully erosion, stream, river, and ditch bank erosion.
2. **Cattle Exclusion:** separating cattle from waterways for protection against bank erosion and direct manure impacts.
3. **Rotational Grazing with Cattle Exclusion:** to enhance forages for pollutant reductions from filtering processes and plant nutrient uptake.
4. **Critical Area Set Aside** of highly erodible land.
5. **Wetland Treatment Systems:** for phosphorus removal from tile outlets or other agricultural related runoff.
6. **Alternative Surface Tile Inlets:** which connect surface water ponding to subsurface tile.
7. **Cover Cropping:** to increase the residue cover for soil protection against erosion.

As trading practices become adopted on a more widespread basis, it is likely that additional BMP categories will be identified. These additional BMP categories can be added to this list during permit reissuance or a permit modification.

The variety of BMPs which can be implemented all contain aspects of their establishment or performance which require special considerations by the operator. Some of the changes will be new to the operator and technical assistance will be required as part of the BMP set up (i.e., rotational grazing of cattle may bring forage questions to bear and technical assistance through the establishment period will be provided). All BMPs with vegetative components will require an establishment criteria to ensure a dense stand. In addition, some BMPs which treat sediment by filtering or settling require on-going maintenance:

- To ensure sheet flow conditions are maintained in upland flow areas.
- To remove sediment build ups which obstruct the operation of the BMP.
- To re-establish a structure or plant life after major storm events or fire.
- To remove harmful infestations (such as carp from treatment wetlands, destructive insects in vegetation and beavers from bioengineering sites).

At the time of the site crediting and approval, the responsibilities and technical assistance proposed to address the above issues for the site will be considered.
There are many alternative ways of achieving the required NPS load reduction. To evaluate the effectiveness and cost of some of the most promising BMPs, the MPCA has used a system of BMP crediting that estimates the reductions in NPS loading that can be expected to result from the implementation of BMPs.

1. Soil Erosion BMPs

Sources of sediment, nitrogen, phosphorus and biochemical oxygen demand (BOD) occur naturally throughout the basin. The transport of these pollutants to the surface water is accelerated by intensive land use management such as roads, drainage, construction activities and agricultural practices. In addition, some land use activities provide increased sources of nutrients for vegetative needs such as cropping or lawns. The BMP Soil Erosion crediting system is based on established programs. The first is soil erosion protection. The U.S. Department of Agriculture NRCS has been successful in defining soil movement from sheet and rill formations with the use of an equation which is based on soil type, field slope, length of slope, vegetation, and management practices. The USLE or the RUSLE is used to predict the erosion tons generated at the field in tons per acre per year. For large gullies or bank erosion, soil loss is estimated by calculating the area which has been eroded divided by the number of years during which the process took place. Once the volume has been established by either of these methods, a conservative value of nutrient content of the soil is determined, preferably through soil analysis. Then a coefficient is used to conservatively estimate how much of the field or bank erosion is transported to the nearest surface water.

2. Cattle Exclusion

The increased density of animals for agricultural production can also increase the NPS loading associated with storm runoff. The elimination of direct deposits of manure in the riparian zone and bank erosion from animal traffic can be credited. The riparian zone typically has a higher delivery ratio associated with it due to its proximity to the water body. The estimated time, number of animals and manure produced is necessary to credit the existing scenario changes in delivery when the animals are no longer allowed access. Likewise, the current bank erosion recession rates are used to estimate future protection provided by stabilizing the current bank and preventing future access.

3. Rotational Grazing with Cattle Exclusion

Pastured areas not currently classified as feedlots may still contribute significant loads of phosphorus. The MPCA has a feedlot permitting process for sites where animals are concentrated to such an extent that natural vegetation is destroyed. However, most existing animal grazing systems which maintain vegetation can greatly reduce the delivery of manure to the water. Cattle exclusion when combined with rotational grazing and the use of buffers or easements can be practiced to lower the amount of phosphorus impacts on the water body. To estimate this process, the number of animals, the manure content and the time spent in relation to the water is all estimated for the “before” conditions. This is then compared with the “after” conditions where the time spent in close relation to the water is eliminated. Delivery of manure volumes from each “paddock” can then be compared with each scenario to predict whole farm reductions of manure delivered to the water. In addition, the management scenarios need to estimate the time the animals occupy each paddock or area of the pasture to rotate the animals sufficiently to prevent a “feedlot” situation and improve the quality of the vegetative stand. The water quality benefit comes from combinations of: (a) improved rotation management providing a better forage, improved nutrient uptake as the plant is in a growth phase and added soil cover; (b) the

use of vegetative filter strips which separate cattle from the water and filter sediment and associated phosphorus in runoff; and (c) the dispersion of manure throughout the pasture providing more opportunities for phosphorus uptake due to proximity of the upper end of the pasture and the water body.

4. Critical Area Set Aside

Critical area set aside refers to the conversion of land use practices in areas which are excessively vulnerable to soil erosion. Traditional soil conservation sites have been steep sloped bluffs or hills, where removal of vegetation or plowing of soil has greatly accelerated the erosion rate. Combining this concept with criteria that are concerned with the proximity to a hydraulic system that delivers the eroded soil to the river, will allow small changes in vegetative management or bio-engineering to provide large protective savings in river load. The targeting of riparian corridors, steep slopes directly connected to the river, and restoring previously drained isolated wetlands, all fit into this category.

5. Wetland Treatment Systems

The construction of wetland treatment systems specifically for water quality enhancement defines the wetland treatment system nonpoint source trading BMPs. Wetlands are a valuable watershed management tool in any basin. Wetlands help stabilize hydraulic peaks, provide necessary habitat for the many species critical to the food chain and settle sediments out of the runoff. However, not all wetlands remove nutrient loading from the watershed. Some wetlands act as sinks for phosphorus much of the year only to pulse the mass of stored nutrients out during stressful times such as after drought periods or snow melt. The constructed wetland treatment system is designed to control the way the nutrients are captured and stored or converted so that the mass of nutrients are not available to be released downstream. By maximizing optimum depths, surface area and detention time, phosphorus is captured and buried. This type of wetland may limit some types of habitat use, but is targeted specifically for chemical (nutrient removal) and sediment treatment.

The science of nutrient treatment by wetlands is relatively new to the design processes in colder climates. Mixed results have often been obtained. Excellent results have been obtained by a system on the Des Plaines River near Chicago, Illinois. The basic concepts designed for with this constructed wetland provide controlled depths ranges to prevent re-suspension of sediments, prevention of short circuiting of flows and adequate detention times which all provide for the loading rates for settling characteristics. Wetland Research will be targeted at assessing the performance of wetland treatment sites in Minnesota. The research can be provided by another partner or non-trade participant. It should be noted that as wetlands age, they may become more of a phosphorus source than a sink. This may cause a wetland trade to lose its effectiveness over time. If this is the case, maintenance on the wetland may be necessary to retain active credits.

6. Alternative Surface Tile Inlets

Surface tile inlets are a length of pipe, slotted or not, which connects the surface water ponding in depressions directly to the subsurface tile. Alternative surface tile inlets means changing past, traditional surface tile inlets by using rock filters and/or buffered areas.

7. Cover Cropping

Cover cropping means using small grain crops planted in the spacing between row crops, or using small grain crops planted after the harvest of the cash crop, to increase the residue cover for soil protection

against erosion. The establishment criteria for the cover crop for each cash crop shall be provided according to the permit.

Other Trade Values Exist (THIS PARAGRAPH SHOULD BE MODIFIED TO REFLECT THE SPECIFICS OF THE PROJECT, THE PERMITTEE AND LOCATION.)

A trade of nonpoint controls to mitigate for point source PARAMETER OF CONCERN discharges has several other valuable contributions to the environment. This trade was set up considering primarily the NPS contribution to the reduction goals of PARAMETER OF CONCERN in the TARGET WATER BODY watershed. Many NPS pollutant reduction practices have the potential to generate various benefits in addition to the PARAMETER OF CONCERN reductions that are generating credits for this permit. Other types of BMPs may also sequester significant quantities of carbon from the atmosphere or provide valuable wildlife habitat. These additional benefits help contribute to water quality goals or other environmental goals and potentially be economically beneficial to the Permittee.

Water Quality Trade Crediting Calculations

The permittee can utilize either Point-Point trades or Point-Nonpoint (P-NP) trades.
Point-Point trades will be made on a trade by trade basis as needed. See table for default trade ratios.

Default Trade Ratios		Credits Users (Buyers) NPDES Permittees
Credit Generators (Sellers)	Wastewater NPDES	1.1:1.0
	Stormwater NPDES	2.1:1.0

A contract with another stormwater permittee or any legitimate wastewater discharger containing PARAMETER OF CONCERN and willing to reduce below the current permitted PARAMETER OF CONCERN load will be required. The contract will need to be reviewed and approved by the MPCA prior to signing by both parties. Monitoring and reporting requirements to provide for tracking actual reductions will be required. This process requires the buyer's and/or seller's permits to be modified to account for the adjustment of the limits, as applicable.

Point-Nonpoint Trades will be facilitated as follows.

"High Delivery Zone" means the corridor of land along a stream, river or other watercourse that demonstrates high interaction of the soils with the watercourse. High Delivery Zones may include floodplains with a high flood return frequency, or land with convex slopes toward the watercourse that does not allow eroded materials to redeposit before overland flow enters the watercourse. The MPCA shall determine whether a proposed site is a High Delivery Zone or not.

The Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) shall be used to project the soil erosion rates from sheet, rill, and ephemeral gullies. The local Natural Resource Conservation Service (NRCS) and Soil and Water Conservation District (SWCD) staff shall determine the USLE and RUSLE coefficients for proposed trade sites in their respective local areas.

Credits under more than one BMP for the same site shall not be allowed unless adequate justification is provided demonstrating that the accumulative credits are additive.

Trade crediting calculations are based on conservative professional estimates. The Permittee is required to achieve and maintain MPCA-approved credits according to the permit. These requirements are based upon a trading ratio of 2.6 which is determined as follows:

- 1.0 (Basic 1:1 Trading Ratio Requirements)
- +0.6 (Engineering safety factor reflecting potential site-to-site variations)
- +1.0 (Net reduction factor to achieve load reductions that improve water quality and account for uncertainty.)
- =2.6 (Overall Trading Ratio)

1. Soil Erosion BMPs

Soil erosion BMPs reduce the impacts of sheet, rill, and ephemeral gully erosion; gully erosion; stream, river, and ditch bank erosion; and erosion at surface tile inlets. The following process shall be used to calculate the phosphorus credits from soil erosion BMPs.

Step 1: Calculate the reduction in soil erosion. The following methods of estimating the erosion rate apply, based on the erosion mechanism:

A. Sheet, Rill, and Ephemeral Gully Erosion: Calculate the site erosion rate before and after installing the BMP using the USLE or RUSLE. (The equation used shall be that currently used by the local NRCS and SWCD.) Express the results in tons/acre/year (SED_b and SED_a).

B. Streambank and Gully Erosion:

1. Using the existing contours, determine the volume of soil removed by gully erosion and/or streambank erosion (VOL).
2. Using the land operator as a reference, determine the amount of time in years it has taken to produce the gully and/or streambank erosion (VOL/YRs).
3. Using the Soil Density Values below, convert the volume per year determination to tons/year (SED_b). SED_a shall be equal to zero.

Soil Density Values

Soil textural class	Dry density (tons/ ft^3)
Sands, loamy sands	0.055
Sandy loam	0.0525
Fine sandy loam	0.05
Loams, sandy clay loams, sandy clay	0.045
Silt loam	0.0425
Silty clay loam, silty clay	0.04
Clay loam	0.0375
Clay	0.035
Organic	0.011

Step 2: Calculate the reduction in sediment delivered to the watercourse.

A. Sheet, Rill, and Ephemeral Gully Erosion: Using the Delivery Ratio Table below, enter the sheet and rill erosion category to calculate the delivery ratio for the site before and after implementation of BMP(s). Sediment reduction in tons equals the difference between these values times the acres that the practice is applied over. $SEDRT_b$ = Area * (SED_b*DR_b) and $SEDRT_a$ = Area * (SED_a*DR_a).

Delivery ratio table

	Surface tile inlets absent			Surface tile inlets	
Area	High delivery zone	Non-high delivery zone less than ¼ mile from watercourse	Non-high delivery zone greater than ¼ mile from watercourse	Without a standpipe	With a standpipe
Gully erosion channelized to watercourse	95%	95%	50%	NA	NA
Gully erosion non-channelized to watercourse	NA	15%	5%	20%	10%
Sheet, rill erosion	95% maximum	15%	5%	20%	10%
Streambank erosion	95%	NA	NA	NA	NA

B. Streambank and Gully Erosion: Using the Delivery Ratio Table above, select the appropriate delivery ratio (DR_b). Multiply the soil erosion rate (SED_b in tons/year) by the delivery ratio to determine the amount of soil reaching the surface water, excluding the landlocked areas or watershed divides within the site. The results shall be in tons/year delivered. SEDRDC = SED_b * DR_b.

Step 3: Determine the phosphorus values associated with the sediment runoff.

A. Sheet, Rill, and Ephemeral Gully Erosion: To determine the annual phosphorus mass reduced, take the sediment tons per acre before and after (similar to step 2, without the area; $SEDRTP_b = SED_b * DR_b$ & $SEDRTP_a = SED_a * DR_a$) and enter the Phosphorus Enrichment Table. Phosphorus enrichment values represent the phosphorus attachment potential of different soil types combined with the settling characteristics of the different particles. The phosphorus attachment in the parent material is as presented in the table below for each soil type (e.g., 1.00 pound/ton for silt), however, as sands deposit out and clays continue on the move and the soil that remains on the move contains more phosphorus per ton of soil. This table is from the CREAMS algorithm for sediment-attached phosphorus and adjusts for phosphorus content of the parent material type. To determine the enrichment, take the phosphorus content results (phosphorus) for the "before value" and subtract the "after value" from the table. (P_b and P_a), PRDC = P_b * Area- P_a. * Area.

B. Streambank and Gully Erosion: Determine the phosphorus values associated with the sediment. Using the default values in the table below, calculate the amount of phosphorus delivered to the surface water, excluding the landlocked areas or watershed divides within the site (PDEL). PDEL = SEDRDC * PhosContent.

Soil type	Sand	Silt	Clay	Peat
Phosphorus content factor	0.85 lb/ton	1.00 lb/ton	1.15 lb/ton	1.50 lb/ton

NOTE: The values used in Step 3 are conservative. At certain trade sites, soils may have enriched phosphorus content due to past application of fertilizers. Higher phosphorus levels may be justified through site-specific soil sampling. However, to account for uncertainties associated with the sample process, site-specific values shall be multiplied by a safety factor of .75 to calculate the amount of phosphorus delivered, unless a site-specific soil sampling plan is approved in advance.

Phosphorus enrichment table

Sediment delivery rate (tons/ac/year)	Phosphorus enrichment value (lbs/acre)			
	Clay	**Silt**	**Sand**	**Peat**
0.01	0.05	0.04	0.03	0.06
0.02	0.08	0.07	0.06	0.10
0.03	0.11	0.10	0.08	0.15
0.04	0.14	0.12	0.10	0.18
0.05	0.17	0.15	0.12	0.22
0.06	0.19	0.17	0.14	0.25
0.07	0.22	0.19	0.16	0.29
0.08	0.24	0.21	0.18	0.32
0.09	0.27	0.23	0.20	0.35
0.1	0.29	0.25	0.22	0.38
0.2	0.51	0.44	0.38	0.66
0.3	0.70	0.61	0.52	0.92
0.4	0.88	0.77	0.65	1.15
0.5	1.1	0.9	0.8	1.4
0.6	1.2	1.1	0.9	1.6
0.7	1.4	1.2	1.0	1.8
0.8	1.5	1.3	1.1	2.0
0.9	1.7	1.5	1.2	2.2
1	1.8	1.6	1.4	2.4
2	3.2	2.8	2.4	4.2
3	4.4	3.9	3.3	5.8
4	5.6	4.8	4.1	7.3
5	6.7	5.8	4.9	8.7
6	7.7	6.7	5.7	10.1
7	8.7	7.6	6.4	11.4
8	9.7	8.4	7.2	12.7
9	10.7	9.3	7.9	13.9
10	11.6	10.1	8.6	15.1
11	12.5	10.9	9.3	16.3
12	13.4	11.7	9.9	17.5
13	14.3	12.4	10.6	18.7
14	15.2	13.2	11.2	19.8
15	16.0	14.0	11.9	20.9
16	16.9	14.7	12.5	22.0
17	17.7	15.4	13.1	23.1
18	18.6	16.1	13.7	24.2
19	19.4	16.9	14.3	25.3
20	20.2	17.6	14.9	26.3
21	21	18.3	15.5	27.4
22	21.8	19.0	16.1	28.4
23	22.6	19.6	16.7	29.5
24	23.4	20.3	17.3	30.5
25	24.1	21.0	17.8	31.5
26	24.9	21.7	18.4	32.5
27	25.7	22.3	19.0	33.5
28	26.4	23.0	19.5	34.5
29	27.2	23.6	20.1	35.5
30	27.9	24.3	20.7	36.4

2. Cattle Exclusion

Cattle exclusion means fencing and an alternative water supply that provides a separation distance protecting the waters of the state and their shorelands.

The following process shall be used to calculate the phosphorus credits from cattle exclusion.

Step 1: Determine the number of head and size of animals. The maximum grazing density for cattle that can be supported without supplemental feeding is one animal per acre (head/ac) over a 5-month grazing season for steer. Other cattle pasture operations shall determine the land's capacity and document the assumptions. The animal count shall be determined by the typical weight categories given in the Midwest Plan Service's Livestock Waste Facilities Handbook (MWPS-18). The Second Edition of MWPS-18 appears to be the most up-to-date version available on the Iowa State University website (https://www-mwps.sws.iastate.edu/catalog/manure-management/manure-characteristics-pdf). Keep separate counts for each animal category presented (HEAD).

Step 2: Determine the manure load generated by the herd. The MWPS-18 lists standard production rates for phosphorus (MP):

MP = HEAD * MWPS-18 P_2O_5 (2.29 units P_2O_5 = 1.0 unit P)

MTP = Phosphorus from all the animal categories presented

Step 3: Determine the field layout before and after cattle exclusion has been implemented. The pasture area shall be divided into a High Delivery Zone and a non-High Delivery Zone. For large pastures, the non-High Delivery Zone shall be divided based on the delivery ratio as shown below:

Area	High delivery zone	Non-high delivery zone less than ¼ mile from watercourse	Non-high delivery zone greater than ¼ mile from watercourse
Delivery ratio	100%	40%	20%

Step 4: Determine the amount of phosphorus delivered in each portion of the pasture before and after implementation of the BMP. Deposition of manure in pasture areas shall be directly proportional to the amount of time spent by the animals in each area. The following time distribution shall be used for cattle having unrestricted access in the riparian zone:

Month	Time in high delivery zone
May	25%
June	25%
July 1 - 15	25%
July 16 - 31	36%
August	36%
September	25%
Average	**28%**

The alternative water supply shall be located in the pasture, as specified in the operation and maintenance plan, to minimize the time the cattle are next to the exclusion fencing.

Time not spent in the High Delivery Zone shall be spread equally throughout the upland pasture area in the following distribution: the ratio of the total field size to the portion less than ¼ mile or greater than a ¼ mile from the watercourse. The amount of phosphorus deposited in each portion of the pasture shall be calculated based on the ratio of the field size to the portion of land less than or equal to ¼ mile and greater than or equal to ¼ mile. For example, if 20 percent of the field exceeds ¼ mile then 20 percent of the manure shall be allocated the 20 percent delivery ratio after the cattle exclusion is implemented.

Example time distributions (TD) are shown below (in this example zero percent of the field is located more than ¼ mile from the watercourse):

Example time distributions

Pasture area cattle management	Before cattle exclusion	After cattle exclusion
High delivery zone	28%	0%
Non-high delivery zone less than ¼ mile from watercourse	72%	100%

Step 5: Determine amount of phosphorus delivered.

The amount of phosphorus delivered shall be calculated from the amount deposited in each pasture area multiplied by that area's delivery ratio, and shall be adjusted according to:

- Herd Size: If a substantial portion of the pasture would fall under a conservation easement, the herd size shall be reduced in the calculations to reflect the decreased carrying capacity after the implementation of cattle exclusion.
- Filter Strips: Filter strip credit may be allowed for management areas where flow characteristics and vegetation are such that filtering out of solids is enhanced. The minimum width of the easement for application of a filter strip function is 25 feet for stem grass vegetation and 50 feet for woody vegetation. Filter strips are assumed to remove 30 percent of particulate pollutants and 0 percent of soluble pollutants. The relative distribution of soluble/particulate fractions shall be 50 percent/50 percent for manure-based phosphorus.

$LPDR_B$ = MTP * THZ * DR + MTP * TG1/4 * DR + MTP *TL1/4 *

$LPDR_A$ = MTP * TG1/4 * DR + MTP *TL1/4 * DR

$LPDR_B$ = Amount of phosphorus delivered before exclusion

$LPDR_A$ = Amount of phosphorus delivered after exclusion

DR = Delivery Ratios as determined by table on Delivery Ratios

THZ = time (days) assumed to be in High Delivery Zone (28% of the time)

TG1/4 = time determined to be spent in pasture more distant than a ¼ mile

TL1/4 = time determined to be spent in pasture closer than a ¼ mile

Filter Strip Crediting

FilterLE = $LPDR_B$- $LPDR_A$ – ($LPDR_A$ * TE* Solidf)

TE = equals a treatment efficiency of 30% removed of particulate matter.

Solidf = equals the assumption of 50% of manure being in solid versus soluble.

3. Rotational grazing with cattle exclusion

The operation and maintenance plans for rotational grazing shall include a description of the enhanced forage species for the pastures, including the vegetation criteria to determine over-grazed pastures from properly rotated pastures.

Rotational grazing with cattle exclusion shall be credited similar to Cattle Exclusion except for the time spent in distant pastures and reductions in the delivery ratio attributed to manure rates being closer to agronomic rates. More credit may be obtained if rotational grazing documents more time spent in the pastures farther than ¼ mile from the watercourse. Acceptable documentation includes establishing a rotational grazing plan and recording the rotational movement in that operation, and an annual "T" transect of the forage grasses present. The "T" transect shall consist of determining the vegetation species found every foot along two 100-foot lines perpendicular to each other in each field paddock. If the paddock shaping has dimension(s) of less than 100 feet, the count may be reduced to every six inches along a 50-foot length. The vegetation ratios shall meet the enhanced forage vegetation criteria included in the project operation and maintenance plan. Over-intensive grazing shall identify which grass species dominate the "T" transect, for example, a pasture that is dominated by Kentucky bluegrass or bare soils.

Steps 1-2. Follow Cattle Exclusion Steps 1-2.

Step 3: Determine the field layout before and after cattle exclusion with rotational grazing has been implemented. The pasture area shall be divided into a High Delivery Zone and a non-High Delivery Zone. For large pastures, the non-High Delivery Zone shall be divided based on the delivery ratio as shown below:

Area	High delivery zone	Non-high delivery zone less than a ¼ mile from watercourse	Non-high delivery zone greater than a ¼ mile from watercourse
Delivery ratio	100%	20%	10%

Step 4. Follow Cattle Exclusion Step 4. Example time distributions (TD) are shown below:

Example time distributions

Pasture area cattle management	Before cattle exclusion	After cattle exclusion
High delivery zone	28%	0%
Non-high delivery zone less than ¼ mile from watercourse	36%	50%
Non-high delivery zone greater than ¼ mile from watercourse	36%	50%

Step 5. Follow Cattle Exclusion Step 5.

4. Critical area set aside

Critical area set aside means changing the principal land use to reduce high erosion levels.

The following process shall be used to calculate the phosphorus credits from critical area set aside.

Set asides may be credited for this permit only if it is verified that the land being credited is not eligible for the Conservation Reserve Enhancement Program (CREP). The permit credit may be used to extend the CREP corridor on land adjacent to the watercourse. If the CREP program sets aside a site stream corridor but does not set aside the whole site, critical area set aside phosphorus credits under this permit may be available for the non-corridor portion of that site.

River flood-scoured areas

Step 1: Determine portion of field subject to scour excavation. This information may be obtained by direct observation of field conditions, or through physical records including maps and photographs. The erosion volumes shall be calculated by averaging the previous events in a documented manner (AREA, VOL). The volume of the soil is determined by multiplying the area by the depth of scour over that area if evenly eroded or, if irregular in shape, determining that volume voided as described in Soil Erosion BMPs.

Step 2: Determine the period of time the scouring occurred. This may be determined from topographic map records, or as determined and justified by a professional engineer (TIME).

Step 3: Using the soil density values under Soil Erosion BMPs calculate the weight of the soil eroded by multiplying the dry density and the volume (tons/acre). SED = VOL * Density.

Step 4: Determine the erosion rate. VER = SED/TIME (tons/acre/yr).

Step 5: Follow Soil Erosion BMPs Step 3B, assuming a 95 percent delivery ratio. SEDP = VER * DR * PhosContent (lbs of P/yr).

Bluffs

The calculations for bluff critical area set asides shall follow the soil erosion calculations under the Soil Erosion BMPs that most closely apply to the type of erosion at the site. In addition, the special practices needed to maintain soil stability during set aside installation and throughout the project trade duration shall be detailed. The design shall consider protecting the site against upland contributing flows from surface and ground water sources, and providing stability at the toe of the bluff.

Restored wetlands

The calculations for restored wetlands critical area set-asides shall follow the sheet, rill, and ephemeral gully erosion calculations under the Soil Erosion BMPs. In addition, it shall be demonstrated that restored wetland contributing areas shall remain hydraulically unconnected with the watershed to which it previously drained. If a restored wetland contributing area remains hydraulically connected with the watershed to which it previously drained, it is not eligible for Critical Area Set Aside credits, but may be eligible for Constructed Wetlands Treatment Systems credits.

5. Constructed wetland treatment systems

Constructed wetland treatment systems shall be designed, constructed, operated and maintained as follows:

1. Water contact recreation and consumptive fishing shall be discouraged in the wastewater treatment system.
2. The wetland shape shall be simple to encourage good water circulation. The length shall be three to five times the width for maximum detention efficiency and the inlets and outlets shall be widely spaced to minimize short-circuiting. Lower length to width ratios shall be allowed if justified based on the design flows and/or energy of the unchannelized water in the wetland.
3. The inlet and outlet areas shall be protected from scour erosion.
4. Minimum and maximum depths of the wetland shall be considered. The depth shall not be such that anoxic layers readily develop. The bounce of the wetland shall not vary sufficiently to impair aquatic emergent vegetation in the wetland.
5. Maximum flows to be treated shall be designed for by providing adequate detention times and emergency spillway or flow bypasses. The design shall address the capture and long-term storage of the sediment and phosphorus.

6. The water level bounce and vegetation shall be controlled such that at least seventy percent of the permanent pool remains vegetated with emergent varieties.

The following equation shall be used to calculate the phosphorus credits from constructed wetland treatment systems:

$$\ln[C_0/C_i] = -k/q$$

where:

C_0 = outlet mean annual phosphorus concentration in milligrams per liter (mg/L)

C_i = inlet mean annual phosphorus concentration in mg/L

k = first order rate constant set at 12.1 meters depth per year (23.7 meters depth per year may be used instead when intensive and continuing monitoring and assessment is provided for a site-specific treatment efficiency; a monitoring and assessment project shall be a minimum of three years long but no longer than six years; upon completion of the assessment at the site the long term average treatment efficiency shall be used)

q = loading rate in meters of depth per year

Sediment trapping phosphorus reduction credits shall be based on the difference in flow-weighted mean annual water concentration of total phosphorus of the inlet and the outlet. Other forms of estimating the inlet concentrations other than monitoring will be reviewed upon submittal to the MPCA. The volume treated shall be determined by the design flows based on the average year's cycle as determined by flow data (if available) at the location. Wetland intensive and continuing monitoring and assessment shall be targeted at assessing the performance of wetland treatment sites in Minnesota. This monitoring and assessment may be provided by another partner or non-trade participant.

For wetland treatment sites using the 23.7-meter depth rate constant, a multiplier of 1.3 times the credit shall be applied to remove site-variability safety factor. (This multiplier reflects the use of known data instead of estimates.) $(C_0 - C_i)$*(volume in million gallons/year)*8.34=pounds reduced.

6. Alternative surface tile inlets

Surface tile inlets are a length of pipe, slotted or not, which connects the surface water ponding in depressions directly to the subsurface tile. Alternative surface tile inlets means changing past, traditional surface tile inlets by using rock filters and/or buffered areas.

The following process shall be used to calculate the phosphorus credits from alternative surface tile inlets.

Step 1. Determine the area in the subwatershed feeding the surface tile inlet. (A=AREA).

Step 2. Determine the RUSLE/USLE erosion rate for that portion of the site in this subwatershed. (ER=Erosion Rate).

Step 3. Determine the sediment treatment efficiency of the pre-existing surface tile inlet. The tile inlet shall have been installed before 1998. The following factors shall be considered in determining the treatment efficiency:

- Slope of field at inlet
- Type of inlet at site

Surface inlet delivery ratio = SIDR

Tile inlet method of delivery	No standpipe	With a standpipe
Delivery ratio	20%	10%

Step 4. Determine the prior sediment delivery mass. $SedDR_b = ER * A * SIDR$.

Step 5. Determine the after sediment delivery mass. $SedDR_a = ER * A * SIDR * TE$.

TE = Surface tile inlet alternative treatment efficiencies

Method	Treatment efficiency
Buffered	35%
Rock filter	50%

Step 6. Determine the phosphorus content of the soil by using the $SedDR_b$ and $SedDR_a$ values to enter the Phosphorus Enrichment Table under the Soil Erosion BMPs. $PSIDR_b$, $PSIDR_a$.

Step 7. Determine the phosphorus reduction by subtracting $PSIDR_a$ from $PSIDR_b$.

Step 8. Determine the phosphorus credit estimate for the site: $PCREST = PSIDR_b - PSIDR_a$.

7. Cover cropping

Cover cropping means using small grain crops planted in the spacing between row crops, or using small grain crops planted after the harvest of the cash crop, to increase the residue cover for soil protection against erosion. The establishment criteria for the cover crop for each cash crop shall be provided according to the permit.

The following process shall be used to calculate the phosphorus credits from cover cropping.

Step 1: Calculate the site erosion rate before and after installing the BMP using the USLE or RUSLE. (The equation used shall be that currently used by the local NRCS and SWCD.) Express the results in tons/acre/year (SED_b and SED_a). The cropping management factor "C" will be the only change in the calculation for before and after BMP calculations. The "C" factor shall be calculated by the local NRCS and/or SWCD or, in the case of sugar beet acreage, by those familiar with those calculations for that crop, such as the local NRCS office.

Step 2: Using the Delivery Ratio Table below, enter the sheet and rill erosion category to calculate the delivery ratio for the site before and after implementation of BMP(s). Sediment reduction in tons equals the difference between these values times the acres that the practice is applied over.

$SEDR_b = SED_b * DR$. $SEDR_a = SED_a * DR$.

Delivery ratio table

Area	Less than a ¼ mile from watercourse	Greater than a ¼ mile from watercourse	Surface tile inlets without a standpipe	Surface tile inlets with a standpipe
Sheet, Rill Erosion	15%	5%	20%	10%

Step 3: To determine the annual phosphorus mass reduced, take the sediment tons per acre before, $SEDR_b$, and after, $SEDR_a$, and enter the Phosphorus Enrichment Table under Soil Erosion BMPs (P_b and P_a) Phosphorus enrichment values represent the phosphorus attachment potential of different soil types combined with the settling characteristics of the different particles. To determine the enrichment, take the phosphorus content results (phosphorus) for the "before value" and subtract the "after value" from the table. (P_b and P_a), PRDC = P_b * Area - P_a * Area.