Maintenance for Storm Water Guide

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Quick Reference

1 foot (1') = 12 inches (12") 1 mile = 5280 feet 1 square yard = 9 square feet 1 cubic yard = 27 cubic feet 1 acre = 43560 square feet

Erosion = Wearing away of soil or rocks **Sediment** = Soil particles suspended in water **BMP** = Best Management Practice **BWSR** = Board of Water and Soil Resources **DNR** = Department of Natural Resources **EPA** = Environmental Protection Agency **MPCA** = Minnesota Pollution Control Agency **MS4** = Municipal Separate Storm Sewer System **NPDES** = National Pollutant Discharge Elimination System **NTU** = Nephelometric

Turbidity Unit, an index measure of water quality
RECP = Rolled Erosion Control Product, like a blanket **SWPPP** = Storm Water Pollution Prevention Plan (Construction Stormwater Permit)

or

Storm Water Pollution Prevention Program (MS4 permit)
TMDL = Total Maximum Daily Load, a measure of pollution **TRM** = Turf Reinforcement Mat

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Erosion and Sediment Control
Certification Program

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1. INTRODUCTION

This pocket guide is intended to give GENERAL guidelines for performing Mn/DOT maintenance activities while protecting the quality of Minnesota's water resources. Protecting water quality is everyone's responsibility. We are all stewards of the state, working to protect and improve Minnesota's rivers, lakes, wetlands and ground water to support healthy aquatic life for our generation and generations to come.

Soil erosion and sediment are significant causes of water pollution. Erosion and storm runoff can be a serious problem along roadsides and in ditches. In addition to losing valuable soil resources, erosion and sediment can result in an unhealthy environment for vegetation and aquatic life.

The objectives and arrangement of this manual are as follows:

Section Objective
1 Summarize the rules and regulations governing Mn/DOT maintenance activities;
2 Provide basic guidelines for maintenance activities, which address erosion and sediment control and water quality;
3 Provide familiarity with basic tools and practices for protecting water quality;
4 - 6.0 Provide a network of maintenance contacts and references.

Before you begin maintenance activities, complete the following practices to help best preserve the environment:

 Check to see if you need a permit to perform maintenance work; Review as-built drawings or Plan sheets if possible.

Review Operations and Maintenance manuals or other appropriate manuals and regulations.

If you have any doubts about your duties go over them with your

supervisor

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2. PERMITS

2.1 Introduction

There are a number of maintenance activities that could require obtaining a permit. Environmental permits that may be required include the National Pollution Discharge Elimination (NPDES) Construction Storm Water Permit, a Department of Natural Resources (DNR) General Public Waters Work Permit or a United States Army Corps of Engineers (USACE) Section 10 Permit.

As of 2006, certain urbanized areas within the Minnesota Department of Transportation have obtained a Municipal Separate Storm Sewer (MS4) Permit to discharge storm water. The MS4 permit requires Mn/DOT to develop and implement a **S**torm **W**ater **P**ollution **P**revention **P**rogram (**SWPP**-**P**rogram).

The SWPP-Program includes requirements on properly maintaining storm

water control infrastructure and taking actions to minimize storm water pollution while performing maintenance activities. The goal of the MS4 Permit is to ensure water quality and restore and maintain the integrity of waters of the state through management and treatment of storm water runoff.

The NPDES regulations are driven by federal water quality protection laws. The quality of life in Minnesota is linked to the quality of water. When water quality suffers our quality of life suffers, whether we are dealing with federally protected species, such as the Topeka Shiner which is integral to maintaining game fishing, or just having a drink of water.

The MPCA Construction Stormwater General Permit (MNR100001) is another possible permit needed for maintenance activity. Five or more acres of land disturbing maintenance activity will need this permit. For example, cleanout of all vegetation from an 8 foot wide ditch for over 1 mile will result in about 5 acres of disturbance (or a half mile if cleaning ditches on both sides of the road). Additional conditions can also trigger this permit. For example, if ditch maintenance activities result in excavation beyond the originally designed ditch bottom, and more than one acre of land is disturbed, this maintenance activity will be subject to this permit.

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Pollutants, such as sediment or oil, can reach the lakes and rivers of Minnesota through storm sewer pipes. For this reason, storm water pollution regulations restrict pollutants from entering ditches, pipes, and gutters, in addition to lakes and rivers.

2.2 Permitting Agencies Department of Natural

Resources (DNR)
Any project or work affecting “public or private water.” Reference: Minnesota Statutes, Chapter 105
(651) 296-6157 or (888) 646-6367

Watershed Districts
“regulate improvements of the beds, banks, and shores of lakes, streams, and other water resources for preservation and beneficial use.” Reference: Minnesota Statutes, chapter 112. For your watershed district, contact Minnesota Association of Watershed Districts (651) 452-8506

U.S. Army Corps of Engineers (USACE)
Section 10 permits: “for all work in, over or under navigable waters of the United States.” (651) 2905200.

Minnesota Pollution Control Agency (MPCA)
A National Pollutant Discharge Elimination System (NPDES) Permit and Storm Water Pollution Prevention Plan (SWPPP) are necessary for construction or maintenance projects that disturb more than 1 acre of land or create more than 1 acre of new impervious surface.
(651) 296-6300 or (800) 657-3864

Contact Person and References
MS4 Outstate Program Coordinator
(651) 366-3604

When doing work on or around bridges or culverts that cross watercourses, a DNR Public Waters permit may be required.

Any disturbance of a wetland, lake,  or river (fill, excavation, crossing) or grading adjacent or upstream of these may require a Section 404 permit. The USACE generally covers all water and wetland areas, including those subject to the Wetland Conservation Act (WCA).

The NPDES Construction Storm Water Permit states that routine maintenance that is performed to maintain the original line and grade, hydraulic capacity or original purpose of the facility does not require a permit if under 5 acres of disturbance. Check with supervisors, the MPCA, or the MN/DOT Office of Environmental Services on permit needs.

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3. MAINTENANCE ACTIVITY PROCEDURES

The procedures for maintenance activities are outlined in the MN/DOT Maintenance Handbook. The following section provides some additional information on how maintenance activities can be performed while better protecting the waters of Minnesota.

The potential for damage to Minnesota's water resources increases the closer our activities are to the resource. Activities such as riprap maintenance and shoreline maintenance that occur in waters need to be well maintained, and the work we perform needs to be done in a manner to not cause distress.

Maintenance activities on storm water treatment structures, like ponds, should always begin with consulting the operations and maintenance plans for the specific structure and as-built records. New storm water treatment technology, such as infiltration and bioinfiltration systems, will have specific O&M requirements.

Some of these procedures will require the tools listed in the next section.

The amount of pollution prevention needed for an activity will depend on the storm water risk. A lengthy activity requiring work in a water resource during a wet period of the year will require more pollution prevention effort than a 1-day activity scheduled for the driest time of the year.

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3.1 Vegetation Maintenance Procedures

Where applicable, Mn/DOT has established a healthy herbaceous vegetative cover on its roadsides to protect against erosion. Plants decrease the amount of rainfall that directly falls on the ground surface by intercepting and holding water on their leaves and stems. If an area is lacking required vegetation, see section 4.2.2.

3.1.1 Mowing

Key Points:

- Grass clippings are high in nitrogen and provide a natural fertilizer when left on areas mowed. These same clippings can cause water quality problems if placed into lakes and streams. Clippings should be directed away from surface waters and kept away from curb and gutters, catch basins, storm water pipes, and ditch bottoms.

- Communicate with other maintenance staff to avoid mowing areas soon after or just before spraying.

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Special caution should be given to mowing in areas around wetlands and ponds, where native or special vegetation may exist. Check with supervisors or the District Hydraulic Engineer for unique mowing details.

For more information on Mn/DOT's mowing policy, see the Mn/DOT Maintenance Manual.

Think ***Safety*** when trimming trees, mowing, and applying herbicides!

3.1.2 Herbicide Application

One method of vegetation control is the use of herbicides to eliminate unwanted vegetation.

Do not spray next to surface waters or wetlands unless by licensed operator

Consider an aquatic herbicide (2-4D, Rodeo, pre-emergent)

Mn/DOT is required by law to control noxious weeds within its right of

way (MN Statute 160.23)

Chemicals can damage water resources. Know the application rate for each herbicide prior to spraying and prevent overspraying.

Do not spray in windy conditions.

Do not spray prior to a rain event. Applications prior to rain can result in flushing chemicals into unwanted areas causing environmental damage.

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3.1.3 Bioengineering Applications

Bioengineering uses vegetation as a structural component of a design. The vegetation may provide soil reinforcement through root structure or provide benefit by moisture or pollutant uptake. Maintenance activity occurring for bioengineered projects should consult as-build records and O&M manuals before starting.

 For additional information consult the *Minnesota Soil Bioengineering Handbook* produced by Mn/DOT.

3.2 Pond Maintenance Procedures

Storm water ponds remove pollutants transported by rain events through settling and biological uptake. To function properly, storm water ponds need to have volume to hold water and wetland plants along the pond edges and shallow areas.

Storm water ponds often have an inlet structure, forebay, permanent pool with possible liner, an outlet structure, an emergency spillway, and an access road. A specific operations and maintenance plan should be available for storm water ponds. Check for the plan before inspections or maintenance.

A good pond has: 3 a sound embankment 3 functional overflow structures clear of debris 3 well established vegetation

A poor pond condition will show: 3 overtopping 3 noxious weeds 3 missing vegetation 3 damaged embankment Maintenance plans will typically include the following items.

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Monthly Inspection: Permanent pool checked for weeds, floating debris, visible pollution, shoreline erosion

 Sediment forebays capacity noted, cleanout needed when 50% full

Dry areas checked for adequate vegetation, weeds, undesirable trees, trash or debris, low flow bypass area is not obstructed

Graffiti, vandalism, or other public hazards

Annual Inspections (and after storms larger than 10-year events):

 Embankment and emergency spillway checked for vegetation cover, erosion, ani-

Stormwater pond with excess sediment

mal burrows, unauthorized planting, embankment distress, drains clear and functioning, slope protection, riprap damage, spillway clear of obstructions, all embankments are at the “as-built” levels and free of leaks or seeps.

The Riser or principal spillway are checked for obstructions, corrosion, sediment accumulation, cracks, spalling, joint failures / water tightness, control valve operation exercised and locked, pond drain valve operation exercised and locked, and outfall channels functioning.

Outfalls should be checked for riprap failure, erosion on the slopes, pipe conditions, condition of endwalls and headwalls.

Wetland vegetation should be checked for cover and health, if desired species are surviving, evidence of invasive species, if harvesting of emerging

plantings is needed, has sediment level buried or distressed plants, is the wetland becoming eutrophic (algae or green scum covering the water).

If the inspection suggests maintenance is needed, consult the tools in other sections of this reference for:

Permits Section 2.0 Vegetation establishment Section 4.2.2 Shoreline erosion Section 3.5 Sediment removal Section 4.6.2 Riprap repair Section 4.2.6 Repairs to culverts or structures Section 3.4

3.3 Ditch Maintenance Procedures

Ditches provide drainage along roadways. In addition, these features remove pollutants from runoff before reaching lakes and streams. Pollutant removal may occur by infiltration, filtering by vegetation, or other mechanisms. Some ditches are specifically designed to take advantage of storm water treatment technologies. As-built records and O&M manuals should be consulted before maintenance activities begin.

Ditch maintenance procedures may follow the following steps to better protect waters.

1. Inspect the site and check the as-builts. Common biannual ditch maintenance activities should include:

 Check and maintain to the designed line, grade, depth and cross section. Non-standard ditches could be modified for safety when practical.

 Vegetation in ditches prevents erosion and aids storm water treatment. Vegetation should be removed only when large sediment accumulation or blocked flow occurs.

 Check for erosion. Erosion problems can be mitigated by lining the ditch with energy dissipation products like riprap, but such lining will require additional inspections and repairs.

 Check for litter and trash.

2. Determine if vegetation management will ad
equately return the functionality of the ditch. If so,
see section 4.2 for vegetation management.

 When using chemicals, such as herbicides, for ditch maintenance, be mindful of surrounding resources and contamination.

3. If sediment needs to be excavated

Step A. Survey or measure the ditch bottom and adjacent culverts to determine where sediment has accumulated.

 Diversion ditches are often overlooked. Diversion features may be located at the top of cut slopes to reduce erosion, or may be located within larger ditches for flow controls. These features need to be maintained to sustain their function. Consult as-build records and O&M plans for specific guidance.

 When excavating excess material from a ditch, return the ditch to the original design depth and location. Over-excavation and undercutting can result in slope failure, road failure, and ditch head cutting. Reestablishing the original ditch shape may require the use of survey equipment.

 If over five acres of disturbance occurs, you will be required to get a NPDES construction storm water permit. If 0.25 miles of distance separates the disturbance it could be considered a separate project.

Step B. Establish temporary sediment controls down stream. Tools from section 4.3.2, 4.3.3, and 4.5 may be helpful.

Step C. Excavate and dispose of the sediment. Section 4.6 has more information on this. Remember that maintaining vegetation (section 4.2.1) is easier than reestablishing cover.

 Excavated material generated from ditch maintenance must be disposed of properly. When possible, use the material for other maintenance activities. Material should not be disposed of in a manner that will obstruct existing drainages, cause erosion or sedimentation problems.

 Dirt and debris must be removed from roadway surfaces in a timely manner. This may require the use of street sweeping equipment.

Step D. Establish cover over the exposed soil. See section 4.2 for helpful tools.

Step E. Remove the temporary sediment controls placed in step B.

 Occasionally a water diversion (section 4.4) is helpful during ditch maintenance activity.

3.4 Culvert Maintenance Procedures

Culverts and pipes act as artificial channels to convey drainage. Culvert maintenance procedures may follow the following steps to better protect waters.

1. Inspect the site and check as-built record information. The inspection information may be needed for inventory records, so consult your

supervisor.

Culverts and pipes should be inspected twice a year. Repair and replace these structures to prevent additional damage to roads and the environment.

2 Determine if a cleanout will restore the function of the structure or if more significant repairs are needed.

If sediment or debris obstructs more than 50% of the structure, maintenance should occur to restore the device to the original capacity. Check as-built records and O&M plans for structures built with natural bottoms for fish habitat, and remove only material that is detrimental to the designed function.

Check for washouts and scour around culvert ends. Repair scoured ends with riprap as described in section 4.2.6

Check culvert ends for excessive vegetation or blockage. Vegetation can be removed using mechanical cutting, burning, or herbicides, depending on the structure and surrounding resource.

Grit chambers, sediment traps or sumps should be inspected for capacity. These are manholes built deeper than their outlet pipe or traps used to settle out coarse sediment. If the device is more than 50% full it should be cleaned. The O&M manual should be consulted and maintenance may require the use of vacuum equipment.

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3. For culvert cleanout

Step A. Establish temporary sediment controls down stream from the culvert using tools from section 4.3, 4.5, and maybe section 4.8.1.

Step B. Remove sediment using mechanical, vacuum, or hydraulic methods. Section 4.6 and 4.7 provide more information on sediment excavation and disposal.

Step C. Occasionally you will have to consider water diversions and dewatering discharge tools in section 4.4 and 4.4.3.

Step D. Establish cover over any disturbed ground using tools in section 4.2.

Step E. Remove temporary sediment controls from Step A.

4. If repairs are needed to the structure, consult with the district engineer. Some information on riprap repair is provided in section 4.2.6. Culvert renewal may be an option if full culvert replacement is not possible.

> Culvert renewal involves placing a new liner into an existing culvert. Relining and joint repair should be considered as inexpensive, time saving, and minimally disruptive alternatives to removal and replacement of deteriorated culverts.

3.5 Shoreline and Riverbanks

Roadways adjacent to water resources are subject to damage from high water and wave action. In addition to increased road damage, maintenance activity has a greater potential for damage to the water resources in close proximity. Inspection of shoreline should occur once a year and after each large storm or flood event.

Shoreline and riverbank maintenance procedures may follow the following steps to better protect waters.

1. Inspect the site and check as-built records.

 Check for scour, undermining and erosion after large storm and flood events.

Inspect protection structures, such as riprap, stream barbs, retaining walls, and vegetation.

2. Confirm which permits, if any, are needed for maintenance or repair work. See section 2.0 and consult with governmental and Mn/DOT contacts.

> Activity along water resources may require permits from the US Army Corps of Engineers, the Minnesota Department of Natural Resources, the Board of Water and Soil Resources, Watershed Districts, or management organizations. Check regulations before beginning any activity.

Even vegetation removal may require a permit along some water resources. 3. If maintenance is needed:

Step A. Establish temporary sediment controls down stream from the activity. This may include tools from section 4.5 and 4.8.3.

Step B. Perform the maintenance activity. Additional information on vegetation is in section 3.1 and riprap is in section 4.2.6. **Step C**. Establish cover over any exposed soil. Faster establishment of cover reduces the risk of water pollution. Section 4.2 has tools for establishing cover.

Step D. Remove temporary controls from Step A.

3.5.1 Flooding (Emergency Work Procedures)

Safety should be considered first in all circumstances. Natural events, such as storms and floods, can compromise structures and be a safety hazard. Maintenance activity done as an emergency response to public safety should consider water resource pollution prevention where practical.

Frequent inspections should occur in areas with a high flooding potential. Consideration should be given to placing erosion protection on embankments.

Riprap armoring is needed on the “dry” side of a road along a flooding river. If the river overlaps the road, the water running down the dry side typically causes embankment failure.

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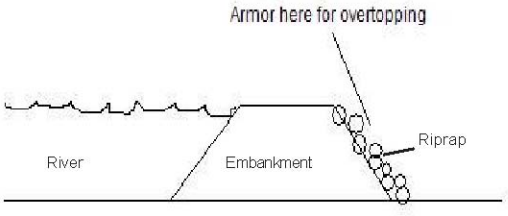

Emergency erosion protection for flooding

Planning for an emergency is of critical importance. In an emergency the selection and availability of materials may be limited. Having stockpiles on hand before the emergency is helpful. Placing poor or contaminated material into water resources will make clean up more difficult after the emergency.

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4. TOOLBOX

4.1 Introduction

The following section contains the individual products and practices helpful for protecting the waters of Minnesota while performing maintenance activities. These are general procedures and the information shown here will need to be customized to meet your specific needs.

The basic procedures for keeping water clean include:

Establish cover over soil (4.2)
Slow water running over your site (4.3)
Divert Water away from your site (4.4)
Filter water running off your site (4.5)
Excavation/ sediment removal (4.6)
Disposal of materials (4.7)
Specialty tools (4.8)

4.2 Establishing Cover

A big part of preventing pollution from entering our waters can be done by providing cover over exposed soils. The following is a list of options for providing cover, starting with vegetation, then using mulch to secure soil for

vegetation to grow, then using straw blanket if the mulch won't hold, and finally using rock.

4.2.1 Maintaining Vegetation and Topsoil

The fundamental way to keep cover over exposed soils is to reduce the amount of disturbance to the existing vegetation. Keeping the existing vegetation reduces the costs for establishing new vegetation as well.

If vegetation has to be disturbed, stage the disturbance so open areas are stabilized before removing more vegetation.

Placing organic topsoil over sands, silts, and clays will greatly reduce erosion. Organic topsoil will absorb more water than sands and clays and help to stabilize sites. Wind erosion can cause topsoil and seed loss. Wind breaks of brush, silt fence (section 4.5.1), or snow fence can reduce wind erosion. Protection for a distance of 8 to 10 times the break height is common, so multiple breaks may be needed.

4.2.2 Reestablishing Vegetation

Seeding is a cost effective way to establish cover over exposed soil. Occasionally, seed is naturally located in salvaged topsoil and you may not need to add additional seed.

Step 1. Seed Selection
There are many different seed mixes listed in Mn/ DOT's Standard Specifications for Construction. The varieties of seed mixes are due to the different conditions and various applications found on Mn/DOT roadsides. Mn/DOT seed mixes numbered in the 100s are for temporary stabilization and most likely not used during maintenance work. The 200 seed mixes are non-native general roadside seed mixes for slopes and ditches and the 300 seed mixes are native general roadside seed mixes used for slopes and ditches where a native habitat is desired. For specific information on seed mixes for your area see the Mn/DOT Seeding Manual and district seeding recommendations at http://www.dot.state.mn.us/environmental/erosioncontrol/seedmixes.html

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No.250 Mn/DOT Seed Mix

Use: Non-native General Road Side Grass; for general cover, slopes, and ditches. Preferable soils types: All soil types Application Rate: 70 lbs/acre Preferable planting times: April 1-June 1 or July 20Sept 20

Step 2. Soil Preparation
Seed or sod should not be placed without adequate soil preparation, including shaping, topsoil placement, soil amendments, and tillage.

Loosen soil Immediately prior to sowing the seed:

3 Loosen the soil to a minimum of 3" on all soils using disks, harrows, field diggers or other cultivating equipment.

3 Slopes steeper than 1:2 typically do not require additional tillage.

3 Areas that are substantially compacted should be ripped to a minimum depth of 24".

Fertilizer

3 Fertilizer enhances germination and plant establishment in soils that are deficient in vital nutrients.

3 A soil memo is written by the MNDOT office of Environmental Services each year with specific fertilizer recommendations for each district. Consult the current soil memo for fertilizer type and application rate.

As a rule of thumb and to be in compliance with Minnesota law, use phosphorous free fertilizer.

Soil should be tilled at least once within 24 hours of applying the fertilizer to ensure incorporation into the soil.

Seeding should take place within 48 hours of applying the fertilizer.

Step 3. Seed Placement
Methods available for seed placement are:

Hand or Broadcast Seeding

Consists of casting the seed by hand or equipment

Preferred on sandy soils because the drill generally sinks into the soil, planting the seed too deep.

Can be done a number of different ways: hydroseeder, mechanical cyclone seeder, or by hand.

Must look for even distribution of seed.

After seeding, the site is raked or harrowed and then firmed with a cultipacker to ensure seed-to-soil contact.

Hydroseeder

Seed spread using a water sprayer

Drill Seeder

Consists of a seed hopper and spring loaded disks to aid in loosening soil

Preferred on heavier soils such as loams and clays.

Interseeder

Consists of placing seed with an implement that does not disturb existing vegetation Used to seed into temporary mulched areas or to drill additional seed into previously seeded areas.

Dormant Seeding

Dormant seeding is done on exposed cold soils so that normal seed germination does not occur until the following spring. This occurs after October 20 and when soil temperatures at a depth of 1" are at or below 40 degrees.

Snow Seeding

Snow seeding is done over the top of snow so that the seed melts through the snow and germinates upon warm up in the spring.

Step 4. Mulch Placement after Seeding
Section 4.2.3 has more information on mulch.

 On all seeded areas within 10’ of the shoulder, use a continuous operation to seed and immediately firm the seedbed, mulch and anchor the mulch.

 All seeded areas outside of 10’ of the shoulder must have mulch within 24 hours of seeding.

Contacts and References

 Mn/DOT Office of Environmental Services
(651) 366-3603

Mn/DOT Standard Specifications for Construction, 2005 edition. Section 2575

4.2.3 Mulch

Mulch is placed on seeded land to provide protection while the seed begins to grow. Temporary mulch can also be placed on slopes to provide temporary protection from rain. This may happen due to weather conditions, necessary consolidation time, focusing on another portion of the work, or in a poor season for planting. Mulch can often be incorporated into the soil as the work progresses and as seeding occurs.

There are several types of mulch available. See current Standard Specifications for Construction for more information. Mulch commonly used for maintenance activity includes:

Straw Mulch
Grain straw, hay, or cuttings of agricultural grasses and legumes (Type 3 mulch).

The mulch will need to be tacked or pressed into the soil for it to stay in place. If this cannot be done, use another mulch type or blanket.

If disk anchoring will be used, the soil should first be loosened before applying the mulch.

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Apply at approximately 2 tons/acre such that 90% of the ground is covered.

Straw Mulch Secured with Hydromulch
Straw cutting mulch over-sprayed with Hydraulic soil stabilizer (also called a Type 4 mulch)

Apply straw mulch at 1.5 tons/acre and immediately over-spray with (Type 5) Hydraulic Soil Stabilizer at 750 lbs/acre.

Wood Chips

Wood chips from onsite materials (also called Type

Raw wood material from hard or soft timber harvested during clearing and grubbing operations on the project.

Wood is chipped or ground such that it has a long shredded appearance.

4.2.4 Hydraulic Soil Stabilizers or Hydromulch

Hydraulic soil stabilizers (HSS) are hydraulically-applied tackifiers (glues) or mulch material (like shredded paper) with a tackifier. HSS are typically used on areas with limited access or steep slopes. HSS can be used as a temporary application with or without seed, such as on stockpiles needing mulch.

Wood ch
5 mulch)

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HSS should never be used in an area with concentrated flow.

4.2.5 Erosion Control Blankets

Erosion control blankets protect soils from concentrated flows that occur in ditch bottoms or slopes. Blankets are also used where mulch would be ineffective or is too difficult to place. These areas include slopes steeper than 1:3, areas where the mulch would blow away such as the inslope, concentrated flow areas such as ditch bottoms, and narrow areas where a tractor could not maneuver. The most common uses are:

- the last 200' of a ditch bottom that drains to a surface water;
- bridge end slopes that need time to consolidate;
- and corners of ponds receiving concentrated flow.

Blanket Types

There are 9 categories of blanket for different site conditions. The common blankets for maintenance are listed below.

Category 0:
There is no netting in this blanket, only stitching that is rapidly degradable. These are commonly used on flat areas to be mowed.

Category 1:
Commonly used for flat areas and shoulder drains.

Category 3:
The netting is on both the top and bottom of the blanket and will last approximately 1 growing season before losing its integrity. These are used primarily on moderate slopes and in ditch bottoms less than 3%.

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A blanket that has rapid degradable netting and stitching should be used in areas where mowing will take place

Blankets should be secured with a U-shaped stable or biodegradable hook as appropriate.

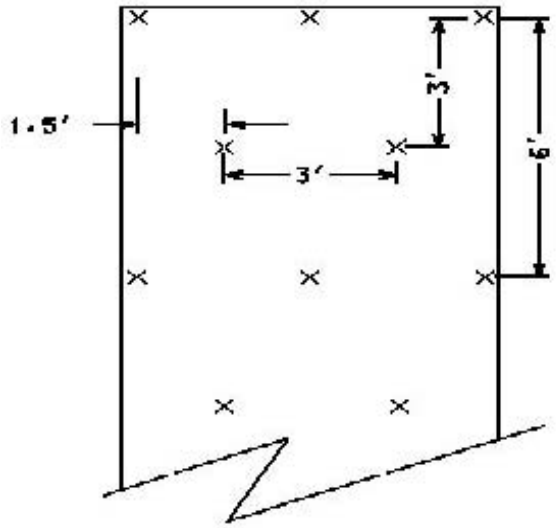
Installation Adequate stapling is the biggest factor in determining if a blanket will be successful or if it will fail.

Before laying the blanket, the soil should be shaped and prepared to allow the blanket to lie flush to the soil.

More staples are needed on steeper slopes and in ditch bottoms.

The blanket must have the upgrade end buried and stapled into a check slot. The check slot helps to keep water on top of the blanket rather than undermining the blanket immediately.

When a blanket is used along traffic, the entire edge length adjacent to the traffic must be buried into a check slot.

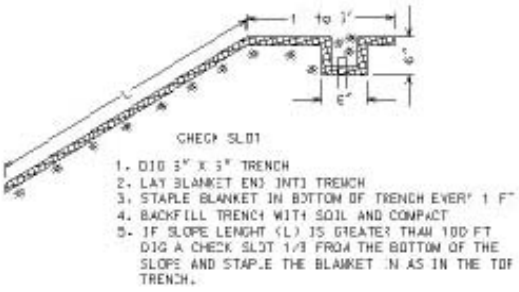


A check slot is a trench dug 6" deep by 6" wide. The blanket is placed into the trench and stapled every 1’ on the bottom of the trench.

Blankets should be laid parallel to the direction of water flow.

Adjacent strip edges need to overlap a minimum of 4".

Strip ends need to overlap a minimum of 7" with the upgrade end on top of the downgrade end and stapled every 1.5’.



4.2.6 Riprap

Riprap is rock used to armor soil in areas of high water flow, such as at the end of a culvert or ditches flowing at more than 5 ft/sec.

Key points to successful riprap:

3 Proper size rock
3 Proper filter or bedding
3 Good placement

Size
The riprap should be maintained using similar materials to those identified in the as-built records. Riprap sizes are grouped into classes. (See Specification 3601 for the gradation requirements of each class.)

The table below shows the average rock size for each class. Good riprap has both large and small rocks fitted together into an armor blanket.

General Riprap Description

Class	Avg. Rock Size (d50)
II	6”
III	9”
IV	12”
V	15”

Filter and Bedding
Riprap is not effective without a proper filter. Maintenance and restoration of the geotextile filter fabric or graded sand filter may also be required.

Granular sand filters are often as thick as the average riprap rock size.

Placement
Riprap at the end of culverts should be maintained so that water flows into a pool. Rock should not be placed too high, or above the lowest part or invert of the pipe.

Riprap placed as a ditch liner needs to be keyed in, or matched in with the ground line. If the rock is too high or too low compared to the surrounding soil, water will erode the soil along side of the rock/soil transition and slumping of the slope will occur.

Riprap placed along a shoreline should also be keyed in, or placed lower than the lake bottom so water and ice cannot get under the rock and lift it out of place.

4.3 Slow Water Down

When water moves slower, it cannot carry as much soil and pollutants. The slower the water is moving, the less pollution is leaving your activity.

4.3.1 Grading practices

Slope Roughening
Slope roughening is achieved by creating small speed bumps for water using equipment cleats or teeth. These also help mulch and seed stay in place better when it rains.

Berms and Benches
When working on large slopes or open ground, use temporary berms or benches to slow water down. Sand bags can be used as well.

A 89

4.3.2 Check Dams

Small check dams can be created a number of ways. These are often used in ditches, and are also called ditch checks. Ditch checks can be constructed using any available materials, such as rock, wood, or soil. The effectiveness of a ditch check is related to the ditch gradient, expected flow velocity and soil type. If the ditch check you are using is not working, you may need to use a stronger ditch check.

All ditch checks must be placed so that the bottom of the outer edges are a minimum of 6" higher than the top of the center of the ditch check. This will force water over the center of the check, rather than around the edges.

All ditch checks must be removed at the end of the project.

Soil
A very quick check dam can be constructed out of material on site. Any soil will work for very light rain or slow flows. Sand bags can be used as well.

A 90

Brush Dams
If you have small trees or brush material available, this can be placed as a check dam. Lighter material may need to be secured in place by partial burial or using stakes driven in downstream of the check dam.

Filter logs
Several commercially available products exist that can be placed as check dams. These can be found in the approved products list under filter logs or type 2 ditch checks in construction specifications.

3 The bioroll filter log is anchored with wood 0.5" x 2" stakes at a maximum spacing of 1'. The stakes should be angled upstream.

3 Filter log ends should be overlapped about 6"

3 A Category 3 blanket can be placed under the bioroll in higher flow conditions. Blankets in the ditch should have 6" - 8" U-staples placed every 1' on center.

Timber Weir
Lumber (such as a 2x10) can often be placed as a temporary weir to slow flow in a ditch or near a structure.

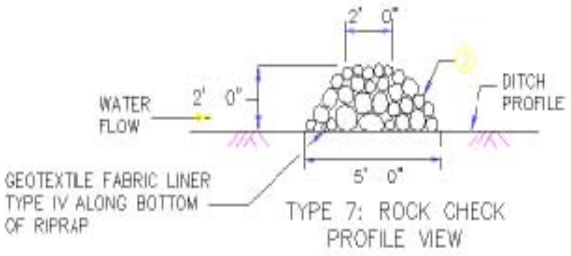
TYPE 2: BIOROLL DITCH CHECK
USE ON ROUGH GRADED AREAS

A 91

Rock
Use class I–IV riprap for construction of rock check dams. (See section 4.2.6)

4.3.3 Sediment Traps

Sediment traps help reduce flow velocities in ditches and capture sediment using gravity. Typical



essary to capture larger amounts of sediment.

Sediment traps are temporary in nature and can be constructed where problem areas develop. In general, traps are two times longer than wider.

4.4 Water Diversions

Occasionally, it is easier to divert the water away from your activity. Grading practices (Section 4.3.1) can incorporate some water diversions using berms and benches. The following items are tools you can also use to divert water.

4.4.1 Plastic Sheeting

A temporary diversion for small flows can sometimes be done using plastic sheeting and sand bags or rocks.

4.4.2 Temporary Down Drains

Temporary down drains are typically used to carry water down a bare slope. Down drains can also be used near bridge abutments where the curb ends.

The pipe may be metal, plastic or flexible rubber.

Water needs to be channeled to the inlet of the pipe. Soil berms, biorolls, and bituminous curbs can be used.

A 93

Provide adequate energy dissipation on the end of the pipe, such as riprap or an attached pipe tee.

4.4.3 Dewatering

Dewatering describes the activity of pumping water from one location to another.

Any dewatering activity that exceeds 10,000 gallons per day or 1 million gallons per year requires a water appropriation permit from the DNR.

Discharges should be directed into a temporary or permanent sediment basin when possible. When it is not possible, other treatment measures must be used so that the discharged water does not create a nuisance in the receiving water.

Treatment measures could include:

- using a flocculant,
- creating filter berms of gravel and silt fence,
- creating a wood chip filter,
- or using dumpsters as temporary basins

This water should not have been released into a surface water.

A 94

4.5 Water Filtering Practices

Water filtering practices provide a safety net when pollution is generated. Two mechanisms commonly remove pollutants from water: filtering, and settling. A filter allows water to pass and holds the pollutants. Settling works by holding the water long enough for gravity to pull pollutants out of the water. A number of the water slowing practices (section 4.3) can also work to settle out pollutants.

4.5.1 Silt Fence

Silt fence is generally used as perimeter control to keep sediment on-site. It can also be used to keep sediment-laden runoff from entering an area you want to protect, such as a newly created wetland. The most common type used in maintenance activity is Heavy Duty silt fence.

 Geotextile fabric embedded in a 6" deep by 4" wide trench with the bottom edge of the geotextile wrapping back up to the soil surface. The trench is backfilled and tamped for compaction.

 Where fabric cannot be embedded, weights (such as rocks or rock logs) can be placed over the bottom 12" of geotextile at grade.

All silt fence must be removed at the end of maintenance activity.

4.5.2 Filter Logs

Filter logs are used for slowing water, and filtering storm water runoff or other water encountered on the project. Because of their flexibility filter logs can be used in numerous ways and in a multitude of locations, i.e. ditch checks, inlet protection and directing or diverting water runoff.

A 95

Straw, Wood Fiber, and Compost logs These are straw, wood fiber, or compost encased in plastic netting Staked into the ground with wood stakes are a minimum 0.5" x 2" nominal by 16" long and placed every 1’ unless precluded by paved surface or rock.

Overlap ends a minimum of 6" and stake.

Rock Log Geotextile bag filled onsite with washed rock

Rock logs are typically used on paved surfaces. The weight of the log is usually sufficient to keep it in place without staking.

4.6 Excavation and Sediment Removal

Whenever we excavate soil or remove existing cover material we are exposing ourselves to water pollution risk. The following items are some practices you can use to reduce your risk.

4.6.1 Smooth-Rough Grading

Smooth-rough grading is done to prepare an area for erosion stabilization. It removes large clods of soil greater than 3" in diameter and ruts deeper than 3". Whenever you have finished working with soil, leave it in a smooth rough graded condition to allow quick stabilization.

4.6.2 Sediment Removal

Sediment removed from ponds and traps should be disposed of according to local and state rules and regulations. (See section 4.7.3)

Sediment control devices, such as ponds, must be cleaned out when 1/2 of the height is full of sediment.

Remember to sweep the streets

4.7 Disposal

The MS4 SWPP-Program requires Mn/DOT practice good housekeeping. Chemical spills or other noxious spills exposed to rainwater or the storm sewer system can leave the workshop area and damage water resources.

4.7.1 Noxious Weeds

Care should be taken when working around areas contaminated with noxious weeds. If seeds or pieces of noxious weeds contaminate sediments, these sediments may need to be kept on site. It there is a need to transport the noxious weeds or dispose of them at another site, you will need to consult local and state regulations.

For more information on herbicides and noxious weed control, consult the Mn/DOT Maintenance Manual.

4.7.2 Road Kill

Animal carcasses should be moved out of ditch bottoms or anywhere water will flow or collect to reduce the impacts on water resources.

For more information on road kill disposal contact Mn/DOT Office of Environmental Services at 651-366-3630.

TIP

Proper perme
fence, concret
structed walls

Soil s
should be mu

4.7.3 Excavated Material

Material excavated during maintenance activities should be disposed in a manner acceptable to the local and state policies. Often excavated material is spread in the area where it was removed. When spreading material, provide cover over the exposed soils until vegetation is established (see section 4.2).

Proper stockpile management makes sense both economically and environmentally. Leaching or washing from sand or salt stockpiles can have negative impacts on nearby water bodies.

Proper perimeter enclosure. Possibly: silt fence, concrete median barriers, or con-

Soil stockpiles at a minimum should be mulched to reduce erosion due to wind and rain. (See Section 4.2)

Contact Person and References

 For questions on Hazardous Waste Disposal contact Mn/DOT Office of Environmental Services at 651-366-3630.

4.8 Specialty Tools

Occasionally, maintenance activity will require the use of some special tools in order to properly protect the environment. This section contains some uncommon items that may be required at times.

4.8.1 Culvert Protection

Culverts that outlet water off of the right-of-way or into surface waters should have sediment control devices installed if the project is generating sediment.

This culvert requires sediment removal.

Sediment control is most effective when placed on the inlet side, so sediment is not trapped in the culvert. Culverts in sediment basins have more sediment control options due to the ability to pond water without causing additional flooding problems. Examples of culvert protection include:

Geotextile fabric wrapped over the inlet

Placing a rock check before the inlet

Placing a temporary weir board against the inlet

4.8.2 Storm Drain Inlet Protection

Storm drain inlets must be protected with sediment capture devices prior to soil disturbing activities that would result in sediment laden storm water runoff entering the inlet. Limiting the amount of sediment entering into a storm sewer will reduce the need to cleanout pipes at the end of the project.

Caution: Inlet protection devices need to be inspected and cleaned out regularly especially if the road is open to traffic. ALL inlet devices should have an emergency overflow feature equivalent in size to the apparent grate opening size. Captured sediment reduces the flow rate of the inlet protection device and can result in flooding conditions. For safety reasons, inspect for

proper drainage during a rain event to ensure the road is safely open to traffic.

Devices can be created in the field or a prefabricated product can be used. Materials that can be considered for use are: rock logs, sand bags, compost logs, sediment control inlet hat, silt fence ring, rock filter berm, rock log combination, pop-up head, and filter bag inserts.

Remove the inlet protection device immediately once all sources with potential for discharging to the inlet have been stabilized.

4.8.3 Floating Silt Curtain

Floating silt curtain can be used in moving water or still water conditions to capture sediment. Sediment captured by the silt curtain should be removed before the curtain is pulled out.

Installation

For still water, locate the curtain as close to the shore as possible.

Anchor silt curtain so that the bottom edge rests on the bottom of the water resource.

Do NOT place silt curtain across a flowing channel in its entirety. This will cause scouring of the channel bottom. If silt curtain is necessary in flowing water to capture upstream disturbance, place the curtains diagonally, alternating from each stream bank, 1/3 of the stream width.

5. REFERENCE LIST

The following references were used in the preparation of this manual.

Mn/DOT Maintenance Manual. October 1, 1996. St. Paul, MN: Minnesota Department of Transportation.

Culvert Renewal: Final report. Dave Johnson and John Zollars. 1992. St. Paul, MN: Minnesota Department of Transportation. TE213.J64

Erosion and Sediment Control Pocketbook Guide. February 2005. University of Minnesota Erosion and Sediment Control Program.

http://www.erosion.umn.edu, July 2007

NCHRP Project 25-25(04) Environmental Stewardship Practices, Procedures, and Policies for Highway Construction and Maintenance. November 2005. Washington D.C.: Center for Environmental Excellence by the American Association of State Highway and Transportation Officials.

http://environment.transportation.org/ environmental_issues/construct_maint_prac/ compendium/manual/

New York State DOT Region 8 Stormwater Facilities Operations and Maintenance Manual, September 2003. Poughkeepsie, NY: New York State Department of Transportation.

www.nysdot.gov/portal/page/portal/divisions/ engineering/environmental-analysis/repository/ nysdot8storm_a.pdf

Washington State DOT Maintenance Manual M51-01. March 2002. Olympia Washington: Washington State Department of Transportation.

http://www.wsdot.wa.gov/fasc/ EngineeringPublications/Manuals/ MaintenanceManual.pdf

6. CONTACT LIST

 When working in the field plans may change and questions can arise. Use the following list of resources to aid in project related decision making.

Gopher State One-Call Phone Number
Call before you dig to locate underground utilities.
(800) 252-1166

State Duty Officer
To Request State Assistance or Report a Petroleum or Hazardous Materials Spill Call 24 Hours a Day In Greater Minnesota Only (800) 422-0798

Twin Cities Metro Area and (651) 649-5451 Outside Minnesota

Work Zone Safety (651) 366-4222

Mn/DOT Environmental Services Unit
Questions on NPDES permit as well as erosion and sediment control questions (651) 366-3603

Section 404 permit questions Nick Tiedeken
(651) 366-3628

Minnesota Department of Natural Resources
Waters Division–Permits (888) 646-6367

U.S. Army Corp of Engineers (651) 290-5200

Minnesota Board of Water and Soil Resources
Comprehensive information about wetland regulations and permits under the Minnesota Wetlands Conservation Act. (651) 296-3767

Natural Resources Conservation Service
(651) 602-7900