FDM 10-1-1 Purpose and Objectives

February 18, 2020

1.1 Originator

The Environmental Services Section is the Originator of this chapter. Questions and comments on the content of this chapter should be sent to the Statewide Stormwater Quality Engineer at (608) 266-0279 or DOTStormwater@dot.wi.gov.

1.2 Purpose

The purpose of this chapter is to provide information and guidance to designers on erosion control and storm water management. This guidance is provided so WisDOT projects will comply with all applicable laws and regulations. See FDM 10-1-2 for a summary of these laws and regulations.

1.3 Chapter Organization

The chapter is divided into two parts, Part A and Part B (see table below). Part A, which applies statewide, provides guidance for developing construction site erosion control plans as required by TRANS 401 and the WisDOT/DNR Cooperative Agreement. Part B provides guidance for developing permanent storm water management measures to protect water quality, primarily when dealing with WisDOT drainage facilities that are located within municipalities regulated by Chapter NR216, Wis. Adm. Code. In areas of the state not covered by NR216, the use of "Best Management Practices", as defined in Part B, may be applicable, especially where water quality concerns are an issue, such as near high quality waters.

Chapter 10	
Part A - Erosion Control	**Part B - Water Quality**
Who Does It Apply to: - applies statewide to any DOT administrated construction site	Who Does It Apply to: - applies to DOT transportation facilities located within municipalities permitted under the authority of Chapter NR 216 Wis. Adm. Code
What is Required: - must develop and implement construction site erosion control plans (see FDM 10-5-55)	What is Required: - must fulfill requirements of DOT/DNR Memorandum of Understanding - must implement storm water quality best management practices

1.4 Glossary

A glossary of key words used in this chapter is located in FDM 10-15-1.

FDM 10-1-2 Applicable Laws and Permits

November 30, 2018

2.1 Federal, State, and Local Laws and Regulations

As a result of the National Environmental Policy Act of 1969 and the Clean Water Act of 1972, numerous state and federal regulations governing land disturbing activities have been developed. In addition, various permits are being required (Section 404, Section 402 of the Federal Water Pollution Control Act, and Sections 9 and 10 of the Rivers and Harbor Act) by a number of agencies such as the Army Corps of Engineers, Environmental Protection Agency (EPA) and Fish and Wildlife Service.

A more recent regulation is EPA's National Pollution Discharge Elimination System (NPDES), requirement of

which EPA has delegated the Wisconsin Department of Natural Resources (WDNR) to administer. Under WDNR's authority, these regulations are known as the Wisconsin Pollution Discharge Elimination System (WPDES) requirements and are authorized under Chapter 283 of the Wisconsin Statues. The WPDES requirements are designed to regulate the quality of storm water being discharged into the waters of the United States to include surface and ground waters.

The following Wisconsin statutes and administrative codes are applicable:

1. WisDOT/WisDNR Cooperative Agreement

   https://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/environment/formsandtools.aspx

2. Cooperative Agreement Memorandum of Understanding of Erosion Control

   https://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/environment/formsandtools.aspx

3. Chapter 30.12(4) Wis. Stats. DOT Activities; exemption; interdepartmental coordination of environmental protection measures.
4. Trans 401 Wis. Administrative Code, relating to WisDOT construction site erosion control procedures.
5. NR 216 Wis. Admin. Code - Administrative rule on Storm Water Discharges and Permits.
6. Chapter 283 Wis. Stats. Wisconsin Pollution Discharge Elimination system.
7. Section 281.31 Wis. Stats. Construction Site Erosion Control and Storm Water Management.

2.2 Transportation Construction General Permit

WDNR has issued a general permit authorizing WisDOT to discharge storm water associated with land disturbing construction activity. This general WPDES permit is issued pursuant to ss. 283.33(4m), and 283.35(1) Wis. Stats.

Coverage under the Transportation Construction General Permit is required for WisDOT directed and supervised projects with one acre or more of land disturbing construction activity.

To obtain permit coverage, a complete Notice of Intent (NOI) must be submitted to the WDNR. The NOI should be submitted after WisDOT requests WDNR final concurrence, typically around 90% final design. After submission of the NOI, WDNR will review and grant permit coverage if warranted. Verification of permit coverage will be received with the WDNR final concurrence letter in the form of a certificate.

Directions for submitting the NOI are available at:

http://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/environment/erosion-ctrl-drainage.aspx

2.2.1 Area of Land Disturbance

Permit coverage is required for projects with an acre or more of land disturbance. Land disturbance is defined as: any man-made alteration of land surface resulting in a change in topography or existing vegetative or non-vegetative soil cover that may result in storm water runoff and lead to increased soil erosion and movement of sediment into waters of the state.

Land disturbing construction activity includes, but is not limited to, clearing and grubbing, demolition, excavating, pit trench dewatering, filling and grading activities. The following are common areas of land disturbance:

- Any area where subsoils are exposed or vegetation has been removed or disturbed, including areas within your slope intercepts, or areas outside your slopes intercepts that you anticipate will be disturbed to perform the work or topsoil storage areas.
- Underground utility work including pipe culverts and storm sewer installations.
- Grading associated with beam guard replacement or upgrading of end terminals.
- Ground disturbance at select sites and contractor staging areas not permitted separately are to be added to the project total. This will need to be estimated based on the scope of the project. One way to estimate would be to assume a depth at the select site. i.e. if a project is estimated to require 27,000 CY of borrow, and the assumed depth is 6 ft., the ground disturbance would be 121,500 sf. (the assumed depth of 6 ft. can be adjusted to account for site conditions.)

$$\left(27{,}000\ CY \times 27\frac{CF}{CY} \div 6ft\ deep = 121{,}500\ SF\right)$$

- Staging area where existing vegetation will be disturbed.
- It is understood all estimates for ground disturbance are estimates only. Please be more detailed if a project will be close to 1 acre.

Once determined, the area of land disturbance should be included in the plan set, on the Runoff Coefficient Table (refer to FDM 10-5-60).

2.3 Transportation Separate Storm Sewer System Permit

WDNR has issued a general permit authorizing WisDOT to discharge storm water from the transportation separate storm sewer system. This general WPDES permit is issued pursuant to ss. 283.33(4m) Wis. Stats.

Coverage under the TS4 permit is required for WisDOT storm sewer system discharge located within a United States Environmental Protection Agency (USEPA) designated Urbanized Area (Appendix A, Table 1) and the area of any incorporated municipality separate from an Urbanized Area requiring an MS4 permit from WDNR (Appendix A, Table 2). WisDOT is not responsible for a separate storm sewer system that drains a connecting highway. WisDOT is only responsible for storm water discharges of runoff that originate within the WisDOT right-of-way (ROW). Both tables are in the TS4 permit available on line.

https://dnr.wi.gov/topic/stormwater/documents/WPDES-WI-S066800-1.pdf

Contact WisDOT Central Office storm water quality engineer for specific guidance to meet storm water pollutant load reduction requirements.

2.4 Wis. Adm. Code, Chapter Trans 401

Trans 401 was created to establish and implement erosion control and storm water management standards for airport, railroad, highway, and bridge projects which are administered by WisDOT.

Trans 401 establishes minimum performance standards which all projects administered by WisDOT should meet. An erosion control plan and an erosion control implementation plan are also required under Trans 401. Erosion control and storm water management measures should be maintained and inspected prior, during and after construction or maintenance of a transportation facility.

2.5 Administration Rules for Erosion and Sediment Control on Highway Construction Projects

The Federal Highway Administration (FHWA) has adopted the American Association of State Highway and Transportation Officials (AASHTO) Highway Drainage Guidelines, Vol. III, "Erosion and Sediment Control in Highway Construction," 1992. The FHWA has adopted these guidelines to be followed on all construction projects funded under title 23, United States Code. These guidelines are not intended to preempt any requirements made by or under State law if such requirements are more stringent.

To develop standards and practices of erosion and sediment control on Federal-aid construction projects, each State should apply the AASHTO guidelines or apply its own guidelines, if its own guidelines are more stringent.

To be consistent with the requirements of section 6217 (g) of the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA), some certain states should follow specific management measures of erosion and sediment non-point source pollution control. Highway construction projects funded under title 23, United States Code, located in States with federally approved coastal zone management programs should utilize "Guidance Specifying Management Measures for Sources of Nonpoint Source Pollution in Coastal Waters," U.S. EPA, January 1993.

FDM 10-1-3 Erosion Control Plan

January 24, 1997

The design erosion control (EC) plan includes all erosion and sediment control considerations made during the planning, location, and project development phases and is found in the contract plans, specifications, and special provisions.

In general, the design EC plan should accomplish three objectives:

1. Limit off-site effects to acceptable levels;

2. Facilitate project construction and minimize overall costs;
3. Comply with federal, state and local laws and regulations.

Once the project is let, the design EC plan is used by the contractor to develop an "Erosion Control Implementation Plan", (ECIP). The ECIP is a narrative and pictorial plan based on the contractor's schedule of operations. It differs from the design EC plan in that it outlines a general timetable of when each erosion control device or set of devices is expected to be installed by the contractor before, during and after construction based on the estimated schedule of operations.

3.1 Limit Off-Site Effects

Off-site effects are defined in relation to the levels of sediment that may cause damage to the environment and/or customer sensitive areas.

An evaluation of each site for possible actions and their consequences is central to the development of an effective erosion and sediment control plan. Designers should analyze the probable effects to be expected from both the implementation of the control measures as well as their omission; the location of the effects; whether or not potential damage is acceptable; and the cost effectiveness of the chosen action.

Proper planning and scheduling of the construction operations are major factors in controlling anticipated erosion and sediment problems. The contract documents should require that the work be performed in a manner which will cause minimum soil disturbance. Designers should consider including, in the contract documents, a limitation on the amount of erodible surface area which may be exposed at any one time, especially when working near sensitive areas as defined in FDM 10-5-10 and FDM 10-5-15.

3.2 Facilitate Construction and Minimize Cost

To help minimize overall costs, control measures should be effective and safe in their operation, simple to construct, afford as little interruption to normal construction procedures as practicable, and be reachable to ensure proper maintenance.

Care should be taken to avoid the "shot-gun approach." Much is lost when the designer attempts to achieve total control of both erosion and sediment by calling for rigorous or inflexible design plan measures of questionable effectiveness. The design EC plan should be flexible enough to allow construction to be able to adjust the control measures to field conditions when necessary.

3.3 Laws & Regulations

See FDM 10-1-2 for a summary of applicable laws and regulations.

FDM 10-1-5 The Erosion Process

January 24, 1997

Soil erosion is the process by which the land's surface is worn away by the action of wind, water, ice and gravity. Natural, or geologic erosion has been occurring at a relatively slow rate since the earth was formed, and is a tremendous factor in creating the earth as we know it today. Except for some cases of shoreline and stream channel erosion, natural erosion occurs at a very slow and uniform rate and remains a vital factor in maintaining environmental balance.

Water-generated erosion is unquestionably the most severe type of erosion, particularly in construction areas. It is, therefore, the main problem addressed in this chapter. It is helpful to think of the erosive action of water as the effects of the energy developed by rain as it falls, or as the energy derived from its motion as it runs off the land surface. The force of falling raindrops is applied vertically, and force of flowing water is applied horizontally. Although the direction of the forces created is different, they both perform work in detaching and moving soil particles.

Water-generated erosion can be broken down into the following types:

Raindrop erosion is the first effect of a rainstorm on the soil. Raindrop impact dislodges soil particles and splashes them into the air. These detached particles are then vulnerable to the next type of erosion.

Sheet erosion is the erosion caused by the shallow flow of water as it runs off the land. These very shallow moving sheets of water are seldom the detaching agent, but the flow transports soil particles which are detached by raindrop impact and splash. The shallow surface flow rarely moves as a uniform sheet for more than a few feet on land surfaces before concentrating in the surface irregularities.

Rill erosion is the erosion which develops as the shallow surface flow begins to concentrate in the low spots and irregular contours of the surface. As the flow changes from the shallow sheet flow to deeper flow in these low areas, the velocity and turbulence of flow increase. The energy of this concentrated flow is able to both detach

and transport soil material. This action begins to cut small channels of its own. Rills are small but well- defined channels which are, at most, only a few inches in depth. They are easily obliterated by harrowing or other surface treatments.

Gully erosion occurs as the flow in rills comes together in larger channels. The major difference between gully and rill erosion is the order of magnitude. Gullies are too large to be repaired with conventional tillage equipment and usually require heavy equipment and special techniques for stabilization.

Channel erosion occurs as the flow cases movement of the stream bed and bank materials. Wind can have similar erosive effects as water and should be considered in the design and construction phases.

FDM 10-1-10 Basic Principles of Erosion and Sediment Control

January 24, 1997

An effective erosion and sediment control plan originates in the project planning stage. When conscientiously and expeditiously applied, these planned measures should result in a project that facilitates construction without environmental degradation.

In general, the following basic principles apply to all projects:

1. Plan the highway project to fit the particular topography, soils, drainage patterns and natural vegetation as much as practicable. Designers should take special precautions in areas with steep slopes and highly erosive soils. When possible, these areas should be avoided.
2. Minimize the extent and duration of erodible surface area. The contract should require that the work be performed in a manner which will cause minimum soil disturbance. When working near sensitive areas, the designer should consider including, in the contract, a limitation on the amount of erodible surface area which may be exposed at any one time during construction of the project. In addition, because projects may need to be "buttoned up" over the winter, the designer should provide adequate quantities and special provisions to prevent erosion through the spring thaw.

   Grading should be completed as soon as possible after it has begun and the phases or stages of construction should be planned to minimize this exposure. Once completed, permanent vegetative cover should be established in the area. As cut slopes are made and fill slopes are brought up to finished grade, areas should be revegetated as the work progresses.

   If it is not possible to bring the area to final grade within a reasonable period of time as determined by the engineer, the use of temporary devices such as temporary seed should be considered. In any event, the contractor should not be allowed to delay in bringing the grading to final stages.
3. Utilize erosion and sediment control practices to prevent erosion and protect sensitive areas. This third principle involves using temporary and permanent best management practices. These practices should be judiciously planned and implemented so as to prevent sediment from entering environmental and customer sensitive areas. Practices include utilizing:
   - Flat side slopes rounded and blended to the natural terrain with adequate right-of-way or temporary easements for construction equipment to perform the work;
   - Drainage channels that are designed with due regard to width, depth, gradient, side slopes, alignment, energy dissipation, and protection treatment;
   - Protective ground covers such as vegetation, mulch, erosion mat or riprap to help prevent erosion from occurring;
   - Diversion measures such as dikes and intercepting embankments to help divert sheet flow away from disturbed areas;
   - Slope drains or flumes for channeling runoff to appropriate locations;
   - Sediment control devices such as traps, basins, stone or rock ditch checks, erosion bales or silt fence (not to be used in channels) to help filter out sediment;
   - Located and spaced facilities for ground water interception;
   - Special grading methods such as roughening a slope on the contour or tracking with a cleated dozer to reduce runoff velocities and allow sediments to settle out;
   - Available technical assistance.
4. Apply perimeter control practices, as needed, to protect the disturbed area from off-site runoff and prevent sediment from leaving the construction site. This principle relates to using practices that effectively isolate the construction site from surrounding properties in order to prevent sediment damage. Generally, sediment can be retained by two methods: (1) filtering runoff as it flows through an area, and, (2) impounding the sediment-laden runoff for a period of time so that the soil particles settle

out.

5. Keep runoff velocities low. The removal of existing vegetative cover and the resulting increase in impermeable surface area during construction will increase both the volume and velocity of runoff. These increases must be taken into account when providing for erosion control. Keeping slope lengths short and gradients low, and preserving natural vegetative cover can limit erosion hazards. Runoff from the construction site should be safely conveyed to a stable outlet using storm or slope drains, diversions, stable channels or similar measures. Conveyance systems should be designed to withstand the velocities of projected peak discharges and should be operational as soon as practicable.
6. Stabilize disturbed areas as soon as possible after final grade has been attained. Permanent structures, temporary or permanent vegetation, mulch, stabilizing emulsions, or a combination of these measures, should be employed as quickly as possible after the land is disturbed. If a delay is anticipated in obtaining the finished grade, temporary measures should be implemented immediately after rough grading is completed.
7. Establish and implement a thorough maintenance and follow-up program. This last principle is vital to the success of the six other principles. A site cannot be effectively controlled without thorough, periodic checks of the erosion and sediment control practices. The practices must be maintained just as construction equipment must be maintained, and material checked and inventoried. It is recommended that a routine "end of the day check" be made to ensure that all control devices and measures are functioning properly. Designers should schedule a time to meet with the construction project engineer in the field to evaluate and obtain feedback.

In general, limiting the time of exposure and judiciously selecting control practices will help minimize erosion and sediment loss.