IOWA DOT

Erosion & Sediment Control Field Guide

October 2022

The guidance presented in this manual was current as of the printing date. However, it is not intended to modify or replace any contract document requirements.

For updates to field guide, ordering information or electronic version:
https://iowadot.gov/construction_materials/earthwork-and-erosion-control

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Chapter 1: Introduction

Why is It Important to Understand Storm Water Permits and Their Requirements?

The U.S. Environmental Protection Agency (EPA) identifies which activities or facilities require storm water permits. The Iowa Department of Natural Resources (IDNR) has been granted authority to issue National Pollutant Discharge Elimination System (NPDES) general storm water permits in Iowa. The intent of the federal storm water regulations is to improve water quality by reducing or eliminating contaminants in storm water.

Any permit noncompliance may constitute a violation of the Code of Iowa and the Clean Water Act and could be grounds for enforcement action.

Impacts of permit noncompliance also include:

- **Financial Impacts:** Allowing erosion to occur is costly. This cost includes more than the penalties that may be imposed by both the IDNR and EPA. They also include the cost of repair, possible litigation, and expenditure of resources.

Deposits of silt on an access drive made this area impassible. Cost to repair included removing deposited silt and installing new rock.

- **Environmental Impacts:** Erosion causes the loss of fertile topsoil, causes sediment to fill lakes and streams, increases flooding, damages plant and animal habitat, and causes structural damage to buildings and roads. In Iowa, the No. 1 pollutant by volume is sediment. A major source of sediment comes from unprotected construction sites under development.

"Dirty" water such as this can affect plant and animal life downstream by reducing oxygen levels and reducing overall water quality.

FACT

Allowing erosion to occur is expensive.

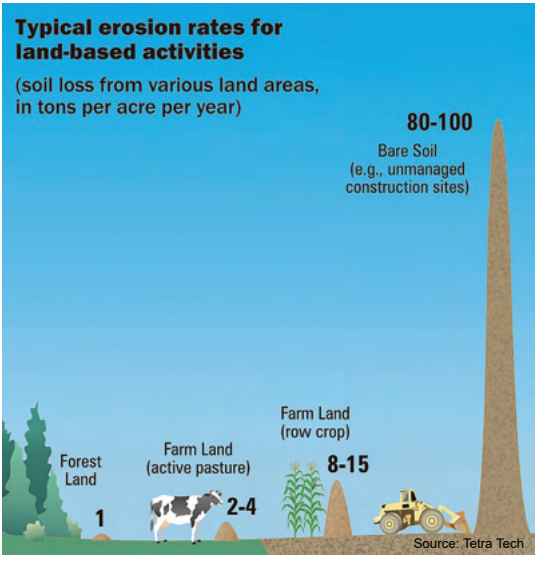
Cause of Erosion and Loss of Sediment

There are two main reasons construction activities increase sediment loads in storm water run-off.

First, vegetation and topsoil are removed, leaving bare sub-soil that is vulnerable to erosion.

Second, construction techniques, including soil compaction, typically increase the amount (volume) and speed (rate) of run-off allowing sediment to be quickly carried away from work areas to ditches or storm drains and eventually into area streams. Most construction sites focus on attempting to capture sediment. As you will learn, this is not the most effective means to prevent sediment from leaving the site.

Bare and compacted soil is very susceptible to erosion.



Soil loss from unmanaged construction sites is approximately ten times that of crop farm land.

Typical sediment rates leaving construction sites without erosion and sediment control practices vary from 80 to 100 tons per acre per year.

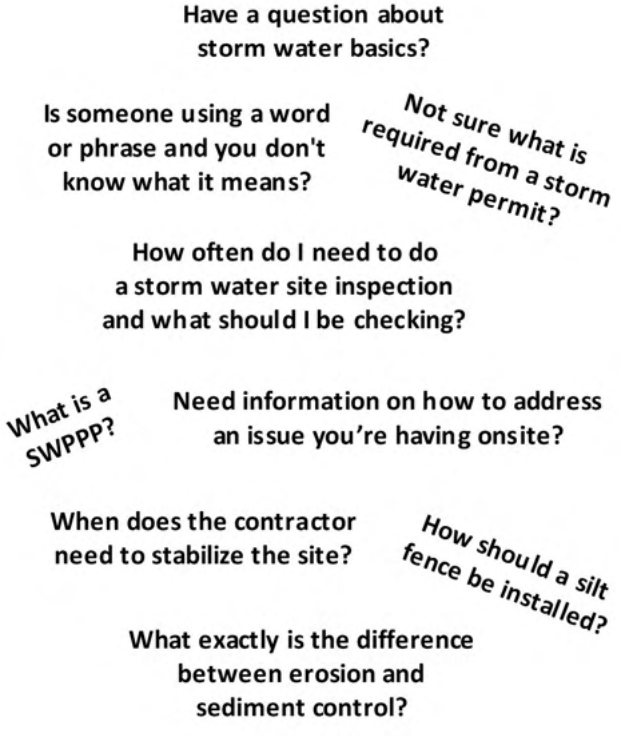
If a site is left unprotected, this sediment will travel off-site and into our waterways.

Beyond risking costly penalties, discharge of sediment into waterways has the potential to cause great harm to the environment.

Purpose of this Guide

Storm water permit compliance is an important issue. The purpose of this book is to help provide some background on the importance of compliance and provide information on how to remain in compliance.

Have you found yourself thinking any of the following?



This book addresses all those questions!

Our goal in creating this manual was to make a sediment and erosion control resource that wouldn't end up getting dusty on a shelf but rather warped and muddy from use onsite.

Chapter 2: Storm Water Permit Requirements and Compliance

Background

In 1972, the National Pollutant Discharge Elimination System (NPDES) permit program was created.

Since 1978, the Iowa Department of Natural Resources (IDNR) has been delegated by the EPA to administer the federal NPDES wastewater discharge permit program in Iowa.

Accordingly, IDNR is responsible for issuing NPDES permits for all storm water discharges subject to the federal permit requirements.

In Iowa, the EPA has authorized the Iowa DNR to issue storm water discharge permits.

TIP

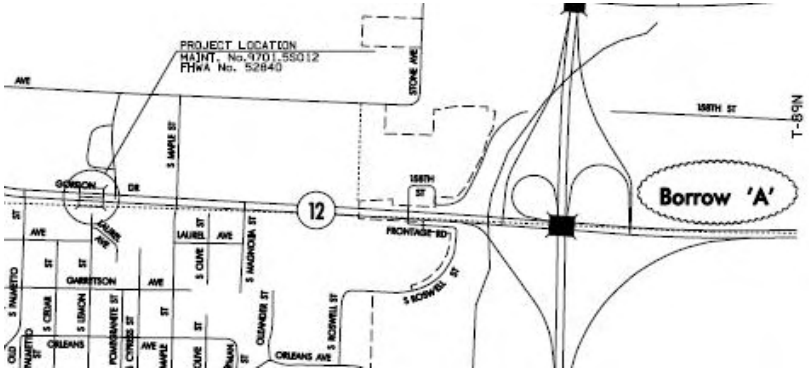
Best Management Practices (BMPs) refer to any measure, device or practice used to reduce or eliminate the amount of erosion or sediment released from a construction site.

Permitting Requirements

Effective on March 10, 2003, federal regulations require that storm water discharges from certain construction activities be covered under a NPDES permit. **This means if construction activities will cause a land disturbance of one or more acres, any storm water or snow melt run-off from the project requires NPDES permit coverage.** The NPDES general permit these projects will be covered under is General Permit No. 2.

Typically IDNR General Permits are effective for five years. However, if a new general permit has not been adopted prior to expiration of an existing permit, the expired permit remains in effect.

Also, the IDNR provided guidance that if the project has a Iowa DOT offsite borrow (i.e. a borrow that is not contiguous to the project site), the borrow may require a separate storm water permit if the borrow is greater than one acre. If this is a contractor furnished borrow site, the contractor is responsible for obtaining permit coverage.



An offsite borrow may require its own storm water permit.

Individual Permits

Most projects will be able to obtain permit coverage under NPDES General Permit No. 2. However, if the project is located in an Outstanding Iowa Waters (OIW) watershed, the project is required to be permitted under an individual NPDES storm water permit. OIW watersheds are located in the following ten counties:

- Allamakee
- Benton
- Buchanan
- Clayton
- Delaware
- Dickinson
- Fayette
- Jackson
- Winneshiek
- Worth

Role of Regulatory Agency

The role of the IDNR or EPA is to determine compliance with permit requirements and assess the adequacy of best management practices (BMPs) to protect natural resources. This is primarily accomplished by reviewing on-site activities for permit compliance and the Storm Water Pollution Prevention Plan (SWPPP or also referred to as PPP).

Not only is the IDNR a regulatory agency, they should also be considered a resource. The Iowa DOT and IDNR should work together to address compliance issues before they become problems that need to be addressed in more aggressive ways, such as detailed in “Enforcement Action” in the following section.

TIP

You may not always receive notification that a Regulatory Agency will be conducting an inspection.

Enforcement Action

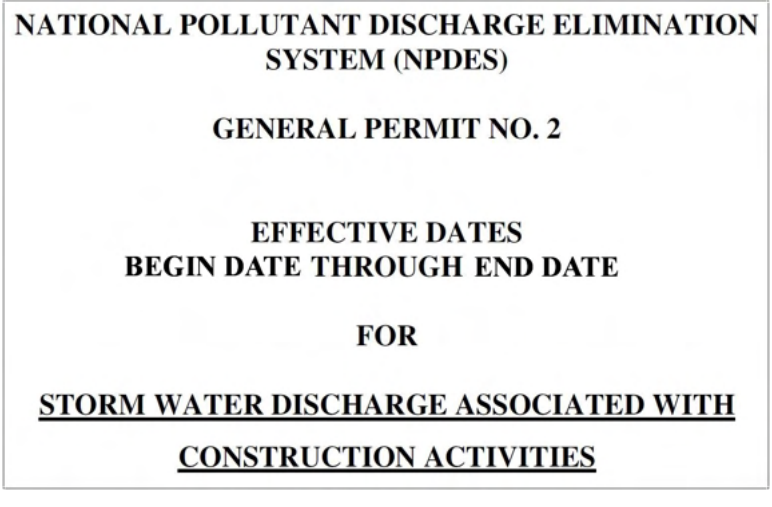
Part VI. N of the General Permit No. 2 allows the IDNR or an authorized representative of the EPA to inspect construction projects as well as have access to and copy any records that must be kept under the conditions of the permit.

The Regulatory Agency will complete a report noting violations, possible corrective actions, and the time frame by which the actions should be completed. If violations are found, a follow-up inspection may be completed to verify the project is now in compliance.

Both the IDNR and EPA may issue penalties if the project is found to be in noncompliance with the permit requirements.

Iowa Code section 455B.191 authorizes the assessment of civil penalties of up to $5,000 per day of violation for the NPDES permit violations. The EPA may also issue a civil penalty of more than $37,500 (adjusted by inflation) per day for each violation.

Penalties from either agency can amount to large fines. In addition, the resolution process may take months or even years, expending additional time and effort.


NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

GENERAL PERMIT NO. 2

EFFECTIVE DATES
BEGIN DATE THROUGH END DATE

FOR

STORM WATER DISCHARGE ASSOCIATED WITH CONSTRUCTION ACTIVITIES

IDNR General Permit #2 is typically effective for a 5 year time period.

So the lesson to be learned is that it's cheaper to address erosion and sediment control issues before they become costly and damaging problems.

What to Expect During a Regulatory Agency Inspection

During their inspection, a Regulatory Agency will evaluate the effectiveness of the erosion and sediment controls and check discharges to surface waters or wetlands. They may also ask to see records and documentation which includes your inspection reports.

Be aware that the IDNR or EPA inspector may use language with which you are unfamiliar. Likewise they may be unfamiliar with some highway construction practices, terminology, and Iowa DOT contract documents.

Here are some terms that the regulatory agency inspector may use that you should be familiar with:

- SWPPP or PPP (Storm Water Pollution Prevention Plan): This should be found in the C, CE, or R sheets and is titled "Pollution Prevention Plan".

Section 2601 of the Specifications covers Erosion Control.

Section 2602 covers Water Pollution Control.

Specifications for Erosion and Sediment Control Materials begin in Section 4169.

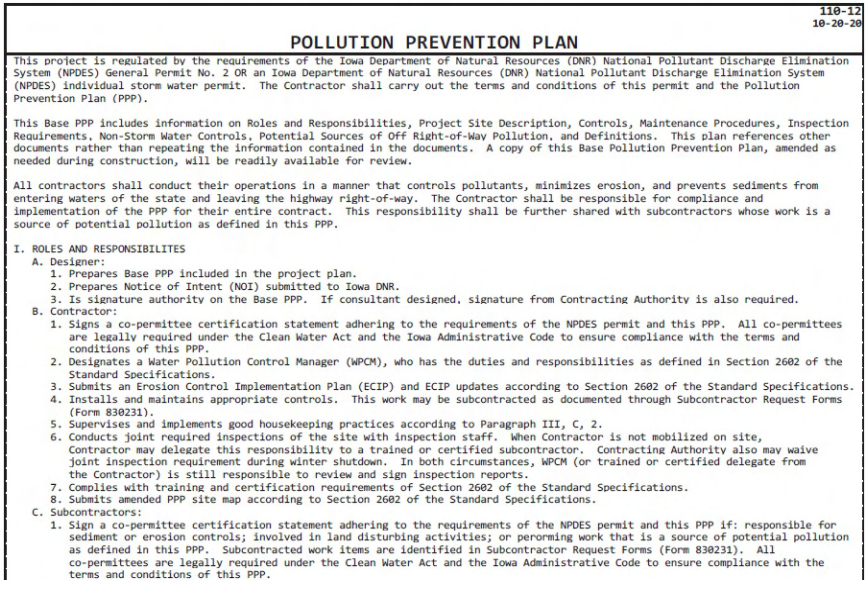
- Site Map – Storm Water Site Map: Refer to the PPP in the DOT plans (in the C, CE, or R sheets) for a list of sources of information which comprise the base storm water site map or site map pages.

- BMPs (Best Management Practices): This refers to any measure, device or practice used to reduce or eliminate the amount of erosion or sediment released from a construction site (such as silt fence, mulching, etc.).

Be aware that you may not always receive notification that a Regulatory Agency will be conducting an inspection.

Both Iowa DOT and the contractor should cooperate with the Regulatory Agency inspector and then work quickly to have noncompliance issues resolved.

Additionally, if a project is in a MS4 (Municipal Separate Storm Sewer System) area, someone from the MS4 might be out performing a quarterly inspection to fulfil a requirement of the MS4's own permit with the IDNR. If this occurs on your project, please cooperate just as you would with a Regulatory Agency inspector.



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POLLUTION PREVENTION PLAN

This project is regulated by the requirements of the Iowa Department of Natural Resources (DNR) National Pollutant Discharge Elimination System (NPDES) General Permit No. 2 OR an Iowa Department of Natural Resources (DNR) National Pollutant Discharge Elimination System (NPDES) individual storm water permit. The Contractor shall carry out the terms and conditions of this permit and the Pollution Prevention Plan (PPP).

This Base PPP includes information on Roles and Responsibilities, Project Site Description, Controls, Maintenance Procedures, Inspection Requirements, Non-Storm Water Controls, Potential Sources of Off Right-of-Way Pollution, and Definitions. This plan references other documents rather than repeating the information contained in the documents. A copy of this Base Pollution Prevention Plan, amended as needed during construction, will be readily available for review.

All contractors shall conduct their operations in a manner that controls pollutants, minimizes erosion, and prevents sediments from entering waters of the state and leaving the highway right-of-way. The Contractor shall be responsible for compliance and implementation of the PPP for their entire contract. This responsibility shall be further shared with subcontractors whose work is a source of potential pollution as defined in this PPP.

I. ROLES AND RESPONSIBILITES

A. Designer:
1. Prepares Base PPP included in the project plan.
2. Prepares Notice of Intent (NOI) submitted to Iowa DNR.
3. Is signature authority on the Base PPP. If consultant designed, signature from Contracting Authority is also required.

B. Contractor:
1. Signs a co-permittee certification statement adhering to the requirements of the NPDES permit and this PPP. All co-permittees are legally required under the Clean Water Act and the Iowa Administrative Code to ensure compliance with the terms and conditions of this PPP.
2. Designates a Water Pollution Control Manager (WPCM), who has the duties and responsibilities as defined in Section 2602 of the Standard Specifications.
3. Submits an Erosion Control Implementation Plan (ECIP) and ECIP updates according to Section 2602 of the Standard Specifications.
4. Installs and maintains appropriate controls. This work may be subcontracted as documented through Subcontractor Request Forms (Form 830231).
5. Supervises and implements good housekeeping practices according to Paragraph III, C, 2.
6. Conducts joint required inspections of the site with inspection staff. When Contractor is not mobilized on site, Contractor may delegate this responsibility to a trained or certified subcontractor. Contracting Authority also may waive joint inspection requirement during winter shutdown. In both circumstances, WPCM (or trained or certified delegate from the Contractor) is still responsible to review and sign inspection reports.
7. Complies with training and certification requirements of Section 2602 of the Standard Specifications.
8. Submits amended PPP site map according to Section 2602 of the Standard Specifications.

C. Subcontractors:
1. Sign a co-permittee certification statement adhering to the requirements of the NPDES permit and this PPP if: responsible for sediment or erosion controls; involved in land disturbing activities; or perorming work that is a source of potential pollution as defined in this PPP. Subcontracted work items are identified in Subcontractor Request Forms (Form 830231). All co-permittees are legally required under the Clean Water Act and the Iowa Administrative Code to ensure compliance with the terms and conditions of this PPP.

The PPP is located in the C, CE, or R sheets of the plans.

Compliance and the Route to Success

Here are some proactive tips to achieve permit compliance:

- Be familiar with the PPP and the sediment and erosion control measures on the project.
- Discuss storm water requirements at the preconstruction conference. Follow it up with meetings in the field.
- Keep storm water records organized.
- Keep up with inspections and paperwork.
- Call your RCE office or the Earthwork Field Engineer if you need assistance.
- Be familiar with and use the resources available to you. This includes using the bid items included with your project and enforcing the requirements in the PPP and the Standard Specifications.
- One of the most important things you can do is keep the contractor involved. The route to success is difficult without effective communications with the contractor and a shared responsibility for identifying compliance issues with the PPP.

Failure to install proper erosion and sediment controls in a timely manner can result in damage to the environment and costly fines.

ESTIMATED PROJECT QUANTITIES

Item Code	Item	Unit	Total
2101-0850001	CLEARING AND GRUBBING	ACRE	45.72
2102-0425070	SPECIAL BACKFILL	TON	1280.00
2102-2200000	INTERCEPTING DITCHES AND FLUMES	LF	3867.00
2507-3250005	ENGINEERING FABRIC	SY	9872.30
2507-6800061	REVETMENT, CLASS E	TON	7183.50
2507-8029000	EROSION STONE	TON	135.20
2599-9999001	STABILIZING CROP - NATIVE GRASS SEEDING AND FERTILIZING (INSTALL ONLY)	ACRE	69.80
2599-9999005	GRATE INTAKE SEDIMENT FILTER BAG	EACH	1.00
2599-9999005	MAINTENANCE OF GRATE INTAKE SEDIMENT FILTER BAG	EACH	1.00
2599-9999005	REMOVAL OF GRATE INTAKE SEDIMENT FILTER BAG	EACH	1.00
2601-2633100	MOWING	ACRE	281.40
2601-2634100	MULCHING	ACRE	93.30
2601-2636060	SALT TOLERANT SEEDING	ACRE	23.60
2601-2640350	SPECIAL DITCH CONTROL, WOOD EXCELSIOR MAT	SQ	1346.70
2601-2642100	STABILIZING CROP - SEEDING AND FERTILIZING	ACRE	47.30
2601-2643110	WATERING FOR SOD, SPECIAL DITCH CONTROL, OR SLOPE PROTECTION	MGAL	269.34
2601-2643300	MOBILIZATION FOR WATERING	EACH	3.00
2602-0000020	SILT FENCE	LF	16556.00
2602-0000030	SILT FENCE FOR DITCH CHECKS	LF	15090.00
2602-0000050	SILT BASIN	EACH	94.00
2602-0000071	REMOVAL OF SILT FENCE OR SILT FENCE FOR DITCH CHECKS	LF	15823.00
2602-0000080	REMOVAL OF SILT BASIN	EACH	94.00
2602-0000101	MAINTENANCE OF SILT FENCE OR SILT FENCE FOR DITCH CHECKS	LF	3165.00
2602-0000130	TEMPORARY SEDIMENT CONTROL BASIN	EACH	30.00
2602-0000135	REMOVAL OF TEMPORARY SEDIMENT CONTROL BASIN	EACH	30.00
2602-0000140	MAINTENANCE OF TEMPORARY SEDIMENT CONTROL BASIN	EACH	30.00
2602-0000150	STABILIZED CONSTRUCTION ENTRANCE	LF	700.00
2602-0000160	ROCK CHECK DAM	LF	5067.50
2602-0000170	MAINTENANCE OF ROCK CHECK DAM	EACH	600.00
2602-0000180	REMOVAL OF ROCK CHECK DAM	EACH	200.00
2602-0000312	PERIMETER SLOPE AND SEDIMENT CONTROL DEVICE, 12 INCH	LF	300.00
2602-0000320	PERIMETER SLOPE AND SEDIMENT CONTROL DEVICE, 20 INCH	LF	8004.00
2602-0000350	REMOVAL OF PERIMETER SLOPE AND SEDIMENT CONTROL DEVICE	LF	8304.00
2602-0010010	MOBILIZATIONS, EROSION CONTROL	EACH	4.00
2602-0010020	MOBILIZATIONS, EMERGENCY EROSION CONTROL	EACH	2.00
2612-0000520	ROADSIDE SPRAY FOR WEED CONTROL	ACRE	14.10

Be familiar with the bid items for erosion and sediment control.

TIP

Work with contractors if they recommend additional controls. Oftentimes, the measures in the plans are a minimum, and additional measures may be needed to ensure compliance.

Erosion & Sediment Control Training & Certification Program

There are two types of training or certification: Erosion and Sediment Control Basics (ESC Basics) and Erosion Control Technician (ECT). The requirements are found in Specifications Section 2602.

IOWA DOT EROSION AND SEDIMENT CONTROL TRAINING PROGRAM (UPDATED 1/5/2022)

	EROSION & SEDIMENT CONTROL BASICS (ESC BASICS)	EROSION CONTROL TECHNICIAN (ECT)
Type	Web-based training	Certification class
Course Length	Approx. 1-2 hours	2.5 days
Prerequisite	None	None
Fee	None	See Registration Book
Prime Contractor requirement*	1 per project(s)	1 per Prime Contractor
DOT requirement*	1 per project(s)	1 per RCE office
Exam required?	No	Yes
Valid for	2 years**	5 years***
Other state/national training accepted?	No	Yes****

* Requirement applies to projects that are covered by a NPDES storm water permit.
** To renew for another 2-year period, individuals shall retake entire ESC Basics course.
*** Updates (web-based) are recommended, but not required.
**** Exam still required. See Materials IM 213. Contact Iowa DOT TTCP training coordinator for more information.

Summary of training and certification requirements.

These requirements only apply when there is storm water permit coverage for a project. To determine if the project or contract is covered by a permit, check the plans for a Pollution Prevention Plan. Also, for DOT administered projects, check for a copy of the permit authorization on DocExpress (contract documents drawer).

Responsibilities of an ESC Basics trained individual are found in Specifications Section 2602. Responsibilities of an ECT are found in Materials IM 213, Appendix D.

For frequently asked questions and instructions for how to access the web-based course, refer to https://iowadot.gov/construction_materials/earthwork_erosion/escontrol_training.

Chapter 3: EC/SC Measures and How to Use Them

How to Reduce Erosion and Sedimentation

Once vegetation is removed, the soil is left unprotected and is susceptible to erosion. Eroded soil particles result in sedimentation. So, if we reduce the amount of erosion occurring, we can limit the amount of sedimentation that is created.

Erosion is caused primarily by wind and water. Water-generated erosion is usually the most severe type of erosion.

Erosion can occur in vegetated areas, such as this ditch which was seeded and mulched.

Close-up image of a raindrop impacting the ground.

**Sheet erosion transports soil particles.
As water accumulates, rills are formed.**

Rill erosion should be repaired prior to seeding.

- **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. The flow transports soil particles which are detached by raindrop impact. 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 shallow surface flow begins to concentrate in the low spots of the irregular contours of the surface. As the flow changes from the shallow sheet flow to deeper flow in these low areas, the flow velocity and turbulence increase. The energy of this concentrated flow is able to both detach and transport soil materials. 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.

These photos show how deep gullies can become. Repair is time consuming and costly due to the tremendous amount of soil loss.

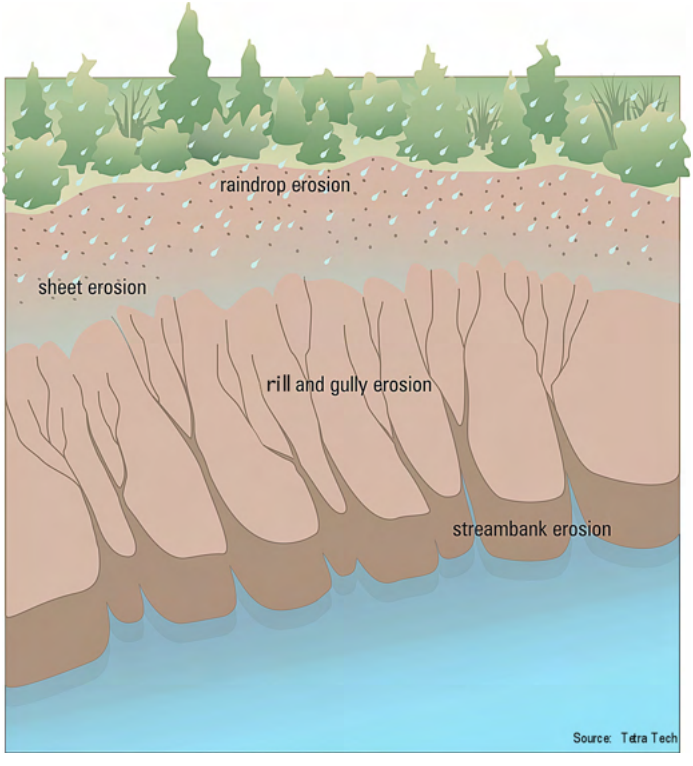
- **Gully erosion** occurs as the flow in rills come together in larger and larger channels. The major difference between gully and rill erosion is a matter of magnitude. Gullies are too large to be repaired with conventional tillage equipment and usually require heavy equipment to correct and may also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

Active erosion on both sides of streambank.

- **Streambank or channel erosion** occurs as the volume and velocity of flow causes movement of the stream bed and bank materials. Three causes of channel erosion are increased run-off, removal of natural vegetation, and channel alteration.

TIP

When there are high backslopes with large drainage areas, installing an intercepting ditch at the top of a slope in conjunction with seeding and mulching will help control run-off and promote establishment of vegetation.

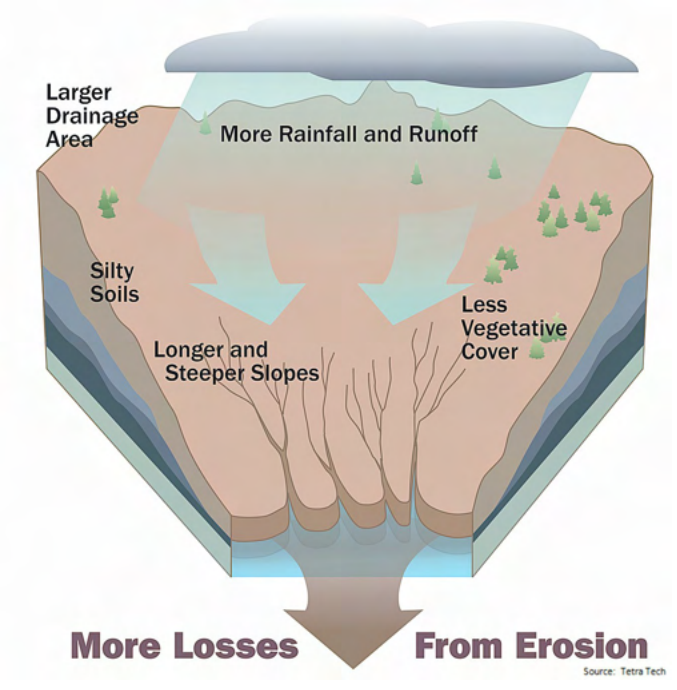


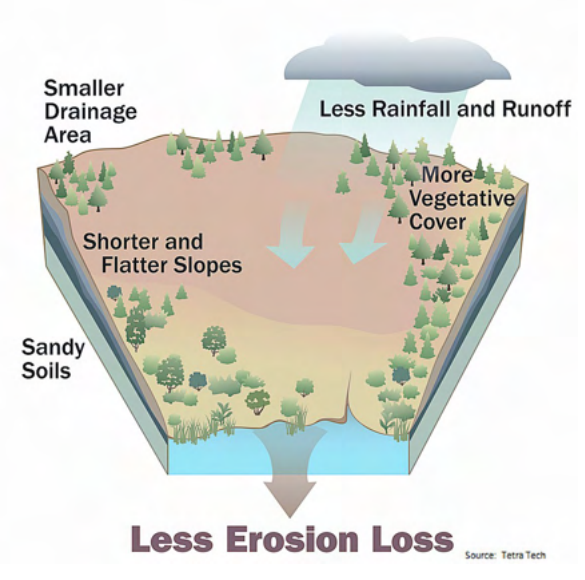
This image depicts the different types of erosion.

TIP

Stabilization practices are items that stabilize the soil such as existing vegetation, temporary or permanent seeding, slope protection, ditch control, and mulching.

What Influences Erosion





Factors affecting erosion.

Best Management Practices

There are different types of Best Management Practices (BMPs)

- Erosion Control: To help keep soil in place.
- Sediment Control: To collect or allow soil to settle to prevent it from traveling offsite.

The following table lists examples of these practices:

Erosion Control	Sediment Control
Mulching	Silt Fences
Seeding	Rock Check Dams
Sodding	Wood Excelsior Logs/Straw Wattles/Filter Socks
Slope Protection & Ditch Mat	Straw Bales
Turf Reinforcement Mat (TRM)	Silt Dikes & Ditches
Transition Mat	Silt Basins
Erosion Stone & Riprap	Storm Drain Inlet Protection
Temporary Stream Diversion	Filter Berm e.g. Slash Mulch Berm
Temporary Stream Crossing	Floating Silt Curtain
Temporary Slope Drain	Vegetated Buffers
	Flocculants/Polymers
	Stabilized Construction Entrances

Refer to the FAQ section for a table that provides contract document references (specifications, IM's, etc.) for various erosion and sediment controls.

Vegetation is a highly effective means of controlling erosion. Preserving existing vegetation can increase the effectiveness of other controls and reduce run-off volumes.

Beyond limiting disturbed areas, the most effective type of practice is erosion control. The following chart illustrates the relative effectiveness and cost of various erosion and sediment control practices.

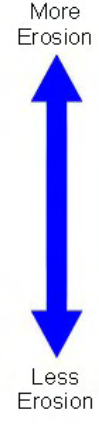
Prioritization of erosion and sediment controls for construction sites

Practice	Cost	Effectiveness
Limiting disturbed areas through **phasing**	$	
Protecting disturbed areas through **mulching and revegetation**	$ $	
Installing diversion around disturbed areas.	$ $ $	
Sediment removal through **detention** of all site drainage	$ $ $ $	
Other **structural controls** to treat sediment-laden flow	$ $ $ $ $	

Source: Tetra Tech

The condition of the soil surface has an impact on the erosion potential. As shown in the table below, a slope that is mulched and had a track machine walked up and down the slope has much less erosion potential than if it were compacted and smooth.

Soil Surface Condition	Effect on Erosion Potential
Compacted & Smooth	+30%
Track walked along contour	+20%
Track walked up & down slope	-10%
Punch or crimped straw	-10%
Rough, irregular cut	-10%
Loose to 12 in. depth	-20%
	Source: Goldman, 1986



Inspection, maintenance and repair of damaged devices are important to keep the BMPs working properly. Allowing a device to fail and remain unrepaired could be as bad as having no controls in place. Both instances would be an issue of noncompliance and could be a permit violation.

Thorough storm water site inspections are important to avoid noncompliance and costly repairs.

Stabilizing slopes as soon as possible can go a long way in protecting against erosion.

FACT

Structural practices include items that divert, store or otherwise limit run-off from exposed areas of the site such as silt fence, dikes, slope drains, storm drain inlet protection, and silt basins.

Erosion Controls

Erosion controls provide soil erosion protection and may also assist in the establishment of vegetation. The following sections will provide information on different types of erosion control used by Iowa DOT.

Mulching – Straw, Hydraulic

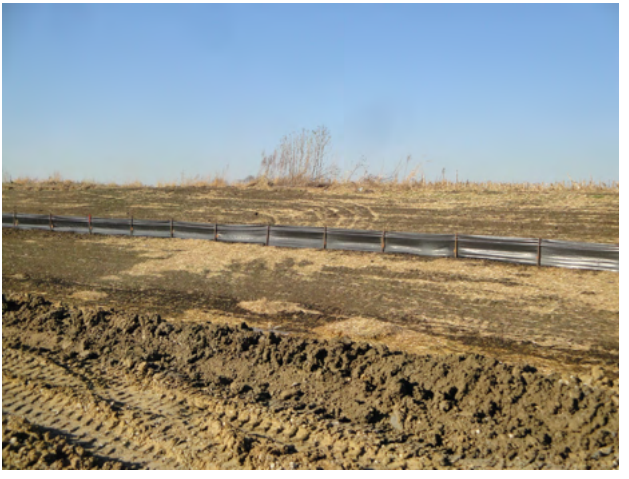
One of the most commonly used forms of erosion control is mulching. Mulching may be done with or without seeding, depending on the timing of the contractor's activities.

Straw Mulching Machine

Straw mulch should be spread evenly, uniformly, and without excessive pulverization to protect the surface of the soil. The application rate for straw mulch is approximately 1 ½ tons per acre.

When done in conjunction with seeding, mulch enhances the germination rate and growth of the seed.

Unevenly applied mulch will not perform well.



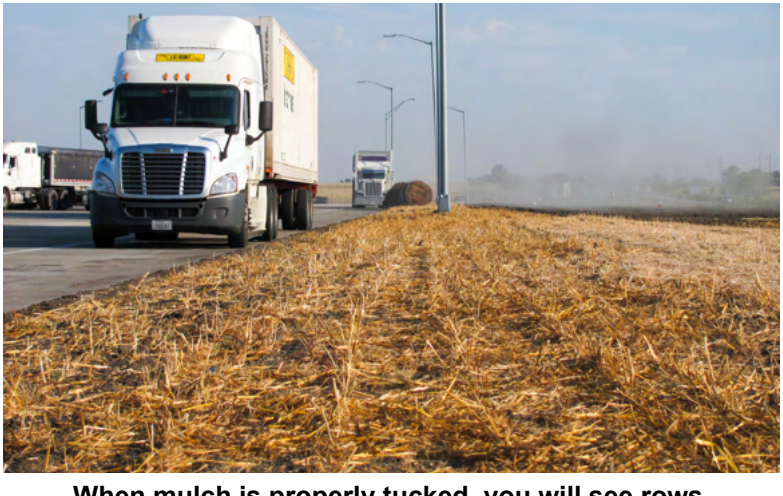
Piles of mulch will not allow seed to germinate and result in unstabilized areas.

Mulch should be anchored a minimum of two inches into the ground surface with two passes of the mulch anchoring equipment. If not anchored, the mulch will blow or wash away easily.

Mulch should not be applied when wind velocities are greater than 15 mph.

Mulch blowing equipment should not be operated on slopes steeper than 2.5:1 or on slopes that may rut. In these cases, the contractor is required to use blower attachments to apply mulch without traversing the slope or apply hydraulic mulch.

Mulch Anchoring Equipment



When mulch is properly tucked, you will see rows where the mulch looks like a buzzed haircut.

Besides straw mulch, hydraulic mulch may be used as a type of erosion control. The specifications have three different types of hydraulic mulch: wood cellulose fiber, bonded fiber matrix (BFM), and mechanically-bonded fiber matrix.

Hydraulic mulch products should be applied at no less than 3,000 pounds/acre unless specified otherwise in the contract documents. Typical applications also vary depending on the type of hydraulic mulch. CM 7.30 provides application guidance and a mixing chart for hydraulic mulches.

Application of hydromulch following hydraulic seeding.

Q. What does BMP stand for?

A. Best Management Practice, it is a term associated with those practices selected to manage and maintain soil erosion and storm water run-off quality.

Hydraulic mulches typically last between 3 to 12 months. This is a great option for hard to reach or wet areas.

In most cases, hydraulic mulch requires a drying period in order to control erosion.

If performing hydraulic seeding and mulching, Article 2601.03, requires hydraulic mulch be performed as a separate operation from seeding.

Hydromulch should be evenly applied.

In this photo, the hydromulch was not adequately applied. At the application rate of 3,000 lbs./acre, you shouldn't be able to see the soil.

An example of an area where the contractor used hydraulic seeding and mulching to reseed an area that was wet and would have been difficult to access.

Vegetation – Temporary & Permanent Seeding, Sod

Vegetation is the most common and one of the most effective forms of erosion control. Seeding and sodding are methods used to establish vegetation.

Seed that is installed may be considered temporary, (i.e., stabilizing crop seeding) or permanent. Temporary seeding is a temporary vegetative cover that consists primarily of rapidly growing annual plant species.

There are different permanent seed mixtures for urban and rural areas that consist primarily of perennial species. There are also bid items for Native Grass Seeding, Salt Tolerant Seeding, Wetland Grass Seeding, and Wildflower Seeding. If these bid items are part of your project, the plan notes or tabulations will typically provide information on these mixes and where the mixes are to be installed.

However, if the seeding, fertilizing, and mulching items contain less than one acre, in most cases there will be a plan note that the seeding, fertilizing, and mulching are incidental to construction and there will be no bid item for this work.

Good stabilization will help protect your project.

Both types of seeding require correct and proper seedbed preparation for optimum growth. Application of fertilizer may also be required, and areas are mulched with dry cereal straw or other approved material. Working the soil to a depth of 3 inches is important. Care should be taken to properly prepare all areas to be seeded. Areas around culvert headwalls and wingwalls, shoulders, flumes, sign posts, and other structures may require special attention. Additionally, where enough vegetative growth exists to interfere with proper seedbed preparation the contractor shall mow before seeding at no additional cost.

Getting temporary seed and mulch installed as soon as possible will provide growth that much sooner.

The seedbed should be smooth and all rills and gullies should be filled. Gullies that exceed 6 inches should be compacted with a tractor wheel or other suitable field equipment.

Areas inaccessible to field machinery should be prepared by hand to a depth of not less than 2 inches. Weed growth should be disked into the ground. If weed growth is such that it interferes with proper seedbed preparation, the contractor is required to mow the weeds and remove them from the project at their own expense.

Excessive ridging (4 inches or more) caused by operation of tillage equipment will require harrowing prior to rolling with the cultipacker. Harrowing breaks up the soil clods and provides a finer finish.

After seedbed preparation the contractor is expected to pick up and remove all debris including 3-inch diameter or larger stones, logs, or other objectionable material that will interfere with the seeding operation.

The contractor will then apply the fertilizer. Depending on the type of seed mix, a certain grade/type and rate of fertilizer will be required. For example, the typical rate for rural stabilizing crop seeding is 250 pounds per acre of 13-13-13 and for permanent rural and salt tolerant seeding is 300 pounds per acre of 6-24-24. Additionally, a different type or mix of fertilizer can be applied if equivalent.

A fertilizer is considered equivalent when it meets the minimum total pounds per acre of Nitrogen (N), available phosphoric acid (P_2O_5), and water soluble potassium (K_2O). To help in determining what rate of fertilizer is equivalent to a specified type and rate, a spreadsheet is available at the Construction & Materials - Earthwork & Erosion Control webpage.

Native grass, wetland, and wildflower seeding do not require fertilizer unless specified otherwise in the contract documents.

Fertilizer shall be spread with a mechanical spreader to ensure a uniform rate of application. The fertilizer shall be disked in, and the area rolled prior to the application of seed.

Spike Tooth Harrow

Cyclone Seeder

Cultipacker

Hydraulic seeding - Typically, inoculant, seed, and fertilizer are to be applied in a single operation. Hydraulic mulch is then applied as a separate operation.

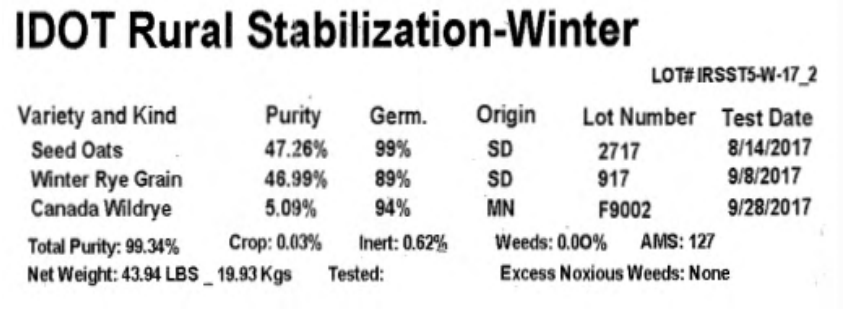
Seed conditioner requirements are included in Specifications Section 2601 and Materials IM 469.02.

The seed conditioner requirements mean that the engineer will no longer be required to witness mixing for native, wetland, and wildflower seed. There will also be no onsite mixing allowed for any mixes (except for rural stabilizing crop seeding). Lastly, seed bags should arrive onsite sealed.

For approved seed conditioners or contact information for Iowa and adjacent states crop improvement associations, click on "Approved Seed Conditioners" drop-down at the Construction & Materials-Earthwork & Erosion Control webpage.

As part of the seed conditioner requirements, contractors will provide seed mixture reports and a certification sheet. Forms are available online for the standard seed mixes. Also available are forms where the seed mixture (with and without PLS) needs to be entered. To access these forms go to the Construction & Materials-Materials Forms webpage.

Also as part of these requirements, district materials staff will be responsible for establishing and performing a supplier monitoring program at least once per year.



IDOT Rural Stabilization-Winter

LOT# IRSST5-W-17_2

Variety and Kind	Purity	Germ.	Origin	Lot Number	Test Date
Seed Oats	47.26%	99%	SD	2717	8/14/2017
Winter Rye Grain	46.99%	89%	SD	917	9/8/2017
Canada Wildrye	5.09%	94%	MN	F9002	9/28/2017

Total Purity: 99.34% Crop: 0.03% Inert: 0.62% Weeds: 0.00% AMS: 127

Net Weight: 43.94 LBS _ 19.93 Kgs Tested: Excess Noxious Weeds: None

Example of a seed tag

There are several different methods utilized in the application of seed. The Construction Manual (CM) lists the suggested sequence of operations for the following types of permanent seeding.

- CM 7.13 Rural Seeding
- CM 7.14 Hydro-Seeding (Hydraulic Seeding)
- CM 7.15 Urban Seeding
- CM 7.16 Native Grass Seeding
- CM 7.18 Aerial Seeding

Urban seeding has other special requirements; such as a rotary tiller must be used for the preparation of the seedbed. The seedbed should be firm, smooth, and free of any material 1 ½ inches in diameter or greater including clods, rocks, and other debris. The seedbed should also be rolled before and after the application of seed.

Rotary Tiller

TIP

Remember the 0/14 day rule. This means areas may need to be mulched even if topsoil is not placed.

A grass drill is used to apply native grasses and wildflowers. Existing vegetation must be mowed prior to seeding. Seedbed preparation and cultipacking are not normally required.

Seed Drill

If areas are washed out or damaged by rain, they may need to be re-worked. Details on requirements and compensation, depending on the circumstances, are available in Article 2601.03.

Other types of seeding include pneumatic seeding which incorporates the use of compost applied with a pneumatic (air blower) system.

Pneumatic Seeding - Application of compost and seed

Sodding requires the sod bed to be shaped and prepared. The surface should be firm, even and free of material 1 ½ inches in diameter or greater, including clods, rocks, and other debris.

Fertilizer should be placed prior to the placement of sod. Staking of the sod may be ordered by the Engineer. The soil along the edge of the sodded area should be firmed, properly shaped and smooth. Seeding and mulching is required for all disturbed areas adjacent to the sod.

The contractor is to water the sod within one hour of placement and thereafter according to specifications. See “Watering” section for more details.

To secure bonding, the sod may need to be tamped or rolled.

On Iowa DOT projects, sod might be used to establish vegetation in commercial or residential areas. Following the requirements for watering and sod application are important to keep the sod healthy.

Topsoil Preservation

A requirement of NPDES General Permit No. 2 is to preserve topsoil. This means that unless infeasible, topsoil from areas of the site where the ground is disturbed shall remain within the area covered by the applicable permit authorization.

Additionally, topsoil preservation will help in the establishment of vegetation and the site reaching final stabilization.

The Iowa DOT design default is to replace a minimum of 4 inches, with 8-inches being the preferred thickness. Check tabulations in the C, CE, CS and/or T sheets or the topsoil bid item notes to verify the amount stripped and respread, or furnished.

Additionally, you may reference Standard Specifications Section 2105.

Topsoil was stripped and stockpiled and is shown being respread in the background.

This area did not have topsoil respread, and the vegetation is sparse. It will be difficult to reach 70% permanent vegetative growth on this project.

TIP

Check bid items, bid item notes, tabulations, and plan notes for topsoil stripping requirements.

Slope and Ditch Protection

Typically, erosion on ditch slopes of 2 percent or less can be controlled through staged clearing and grading, mulch, and temporary or permanent seed. However, ditch slopes greater than this may require more attention due to sheet run-off volume and convergence of flows. These are areas where the growth from seeding and mulching may be too slow to provide adequate stabilization alone, so wood excelsior mat during the seeding operation would be an effective means of stabilization.

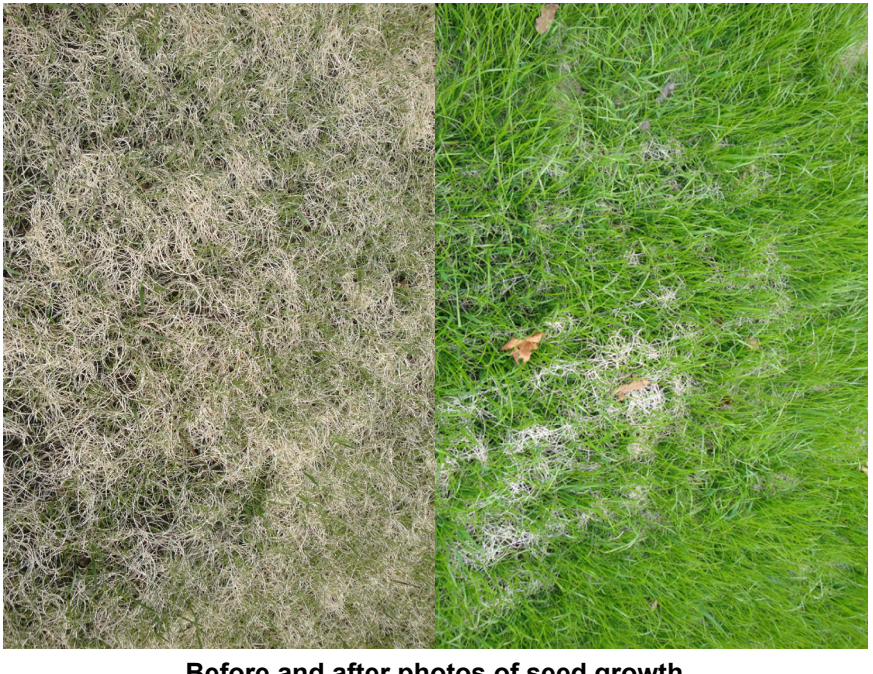
The contractor may substitute coconut fiber mat for Ditch Control, Wood Excelsior Mat. Straw mat is not allowed as a substitution in ditches or swales.

Installation of slope protection on a slope near a bridge.

Also, long foreslopes, backslopes, or bridge berms (greater than 100 feet) exceeding 3H:1V with highly erodible soils may need another type of slope stabilization besides mulch and seed.

One bid item that is available is Slope Protection, Wood Excelsior Mat. A wood excelsior mat is a mat of interlocking wood fibers. Per Specifications Article 4169.10, the contractor may substitute straw mat, straw-coconut mat, or coconut fiber for wood excelsior mat on slopes.

Slope protection slows run-off and keeps the soil moist while seed germinates.



Before and after photos of seed growth using a wood excelsior blanket.

A list of approved sources, the type of material and allowed use (slope protection and/or ditch control) is provided at the Materials Approved Product List Enterprise (MAPLE) at https://maple.iowadot.gov/.

Standard Road Plan EC-101 and EC-103 show requirements of Wood Excelsior Mat for Ditch Protection and Wood Excelsior Mat for Slope Protection, respectively.

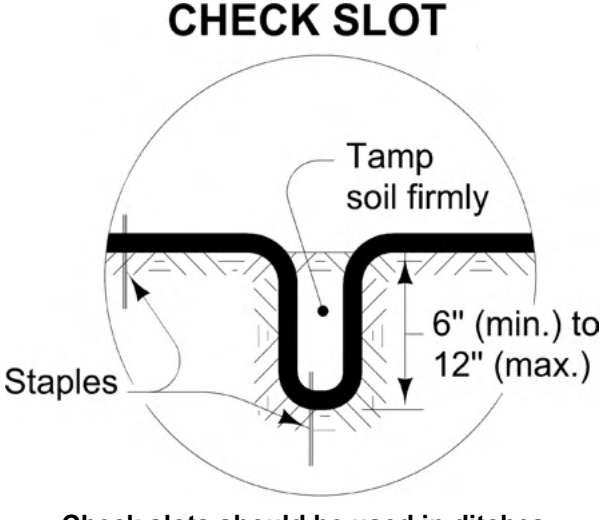
Here are some guidelines for the contractor when installing slope protection and ditch control:

- Coordinate preparation and placement with seeding operations.
- Prepare areas to be protected similar to seedbed preparation except with a depth no less than 3/4 inch.
- Remove all material 1 1/2 inches in diameter or greater, including clods, rocks, and other debris, which will prevent contact of the material with the seedbed.
- Space check slots on ditch channels so one check slot occurs within each 50 foot increment on slopes of more than 4%.

TIP

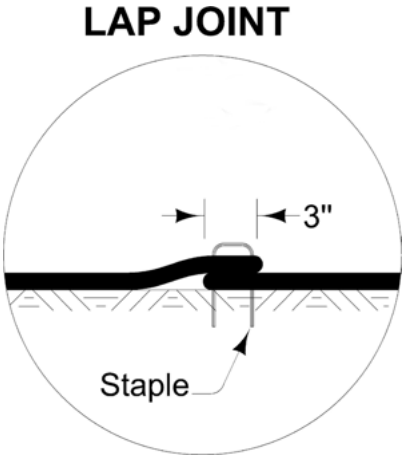
Inspect slopes and ditch bottoms for evidence of concentrated flows which could indicate a need for further controls. You do not have to wait until a permanent erosion control project to install slope or ditch protection.

Wood excelsior and coconut fiber mat is more durable to withstand the concentrated flow found in ditches.



Check slots should be used in ditches with slopes of more than 4%.

- Apply mat without tension and in the direction of the flow of water. Where more than one strip is required, lap the sections no less than 3 inches.

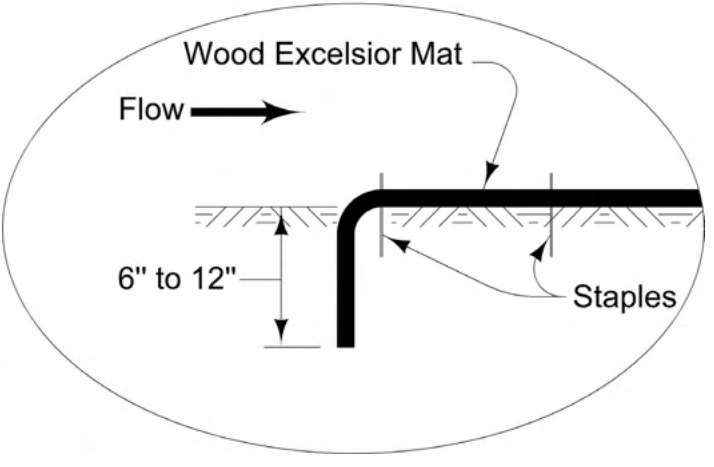


When a new section is added, it should be placed 3 inches over the previous section of fabric and stapled in place.

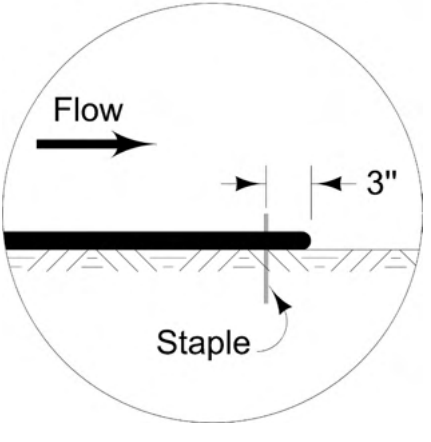
Mat should be smooth and in contact with the soil surface. It should also be stapled in place.

- Bury the anchor slot on the top edge of the mat from 6 inches to 12 inches.
- Staple the terminal end at the bottom of the wood excelsior mat.

ANCHOR SLOT



TERMINAL END



It is important to ensure that the contractor installs the slope protection properly – this includes using anchor slots at the top of the slope protection to ensure flows do not travel underneath.

This contractor is installing staples near the anchor slot.

Speed of growth depends on temperature and rainfall. This photo was taken three weeks after installation of the blanket.

- For adjacent areas disturbed outside of ditch channels, uniformly shape, fertilize, seed, and rake in the seed in the same manner required for other disturbed areas.

Turf Reinforcement Mat (TRM)

Specifications Section 4169 has four types of Turf Reinforcement Mat (Type 1, 2, 3 and 4), with Type 4 being the most heavy duty.

The purpose of TRMs is to provide a stronger root structure for vegetation to resist larger run-off velocities. In most cases, TRMs will also provide permanent reinforcement and anchor for vegetation roots and stems.

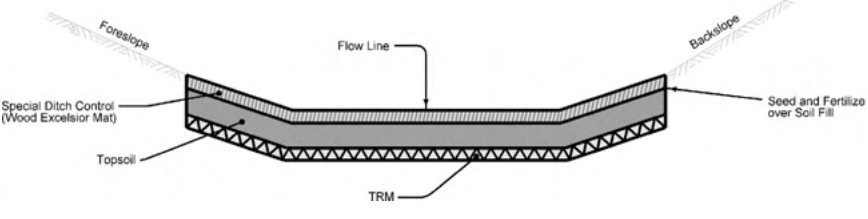
TRMs enable vegetation use in applications where slope or ditch protection would not provide adequate vegetation reinforcement.

Here TRM was used in a ditch that has potential for high velocity flows.

There may also be a substantial cost savings compared to revetment. Additionally after vegetation growth, TRM is considered more aesthetically pleasing than revetment.

Here are installation steps for TRM:

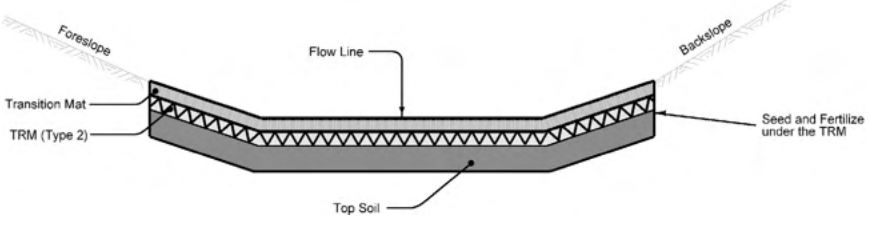
- Coordinate preparation and placement with seeding operations.
- Shape channel, ditches, or slopes.
- Furnish and apply TRM.
- Furnish and apply a minimum of 1 inch of soil suitable for the establishment of vegetation on the TRM.
- Furnish and apply seed and fertilizer.
- Furnish and apply special ditch control wood excelsior mat on the soil fill. Do not install special ditch control with junction slots or check slots.
- Watering (see watering requirements in Slope and Ditch Protection section).



This detail and photo show installation of TRM, which includes TRM, topsoil, and special ditch control.

Transition Mat

Transition mats are used as a permanent method of erosion control and energy dissipation to prevent scour downstream of culverts or at bridge end drains. Typically, the seedbed is prepared and a Type 2 TRM is installed. The transition mat panels are then installed on top of the TRM without a soil fill or special ditch control. Panels should be overlapped upstream over downstream or upslope over downslope. The panels are anchored to the ground using bullet-tip style anchors per Specifications Section 4169.



Transition Mat used at a pipe culvert outlet.

Watering

With certain types of erosion control, watering might be required by the specifications.

Blankets or mats may require watering so that seed has ample moisture to germinate and become established in these critical areas.

Additionally, newly installed sod has very important watering needs. Proper watering immediately after installation will ensure the turf gets established, and it will also have an impact on how well it continues to flourish.

Watering of Special Ditch Control, Turf Reinforcement Mat, Slope Protection, and Transition Mat

The contractor shall provide watering equipment and an approved water supply before starting special ditch control, turf reinforcement mat (TRM), slope protection, or transition mat work.

- Water the area no later than the day following placement of the materials. If the contractor fails to water by the second day following placement, a price adjustment will be assessed at a rate of $200.00 per calendar day until the watering has been completed.

- Apply three additional waterings at intervals of 5 to 8 calendar days. Perform all waterings unless notified by the Engineer in writing at least 1 calendar day prior to the day the watering is to occur. If the contractor fails to complete the watering before the 8th calendar day has elapsed, a price adjustment will be assessed at a rate of $200.00 per calendar day, beginning on the 9th day, until the watering is completed.

- Ensure all waterings are sufficient to thoroughly saturate the seedbed to a depth of approximately 2 inches.

- Each watering may require a maximum of 50 gallons of water per square. Apply the water as a spray or dispersion to prevent damage to the seedbed. Complete each watering within a 4 hour period.

- More than one application for each watering may be necessary to provide adequate saturation without run-off.

Watering Sod

The contractor shall provide watering equipment and an approved water supply before beginning sodding operation. Six waterings will be required. No more than 1 hour should elapse between laying and initial watering of sod. Second, third, and fourth waterings should be performed at 4 calendar day intervals; and fifth and sixth waterings at weekly intervals. Perform waterings unless notified by the Engineer in writing at least 1 calendar day prior to the day watering is to occur. A price adjustment will be assessed at a rate of $200.00 per day for each calendar day that the Contractor fails to complete watering from the day watering is to commence.

Waterings should be sufficient to thoroughly saturate sod, sodbed, and adjacent disturbed areas to a depth of approximately 4 inches.

Each watering may require a maximum of 100 gallons of water per square. Apply water as a spray or dispersion to prevent damage to the sod. Complete each watering within a 4 hour period. More than one application for each watering may be necessary to provide adequate saturation without runoff.

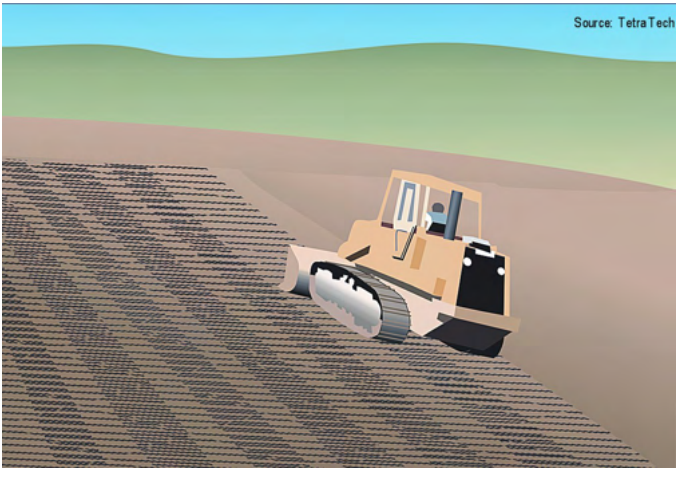
TIP

Do not feel restricted to use only the bid items provided. If a new item is needed, then add it by contract modification.

Other Methods of Erosion Control:

Another method of temporary erosion control is surface roughening. This BMP may be used on a slope that is being graded as a way of preparing for a storm or on areas where activity has ceased temporarily.

One type of surface roughening is dozer tracking created from track equipment driving up and down a slope. Depressions left behind will help slow the water as it flows down a slope. Equipment should move up and down the slope so that the grooves are parallel to the contour.



Dozer tracking is created by equipment moving up and down a slope rather than along the contour.

Another type of surface roughening is soil ripping or grooving using rippers, disks, harrows or plows. Soil ripping is more effective than dozer tracking on steeper slopes (greater than 3:1).

The benefits of surface roughening include:

- Reduced storm water run-off volume and velocity.
- Improved infiltration rate.
- Improved soil water holding capacity.
- Improved potential for vigorous long term vegetation coverage.

Neither of these methods would be considered temporary stabilization.

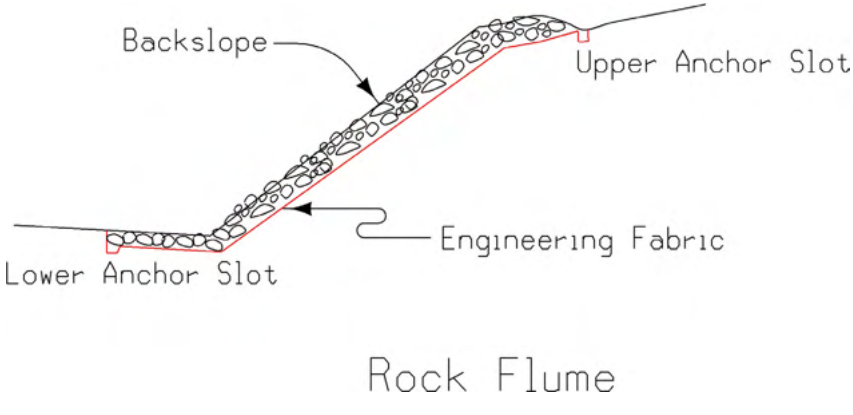
Rock Flumes, Splash Basins, and Ditches

Rock flumes, splash basins, and ditches involve installing rock over engineering fabric. Typically, these measures will be permanent but can also be useful during construction as temporary erosion control measures.

Rock flumes are installed to prevent gullies from forming in areas where there is concentrated flow down a slope.

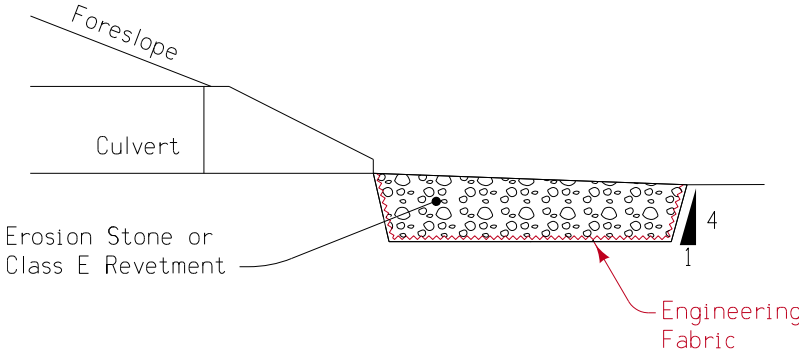
Splash basins are installed at outlets of pipes to reduce the velocity of water just downstream of the pipes. This will help prevent scour and erosion.

Splash basin locations will be shown in Tab. 100-23 in the C, CE, or R sheets. Typically, the locations are estimated locations for placement where the designer anticipates problems with erosion. The field inspector and contractor may also determine additional locations or revisions to the estimated locations.



Detail of rock flume.

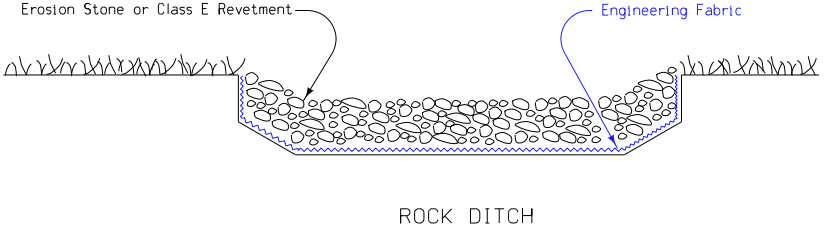
Rock flume installed to convey flows from a backslope bench.



Detail of splash basin at a culvert.

This pipe outlet does not have a splash basin, and erosion is occurring.

A ditch may be lined with rock when velocities prevent establishment of vegetation. A rock ditch would be used when the slope of the ditch and the volume and velocity of water exceed the capabilities of special ditch control or TRM. Disadvantages of rock include difficulty of maintenance and aesthetics.



Detail of rock ditch.

A contractor is installing riprap on top of engineering fabric to create a rock ditch.

These rock ditches were included in the design of the project due to the steep slopes and potential for erosion.

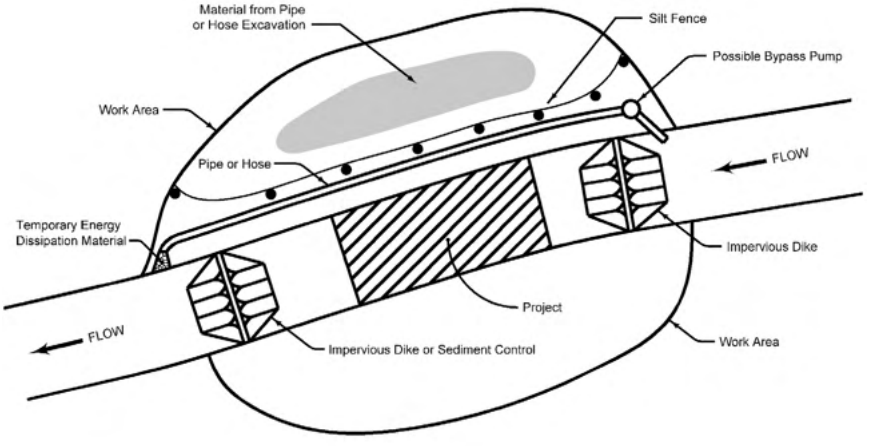
Temporary Stream Diversion

A temporary stream diversion involves diverting the flow of a stream around the construction site by use of either a diversion channel, pipe, or hose. It applies to projects involving installation or extensions of reinforced or precast box culverts 6 ft. by 6 ft. or larger, or arch pipe culverts 102 inches by 62 inches or larger.

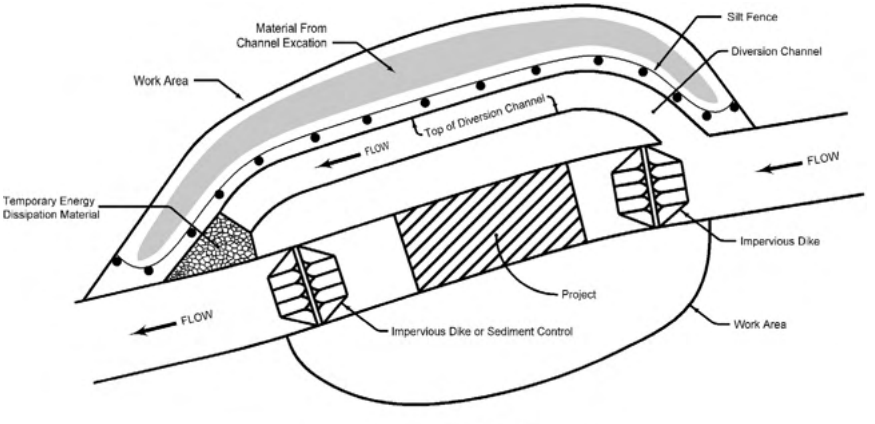
Standard Road Plan EW-402 shows location and type of controls required. Specifications Section 2418 provides material requirements for the impervious dike and temporary energy dissipation.

DID YOU KNOW?

Stabilization measures are more cost effective than sediment controls (such as silt fence).



PIPE OR HOSE



DIVERSION CHANNEL

EW-402 provides for different methods the contractor may use to divert flow of a stream. As shown above, a diversion channel is one of the methods. Using a pipe or hose is another method to divert the flow.

Example of a temporary stream diversion using bypass pumping.

Temporary stream diversion showing a diversion channel and upland sediment controls.

Temporary Stream Crossing

A temporary stream crossing is a temporary structure used to provide construction access along or into waters of the United States. Unless indicated otherwise in the contract documents, the Contracting Authority will obtain approval for a temporary stream crossing constructed according to EW-401 in the 404 permit. Specifications Section 2547 also provides requirements for temporary stream crossings. A contractor should not use dredged material or stream excavation to construct their temporary stream crossing, unless it is authorized by the 404 permit.

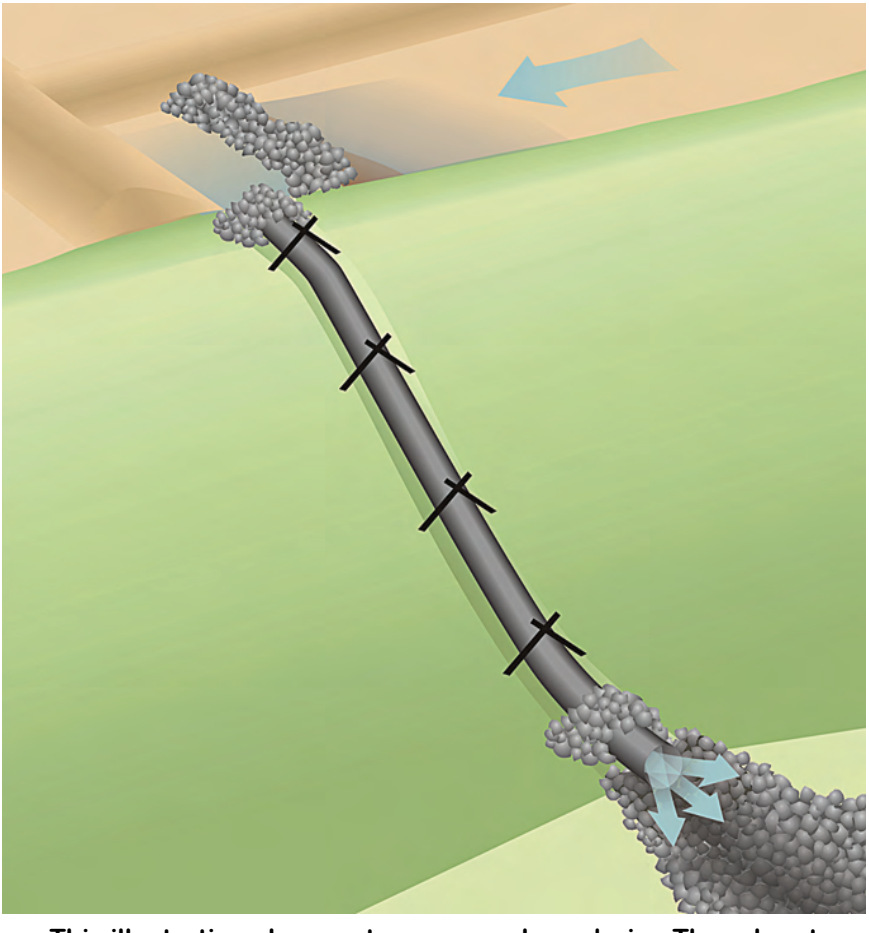
Additional information on temporary stream crossings is provided at:

https://iowadot.gov/construction_materials/faqs/environmental

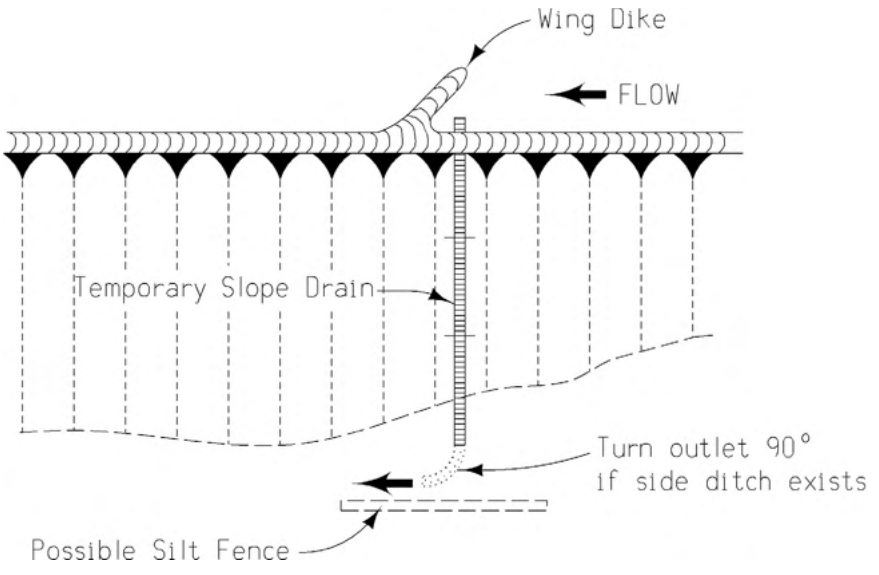
A temporary stream crossing was constructed by the contractor to allow for access to both sides of the creek. When a temporary stream crossing is used, it should be completed according to EW-401.

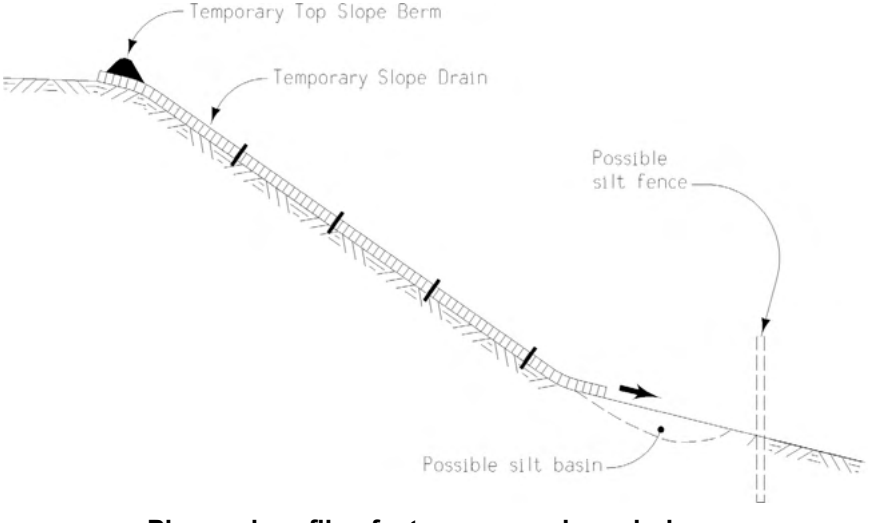
Temporary Slope Drains

Temporary slope drains are used on steep, disturbed slopes to divert storm water run-off and prevent erosion. At the top of a slope, water is diverted into a flexible pipe which then conveys water to a stabilized outlet or channel. Using these drains will reduce gully erosion from concentrated flows on the slope and will also help with the slope's vegetation establishment.



This illustration shows a temporary slope drain. Though not commonly used in Iowa, other states have used this type of control to convey water through a pipe over a disturbed slope.



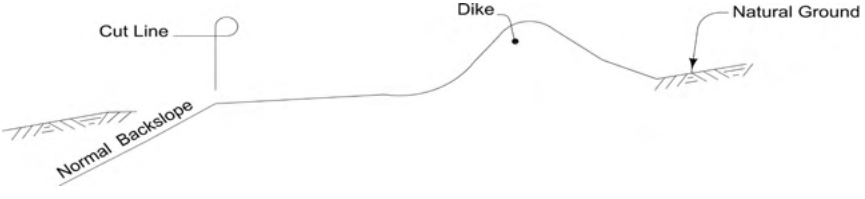


Plan and profile of a temporary slope drain.

How to Control Run-off or Run-on

Controlling run-off or run-on or diverting flows from disturbed areas can minimize erosion. By minimizing erosion, there will be less sediment to control. Controlling run-off will also aid in the establishment of vegetation.

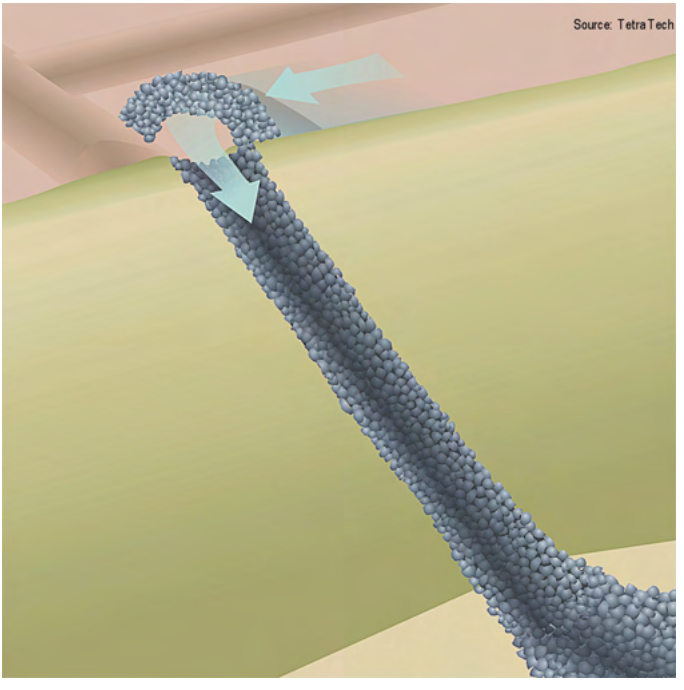
One way to control run-off or run-on is with intercepting ditches. High backslopes with large drainage areas can be problematic. An intercepting ditch next to the top of the backslope can be used to carry the water along the top of the backslope down to the ditch to avoid erosion on the backslope. Sometimes the run-off will be concentrated at one location. If this is the case, a letdown flume should be placed to minimize or prevent erosion from flow down a slope.



Intercepting ditch detail.

TIP

A joint inspection between contractor and inspector is important in successfully planning future work.



A letdown flume is installed to direct water from an intercepting ditch down a slope without causing erosion.

Other items to consider to control run-off:

- Prevent surface run-off from higher undisturbed or stabilized areas from coming in contact with exposed soil surfaces.
- Direct onsite water away from critical areas such as steep slopes and highly erodible soil, landslide-prone areas, etc.
- Prevent sediment-laden run-off from an exposed slope from leaving the restoration site without first passing through a sediment detention structure.
- Install a berm or intercepting ditch above the slope to divert upland rain run-off.

Storage Requirements

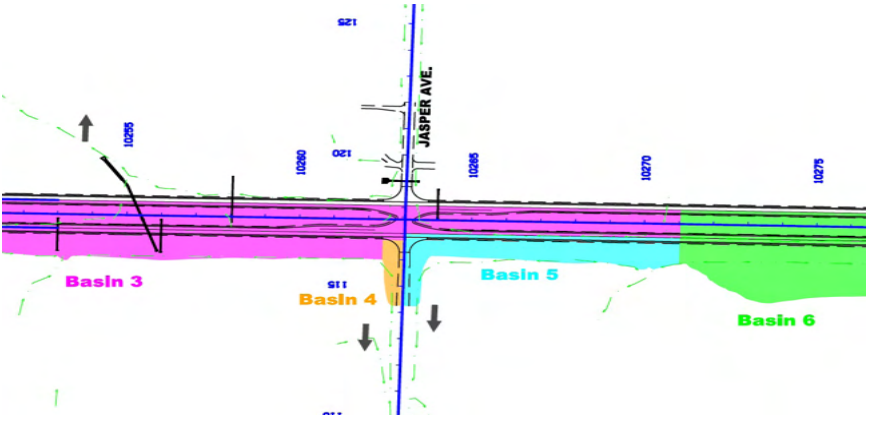
The storm water permit requires a temporary sediment basin providing 3600 ft.^{3} of storm water storage per disturbed onsite acre drained or equivalent temporary sediment control devices may be used.

The designer will determine the number of disturbed acres for each drainage basin. This will be shown in Tab 100-34. Additionally, there might be plan sheets color-coded to show the different drainage basins and their discharge points. The designer will also determine the total volume of storage provided by all temporary sediment control devices (such as silt fence ditch checks, silt basins, etc.). The tabulations for various controls (such as silt fence ditch checks) will include the amount of storage.

During construction, inspectors and contractor should be aware of the permit's storage requirements and how not installing controls could cause issues with permit non-compliance.

STO

Drainage Basin Location								
Basin No.	Station to Station		Side	Discharge Point		Total Disturbed Area	Disturbed Area with Storage Provided	Disturbed Area without Storage Provided
				Station	Side	Acres	Acres	Acres
1	3066+00.00	3090+00.00	Lt	3072+20.00	N	3.6	3.6	0.0
2	3066+00.00	3086+00.00	Rt	3073+00.00	S	4.0	4.0	0.0
3	3182+90.00	3198+25.00	Lt	3183+00.00	W	2.5	2.5	0.0
4	3183+00.00	3198+25.00	Rt		S	2.5	0.0	2.5
5	3198+25.00	3205+00.00	Lt	3205+00.00	E	0.8	0.8	0.0
6	3198+25.00	3207+00.00	Rt	3207+00.00	E	3.0	3.0	0.0



Plan sheet showing color coded drainage basins and discharge points

Summary tab from the plans showing drainage basins, their discharge points and required storage volume.

STORMWATER DRAINAGE BASIN AND STORAGE

Refer to EC Standards and 570s Details.

Summary of Stormwater Storage

Best Management Practice	Total Storage Volume Provided	Total Storage Volume Required	Storage Volume Met?
	CF	CF	Yes/No
	24683.2	12960.0	Yes
Silt Fence for Ditch Check (EC-201)	21946.9		
Silt Basin (EW-403)	2736.3		
	26344.8	14480.0	Yes
Silt Fence for Ditch Check (EC-201)	19768.8		
Silt Basin (EW-403)	3643.8		
Rock Check Dam (EC-302)	2932.2		
	9885.2	9000.0	Yes
Silt Fence for Ditch Check (EC-201)	8751.4		
Silt Basin (EW-403)	1133.8		
	0.0	9000.0	No
Sheet Flow into Vegetated Area			
Multiple Rows of Silt Fence for Perimeter Control			
Rock Berm where Water Leaves Site			
	10483.2	2880.0	Yes
Silt Fence for Ditch Check (EC-201)	9458.2		
Silt Basin (EW-403)	1025.0		
	10961.4	10880.0	Yes
Silt Fence for Ditch Check (EC-201)	9911.4		
Silt Basin (EW-403)	1050.0		

Sediment Controls

Sediment controls provide a way to collect sediment after it has been displaced by erosion. The following sections will provide information on different types of sediment control used by Iowa DOT.

Silt Fence

Silt fence should not exceed 200 feet per run, and the last 20 feet should be flared up the slope or in the direction from which the flow originates. These flares are called J-hooks. Alternatively, silt fence can be placed continuously with a hump up the slope every 200 feet.

Silt fence should be installed along slope contours to avoid concentrated flow along the fence. The ends should be curved up and give the silt fence the shape of a smile when looking along the contour.

Standard Road Plan EC-201 shows requirements of silt fence.

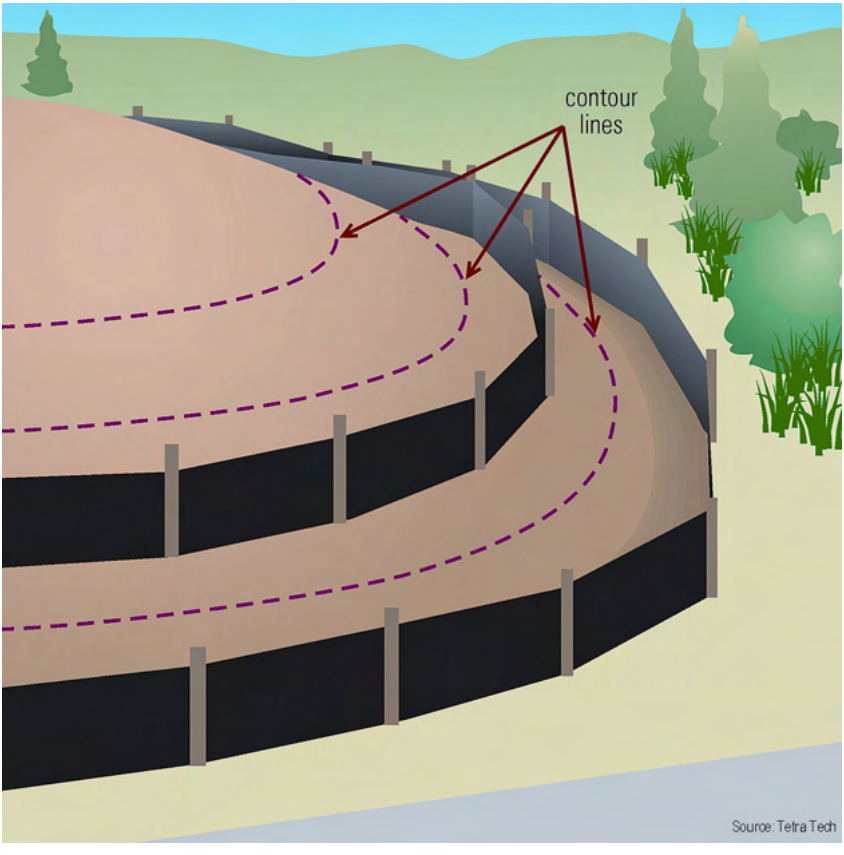
Silt fence with J-hooks.

The blue arrows represent direction of flow.

Installing J-hooks creates additional areas to contain storm water without it all running down to the bottom line of silt fence.

TIP

Destroyed silt fences and ditch checks should be replaced.



This illustration shows multiple rows of silt fence installed along the contour lines.

The following table provides guidelines for spacing of silt fence when installed along the contours of a slope.

slope	approximate spacing (ft)*
up to 10:1 (10%)	100
up to 5:1 (20%)	60
up to 4:1 (25%)	50
up to 3:1 (33%)	40
up to 2.5:1 (40%)	30

*For Loess and other highly erodible soils, these spacings should be decreased.

Information Source: Based on Iowa Construction Site Erosion Control Manual, 2006.

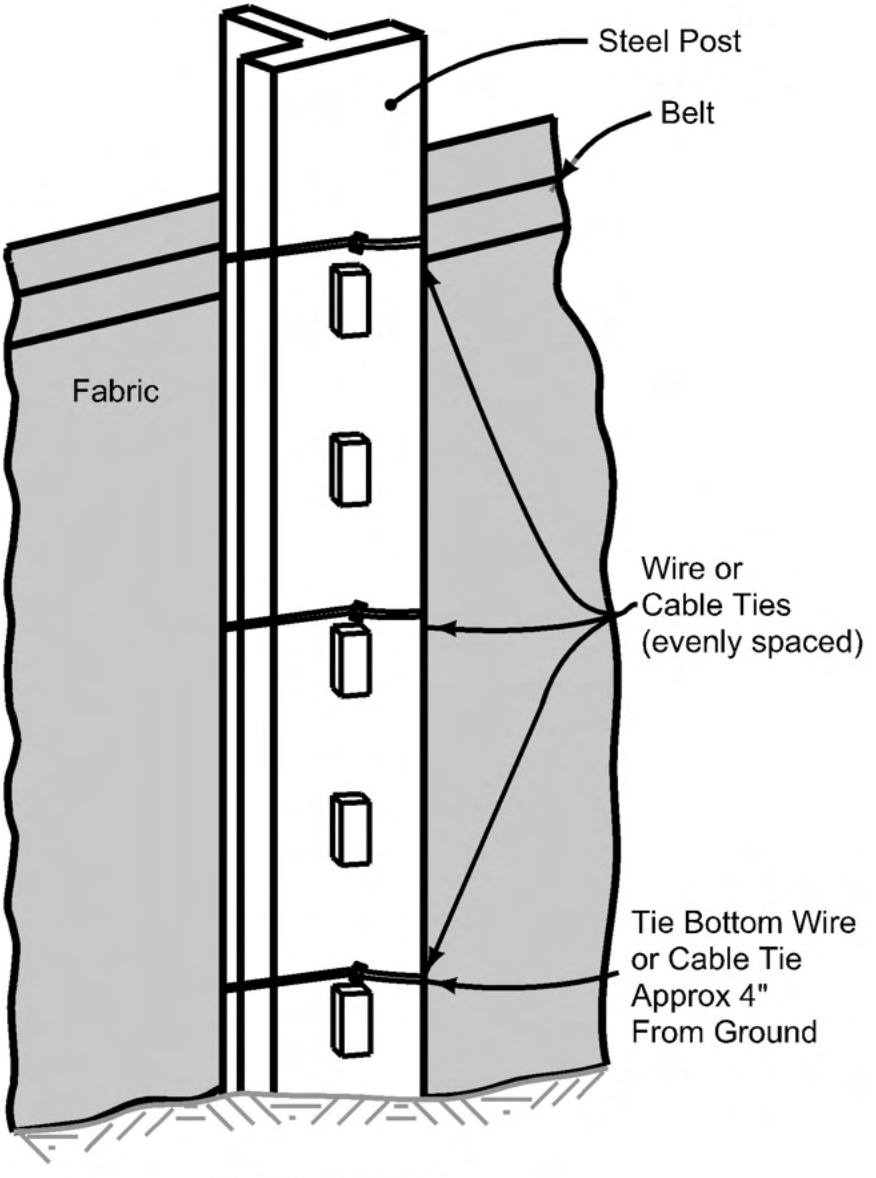
Multiple rows of silt fence installed along the contour of this foreslope.

Silt fence should be fully entrenched. The fabric should be a minimum of inches in the ground and offset from the post 4 inches. Also, fabric should be tight and not sagging between posts.

Both sides of the fence should be compacted after installation is complete. This can be accomplished by running the equipment wheel over both sides of the installation area.

The steel T fence posts shall be a minimum of 4 feet in length. All posts should be embedded 28 inches with a maximum spacing of 8 feet. Post spacing for silt fence ditch checks will be discussed in a following section.

The fabric should be attached to the post with 3 evenly spaced ties with the top tie encompassing the belt in the fabric.



BACK VIEW
ATTACHMENT TO POST

Silt fence fabric is to be attached to the post with three ties.

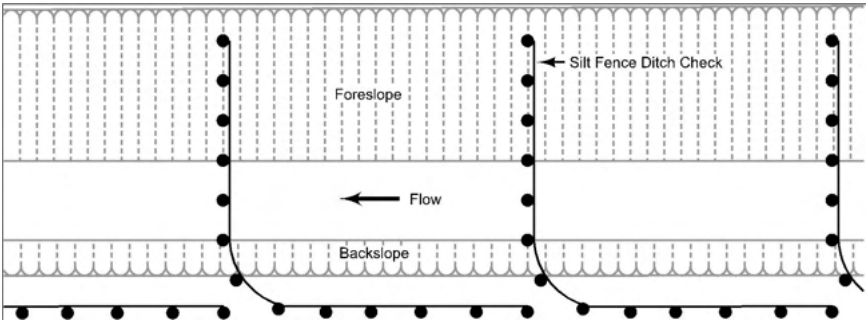
This silt fence installation machine is trenching in the fabric. Following this step, posts will be installed and the fabric attached to the posts.

Give the silt fence fabric a good tug to ensure it's properly installed. When properly installed, silt fence fabric should be tight between the posts.

Do not allow the contractor to use bent or damaged posts.

When installing silt fence at the bottom of a slope, it should be placed anywhere from 10 feet away from the toe of the foreslope to the right-of-way line, running parallel to the foreslope. This allows room for silt to be deposited and for ease of maintenance. Silt fences should be used when the vertical height of the foreslope is greater than 3 feet.

Occasionally, projects might be designed with shallow or no ditch situations. A shallow ditch is defined as a ditch less than 19 inches deep. EC-201 shows how to install silt fence in these situations.



EC-201 showing silt fence installation in shallow or no ditch situation.

If you have silt fences filling up quickly, they are probably collecting run-off from too large an area. In general, the maximum drainage area for 100 feet of silt fence is ¼ acre. To avoid filling up silt fences too quickly, upstream areas should be stabilized with seed and mulch as soon as possible. Additional upstream controls, such as sediment logs or additional silt fence may be required.

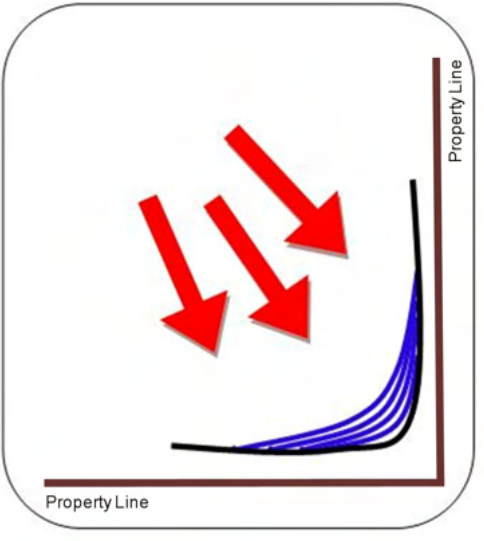
TIP

Silt fence should follow the contour of the land.

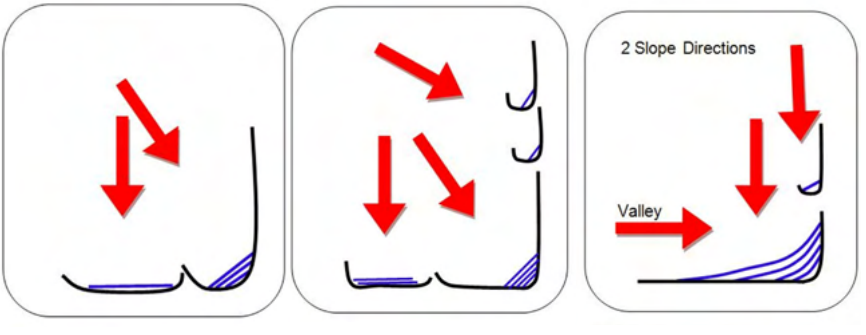
This silt fence was tied with the correct number of ties, but the top tie does not encompass the belt and the bottom tie should be about 4” from the ground.

This silt fence was incorrectly tied to the post with only two ties.

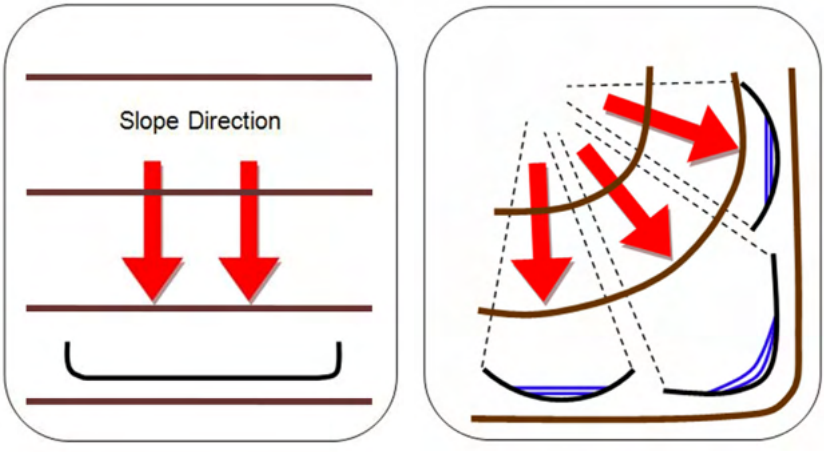
Here are some additional tips regarding silt fence placement with the red arrows showing direction of water flow:



This is an incorrect layout of silt fence installed as perimeter control along a property line. Run-off will concentrate in the lower right corner and overwhelm the silt fence, and a blow-out will occur.



These are examples of correct silt fence placement where a single section of silt fence is broken up into multiple sections with J-hooks. Multiple sections provide multiple storage areas for water to accumulate, thus reducing the chance of a blow-out.



Above illustrations show placement of silt fence along contours of a slope. (The brown lines represent contour lines.)

Silt fence requires regular inspections to check for sediment accumulation, tears, undermining, and separation from posts.

Silt fences require clean-out when capacity has been reduced by 50% or more. There are bid items available for Maintenance of Silt Fence and Silt Fence for Ditch Checks. Specifications Article 2602.03, requires silt material to be disposed of off the project unless the Engineer approves a suitable site within the project limits.

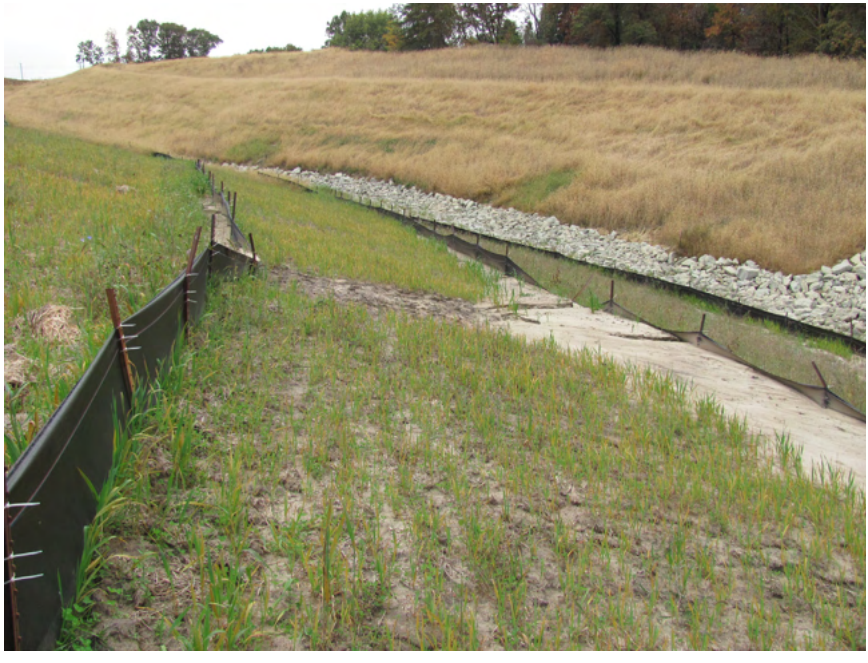
If a silt fence is located in an area where removing the sediment is not possible, a second silt fence should be installed. In most cases, it is recommended to add an additional silt fence in front (downstream) of the existing silt fence. Installing a second fence instead of cleaning out a silt fence may also be preferred in situations where cleaning out the silt fence would cause disturbance to the area (such as an area that has vegetation established).

If an additional silt fence is installed, the silt fence that is at capacity or blown-out should be painted with a large “X” indicating that the inspector recognizes it is no longer functioning and a comment should be made in the storm water site inspection report.

Silt fences at capacity should be noted on the weekly inspection report as a deficiency.

Typically silt fences are removed prior to seeding and mulching. Silt fences should then be reinstalled following seeding and mulching. Seed will not grow well on the silt, and it is better to clean-out and reshape the area before vegetation is established.

This is an example of a second silt fence being placed as a replacement where the existing fence was blown out. To be more effective, the new fence should have been installed downstream of the existing fence.



You may even find silt fences in vegetated areas that have been blown out by silt.

This photo shows a silt fence that was cleaned out. However, the removed silt was incorrectly placed in front of the silt fence.

Perimeter, Slope, and Ditch Check Sediment Control Devices - Sediment Logs, Wattles, and Socks

Perimeter, Slope, and Ditch Check Sediment Control Devices consist of wood excelsior sediment logs, straw wattles, and filter socks.

The devices come in a variety of diameters. Bid items are available for 9, 12, and 20 inches.

These controls provide slope interruption, inlet protection, perimeter control, and energy dissipation depending on the diameter and amount of flow in ditches.

Use of sediment logs as ditch checks over special ditch control.

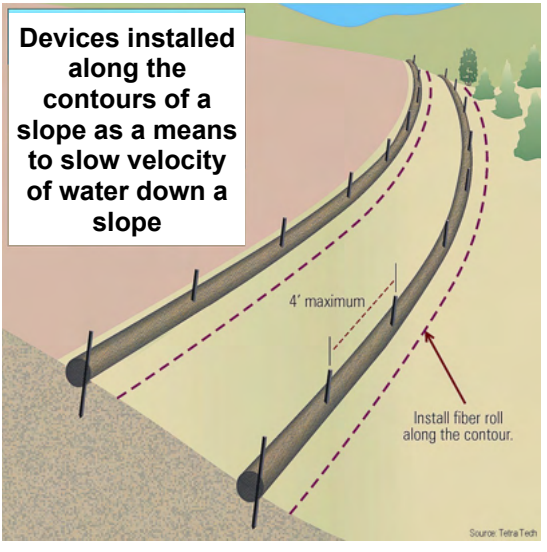
When installed on slopes, the devices should be installed along the contour line.

The recommended maximum spacing of devices on slopes or in ditches are shown in the tables below. However, it should be noted that tighter spacing may be required based on soil type and rainfall.

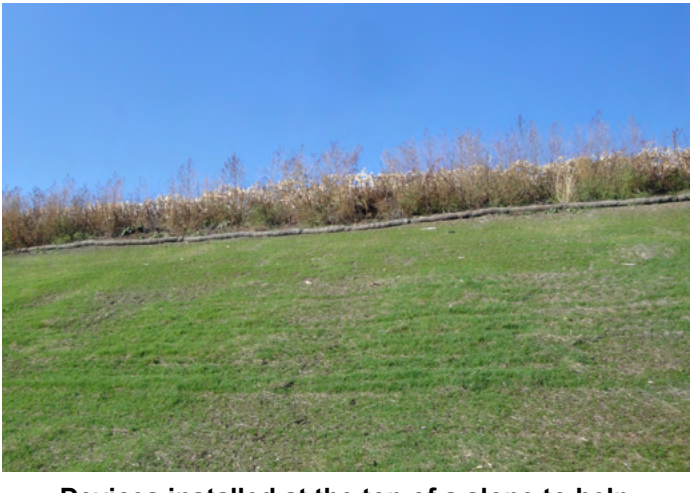
slope	approximate spacing (ft)		
	9 inch device	12 inch device	20 inch device
4:1 and flatter	40	60	80
3:1	30	45	60
2:1	20	30	40
1:1	10	15	20

ditch grade	approximate spacing (ft)	
	12 inch device	20 inch device
≤ 1%	92	133
≤ 2%	46	67
≤ 3%	31	44
≤ 4%	23	33
≤ 5%	18	27
≤ 6%	15	22
≤ 7%	13	19
≤ 8%	11	17
≤ 9%	10	15
≤ 10%	9	13

Recommended maximum spacing for devices installed on slopes and in ditches.



EC-204 shows installation requirements, including proper staking and stapling. **Please be aware** that photos included in this guide show previous staking requirements with the stake going through the device.



Devices installed at the top of a slope to help vegetation get established on the slope.

A benefit of these devices is the flexibility of installation. If these materials are onsite, the contractor can install them and does not have to wait for a subcontractor to become available. This could be especially important in critical areas near wetlands or waterways where the area is disturbed and controls are needed immediately.

Depending on their condition, the devices can also be removed and reinstalled. Once again, this would be useful in critical areas where work is ongoing but the need for controls remains.

Here logs worked well as ditch checks in a shallow median.

EC-204 requires wood stakes be driven into the ground a minimum of 12 inches. This photo shows stakes incorrectly driven into the ground several inches.

Devices should be installed with proper staking. This photo shows <u>improper</u> staking using a metal nail.

Ditch check showing wood stakes at correct spacing and controls overlapped.

Wattles installed at back of curb to prevent sediment from washing onto the road.

Logs/wattles/socks are good controls for culvert inlet protection.

A log was used as a replacement for this silt fence ditch check.

Logs/wattles/socks have the flexibility to be installed in any season. Here a line of logs was installed during the winter to provide protection along a stream.

Both logs used in this ditch check were not properly staked causing them to blow out.

Ditch Checks

Ditch checks can be constructed using a variety of materials, including silt fence, rock or logs/wattles/socks (which were discussed in the previous section).

The purpose of ditch checks is to slow the velocity of the water and to capture sediment.

The steeper the ditch, the closer the ditch checks should be placed to each other. The tables in the following section provide guidelines for spacing of various types of ditch checks.

Silt Fence Ditch Checks

Guidelines for silt fence installation should be followed except that posts for ditch checks should be spaced no more than 4 feet apart.

In the ditch bottom, posts should be placed at the toe of the foreslope and backslope with the remaining posts spread equally.

The steeper the ditch grade, the closer silt fence ditch checks should be installed.

It is important for the silt fence to be tied into the slope and for the top center to be installed lower than the outside edges, otherwise storm water will just flow around the side.

This silt fence ditch check has been improperly installed. The end should extend into the slope on the right, otherwise storm water will just flow around the side.

Machine trenching in a silt fence ditch check.

The approximate spacing of silt fence ditch checks will be according to the following table.

ditch grade	approximate spacing (ft)
≤ 0.5%	315
> 0.5% to ≤1%	155
> 1% to ≤1.5%	100
> 1.5% to ≤ 2%	75
> 2% to ≤ 2.5%	60
> 2.5% to ≤ 3%	50
> 3% to ≤ 3.5%	45
> 3.5% to ≤ 4%	40
> 4% to ≤ 5%	35
> 5% to ≤ 5.5%	30
> 5.5% to < 6%	25
≥ 6%	Special design required – contact the Agronomist

Recommended maximum spacing for silt fence ditch checks.

FACT

The steeper and longer the ditch, the faster and stronger the flows.

Erosion may create gullies in the ditch making it difficult to install silt fence ditch checks. The ditch may require re-grading prior to installing the ditch checks.

Ditch requiring re-grading prior to ditch check installation.

This photo shows a chain of silt fence ditch checks installed to slow velocity of water and collect sediment from flowing downstream.

Silt fence ditch checks at capacity require removal and replacement or clean-out.

TIP

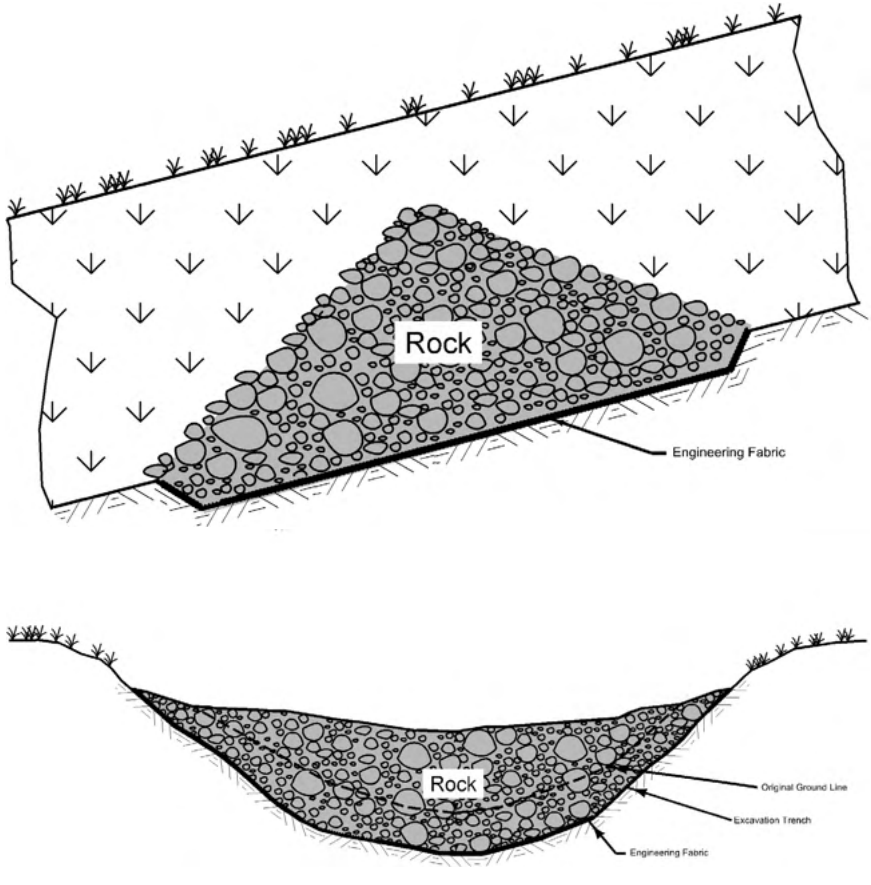
If silt fences or ditch checks are half full of silt, they should be cleaned out.

Rock Ditch Checks - Temporary & Permanent

Rock is another material option for ditch checks.

Just like silt fence ditch checks, rock ditch checks need to be tied into the slopes to prevent washout around the edges.

Rock ditch checks may be temporary or permanent in nature. The bid item used for temporary ditch checks is called Rock Check Dam. If a designer has chosen for a ditch check to be permanent, they will include Rock Ditch Checks in the plans in Tabulation 100-23.



Rock Check Dam detail for temporary applications.

Similar to silt fence ditch checks, Rock Check Dams are used to slow flow of water and to collect soil. They are installed at right angles to the flow of water.

Typically, Rock Check Dams are installed in situations where silt fence ditch checks have failed to hold up.

The recommended maximum spacing for temporary Rock Check Dams is shown in the table below.

ditch grade	approximate spacing (ft)
≤ 0.5%	400
> 0.5% to ≤1%	200
> 1% to ≤ 1.5%	130
> 1.5% to ≤ 2%	100
> 2% to ≤ 2.5%	80
> 2.5% to ≤ 3%	65
> 3% to ≤ 3.5%	55
> 3.5% to ≤ 4%	50
> 4% to ≤ 4.5%	45
> 4.5% to ≤ 5%	40
> 5% to ≤ 5.5%	35
> 5.5% to ≤ 6.5%	30
> 6.5% to ≤ 8%	25
> 8% to ≤ 10%	20
> 10%	Special design – contact the Agronomist

Design guidance for maximum spacing of Rock Check Dams.

The end of a rock check dam should extend up into the side of the slope. The low point should not be at the side; otherwise water will just flow around the ditch check and erode the slope.

Example of a large temporary rock dam to handle extreme flows.

One general rule with ditch checks is that they be spaced so that the toe of the upstream check is the same elevation as the top of the downstream check.

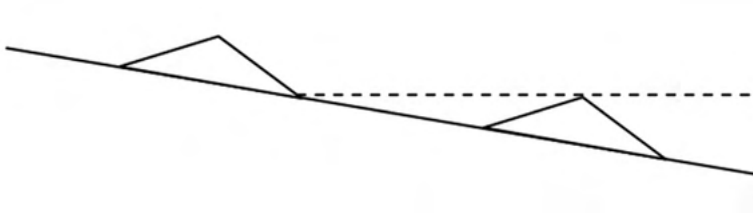
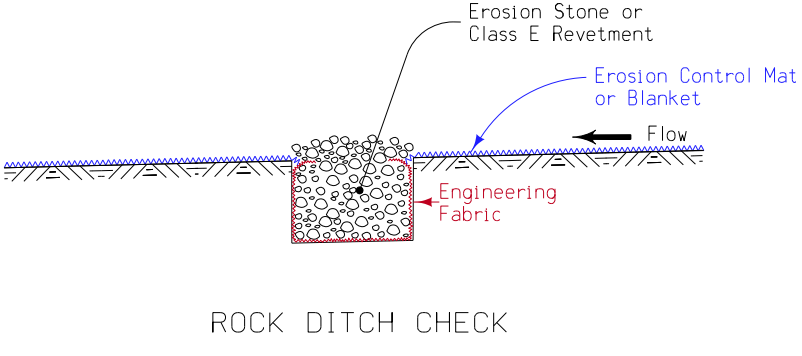


Illustration showing general rule of ditch check spacing.

Rock is used as a temporary sediment control in these Rock Check Dams.

Rock ditch check as a permanent installation.



Rock ditch check detail used for permanent installations.

Other

Bale checks have been used in the past as a last resort. They were not as effective as "properly" installed silt fence but were recommended in situations where the contractor was unable to properly install silt fence - for example, it was too wet and muddy for a trencher to place silt fence or the ground was frozen to a point where a trencher could not work.

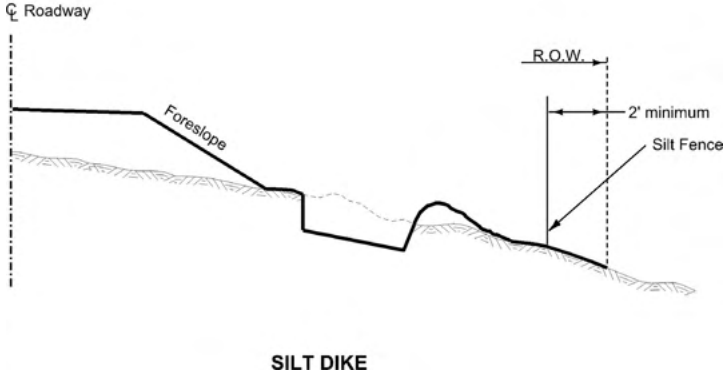
If these situations are encountered, it is now recommended to install logs/wattles/socks in lieu of straw bales. Information on logs/wattles/socks and recommended spacing as ditch checks was previously discussed under "Perimeter, Slope, and Ditch Check Sediment Control Devices".

Two examples of straw bales used as sediment control. Logs/ wattles/socks should now be considered in lieu of bales.

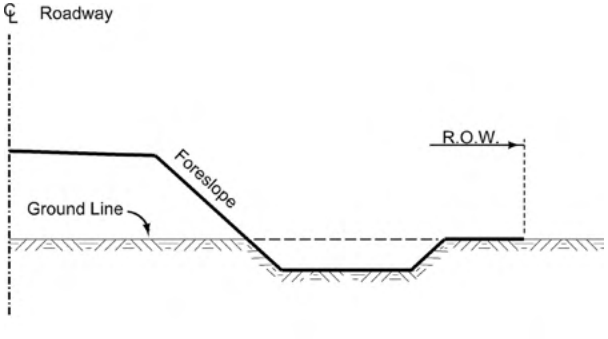
Silt Dikes and Ditches

Silt dikes and ditches trap silt in a depressed area to keep it from migrating through a project and/or flowing onto private property. A silt dike and/or a silt ditch may be used at the base of the foreslope when the natural ground slopes away from the foreslope and a roadway ditch is not provided.

Silt dikes and ditches are constructed opposite the foreslope by excavating the earth to a uniform depth below natural ground at the toe of the foreslope.



SILT DIKE



SILT DITCH

Details of silt dike and silt ditch.

Silt dikes and ditches may be used together or separately, depending on the situation. A silt dike may be constructed by taking the excavated material from a silt ditch and placing it to the side to form a silt dike.

Example of silt dike used on a grading project. This silt dike should also have temporary stabilization.

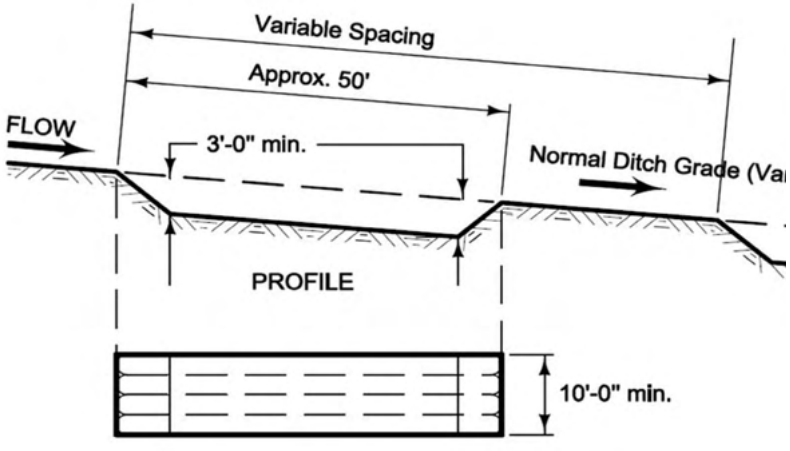
Q. What is the difference between erosion and sedimentation?

A. Erosion is the movement of soil particles and sedimentation is the depositing of soil particles.

Silt Basins

A silt basin collects silt deposits from flowing water. Its purpose is to slow the water and allow the sediment to settle in the basin.

The amount of drainage and the length to width ratio influence the amount of sediment that settles out prior to the water exiting the basin.



Detail of a silt basin - Notice that the length is longer than the width. This is to allow more time for sediment to settle out prior to flows being discharged from the basin.

Silt basins may be used in roadway ditches preceding drainage structure inlets (typically at the last roadway pipe prior to discharging offsite), and at ditch outlets that flow offsite.

Depending on the drainage areas, silt basins may also be placed in ditch grades (1% to 2%) at approximately 100-foot intervals.

Just as with silt fences, silt basins require clean-out where siltation has reduced the basin capacity by 50% or more.

When it is necessary for the contractor to clean-out, repair or reconstruct a basin, the additional payment will be 100% of the contract unit price for construction of the item per Specifications Article 2602.05. However, it should be noted that if pollution control measures are required due to the contractor's negligence, carelessness, or failure to install the controls as a part of the work

as scheduled, and are ordered by the Engineer, the contractor is to perform this work at no additional cost to the Contracting Authority.

Example of silt basin.

This is an improperly sized silt basin and will not function as required, because it will not provide time for sediment to settle.

This silt basin's capacity has been reduced by more than 50% and requires clean-out.

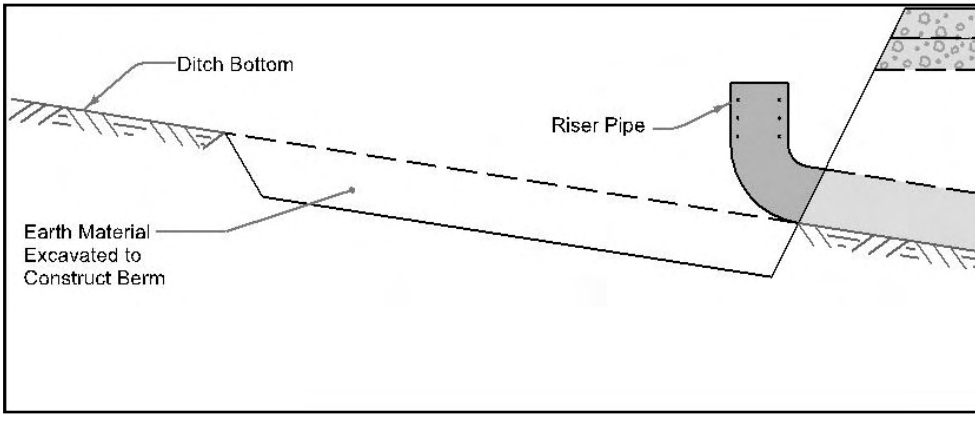
This is a silt basin and rock used together as sediment controls prior to water discharging offsite.

Temporary Sediment Control Basin

A temporary sediment control basin incorporates a temporary earth berm built across a ditch with a riser pipe installed through the berm. The inlet side of the riser pipe has slots or holes drilled or cut to allow water to be slowly discharged. The berm has a rock overflow to handle flows from high intensity rain events. The purpose of this control is to use the ditch area as storage and allow the sediment to settle out.

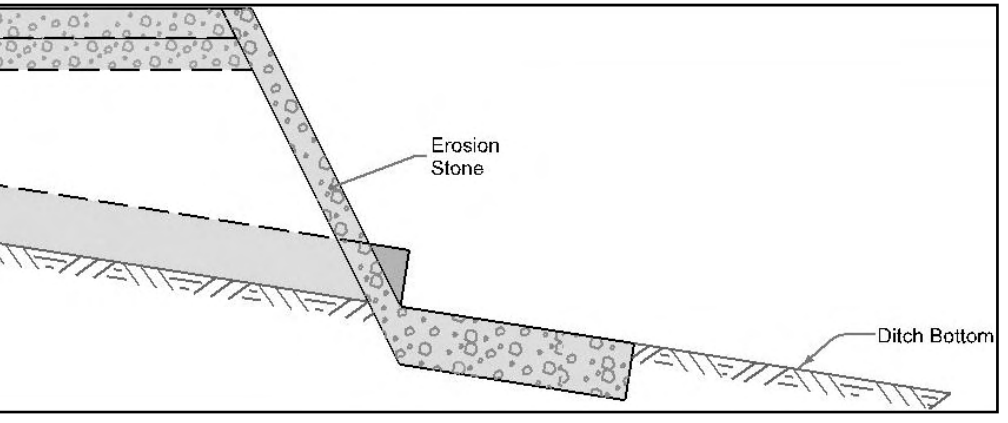
Above, inlet of riser pipe and berm with rock overflow.

Right, outlet of riser pipe with rock overflow.



Profile of a temporary sediment control basin.

Temporary sediment control basin showing the upstream riser pipe and erosion stone overflow.



TIP

Do not wait to have controls installed just because they would be temporary.

Beyond limiting disturbed areas, the most effective type of practice is erosion control.

TIP

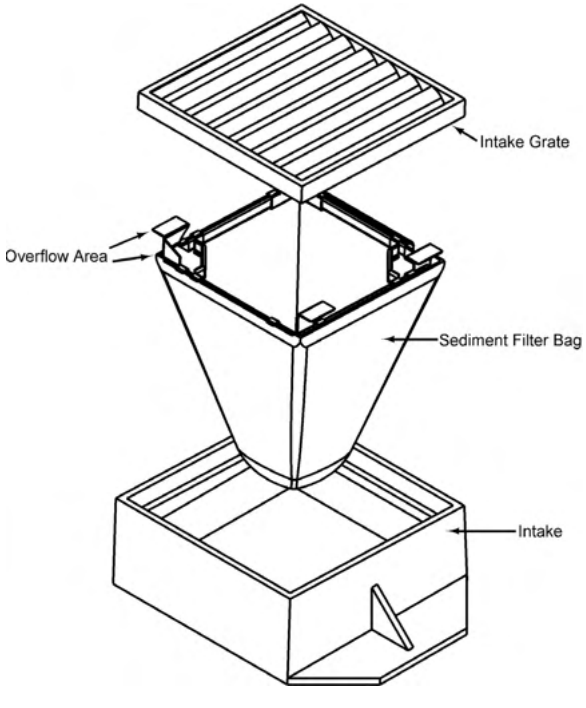
Long runs of silt fence are not as effective as shorter sections installed with J-hooks.

Inlet Protection

There are a number of methods to protect inlets. For example, silt fence, or sediment logs can be used as a type of inlet protection. There are also a variety of products by different manufacturers created specifically as inlet protection.

For existing inlets, controls should be installed prior to disturbing surrounding land. For new inlets, controls should be installed as soon as the inlets are constructed.

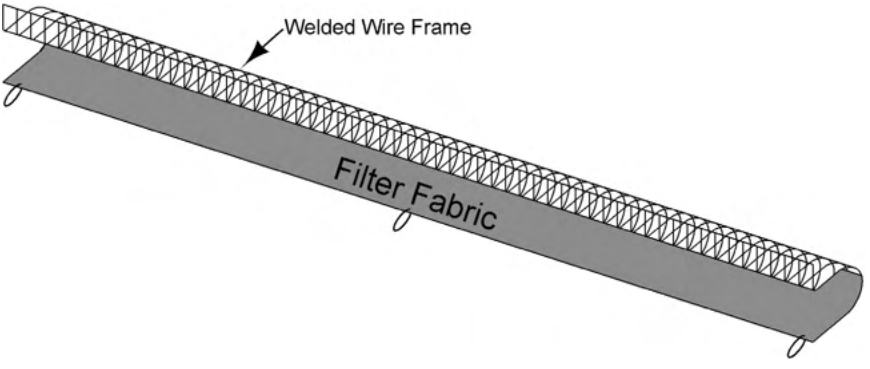
Riprap has been placed around this inlet to prevent erosion. Silt fence has been placed to prevent sediment from entering the inlet.

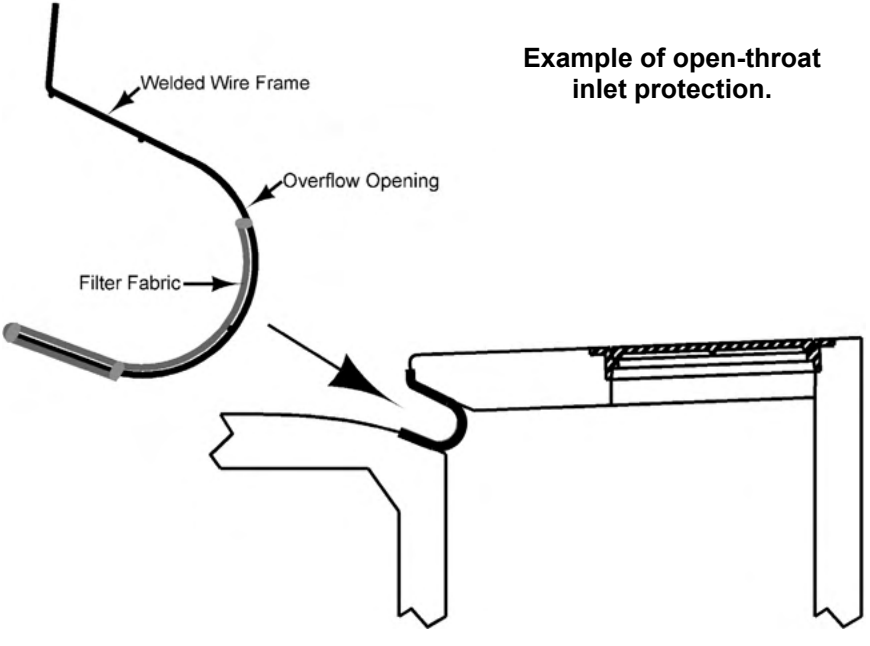


This type of inlet protection uses a sediment filter bag

Inlet protection will serve to slow the water down and may result in creating some ponding upstream of the inlet. Because of this, there is potential for inlet protection to create flooding hazards, and these areas should be monitored closely during rain events.

There are several design details for temporary sediment control devices used to prevent silt from entering intakes or manholes. One example shows a device that is inserted into the throat of an open-throat intake. Another type shows a bag inserted on the casting under the grate.





Example of open-throat inlet protection.

Filter Berms

Filter berms are used as a temporary sediment control. They can be formed from slash mulch, stone, or compost. The berms slow and filter storm water run-off or may also be used to divert flows. Filter berms would be placed along ground contours, similar to silt fence.

Slash mulch berms can be used as ditch checks or perimeter control. Slash mulch consists of wood mulch, which is typically waste material from clearing and grubbing activities.

Slash mulch filter berm used as a perimeter control.

TIP
Check outlets and waterways for sediment leaving the project.

Slash mulch ditch check.

FACT

Storm water site inspections are required weekly, even during the winter.

Floating Silt Curtain

The main purpose of the silt curtain is to isolate the work area from the water body, thus allowing sediment to settle out of suspension.

Two types of Floating Silt Curtains may be utilized - Hanging or Containment.

- Floating Silt Curtain (Hanging) is intended to create a static water area. Sediment suspended in the static water area is isolated and settles out of suspension within the area of the floating silt curtain.
- Floating Silt Curtain (Containment) is intended to capture all sediment entering the water during construction activities and the sediment is to be completely removed with the floating silt curtain upon completion of the work.

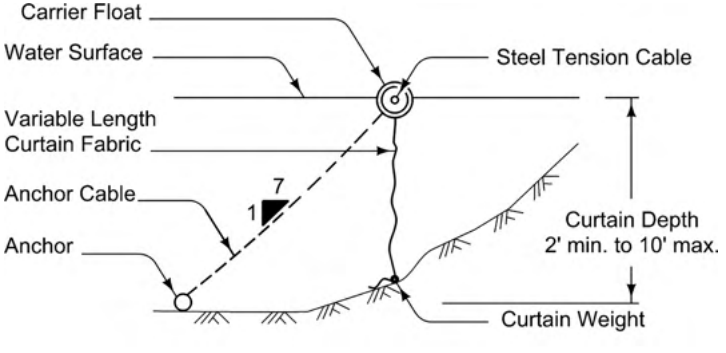
Silt curtains should not be installed across a creek or river.

Floating Silt Curtain (Hanging) is typically provided as a bid item on all bridge and streambank erosion control project locations or when requested by the District. Cleanout is not required for this installation, and removal is incidental to installation.

For bridges, quantity is typically based on two times the ROW (or ROW plus easement) width when both berms are impacted or one times the width if only one berm is affected.

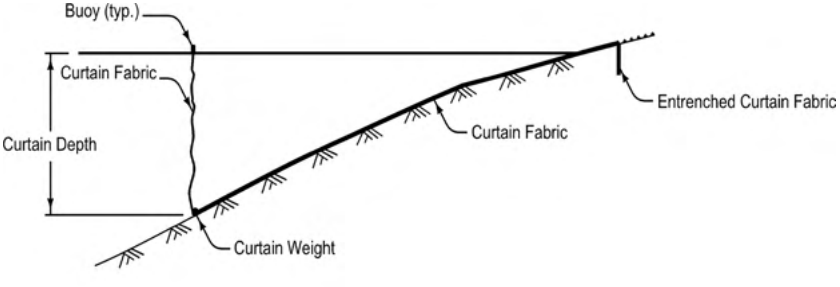
A silt curtain alone should not be considered as adequate perimeter control. Other sediment controls, such as silt fence or perimeter and slope sediment control devices, should be installed upland to manage run-off from the site.

A hanging silt curtain's main purpose is for when we are actively working in the water to create a barrier between an active work area (where dirt is suspended in the water) from the rest of the water body. This allows the suspended sediment to settle on the inside of the curtain and prevents a turbid cloud/plume. Instead of a hanging curtain, the site might be better managed by using revetment or broken concrete to create a temporary rock berm.



Floating Silt Curtain (Hanging) installed on a bridge project and installation detail from Standard Road Plan from EC-202.

Floating Silt Curtain (Containment) is included as a bid item when specified by the Location and Environment Bureau or when requested by the District. It is intended for sensitive areas, protected waters, and where endangered aquatic species are expected to exist. When this item is used, it is installed parallel to the Hanging curtain and payment will be made for both bid items.



Floating Silt Curtain (Containment) installed on a bridge project and installation detail from Standard Road Plan EC-202.

Vegetated Buffers

Vegetated buffers are areas of undisturbed vegetation, typically consisting of grasses, that may be used to slow storm water runoff and filter sediment. They are typically used in combination with temporary sediment control devices or in rare circumstance in place of devices. If used in place of temporary sediment control devices, the use should be limited to projects involving small disturbed areas. When working adjacent to surface waters, vegetated buffers should be used in conjunction with a perimeter control (such as silt fence).

Existing vegetation used as vegetated buffer in conjunction with silt fence (indicated by blue arrow) to protect a wetland.

Vegetated buffer used with silt fence and topsoil berm.

Flocculants/Polymers

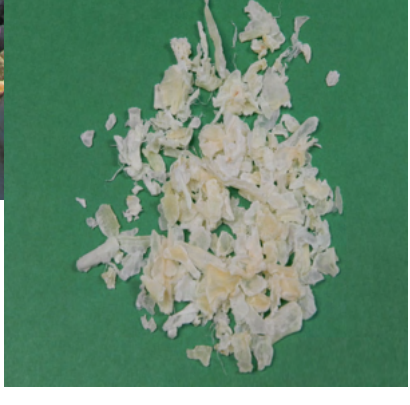
Flocculants or polymers are chemical agents that cause small particles to group together or flocculate. Flocculants can be used in conjunction with silt basins to remove suspended silts and clays. Flocculants can also be used in dewatering operations.

The Iowa DOT has used flocculant bags, which are segmented bags filled with a dry-flake soluble form of chitosan made from crustacean shells. The bags are sized to treat 125,000 to 500,000 gallons of water per bag. As water dissolves the active ingredient, the flocculant bag will become empty and a new bag will need to be installed.

When using flocculants, it is important to allow time for the flocculant to mix with the storm water and to allow an area downstream for the sediment to settle prior to the storm water discharging offsite.

Left, flocculant bag used upstream of Rock Check Dams.

Below, chitosan flakes found in flocculant bag.

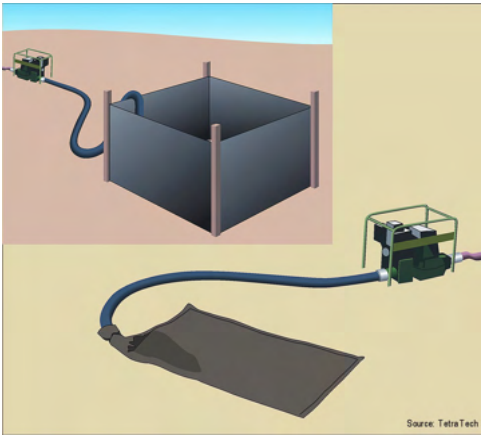


Dewatering

When dewatering, sediment should be prevented from entering receiving waters and wetlands or from traveling offsite. The controls used to prevent this will depend on the site, its proximity to a receiving water, and “dirtiness” of the discharge water.

For example, in some cases outletting the water into a vegetated buffer area onsite may be enough of a control before the discharge travels offsite. In other cases, the discharge may need a dewatering bag or discharge into a rock outlet channel.

Whenever dewatering, some type of control should be used. However, the type will depend on the characteristics of the site and the discharge water.

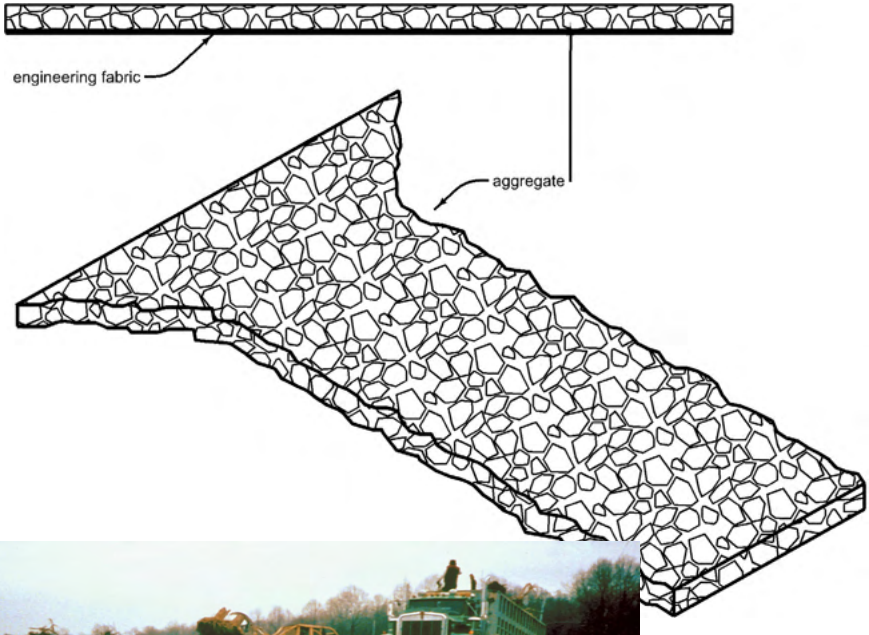


Here are several examples for methods of contractor dewatering.

This is a poor example of dewatering. There is no control used at the hose discharge, and erosion is occurring.

Stabilized Construction Entrances

Stabilized construction entrances are temporary entrances consisting of a layer of aggregate placed on a mat of engineering fabric. The purpose of stabilized construction entrances is to reduce mud tracked onto the roadway. They should be located at points where construction traffic leaves a construction site and enters onto a public road. Per Standard Road Plan EC-303, the contractor should obtain the Engineer's approval for location prior to constructing.



A stabilized construction entrance is designed to minimize tracking of sediment from the site by vehicles and equipment.

Sediment Control Versus Erosion Control

To adequately prevent silt from leaving a project, the focus should not be on just silt fence, silt basins, and ditch checks. Remember that these are just types of sediment control.

Putting a greater focus on erosion control will be less expensive in the long run.

This photo shows rock ditch checks, silt basins, silt fence, logs, and temporary vegetation used to protect a discharge point.

This rock ditch and ditch check are the last line of defense to prevent sediment from entering the stream.

This is a great example of erosion and sediment control used in combination to protect a stream.

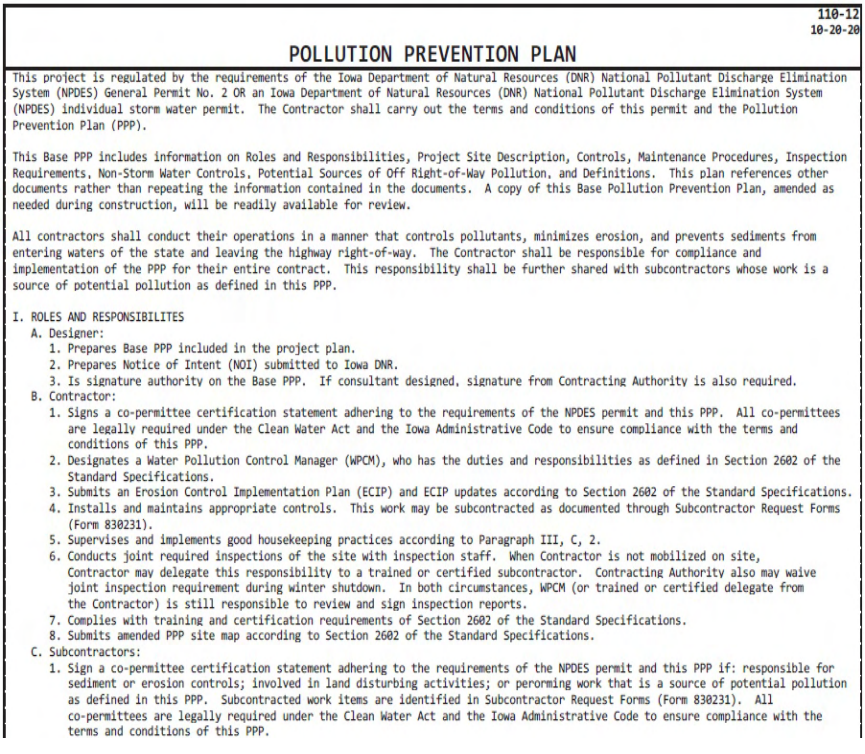
Chapter 4: Storm Water Pollution Prevention Plan

What is It?

A Storm Water Pollution Prevention Plan (SWPPP or PPP) establishes procedures for minimizing erosion and run-off of pollutants and sediment to be carried away in storm water discharges.

A PPP must describe the site characteristics and list the pollutants that could impact storm water quality. The plan must also identify pollution prevention measures designed to minimize the discharge of pollutant laden storm water.

A PPP identifies structural and non-structural controls to be put in place to minimize negative impacts to the environment caused by offsite storm water discharges.



110-12
10-20-20

POLLUTION PREVENTION PLAN

This project is regulated by the requirements of the Iowa Department of Natural Resources (DNR) National Pollutant Discharge Elimination System (NPDES) General Permit No. 2 OR an Iowa Department of Natural Resources (DNR) National Pollutant Discharge Elimination System (NPDES) individual storm water permit. The Contractor shall carry out the terms and conditions of this permit and the Pollution Prevention Plan (PPP).

This Base PPP includes information on Roles and Responsibilities, Project Site Description, Controls, Maintenance Procedures, Inspection Requirements, Non-Storm Water Controls, Potential Sources of Off Right-of-Way Pollution, and Definitions. This plan references other documents rather than repeating the information contained in the documents. A copy of this Base Pollution Prevention Plan, amended as needed during construction, will be readily available for review.

All contractors shall conduct their operations in a manner that controls pollutants, minimizes erosion, and prevents sediments from entering waters of the state and leaving the highway right-of-way. The Contractor shall be responsible for compliance and implementation of the PPP for their entire contract. This responsibility shall be further shared with subcontractors whose work is a source of potential pollution as defined in this PPP.

I. ROLES AND RESPONSIBILITES

A. Designer:
1. Prepares Base PPP included in the project plan.
2. Prepares Notice of Intent (NOI) submitted to Iowa DNR.
3. Is signature authority on the Base PPP. If consultant designed, signature from Contracting Authority is also required.

B. Contractor:
1. Signs a co-permittee certification statement adhering to the requirements of the NPDES permit and this PPP. All co-permittees are legally required under the Clean Water Act and the Iowa Administrative Code to ensure compliance with the terms and conditions of this PPP.
2. Designates a Water Pollution Control Manager (WPCM), who has the duties and responsibilities as defined in Section 2602 of the Standard Specifications.
3. Submits an Erosion Control Implementation Plan (ECIP) and ECIP updates according to Section 2602 of the Standard Specifications.
4. Installs and maintains appropriate controls. This work may be subcontracted as documented through Subcontractor Request Forms (Form 830231).
5. Supervises and implements good housekeeping practices according to Paragraph III, C, 2.
6. Conducts joint required inspections of the site with inspection staff. When Contractor is not mobilized on site, Contractor may delegate this responsibility to a trained or certified subcontractor. Contracting Authority also may waive joint inspection requirement during winter shutdown. In both circumstances, WPCM (or trained or certified delegate from the Contractor) is still responsible to review and sign inspection reports.
7. Complies with training and certification requirements of Section 2602 of the Standard Specifications.
8. Submits amended PPP site map according to Section 2602 of the Standard Specifications.

C. Subcontractors:
1. Sign a co-permittee certification statement adhering to the requirements of the NPDES permit and this PPP if: responsible for sediment or erosion controls; involved in land disturbing activities; or perorming work that is a source of potential pollution as defined in this PPP. Subcontracted work items are identified in Subcontractor Request Forms (Form 830231). All co-permittees are legally required under the Clean Water Act and the Iowa Administrative Code to ensure compliance with the terms and conditions of this PPP.

Here is a copy of the PPP as found in the C, CE, or R sheets of the plans.

What is Required?

A PPP is required to be developed for each construction site covered by a storm water permit. The PPP will be developed by the designer and will be found in the project plans (in the C, CE, or R sheets).

The PPP will include a description of the controls to be implemented and the anticipated sequence of major activities. The description of controls shall address the following minimum components:

- A description of temporary and permanent stabilization practices.
- A description of structural practices to divert, store or otherwise limit run-off from exposed areas of the site.
- Controls that will remain in place after construction operations have been completed.
- Other controls such as waste disposal and off-site vehicle tracking.
- Maintenance and inspection requirements.
- Potential sources of pollution which may affect the quality of the storm water discharge.
- Contractor and/or subcontractors who will implement any measures.

TIP

Keep your eyes open around culverts and bridges for washouts along the sides.

Roles and Responsibilities

The PPP used by the Iowa DOT defines roles and responsibilities of the Designer, Contractor, Subcontractors, RCE/Project Engineer, and Inspector as follows::

Designer:

- Prepares Base PPP included in the project plan.
- Prepares Notice of Intent (NOI) submitted to Iowa DNR.
- Is signature authority on the Base PPP. If consultant designed, signature from Contracting Authority is also required.

Contractor:

- Signs a co-permittee certification statement adhering to the requirements of the NPDES permit and the PPP. All co-permittees are legally required under the Clean Water Act and the Iowa Administrative Code to ensure compliance with the terms and conditions of the PPP.
- Designates a Water Pollution Control Manager (WPCM), who has the duties and responsibilities as defined in Section 2602 of the Standard Specifications.
- Submits an Erosion Control Implementation Plan (ECIP) and ECIP updates according to Section 2602 of the Standard Specifications.
- Installs and maintains appropriate controls. This work may be subcontracted as documented through Subcontractor Request Forms (Form 830231).
- Supervises and implements good housekeeping practices according to Paragraph III, C, 2 of the PPP.
- Conducts joint required inspections of the site with inspection staff. When Contractor is not mobilized on site, Contractor may delegate this responsibility to a trained or certified subcontractor. Contracting Authority also may waive joint inspection requirement during winter shutdown. In both circumstances, WPCM (or trained or certified delegate from the Contractor) is still responsible to review and sign inspection reports.
- Complies with training and certification requirements of Section 2602 of the Standard Specifications.
- Submits amended PPP site map according to Section 2602 of the Standard Specifications.

IOWA DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION
NOTICE OF INTENT FOR NPDES COVERAGE UNDER GENERAL PERMIT

CASHIER'S USE ONLY
0253-542-SW08-0581

Name

No. 1 FOR "STORM WATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITY"
or
No. 2 FOR "STORM WATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITY FOR CONSTRUCTION ACTIVITIES"
or
No. 3 FOR "STORM WATER DISCHARGE ASSOCIATED WITH INDUSTRIAL ACTIVITY FOR ASPHALT PLANTS, CONCRETE BATCH PLANTS, ROCK CRUSHING PLANTS, AND CONSTRUCTION SAND AND GRAVEL FACILITIES."

PERMIT INFORMATION

Has this storm water discharge been previously permitted? ☐ Yes ☐ No

If yes, please list authorization number

Under what General Permit are you applying for coverage?

General Permit No. 1 ☐ General Permit No. 2 ☐ General Permit No. 3 ☐

PERMIT FEE OPTIONS

For coverage under the NPDES General Permit the following fees apply:

☐ Annual Permit Fee $175 (per year) Maximum coverage is one year.
☐ 3-year Permit Fee $350 Maximum coverage is three years.
☐ 4-year Permit Fee $525 Maximum coverage is four years.
☐ 5-year Permit Fee $700 Maximum coverage is five years.

Checks should be made payable to: Iowa Department of Natural Resources.

FACILITY OR PROJECT INFORMATION

Enter the name and full address/location (not mailing address) of the facility or project for which permit coverage is requested.

NAME: COUNTY:

STREET ADDRESS OF SITE:

CITY: STATE: ZIP CODE:

CONTACT INFORMATION

Given name, mailing address and telephone number of a contact person (Attach additional information on separate pages as needed). This will be the address to which all correspondence will be sent and to which all questions regarding your application and compliance with the permit will be directed.

NAME: PHONE:

COMPANY NAME (if applicable):

STREET ADDRESS:

CITY: STATE: ZIP CODE:

E-mail address (if available):

Check the appropriate box to indicate the legal status of the operator of the facility.

☐ Federal ☐ State ☐ Public ☐ Private ☐ Other (specify)

SIC CODE (General Permit No. 1 & 3 Applicants Only)

SIC code refers to Standard Industrial Classification code number used to classify establishments by type of economic activity.

04/2017 cmc

Be sure to complete both sides of this form

DNR Form 542-1415

This is page 1 of the Notice of Intent (NOI) form from the Iowa DNR. The Office of Construction and Materials Bureau submits the NOI to the DNR prior to a project's letting.

FACILITY LOCATION OR LOCATION OF CONSTRUCTION SITE

Give the location by ¼ section, section, township, range, (e.g., NW, 7, T78N, R3W).

¼ SECTION	SECTION	TOWNSHIP	RANGE

MAIL TO:
STORM WATER COORDINATOR
IOWA DNR
502 E 9TH ST
DES MOINES IA 50319-0034

OWNER INFORMATION

Enter the name and full address of the owner of the facility.

NAME: PHONE:

STREET ADDRESS:

CITY: STATE: ZIP CODE:

Owner **E-mail address (if available):**

OUTFALL INFORMATION

Discharge start date, i.e., when did/will the site begin operation or 10/1/92, whichever is later:

Is any storm water monitoring information available describing the concentration of pollutants in storm water discharges? ☐ Yes ☐ No

NOTE: Do not attach any storm water monitoring information with the application.

Receiving water(s) to the first uniquely named waterway in Iowa (e.g., road ditch to unnamed tributary to Mud Creek to South Skunk River):

Compliance With The Following Conditions:	Yes	No
Has the Storm Water Pollution Prevention Plan been developed prior to the submittal of this Notice of Intent and does the plan meet the requirements of the applicable General Permit? (do not submit the SWPPP with the application)	☐	☐
Will the Storm Water Pollution Prevention Plan comply with approved State (Section 161A.64, Code of Iowa) or local sediment and erosion plans? (for General Permit 2 only)	☐	☐
Has a public notice been published for at least one day, in the newspaper with the largest circulation in the area where the discharge is located, and is the proof of notice attached? (new applications only)	☐	☐

GENERAL PERMIT NO. 2 AND GENERAL PERMIT NO. 3 APPLICANTS COMPLETE THIS SECTION.

Description of Project (describe in one sentence what is being constructed):

For General Permit No. 3 - Is this facility to be moved this year? ☐ Yes ☐ No

Number of Acres of Disturbed Soil:
(Construction Activities Only)

Estimated Timetable For Activities / Projects, i.e., approximately when did/will the project begin and end:

CERTIFICATION – ALL APPLICATIONS MUST BE SIGNED

Only the following individuals may sign the certification: owner of site, principal executive officer of at least the level of vice-president of the company owning the site, a general partner of the company owning the site, principal executive officer or ranking elected official of the public entity owning the site, any of the above of the general contracting company for construction sites.

I certify under penalty of law that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified people properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, this information is to the best of my knowledge and belief, true, accurate, and complete. I further certify that the terms and conditions of the general permit will be met. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME: (print or type)	TITLE AND COMPANY NAME OF SIGNATORY:
SIGNATURE:	DATE:

04/2017 cmc

Be sure to complete both sides of this form

DNR Form 542-1415

This is page 2 of the Notice of Intent (NOI) form from the Iowa DNR. The Construction and Materials Bureau submits the NOI to the DNR prior to a project's letting.

Subcontractors:

- Sign a co-permittee certification statement adhering to the requirements of the NPDES permit and the PPP if: responsible for sediment or erosion controls; involved in land disturbing activities; or performing work that is a source of potential pollution as defined in the PPP. Subcontracted work items are identified in Subcontractor Request Forms (Form 830231). All co-permittees are legally required under the Clean Water Act and the Iowa Administrative Code to ensure compliance with the terms and conditions of the PPP.

- Implement good housekeeping practices according to Paragraph III, C, 2 of the PPP.

RCE/Project Engineer:

- Is Project Storm Water Manager.

- On projects where DOT is the Contracting Authority, is current with erosion control training or certification.

- Takes actions necessary to ensure compliance with storm water requirements including, where appropriate, issuing stop work orders, and directing additional inspections at construction project sites that are experiencing problems with achieving permit compliance.

- Orders the taking of measures to cease, correct, prevent, or minimize the consequences of non-compliance with the storm water requirements of the Applicable Permit.

- Supervises all work necessary to meet storm water requirements at the Project, including work performed by contractors and subcontractors.

- Requires employees, contractors, and subcontractors to take appropriate responsive action to comply with storm water requirements, including requiring any such person to cease or correct a violation of storm water requirements, and to order or recommend such other actions as necessary to meet storm water requirements.

- Is familiar with the Project PPP and storm water site map.

- On projects where DOT is Contracting Authority, is responsible for periodically monitoring inspection reports to determine whether deficiencies identified in inspection reports were adequately and timely addressed, and if not, has the authority and responsibility to direct immediate actions to correct the deficiencies.

- Is the point of contact for the Project for regulatory officials, Inspector, contractors, and subcontractors regarding storm water requirements.
- Is signature authority on Notice of Discontinuation.
- Maintains an up-to-date record of contractors, subcontractors, and subcontracted work items through Subcontractor Request Forms (Form 830231).
- Makes information to determine permit compliance available to the DNR upon their request.

Inspector:

- Updates PPP through fieldbook entries and storm water site inspection reports if there is a change in design, construction, operation, or maintenance which has a significant effect on the discharge of pollutants from the project.
- Makes information to determine permit compliance available to the DNR upon their request.
- Conducts joint required inspections of the site with the contractor/subcontractor.
- Completes an inspection report after each inspection.
- Is signature authority on storm water inspection reports.

TIP

Perform joint storm water inspections with the contractor.

Form 830215 (02-20)

IOWADOT

CO-PERMITTEE CERTIFICATION STATEMENT

Project No.: _____

County: _____ Proposal ID No.: _____

Prime Contractor: _____

Subcontractor: _____

Address: _____

Telephone No.: _____

I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Elimination System (NPDES) permit that authorizes the storm water discharges associated with industrial activity from the construction site as part of this certification.

Further, by my signature, I understand that I am becoming a co-permittee, along with the owner(s) and other contractors and subcontractors signing such certifications, to the Iowa Department of Natural Resources NPDES General Permit No. 2 for Storm Water Discharge Associated with Industrial Activity for Construction Activities at the identified site. As a co-permittee, I understand that I, and my company, are legally required under the Clean Water Act and the Code of Iowa, to ensure compliance with the terms and conditions of the storm water pollution prevention plan developed under this NPDES permit and the terms of this NPDES permit.

* Signature: _____

Title: _____

Date: _____

* Certification Statement shall be signed as follows:

Corporation – president, vice-president, secretary or treasurer
Partnership – general partner
Proprietorship – proprietor

The prime contractor submits a signed copy of the Co-Permittee Certification Statement with a copy of their signed contract to the Contracts Bureau on DocExpress.

IOWADOT

Form 830216 (03-15)

NOTICE OF DISCONTINUATION

OF A STORM WATER DISCHARGE
COVERED UNDER IOWA NPDES GENERAL PERMIT NO. 2
FOR CONSTRUCTION ACTIVITIES

Name of the Owner or facility to which the storm water discharge general permit coverage was issued: **Iowa Department of Transportation**

COUNTY: _____
PROJECT No.(s): _____
DESCRIPTION: _____

List the complete permit authorization number for the discharge. This number is provided on the bottom of the authorization sheet for General Permit No. 2.

IA - _____ - _____

List the date the construction site reached "final stabilization": _____

"***Final Stabilization***" means that all soil disturbing activities at this site have been completed, and that a uniform perennial vegetative cover with a density of 70% for the area has been established or equivalent stabilization measures have been employed.

The following certification must be signed in accordance with the signatory requirements of the general permit:

"I certify under penalty of law that disturbed soils at the identified facility have been finally stabilized and temporary erosion and sediment control measures have been removed or will be removed at an appropriate time. I understand that by submitting this Notice of Discontinuation, I am no longer authorized to discharge storm water associated with industrial activity for construction activities by Iowa Department of Natural Resources NPDES General Permit No. 2, and that discharging pollutants from storm water associated with industrial activity to waters of the United States is unlawful under the Clean Water Act where the discharge is not authorized by an NPDES permit.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for known violations."

Name (print)	Title
Signature	Date

This form is to be completed within 20 days following "final stabilization" and submitted to the Office of Construction and Materials.

Form 830216 - Notice of Discontinuation should be submitted by the RCE to the Construction and Materials Bureau after all sites covered by a permit have reached final stabilization.

Controls

Below is a brief summary of stabilization and structural practices and other controls that are referenced in the Iowa DOT's PPP. Controls and BMPs were discussed in detail in Chapter 3.

Stabilization Practices –

Site plans will ensure that existing vegetation or natural buffers are preserved where attainable and disturbed portions of the site will be stabilized.

The permit and PPP include the requirement to immediately initiate stabilization of disturbed areas after clearing, grading, excavating, or other earth disturbing activities have:

- Permanently ceased on any portion of the site, or
- Temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days.

Mulching is one form of stabilization that would satisfy this requirement.

The permit no longer allows for snow cover as an exception for stabilization. So be aware when working late in the season or during the winter that temporary stabilization is still required.

Combining stabilization measures with structural measures is more effective than structural measures alone.

If stabilization measures are not initiated as required by the NPDES storm water permit, there will be a deduct of $750 per calendar day, unless such delay is authorized by the Engineer.

Staged permanent and/or temporary stabilizing seeding and mulching shall be completed as the disturbed areas are completed.

Permanent and Temporary Stabilization practices to be used are located in the Estimated Project Quantities (100-0A, 100-1A, or 100-1C) and Estimate Reference Information (100-4A) located on the C, CE, or R sheets of the plans.

Typical drawings detailing construction of the practices to be used on this project are referenced in the Standard Road Plans Tabulation.

Preservation of existing vegetation within right-of-way or easements will act as vegetative buffer strips.

Structural Practices –

Structural practices will be implemented to divert flows from exposed soils and detain or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Additionally, structural practices may include: silt basins that

Silt Fence is a type of structural control.

provide 3600 cubic feet of storage per acre drained or equivalent sediment controls, outlet structures that withdraw water from surface when discharging basins, and controls to direct storm water to vegetated areas.

Structural items to be used are located in the Estimated Project Quantities (100-1A) and Estimate Reference Information (100-4A) located on the C, CE, or R sheets of the plans, as well as all other item specific Tabulations. Typical drawings detailing construction of the devices to be used on the project can be found on the B or R sheets of the plans or are referenced in the Standard Road Plans Tabulation.

100-17
MODIFIED

TABULATION OF SILT FENCES

Refer to EC-201

Location			Length	Storage Volume	Remarks
Begin Station	End Station	Side	LF	CF	
688+42.00	692+12.00	L	410.0	1620.6	Follow 831 contour on FS
687+95.00	689+90.00	R	215.0	854.1	Follow 830 contour on FS
689+90.00	693+50.00	R	400.0	1576.8	Follow 830 contour on FS
717+60.00	728+16.00	R	1176.0		at toe of slope
723+75.00	730+65.00	R	770.0	3022.2	Follow 785 contour on FS
729+15.00	730+60.00	L	165.0	542.3	Follow 788 contour on BS
769+28.00	772+00.00	R	315.0		Bridge abutment
743+00.00	745+00.00	L	240.0	7065.7	On backslope bench
770+20.00	773+07.00	L	315.0		Bridge abutment
805+42.00	808+30.00	R	350.0		Bridge abutment
805+58.00	809+18.00	L	350.0		Bridge abutment
819+15.00	821+00.00	L	225.0	6534.2	On backslope bench
827+50.00	831+15.00	R	405.0		
828+00.00	832+00.00	L	460.0	14128.0	On backslope bench
831+24.00	834+09.00	R	325.0		
837+28.00	840+05.00	R	315.0		Bridge abutment
837+05.00	841+81.00	L	545.0		Bridge abutment
839+83.00	842+00.00	R	237.0	811.6	Follow 855 contour and BS
845+00.00		B	480.0		Bridge abutment
4487+55.00	4489+80.00	L	245.0	841.5	Follow 821 contour on BS
4491+90.00	4497+75.00	R	645.0	2562.3	Follow 820 contour on FS
7772+57.00	7775+60.00	L	503.0	343.0	
7776+00.00	7783+60.00	L	840.0		
7784+72.00	7786+07.00	L	155.0		
8811+50.00	8817+50.00	L	660.0		
8799+00.00	8804+80.00	R	640.0	2169.2	Follow 810 contour on FS
8799+00.00	8803+20.00	R	460.0		at toe of slope
8801+50.00	8805+00.00	L	390.0	1458.6	Follow 815 contour on FS
8807+85.00	8809+17.00	R	152.0		
9810+89.00	9811+38.00	R	69.0		
9811+46.00	9814+25.00	R	319.0		
9811+21.00	9814+10.00	L	329.0		
10836+05.00	10837+25.00	L	140.0		

Tabulations in the plans will indicate where the designer anticipates erosion or sediment control measures will be required.

Storm Water Management – Measures shall be installed during the construction process to control pollutants in storm water discharges that will occur after construction operations have been completed. This may include velocity dissipation devices at discharge locations and along length of outfall channel as necessary to provide a non-erosion velocity flow from structure to water course. If included with the project, these items are located in the Estimated Project Quantities (100-0A, 100-1A, or 100-1C) and Estimate Reference Information (100-4A) located on the C, CE, or R sheets of the plans, as well as all other item specific Tabulations. Typical drawings detailing construction of the practices to be used on projects are referenced in the Standard Road Plans Tabulation. The installation of these devices may be subject to Section 404 of the Clean Water Act.

Other Controls (Housekeeping Items)

Contractor disposal of unused construction materials and wastes shall comply with applicable state and local waste disposal, sanitary sewer, or septic system regulations. In the event of a conflict with other governmental laws, rules and regulations, the more restrictive laws, rules or regulations shall apply. The following are contractor requirements from the PPP:

This is an example of a stabilized construction entrance. This is one type of control to prevent tracking onto a roadway.

Vehicle Entrances and Exits - Construct and maintain entrances and exits to prevent tracking of sediments onto roadways.

Material Delivery, Storage and Use - Implement practices to prevent discharge of construction materials during delivery, storage, and use.

Stockpile Management - Install controls to reduce or eliminate pollution of storm water from stockpiles of soil and paving.

Stockpiles should be stabilized if they will not be used within 14 days. Silt fence may also be required around stockpiles to protect the surrounding area.

Waste Disposal - Do not discharge any materials, including building materials, into waters of the state, except as authorized by a Section 404 permit.

Spill Prevention and Control - Implement procedures to contain and clean-up spills and prevent material discharges to the storm drain system and waters of the state.

Fuel tanks should have a secondary containment area large enough to handle a potential spill in locations that have potential to discharge to storm drain systems and waters of the state.

This fuel tank has an earth berm built around it to act as secondary containment.

Concrete Residuals and Washout Wastes - The storm water permit does not allow waste from concrete washout and wet sawing to be discharged to a surface water nor does it allow the waste to adversely affect a water of the state.

The contractor shall designate temporary concrete washout facilities for rinsing out concrete trucks.

Provide directions to truck drivers where designated washout facilities are located. Designated washout areas should be located at least 50 feet away from storm drains, streams or other water bodies. Care should be taken to ensure these facilities do not overflow during storm events.

A concrete washout may look like these photos or be as simple as a hole dug to contain the washout as long as it does not adversely affect a water of the state.

Concrete Grooving/Grinding Slurry – Do not discharge slurry to a waterbody or storm drain. Slurry may be applied on foreslopes or removed from the project.

Vehicle and Equipment Storage and Maintenance Areas - Perform on site fueling and maintenance in accordance with all environment laws such as proper storage of onsite fuels and proper disposal of used engine oil or other fluids on site.

Employ washing practices that prevent contamination of surface and ground water from wash water.

Litter Management - Ensure employees properly dispose of litter.

Dewatering – Properly treat water to remove suspended sediment before it re-enters a waterbody or discharges off-site. Measures are also to be taken to prevent scour erosion at dewatering discharge point.

Maintenance Procedures

The contractor is required to maintain all temporary erosion and sediment control measures in proper working order, including cleaning, repairing, or replacing them throughout the contract period. This shall begin when the features have lost 50% of their capacity.

Silt fence must be cleaned out or replaced when it becomes half full.

Inspection Requirements

The permit requires storm water site inspections be conducted at least once every seven calendar days. Iowa DOT's PPP includes the requirement for inspections to be made jointly by the contractor and the contracting authority. Storm water site inspection reports shall include:

- Date of the inspection.
- Summary of the scope of the inspection.
- Name and qualifications of the personnel making the inspection.
- Review erosion and sediment control measures within disturbed areas for the effectiveness in preventing impacts to receiving waters.
- Major observations related to the implementation of the PPP.
    - The location(s) of discharges of sediment or other pollutants from the site.
    - Location(s) of BMPs that need to be maintained.
    - Location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location.
    - Location(s) where additional BMPs are needed that did not exist at the time of inspection.
- Identify corrective actions required to maintain or modify erosion and sediment control measures.
- Verify that locations where vehicles enter or exit the site control offsite sediment tracking.

The Construction & Materials Bureau webpage contains tips for filling out inspection reports and a FAQ about inspection procedures. Both of these are great resources for new inspectors or if you're looking for a refresher.

830214 (02-20)

IOWADOT
SMARTER | SIMPLER | CUSTOMER DRIVEN

STORM WATER SITE INSPECTION

Inspections Made At Least Once Every Seven Calendar Days

Inspection Date and Time: _____ DNR Auth. No.: IA _____ - _____

Project Number: _____ County: _____

Inspection Made By: _____ Title: _____

Precipitation since previous inspection:

_____

_____

Comments and Observations (Include area inspected, status of site, and erosion/sediment control work performed since previous inspection):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Deficiencies Found (items requiring maintenance or inadequate controls) and Additions Required (new items needed due to status of work) (Include specific locations):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Can Corrective Action(s) be made within 72 hours after inspection? If no, document why it is impracticable.
Note: Permit requires Corrective Actions be completed within 7 calendar days following inspection:

_____

_____

Date of Corrective Action (start within 3 days of inspection) and Corrective Action Performed (document either current week or previous week):

_____

_____

_____

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

			ESC Basics	ECT
Inspector's Signature:	_____	Date: _____	☐	☐
Contractor's Signature:	_____	Date: _____	☐	☐

Either a Storm Water Site Inspection Report (Form 830214) should be filled out or a Permix inspection report should be completed for each inspection.

Storm water site inspection reports shall also be considered part of the Amended PPP. Any additional or modified erosion and sediment control measures determined to be required as a result of the inspection shall be incorporated into the project. The contractor shall begin corrective actions within 3 calendar days on all deficiencies found and complete all actions within 7 calendar days of the inspection.

Following along with Iowa DOT's e-Construction initiative, most storm water inspection reports and copies of all storm water permit authorizations and PPPs are stored electronically. Depending on the project, the documents will be stored on DocExpress (online document filing cabinet) or in Permix (web-based software application to record and store storm water permit documents, reports, and controls). Information about these software applications can be found on the Construction & Materials webpage.

Electronic storage of storm water permit documents will be in DocExpress or Permix.

Effective inspections evaluate how BMPs are working and note possible future problems. A joint inspection between contractor and inspector is important in successfully planning future work, such as new erosion control features, repair and maintenance of current installations, scheduling, and how ongoing work in the area may affect the installation.

TIP

Keep on top of your storm water inspection reports. If a report is missing, the regulatory agency may view this as a permit violation.

A proper inspection includes observing all controls on a project, and therefore may take some time. A "drive-by" inspection may not be adequate.

If areas of the site are inaccessible, then note that on the report.

Here is a recommended inspection sequence:

1. Plan your Inspection.
    - Follow a consistent pattern each time to ensure you inspect all areas (for example, starting at the lowest point and working uphill).

Inspect areas not visible from the road. This photo is a good example of deficiencies that were not visible while driving by the site.

2. Inspect discharge points and downstream, off-site areas.

   - Inspect discharge locations to determine whether erosion and sediment control measures are effective. If you see silt entering a pond or waterway, you should direct the contractor to take immediate action.

   - Inspect nearby downstream locations, if feasible.

   - Walk “down the street” to inspect off-site areas for signs of discharge. This is important in areas with existing curbs and gutters.

These photos show silt leaving the site, which is a permit violation.

3. Inspect perimeter controls and slopes and ditches.

   - Inspect perimeter controls, such as silt fences, to determine if sediment should be removed. Check silt fence and ditch checks for undercutting, blow-outs, or destroyed installations. If any are found which are half full of silt, they should be cleaned out.

   - Check slopes and ditch bottoms for evidence of concentrated flows which may indicate a need for further controls.

   - Check the structural integrity of the BMP to determine if portions of the BMP need to be replaced.

   - Inspect slopes and temporary stockpiles to determine if erosion controls are effective.

This ditch check has been undermined and should be removed. This area may benefit from different controls - the ditch bottom should be seeded and mulched or possibly matted.

4. Compare BMPs in the plan with the construction site conditions.

   - Determine whether BMPs are in place as proposed by the plan.
   - Evaluate whether BMPs have been adequately installed and maintained.
   - Look for areas where BMPs are needed but are missing and are not in the PPP.
   - Check for water entering the project from private property. This is called run-on and can cause damage. An intercepting ditch or diversion dike might be needed for such a situation.
   - Look for washouts around culvert headwalls and bridge wingwalls. Check outlets and waterways for silt and sedimentation.

Washouts along culverts and bridges should be repaired before they turn into gullies, such as shown in the photo. The slope should be repaired and seeded.

5. Inspect construction site entrances.

   - Inspect construction exits to determine if there is tracking of sediment from the site onto the street.
   - Sweep the street if there is evidence of sediment accumulation.
   - Install stabilized construction entrance as needed.

Dirt has been tracked onto the street and should be removed.

6. Inspect other sediment controls.

   - Inspect sediment basins for sediment accumulation.
   - Remove sediment when it reduces the capacity of the basin by 50 percent.
   - Check other controls such as slope protection, rock ditch checks and flumes for failure.

7. Inspect erosion control.

   - Check stabilizing crop seeding for growth. Thin or sparse areas should be reseeded. Weed growth is not considered stabilization.
   - Seeding that has been washed out or damaged should also be reseeded and remulched.

8. Inspect pollution prevention and good housekeeping practices.

   - Inspect trash areas to ensure that waste is properly contained.
   - Inspect material storage and staging areas to verify that potential pollutant sources are not exposed to storm water run-off.
   - Verify that concrete washouts are being used properly and are correctly sized for the volume of wash water.
   - Inspect vehicle/equipment fueling and maintenance areas for signs of storm water pollutant exposure.

Providing specific information on found deficiencies is very important. List all of your findings with specific locations of deficiencies on the storm water site inspection form.

This will allow others (such as a subcontractor or regulatory agency) to locate areas that need to be addressed.

STABILIZATION REQUIREMENT

0/14 Day Rule: Stabilize disturbed areas, in which construction activity will not occur for a period of 14 calendar days, immediately.

FACT

The No. 1 source of water pollution in Iowa, by volume, is sediment.

Quality Assurance Inspections

The DOT established a requirement for quality assurance inspections (also called oversight inspections) on projects that disturb five acres or more. QA inspections are in addition to the normal weekly inspections. This inspection is intended to be a second set of eyes to help us find items that need to be addressed or corrected. It is not intended to be a "gotcha" situation.

The individual completing the inspection should be someone other than the individual that completes the weekly inspections.

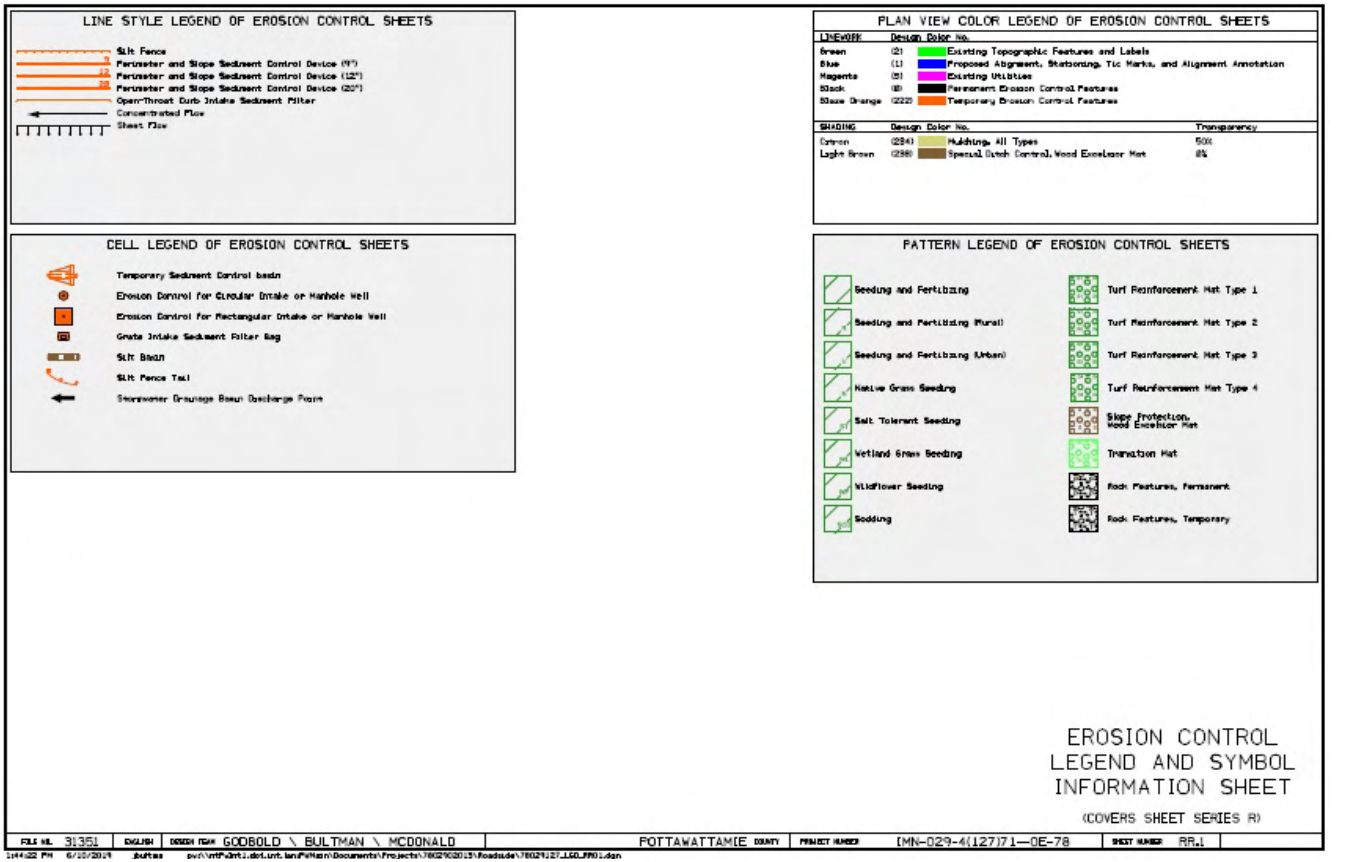
For more information, there is a FAQ on procedures and a form on the Construction & Materials Bureau webpage.

Q. Is dirt/silt really considered a pollutant?

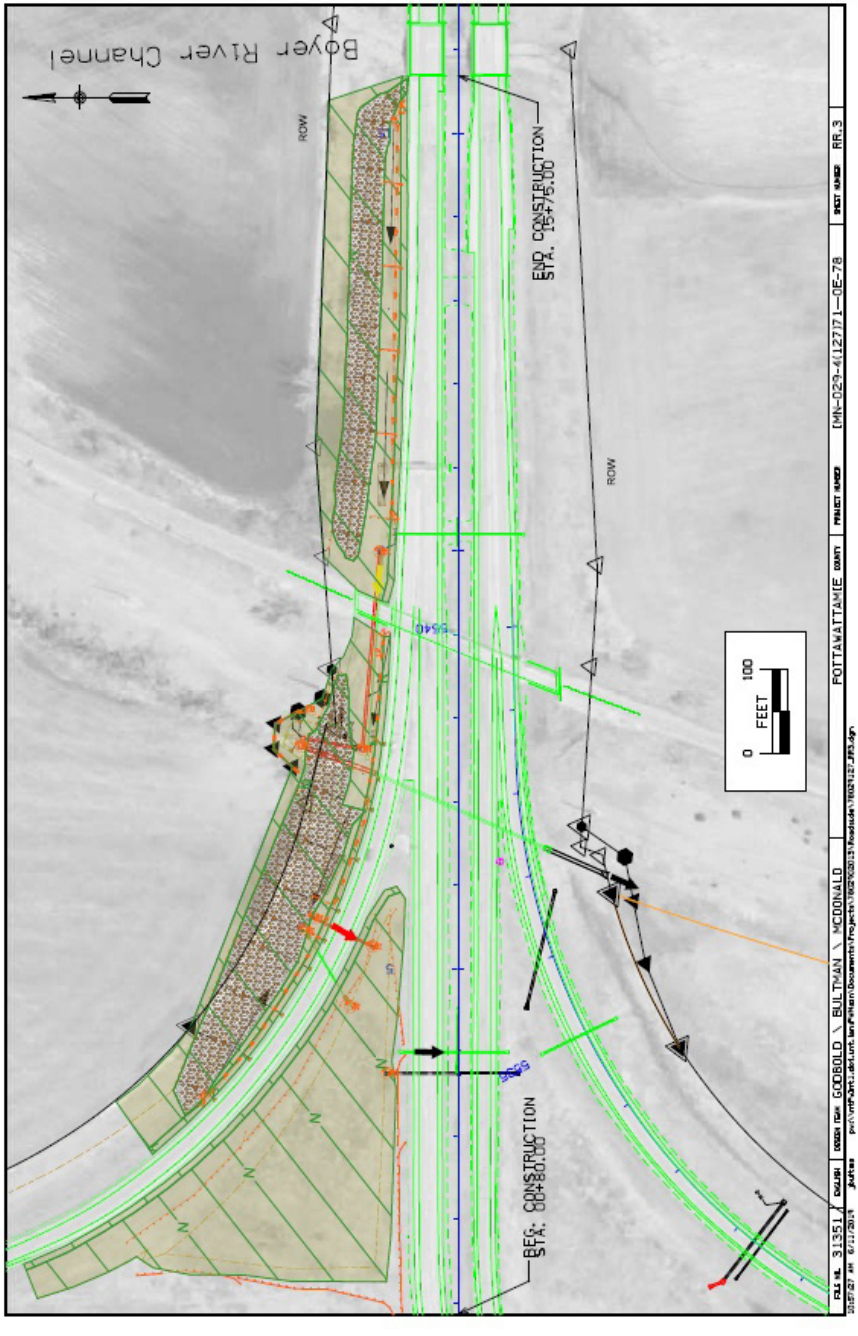
A. Absolutely! Silt discharging off a site is considered a pollutant. The accelerated loss and amounts of silt loss from disturbed soils in construction or farming create a huge impact downstream or on storm drain systems.

How to Amend the PPP

The permit requires that the Iowa DOT keep the site map and PPP updated. Our base site map consists of information found in the R sheets. In addition to the tabulations provided showing locations for various controls, the R sheets contain a picture map. The picture map will provide colors and symbols for erosion and sediment controls and show where the designer anticipates such controls will be needed.



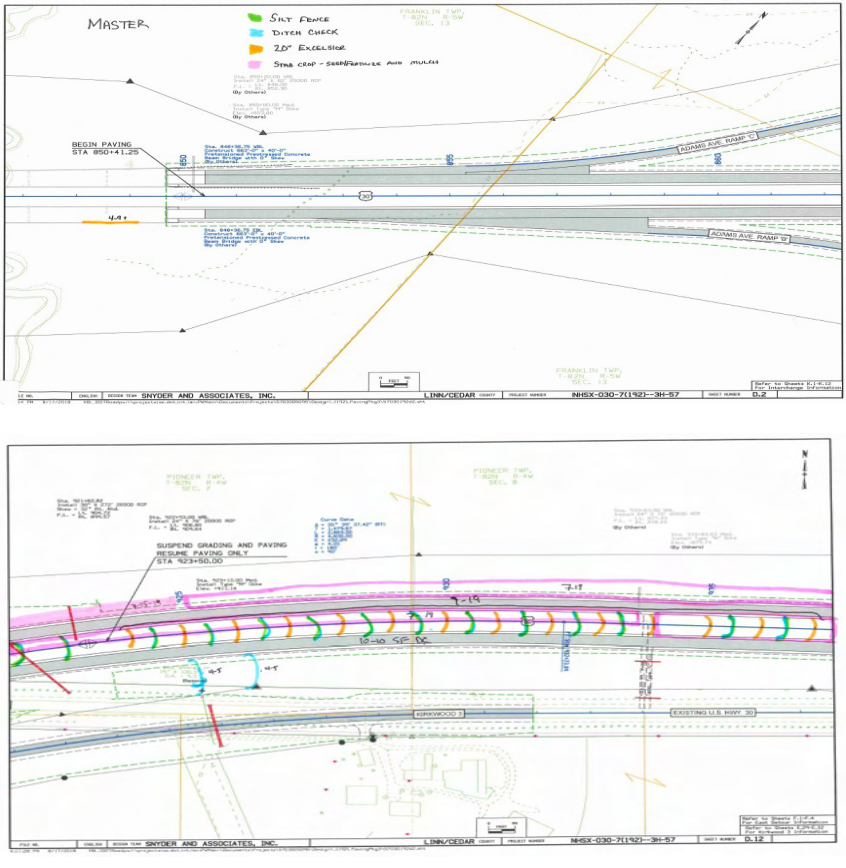
Example of base site map.



Example of base site map.

During construction, the contractor is required to submit an amended site map that shows erosion and sediment work that has been performed. Per Specification Section 2602, this submittal is required prior to payment for erosion and sediment control items from Sections 2601 and 2602, but shall be submitted no later than one week after items are completed. This marked-up site map shall be legible and show status of onsite controls. Examples of items from Sections 2601 and 2602 include installation of seeding, maintenance of silt fence, or removal of silt basins. It may be completed by the prime contractor or erosion control subcontractor and shall be uploaded to the Pay Items drawer in DocExpress.

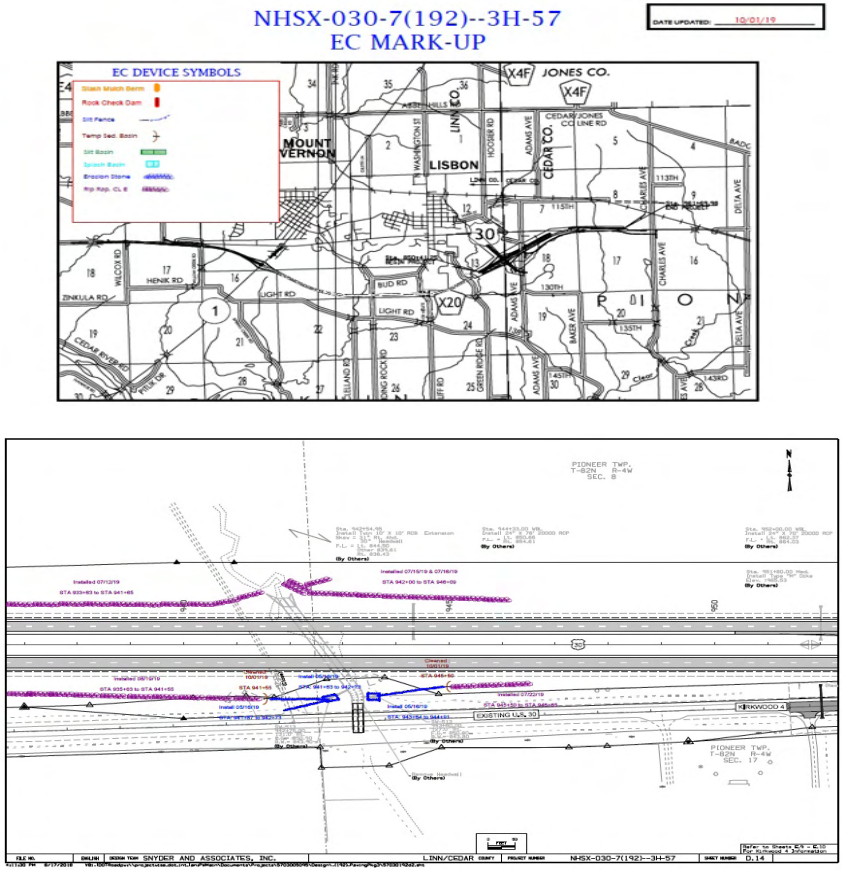
Depending on the project and amount of work completed over time, the marked-up site map might show all work since the start



Example of marked-up site map.

of the project, or if it becomes too cluttered with removal and maintenance mark-ups, the map may have to be restarted. It should show the current status of controls onsite for the contract and not just the controls that were installed over the last week. Plan views from the D/E/K sheets or the R sheets may be used as a basis for the amended site map.

The base PPP is also amended by various other documents, such as plan revisions or contract modifications for new items, storm water inspection reports, fieldbook entries made by the inspector, ECIP, NOI, co-permittee certifications, and Subcontractor Request Forms. These items are stored electronically and therefore shall be readily available upon request by a regulatory agency.



Another example of marked-up site map.

How to Implement It

Early Steps

Start at the beginning and bring up the following discussion items at the preconstruction meeting:

- Storm Water Pollution Prevention Plan (PPP): This would also be a good item to discuss in the field at progress meetings.
- Contractor submittal of subcontractor Co-Permittee Certification Statements: The prime contractor shall collect certification statements from the appropriate subcontractors and then upload on DocExpress or Permix (Refer to C.M. 10.33).
- Contractor submittal of Erosion Control Implementation Plan (ECIP): Standard Specifications Article 2602.03 requires the contractor to submit an ECIP for acceptance. Just like a construction schedule, the ECIP may be outdated the moment it is submitted; however, it encourages the contractor to put some time and effort into their erosion control plan and helps establish a clearly defined starting point for approved mobilizations.
- Work that is planned in critical areas or in/adjacent to waters of the state and contractor's plan for BMPs.
- Weekly inspections.

It may be beneficial to conduct a field site review to determine problem areas in advance. It's recommended to take photos of where discharge points may be (for example, if a creek is crossing a project site, take a photo of the existing creek conditions).

Also, make sure perimeter controls are in place before land disturbing activities begin.

Coordination with Contractor

Coordination with the contractor is vital if the project is to be in compliance with storm water permit requirements.

Timing of erosion and sediment control installation goes hand in hand with the contractor's staging and work plan.

As the project goes through various stages, the contractor and engineer should work closely together to ensure the proper erosion and sediment control measures are installed in a timely fashion.

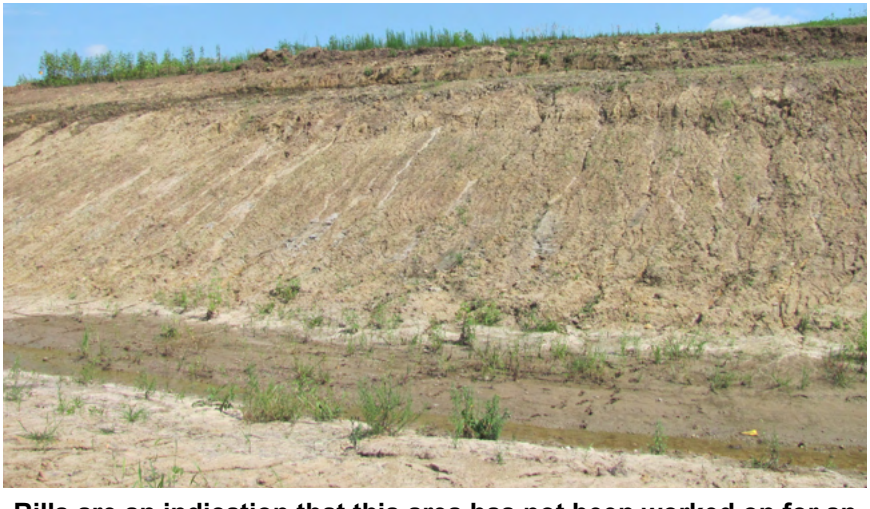
In most cases, sediment control devices should not be installed if a contractor is going to come in and tear them out the next day. However, this does not mean that controls should wait to be installed until the completion of the work.

It is important to remember that erosion and sediment controls are often temporary in nature. A silt fence does not need to remain in place the entire job nor should we wait until an area is finished before silt fence is installed.

The contractor and engineer should consider the contractor's staging and work methods when determining when controls should be installed.

The contractor should coordinate work so that erosion control measures are installed as soon as possible after the work is completed.

If an area is not completed, it may be possible for some controls to be located or relocated up or down a slope or ditch to accommodate work that has not yet been completed.



Rills are an indication that this area has not been worked on for an extended period of time. This area should be repaired by harrowing and deeper gullies may need additional repair. The area should be seeded and mulched or possibly matted.

Contract Administration Tools Available

The PPP is part of the contract documents and accordingly the contractor is contractually obligated to fulfill the responsibilities in the PPP and to adhere to the requirements of the NPDES permit.

Additionally, the following specifications references can be important in the process of resolving storm water noncompliance.

Site Management

The contractor or a competent Superintendent must be on the project when construction activities are taking place. The Superintendent shall supervise, direct, and control the contractor's operations, personnel, work and the subcontractor's operations. (Article 1105.05)

The contractor shall designate a Water Pollution Control Manager (WPCM) who has the duties and responsibilities that are defined in Specifications Section 2602. (Article 2602.01)

For projects regulated by a NPDES storm water permit, the contractor shall also maintain an individual who will be onsite daily during construction activities. This individual shall have completed the Iowa DOT Erosion & Sediment Control Basics training. An ECT certification is also sufficient. This individual shall be responsible for coordinating all erosion and sediment control operations. (Article 2602.01)

TIP

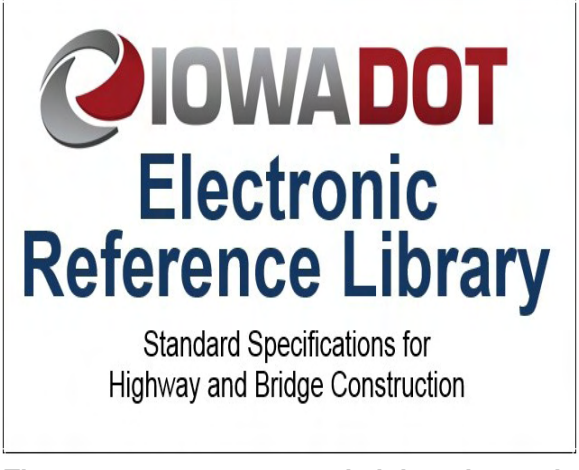
Vegetation is a highly effective means of controlling erosion. Preserving existing vegetation can also increase the effectiveness of other controls and reduce run-off volumes.

Erosion Control Implementation Plan (ECIP)

As discussed previously, the contractor is required to submit an ECIP for acceptance and update the ECIP as needed to address changes in schedule of operations or staging, weather changes, or other changes required to comply with applicable permit requirements. Refer to Construction Manual, Section 7.41 for more information, including copies of the ECIP worksheet and ECIP Update Checklist.

Contract Modifications

If items needed to control erosion and/or sedimentation are missing from the plans, they can be added by Contract Modification to the contract. (Article 1104.04, 1109.03).



There are many contract administration tools available in the Electronic Reference Library.

Types of Noncompliance

If the contractor fails to maintain erosion control devices, performs poor quality work or does not complete work in a timely manner, a noncompliance notice can be issued. (Article 2602.03).

If water pollution control measures are required due to the contractor's negligence, carelessness or failure to install the controls as a part of the work as scheduled, and are ordered by the Engineer, the contractor is to perform this work at no additional cost to the Contracting Authority. (Article 2602.05).

There is a flowchart available in Construction Manual, Appendix 2-34(O) that provides price adjustments for failure to comply with erosion and sediment control requirements.

The controls in this area are inadequate. This culvert and basin must be cleaned out, and the slopes need seeding, mulching, and additional silt fence.

Form 830245
11-18

IOWADOT

NONCOMPLIANCE NOTICE

Contractor _____ Project No. _____

County _____ Contract ID _____ Date _____ Time _____

To: _____ _____ _____
(Name) (Title) (Signature)

You are hereby notified that the following observation and/or test noted

and is a violation of Article

The test data value is

and the specification limits are

- Additional tests may be performed.
- The violation identified in this notice shall be ceased and/or corrected. This may require a modification of current practices or removal and replacement of materials, including labor, at no cost to the Contracting Authority.
- You are to determine corrective action necessary.
- You are to determine if you wish to discontinue operations until the violation is corrected or additional tests confirm or refute this failing test.

Remarks:

Correction:

_____
Inspector's Signature

Distribution: Contractor, Project Engineer, Inspector

Form 830245 is available to issue Noncompliance Notices.

Failure to mobilize or complete timely corrective actions can also result in price adjustments.

For projects that contain a PPP, Article 2602.03 requires the contractor to mobilize within 72 hours of a written order with sufficient labor, equipment, and materials to perform the erosion and sediment control work included in the ECIP or PPP or as ordered or approved by the Engineer. Work shall be completed within 7 calendar days of a written order. If the contractor fails to mobilize and complete work within such time period, a deduction of $750.00 per calendar day will be made from money due under the contract, except when the Engineer extends such time period.

Additionally, Article 2602.03 requires immediate mobilization by the contractor in emergencies. An emergency will be considered to be a sudden occurrence of a serious and urgent nature which requires work not included in the contract or is beyond normal maintenance of erosion control items and the mobilizations included in the erosion control implementation plan. Emergency work requires immediate mobilization and movement of necessary labor, equipment, and materials to the emergency site, followed by the immediate installation of temporary erosion control measures.

In these cases, the contractor is to mobilize within eight hours of the Engineer's written order to install temporary erosion control items on an emergency basis. The Engineer's written order will include a description of the required work. If the contractor fails to mobilize within eight hours of the written order, a deduction of $1500.00 per calendar day will be made.

Q. What is erosion control?

A. Erosion control is any control or practice that protects or prevents soil particles from being detached by wind, water, or rain.

Here are some common compliance problems found during inspections as provided by the EPA in "Developing your Storm Water Pollution Prevention Plan – A Guide for Construction Sites":

- Not using phased grading or providing temporary or permanent cover (i.e., soil stabilization)

  In general, the contractor should phase grading activities so that only a portion of the site is exposed at any one time. Disturbed areas that are not being actively worked should have temporary cover. Areas that are at final grade should receive permanent cover as soon as possible.

- No sediment controls on-site

  Sediment controls such as silt fences and silt basins must be in place before soil disturbance activities begin.

- No sediment control for temporary stockpiles

  Temporary stockpiles must be temporarily stabilized if they will remain in place for more than 14 days and may require to be surrounded by properly installed silt fence.

- No inlet protection

  All storm drain inlets that could receive a discharge from the construction site must be protected before construction begins and must be maintained until the site is finally stabilized.

- No BMPs or measures taken to minimize vehicle tracking onto the road

  Vehicle exits must use BMPs to prevent vehicle tracking of sediment or other measures taken to minimize off-site tracking.

TIP

Temporary mulching may be required if slopes are finished but topsoil will not be placed immediately.

- Improper solid waste or hazardous waste management

  Solid waste (including trash and debris) must be disposed of properly, and hazardous materials (including oil, gasoline, and paint) must be properly stored (which includes secondary containment). Properly manage portable sanitary facilities.

- Dewatering and other pollutant discharges at the construction site

  Construction site dewatering should not be discharged without treatment. Turbid water should be filtered or allowed to settle.

- Poorly managed concrete washouts

  Water from washouts must not enter the storm drain system or nearby receiving water. Make sure washouts are designated, sized adequately, and frequently maintained.

- Inadequate BMP maintenance

  BMPs must be frequently inspected and maintained. Maintenance should occur for BMPs that have reduced capacity to treat storm water or BMPs that have been damaged and need to be repaired or replaced.

- Inadequate documentation or training

  Failing to develop a PPP and keep it up-to-date are permit violations. In most cases, you should also ensure that other documentation such as a copy of the permit, inspection reports and updates to the PPP are kept on-site or are available online.

Q. Why Mulch?

A. Mulching protects the exposed soil from rain drops. Rain drops strike the ground with significant force that will dislodge soil particles, thus starting the erosion process. Properly placed mulch helps prevent this.

What to Do During Winter Shutdown, Other Shutdowns or Emergency Situations

Prior to shutdowns

Every effort should be made in the fall to ensure that all BMPs are in place.

As noted previously, the permit requires stabilization measures be initiated on all disturbed areas immediately if earth disturbing activities have permanently ceased or temporarily ceased and will not resume for a period exceeding 14 calendar days.

Seeding dates for permanent and temporary seeding are provided in Specifications Section 2601. Application of urban and rural stabilizing (temporary) seeding is allowed year-round. Depending on temperature and precipitation, the dates for permanent seeding might be extended on a statewide basis by the Roadside Development Section and Construction and Materials Bureau, or on a project by project basis by the RCE. These extenstionsare posted on the Construction & Materials - Earthworks & Erosion Control webpage. Seeding beyond these dates without approval is at the risk of the contractor.

With winter comes frozen ground and challenges in installing erosion and sediment control measures.

Mulch should be applied evenly without large piles or bare spots. It should be anchored into the soil. A job well done will resemble a flat top haircut.

Winter

Storm water site inspections cannot be suspended over the winter.

This means that inspection reports are required for the following:

- Projects where construction is occurring over winter

and

- Projects where construction activity has ceased for the winter-- even projects that had seed and mulch placed prior to winter require inspection if there is not vegetative cover of sufficient density to preclude erosion.

Inspection reports are to be completed weekly. Observations on the weekly inspection report may be as simple as stating that the ground is frozen and snow-covered. But remember the permit requirement do not provide for snow cover as a type of stabilization, and the 0-14 day rule still applies.

There may be areas that you are unable to access due to snow. If that is the case, then those areas should be noted on the report.

In particular, look for the following during winter inspections:

- Damaged ditch checks.
- Inlet protection needing maintenance.
- Damage to perimeter controls.

Emergencies

Potential emergencies that may occur onsite include hazardous spills.

If you are working on, above, or near water and spill or discharge a listed/regulated waste, you must report this discharge and immediately take action to contain and clean it up. Chapter 10 of the Construction Manual has information on the proper procedures to follow if a spill occurs.

There is risk of chemicals being discharged from the site in storm water and eventually ending up in a receiving water. This is a violation of the permit.

What to Check Before a Project is Considered Complete

- Ensure all disturbed areas have been stabilized with temporary or permanent seeding as applicable and have achieved 70% growth. If project does not have a follow up project with permanent seeding, permanent seeding should be done on the current project before acceptance.
- No project is properly completed until vegetation is established and ditches are stable. Check seeded areas and reseed areas where vegetation is thin or absent. This is especially important for slopes, ditches and channels.
- Reseed and re-mulch where necessary.
- Ensure all permanent storm water features are in place (if they're included with the project's design), functioning and well stabilized.
- All temporary storm water features are removed (or arrangements have been made by the RCE/District to have features removed by the Iowa DOT) unless the project site is transferring to next phase of work – such as completion of a grading project and moving to the paving project. In those cases, ensure all temporary storm water features are in good repair and operating correctly.

Don't forget to remove the old silt fence and posts once the area has reached a density of 70%. Posts should be pulled and silt fence should be cut off at ground level or completely removed.

If a project is an Erosion Control Project, there are some additional items to check:

- All soils must be stabilized with a uniform perennial vegetative cover with a density of at least 70% over the entire site.
- Remove all temporary measures (such as silt fence) after corresponding areas are protected or stabilized. Seedbed preparation and seeding and mulching are required for disturbed areas.
- Culvert inlets should be stabilized, vegetated and showing no visible gullies. Rock or soil that has been washed away by run-off or upstream flows should be replaced.
- Check ditches and channels to make sure banks and ditch bottoms are well vegetated. Reseed bare areas and replace rock that has become dislodged.
- Check areas where erosion control blankets or matting were installed. Reseed all bare soil areas.
- Replace rock washouts near culvert and channel outlets. Fill, grade and seed or riprap eroded areas around inlets or outlets. Make sure downstream ditches and channels are fully vegetated. Fill and seed any gullies along the banks or other slopes.
- Fill, grade and seed all temporary sediment traps and basins.

Once all soil disturbing activities at the site have been completed and the entire area covered under a permit has permanent vegetation with 70% established (or equivalent stabilization measures have been employed), then a Notice of Discontinuation (NOD) should be prepared.

TIP

70% stabilization means 70% overall growth over 100% of the project, not 100% growth over 70% of the project.

Final stabilization means that there is uniform vegetative growth over the entire project of at least 70% density. It does not mean that 70% of the project site is fully seeded and 30% of the project site is bare.

Means this:

Not this:

This site has not yet achieved 70% growth, and a Notice of Discontinuation should not be submitted.

A Notice of Discontinuation could be submitted for this site.

Chapter 5: Good and Bad Examples

The following photos show some good examples of how controls are being used and bad examples showing major deficiencies. Please note an example shown as good may not have everything in compliance, but the overall concept of what is trying to be accomplished is good.

Embankment was stabilized in stages. Contractor did not wait until entire slope was completed before seeding and mulching. Silt fence was installed along contours (though it should have been broken up into smaller sections or installed with bumps - there is a maximum of 200 feet per section as shown in Standard Road Plan EC-201).

Water ran along the silt fence, down the slope, and created a channel. The silt fence was then overwhelmed at one location, and a blow out occurred. Silt fence was also installed in too large of a span and should have been broken up into smaller sections with J-hooks. This would have created multiple storage areas and prevented a channel from forming along the side of the fence.

Multiple rows of silt fence installed along the contour of a slope. Due to the ditch grades, a rock ditch was installed to prevent erosion in the ditch. The backslope was also seeded prior to the road embankment being completed.

This box culvert has no controls installed. Even if this is immediately after topsoil has been placed, there should be a line of controls installed prior to the waterbody.

This box culvert has multiple controls installed, including slope protection, multiple rows of silt fence, and rock.

Pipe culvert with multiple controls of rock, slope protection, silt fence and sediment logs.

This pipe culvert has no controls around it. A silt basin and silt fence are recommended controls for this area.

Multiple controls were installed at a bridge site to protect the creek. They include seed, mulch, logs, rock and multiple rows of silt fence.

This photo shows silt fence that has either been blown-out or run over by equipment. If this occurs, the silt fence should be repaired immediately because it is the last line of defense to prevent silt from entering the creek. It would also be a good idea to have two lines of controls along a waterbody.

Water drained off the top of the embankment and created rills in the foreslope. This is an example of how an area may appear stabilized but is still susceptible to erosion. These areas should be repaired and if possible, flows should be diverted to a stabilized area.

This trench was dug to divert flows down a rock flume and allow vegetation to grow on the slope.

A stream diversion channel was constructed so that the contractor could install a new culvert. This photo shows no controls along the top of the channel (on the left) and spoil piles without silt fence or logs and no stabilization (on the right side of the channel).

This shows a good example of a temporary stream diversion installed per EW-402.

This is a disturbed area alongside a creek without any sediment or erosion controls. Perimeter controls should have been installed to prevent silt from entering the water body.

Slope protection was installed on this bridge berm. Silt fence was also installed to control silt from entering the river and to separate the area that was matted from disturbed areas.

This photo was taken shortly after the outlet end of a box culvert was cleaned out. Based on the silt still remaining in the ditch and the dirt line on the culvert, it's estimated about two feet of silt was removed. The entire site should be reviewed to find what structural controls are needed and areas that should be stabilized. A single silt fence will not prevent recurrence.

This site used multiple controls, including silt fence with J-hooks, mat, staged seeding, logs and rock.

This is an example of a good temporary stream crossing per EW-401. Clean fill was used in the creek, and the crossing was topped with aggregate.

This photo shows a very poor example of a temporary stream crossing on a culvert extension project. Only clean fill per EW-401 should be used in the water.

Two rows of silt fence were installed at this location because the project site was adjacent to a residential area.

Q. Do silt fences and other barriers completely clean the water?

A. No. A majority of the soil particles are removed, but the fine silt and clay may still remain in suspension.

Chapter 6: Frequently Asked Questions

Permits

Q. The regulatory agency asked for my site map. Where is it?

A. Most plan sets will contain the site map in the R sheets. This is a picture map that shows where the designer anticipates controls will be installed. Older plan sets may not contain R sheets. For these projects, the site map is comprised of information throughout a set of plans. You may refer to Paragraph II, D of the PPP that will provide the location for the site map components.

The contractor is required to update the site map per Specification Section 2602. The updated/amended site map should be uploaded by the contractor to the Pay Items drawer in DocExpress.

Q. How is a 404 permit different than a storm water permit?

A. The 404 permit is issued by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act. This permit authorizes construction within wetlands, streams, ponds, etc.

The NPDES storm water General Permit #2 is issued by the Iowa Department of Natural Resources. The purpose of this permit is to regulate storm water discharges from construction sites.

TIP

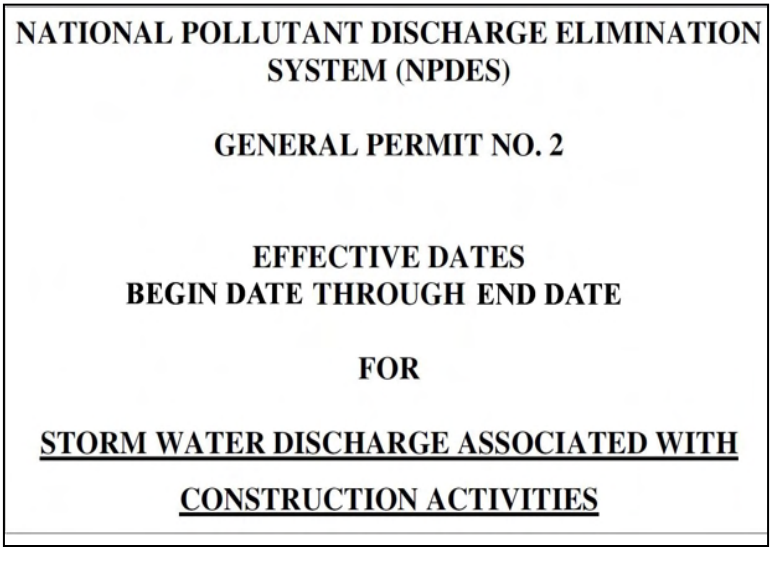
Silt and very fine sand are more erodible than other types of soil. As a result, more erosion & sediment devices are needed for silt and very fine sand.

Q. When do I need a storm water permit?

A. Storm water permits are required when 1 acre or more is disturbed by construction activity. Disturbed area includes any soil that will be exposed to erosive forces. Inlay areas (if soil is exposed), regraded shoulders, and onsite borrows should also be counted as disturbed acres. So, this may include more than just the acres to be seeded.

Also, a smaller project, such as a box culvert, that disturbs less than 1 acre may be covered by a permit if it is part of a larger area of work (such as multi-year, multi-project corridor-wide improvements).

For any contractor-furnished borrow sites, the contractor is responsible for obtaining any necessary permits or clearances.



NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

GENERAL PERMIT NO. 2

EFFECTIVE DATES
BEGIN DATE THROUGH END DATE

FOR

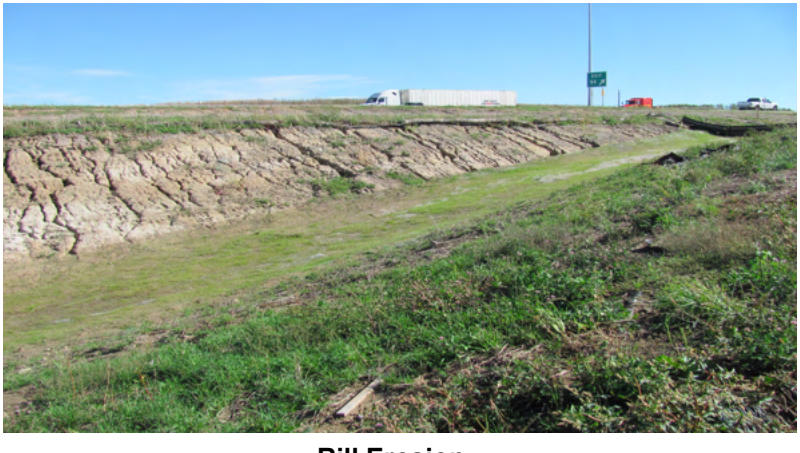
STORM WATER DISCHARGE ASSOCIATED WITH CONSTRUCTION ACTIVITIES

Iowa DNR NPDES General Permit #2 is typically a 5-year permit.

Erosion

Q. What influences Erosion?

- Rainfall intensity (this means how hard it rains - an increase in intensity increases erosion).
- Rainfall duration (Longer duration increases erosion).
- Soil erodibility (this means the more erodible a soil is – for example, soils high in clay and sand have low erodibility, while soils high in silt have high erodibility).
- LS Factor (this means as Length or Slope increase, erosion increases).
- Soil loss will likely also be greater on a cut slope versus fill slope because of greater overland flow.



Rill Erosion

Q. What types of erosion are caused by water?

- Raindrop (dislodges soil particles).
- Sheet (shallow sheet of water running off the land).
- Rill (small, but well defined channels).
- Gully (rills come together and become larger).
- Channel, sometimes called streambank erosion (may be large enough and forceful enough to move a streambed itself, or its bank).

Q. What is the difference between sediment control and erosion control?

A. Erosion control prevents erosion from occurring in the first place. Erosion control is a source control, or in other words, practices to maintain the soil in its original location and state.

Sediment controls are those practices and devices used to manage the discharge waters and soils that have been displaced by erosion that has occurred on site.

Q. Erosion control is just controlling dirt or soil from getting into the storm sewer, right?

A. No. Pollutants also extend to construction debris, oil, gasoline, and anti-freeze - just to name a few. Any of these materials might be a danger to our water quality if they are allowed to enter our lakes, streams, and waterways.

Watering of slope protection.

Best Management Practices (BMP)

Q. Why aren't straw bales recommended?

A. Straw bales have limits for application. Too often they were selected for use in situations where they were not best suited. Straw bales are not recommended for protection of catch basin and drain inlets or in concentrated flow areas such as swales, ditches, or streams. In these conditions, they are too easily undermined.

Proper installation of straw bales requires a sufficiently deep setting trench, installation on their side with the strings (baling twine) not in contact with the soil, and a minimum of at least 2 wood stakes driven through each bale and at least 18" into the ground. Bales must be installed very tightly together, end to end, with no gaps at all. The setting trench must be backfilled and compacted on the up-stream side.

There are better performing and more cost effective controls for the typical applications of straw bales, such as sediment logs.

Q. Why is seedbed preparation important?

A. Seedbed preparation is one of the most important steps in establishing vegetation. It provides a suitable bed for seed germination, facilitates planting, and reduces weeds. Good seed to soil contact helps the seed utilize the moisture in the soil and later in the emerging vegetation to utilize the nutrients in the soil.

Q. What work items require watering?

A. Sod, special ditch control, slope protection, turf reinforcement mat (TRM), and Transition Mat. Refer to Specifications Section 2601 for required rates.

Q. How do I know how to install…?

A. Refer to Specifications Section 2601 for installation of erosion control and 2602 for installation of sediment controls. Also refer to EC and EW standard road plans.

Q. How do I know if the correct amount of hydro-mulch was applied?

A. Specifications Section 2601 requires hydraulic mulch be applied at no less than 3000 lb/acre, unless specified otherwise in the contract documents. Construction Manual 7.32 provides a chart showing how many gallons of water should be mixed with bales of mulch for different sized areas.

Q. What is the most effective control or practice?

A. The most effective control is to limit disturbed areas through phasing. Preserving existing vegetation will help reduce run-off and increase the effectiveness of other controls. After this, the next most effective practice is erosion control (i.e. mulching, reseeding, etc.).

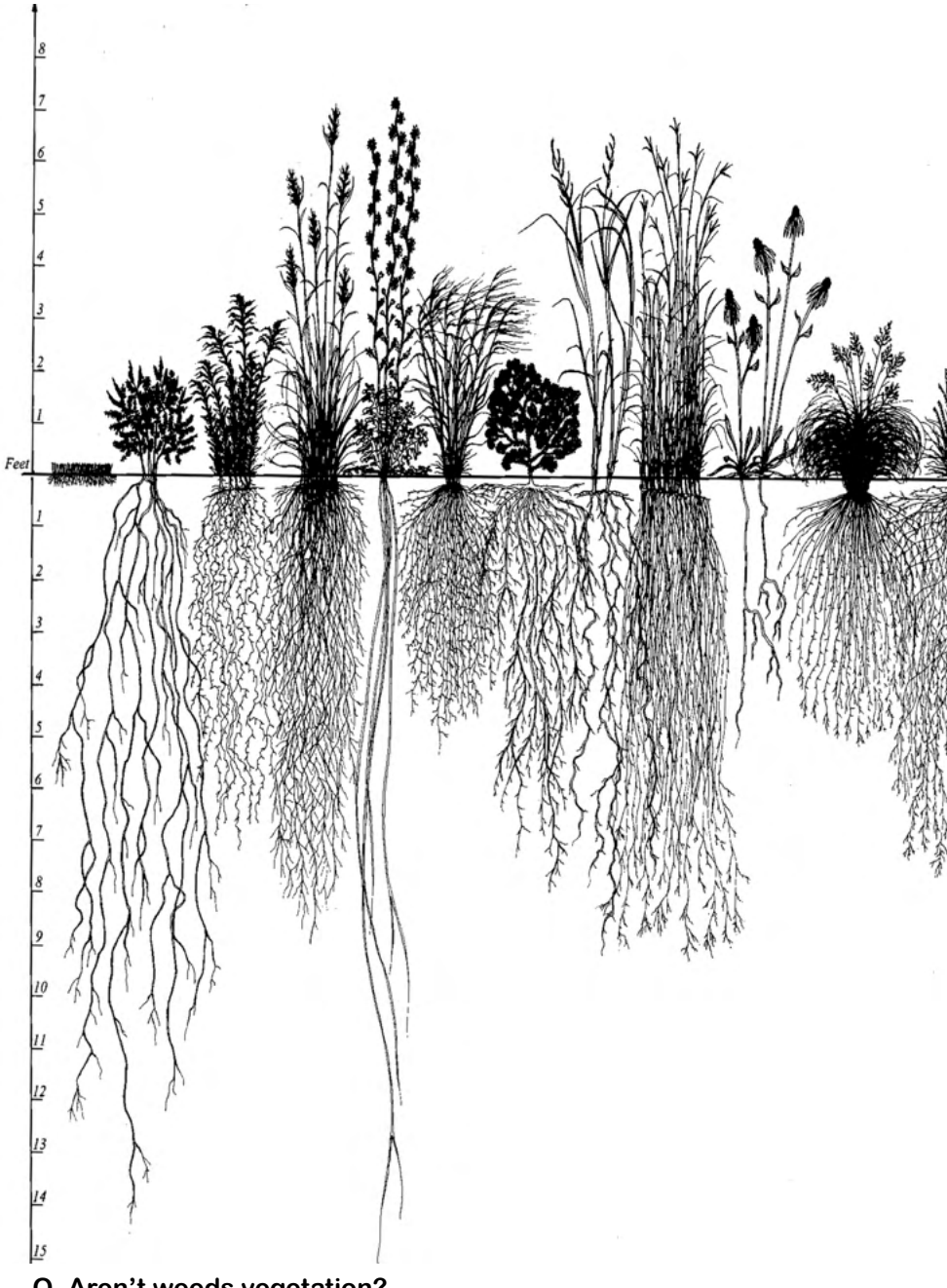
Q, What is required for dewatering?

A. The stormwater permit allows for uncontaminated groundwater to be discharged. The dewatering discharge should not cause a violation of water quality standards of the receiving water. It also shouldn't cause an objectionable discoloration of the receiving water. The contractor should use BMP's to ensure sediment-laden water is not discharged. The contractor should also use BMP's to ensure that scouring is not occurring at the end of the discharge hose.

Q. My project has a bid item for silt curtains. When do they need to be installed?

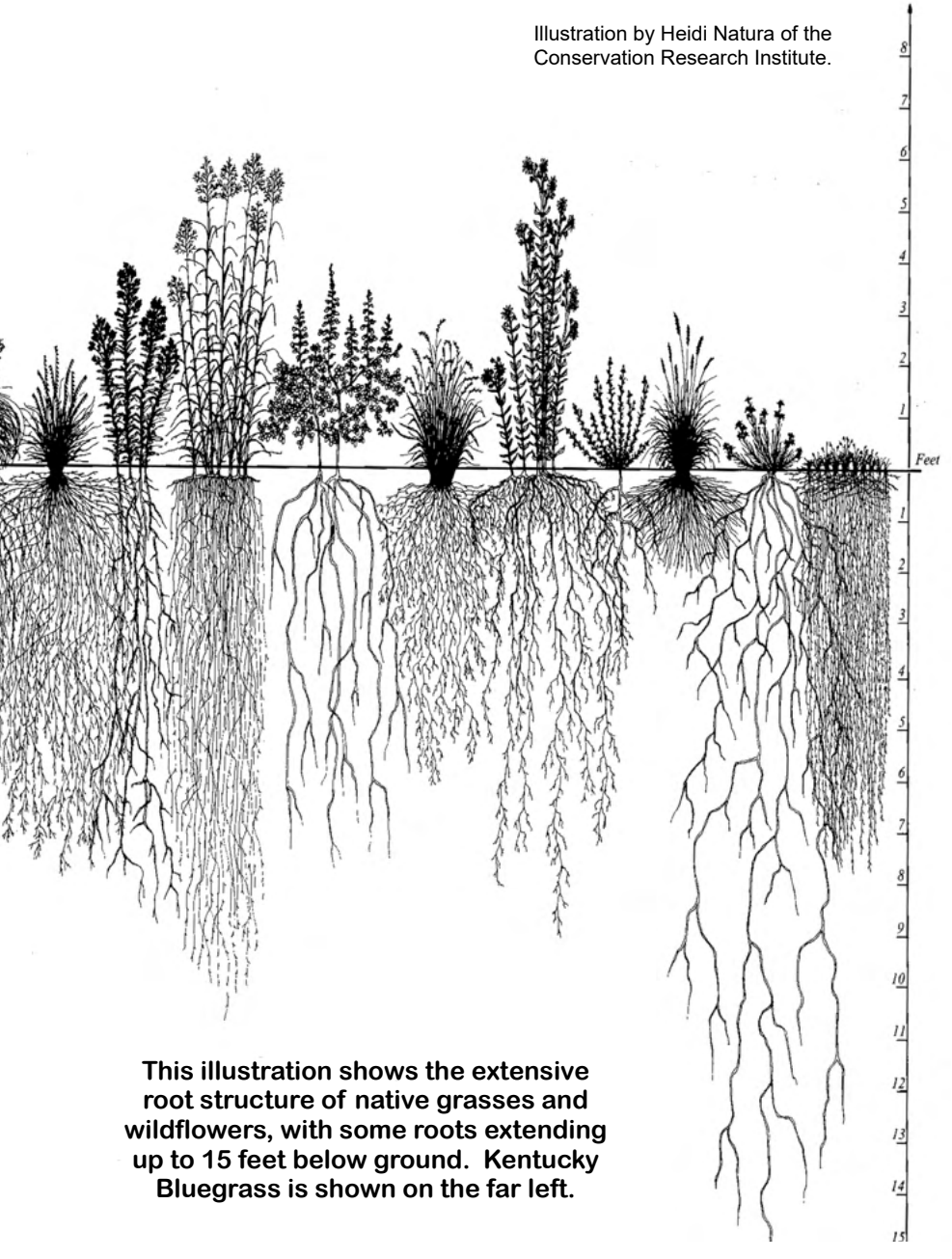
A. The purpose of a silt curtain is to create a separation between the work area in the water or along the streambank from the rest of the water body. As such, the curtain only needs to be installed when this work will occur. Remember, silt curtains should not be viewed as a perimeter control. There should be other controls (such as silt fence or perimeter & slope sediment control devices) installed upland.

Silt curtain used as a separation barrier to keep turbid water from entering the flowing water body. Additionally, the dewatering hose is outletted onto rock.



Q. Aren't weeds vegetation?

A. They are not adequate vegetation. Weeds generally are not able to hold the soil in place because of shallow root structure. Also, once weeds are established, getting rid of them can be difficult.



This illustration shows the extensive root structure of native grasses and wildflowers, with some roots extending up to 15 feet below ground. Kentucky Bluegrass is shown on the far left.

Additionally, it is the Iowa DOT's responsibility to control noxious weeds growing on the roads under their jurisdiction. Applying temporary and permanent seeding and mulch helps reduce establishment of weeds.

General

Q. Where do I look for approved sources?

A. In the past, approved sources were provided in Materials IM appendices. This information is now available online at Materials Approved Product List Enterprise (MAPLE) at https://maple.iowadot.gov/

Q. When should a project have a bid item for erosion control mobilization?

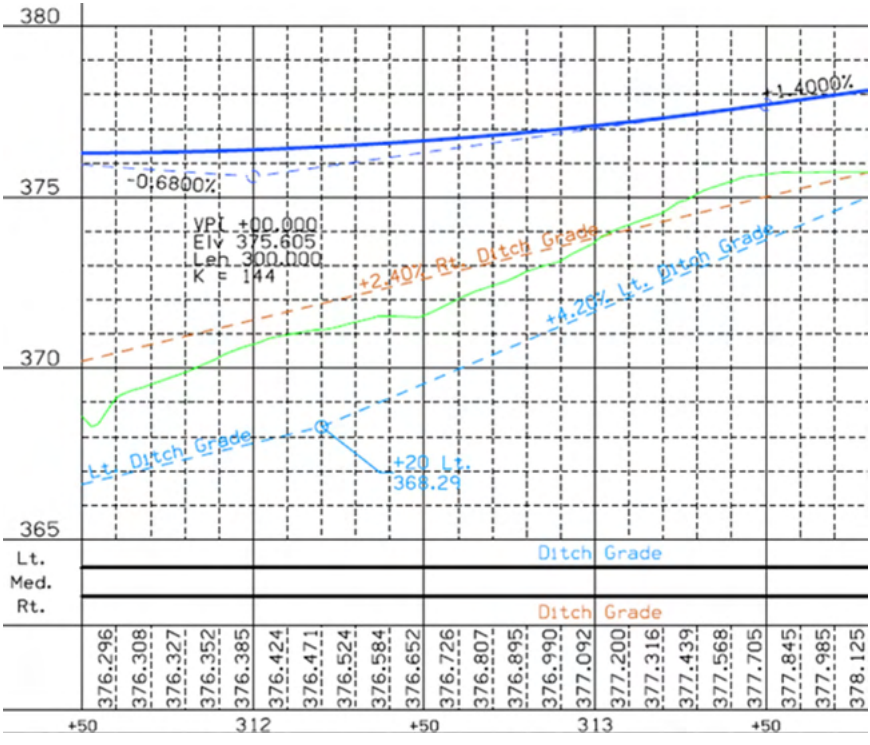
A. Per Specifications Section 2602, Mobilizations, Erosion Control, applies to projects not identified as erosion control or landscaping and contain a SWPPP.

Q. What are some options in dealing with non-compliance?

- Price adjustments for erosion control or other environmental issues (Construction Manual 2.53, J).
- Non-compliance notice (Construction Manual 3.21).
- Penalty for not mobilizing or completing corrective actions. (Specifications Section 2602).
- Reduction in Class 10 payment (Construction Manual 10.41).
- No more opening up of additional ground (Specifications Section 2602).
- Shut-down of job (Specifications Section 2602).
- Deduction for not stabilizing as required by the NPDES storm water permit (Specifications Section 2602).

Q. How can I determine what the slope is in a ditch?

A. Look at the plans. Here's an example – light blue is left ditch grade and brown is right ditch grade.



TIP

Silt fence requires clean-out or replacement if the sediment has accumulated to one-half the height of the fence. Do not wait until there is a blow-out of the fence.

Q. Where can I find information or requirements on various controls in the contract documents?

A. See tables below.

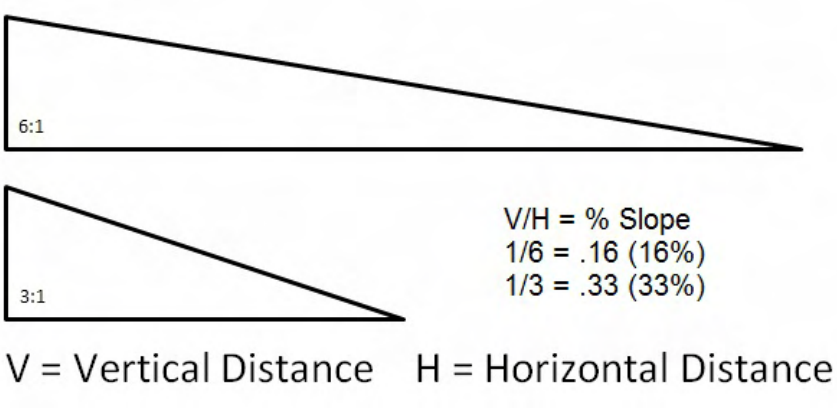
Erosion Control	Specification	Standard Road Plan	Tabulation	Materials IM
Seeding	2601, 4169	EC-502		469.02
Fertilizing	2601, 4169			469.03
Mulching	2601, 4169			
Sod	2601, 4169			
Slope Protection	2601, 4169	EC-103	100-22	469.10
Special Ditch Control	2601, 4169	EC-101	100-22	469.10
Turf Reinforcement Mat (TRM)	2601, 4169	EC-104	100-22	469.10
Transition Mat	2601, 4169	EC-105	100-09	
Rock Erosion Control	2507	EC-301	100-23	
Temporary Stream Diversion	2418	EW-402		
Temporary Stream Access/Crossing	2547	EW-401		

Sediment Control	Specification	Standard Road Plan	Road Design Detail	Tabulation	Materials IM
Silt Fence	2602, 4196	EC-201		100-17	496.10
Silt Fence Ditch Check	2602, 4196	EC-201		100-18	496.10
Perimeter & Slope Sediment Control Device	2602, 4196	EC-204		100-19	496.10
Rock Check Dam		EC-302		100-32	
Silt Dike & Ditch	2602	EW-403		100-13, 100-15	
Silt Basin	2602	EW-403		100-14	
Temporary Sediment Control Basin		EC-601		100-33	
Inlet/Intake Protection		EC-602	570-5 and 570-7	100-36, 100-37	469.10
Slash Mulch Berm			570-1		
Floating Silt Curtain	DS-15019	EC-202		100-10	496.10
Stabilized Construction Entrance		EC-303			

Q. How can I convert a slope ratio (such as 3:1) to a percent slope?

A. Just do a little division. Let's try an example – if you have a 3:1 slope, this means for every 3 feet horizontal, you go up 1 foot vertical. To calculate the percent slope, just divide the vertical change by the horizontal change. In our example, it would be 1/3 or 33%.

Here is a picture to illustrate.



Chapter 7: Troubleshooting

Problem	Possible Solution
Ditch erodes due to high velocity flows.	1. Install ditch protection (special ditch control or TRM). 2. Install riprap. 3. Install velocity reducing BMP's upstream - such as silt fence ditch checks, rock check dams, or logs.

Problem	Possible Solution
Rock check dams wash away.	1. Consider adding more dams upstream. 2. Use larger rock or increase size of dam.

Problem	Possible Solution
Erosion is occurring under logs/wattles/ socks.	1. Make sure logs are placed on level contour. 2. Check for adequate staking.

Problem	Possible Solution
Sediment is being tracked onto road.	1. Clean roadway. 2. Install stabilized construction entrance. 3. If already rocked, increase length of stabilized entrance and keep entrance maintained.

Problem	Possible Solution
Slope protection is getting undercut.	1. Ensure mat is installed properly. This includes: mat to be anchored at top of slope, adjacent sections of mat are overlapped at lap joint, and adequate staples. 2. Divert flows at top of slope. 3. Install rock.

Problem	Possible Solution
Dewatering discharge is dirty and is being discharged to receiving water.	Do not discharge dirty water to a receiving water! This water should first be treated. Here are some ideas: 1. Discharge through a vegetated area. If scour is occurring at discharge location, use rock at discharge. 2. Create a treatment system, such as bags at end of hose, discharge to area surrounded by silt fence or rock, or use flocculants. Do not discharge directly inside a silt curtain. 3. Look at ways of decreasing sediment in water at inlet side of pump, such as creating a rock filled sump.

Problem	Possible Solution
Silt fence at bottom of slope is filling up with sediment or does not provide enough ponding area	1. Stabilize the slope. 2. Install fence at least 10 feet away from toe of slope. 3. Divert flow at top of slope. 4. Install logs or silt fence along slope to shorten slope length. 5. Install maximum length of 200' of silt fence with J-hooks.

Chapter 8: Resources

Iowa DOT Contacts

Construction and Materials Bureau 515-239-1352

Contracts Bureau..... 515-239-1414

Roadside Development 515-239-1424

Location & Environment Bureau..... 515-239-1225

District 1..... 515-239-1635

District 2..... 641-423-7584

District 3..... 712-276-1451

District 4..... 712-243-3355

District 5..... 641-472-4171

District 6..... 319-364-0235

Other Iowa Government Contacts

Iowa DNR Storm Water

Program Coordinator 515-725-8417

Iowa DNR Field Services:

http://www.iowadnr.gov/fieldoffice

Iowa DNR Field Office 1 563-927-2640

Iowa DNR Field Office 2 641-424-4073

Iowa DNR Field Office 3 712-262-4177

Iowa DNR Field Office 4 712-243-1934

Iowa DNR Field Office 5 515-725-0268

Iowa DNR Field Office 6 319-653-2135

Technical Resources

Iowa Construction Site Erosion Control Manual

http://publications.iowa.gov/8127/1/const_erosion.pdf

Iowa DNR Storm Water Program

https://www.iowadnr.gov/Environmental-Protection/Water-Quality/NPDES-Storm-Water

Iowa DNR Watershed Improvement

https://www.iowadnr.gov/Environmental-Protection/Water-Quality/Watershed-Improvement

Iowa DNR Water Quality

https://www.iowadnr.gov/environmental-protection/water-quality

Iowa DOT Design Manual

https://iowadot.gov/design/design-manual

Iowa Statewide Urban Design Standards Manual

http://www.iowasudas.org/manuals/manual.cfm?manual=design

Iowa Storm Water Education Program

http://www.iowastormwater.org/

Iowa Storm Water Management Manual

https://www.iowadnr.gov/Environmental-Protection/Water-Quality/NPDES-Storm-Water/Storm-Water-Manual

Natural Resources Conservation Service

http://www.nrcs.usda.gov/wps/portal/nrcs/site/ia/home/

USEPA Storm Water Program

https://www.epa.gov/npdes/npdes-stormwater-program

Chapter 9: Credits

Information Sources

- Managing Iowa Stormwater for Quantity and Quality. The Iowa Policy Project, August 2007. Available: http://www.iowapolicyproject.org/2007docs/070809-stormwater.pdf

- United States Environmental Protection Agency. A Brief Summary of the History of NPDES. Available: https://www.epa.gov/npdes/npdes-regulations

- Iowa Department of Natural Resources. Understanding Storm Water NPDES Permitting Requirements. Available: http://www.iowadnr.gov/Environmental-Protection/Water-Quality/NPDES-Storm-Water/Permitting-Requirements-Info

- Iowa Department of Natural Resources. Storm Water Management for Construction Activities - General Permit No. 2. Available: http://www.iowadnr.gov/Environmental-Protection/Water-Quality/NPDES-Storm-Water/Permits-Guidance-Forms

- Pima County Department of Environmental Quality. What is a Stormwater Pollution Prevention Plan? Accessed (no longer available): http://www.pima.gov/deq/pdf/Water/What_is_a_SWPPP.PDF

- Virginia Department of Conservation and Recreation. The Virginia Erosion and Sedimentation Control Handbook. Accessed (no longer available): http://www.dcr.virginia.gov/forms.shtml

- Kentucky Transportation Cabinet. Kentucky Construction Site BMP Planning and Technical Specifications Manual. Accessed (no longer available): http://www.kytc.state.ky.us/.../PDF/...Manual/3-Slope%20Protection.pdf

- Vermont Department of Environmental Conservation. Vermont Erosion Prevention and Sediment Control Field Guild. Available: https://dec.vermont.gov/sites/dec/files/wsm/stormwater/docs/StormwaterConstructionDischargePermits/sw_vermont_field_guide.pdf

- Minnesota Department of Transportation. Erosion Control Handbook II, 2006. Available: http://www.dot.state.mn.us/environment/erosion/pdf/2006mndotecfieldhandbook.pdf
- Iowa Department of Transportation. Road Design Manual, Standard Road Plans, Construction Manual, Standard Specifications, Supplemental Specifications.
- Various photographs of BMP's. Accessed, no longer available: http://www.ccgov.org/dept_works/sediment_stormwater/constructionsitebmps.cfm
- Sheet erosion photograph. Accessed (no longer available): http://science.nationalgeographic.com/science/photos/weathering-erosion-gallery/#/soil-erosion_1219_600x450.jpg
- Streambank erosion photograph. Available: http://www.teara.govt.nz/en/soil-erosion-and-conservation/3/3
- Spike tooth harrow photograph. Accessed (no longer available): http://www.flexharrow.com/PICTURES/flex3pt.jpg
- Cultipacker photograph. Accessed (no longer available): http://prairies.info/img/implant14.jpg
- Hydraulic seeding photograph. Accessed (no longer available): http://www.geo-synthetics.com/images/flexterra-eau-claire-2006-002.jpg
- Rotary tiller photograph. Accessed (no longer available): http://br-equipment.com/products/img/rotarytiller.jpg
- Seed drill photograph. Available: http://img.alibaba.com/photo/10235293/Seed_Drill.jpg
- Filter berm photograph. Accessed (no longer available): http://www.elibrary.dep.state.pa.us/dsweb/GetRendition/Document-87860/html/index464480.png
- Vegetated buffer photograph. Available): http://stormwater.pca.state.mn.us/images/2/28/Example_of_vegetated_buffers.jpg

- Dewatering photograph. Accessed (no longer available): http://www.ccgov.org/images/Sediment%20and%20Stormwater%20Branch/OutletonBerm1.jpg
- Stabilized Construction Entrance. Accessed (no longer available): http://www.lakecountyohio.gov/smd/Construction.aspx
- Spill in water photograph. Available: http://nubiannewsnetwork.files.wordpress.com/2010/07/oil-on-the-water.jpg

Other Photos and Illustrations

- Various illustrations in this guide were produced by Tetra Tech for the Kentucky Erosion Protection and Sediment Control Field Guide, and provided to the Iowa Department of Transportation to improve understanding of construction storm water management techniques.
- Iowa Department of Natural Resources
- USDA Natural Resources Conservation Service
- United States Environmental Protection Agency
- Iowa Department of Transportation

Handbook Development

- Manual Development Team – Melissa Serio, Earthworks Engineer & Rhonda Pecenka, Engineering Tech Sr., Iowa DOT Construction and Materials Bureau.
- Other Contributors – John Smythe (retired), Ole Skaar (retired), John Vu (retired), RCE and District offices & other Central Construction staff for their review, comments and photographs.

DID YOU KNOW?

Q. If an area has weeds, is it stabilized?

A. No, weeds generally are not able to hold the soil in place because of shallow root structure. Also, once weeds are established, they are hard to get rid of, which makes it difficult for other seeds to be successful.

FACT

Concrete washout wastewater is caustic and considered to be corrosive with a pH of 12, essentially the same as liquid Drano.

Chapter 10: Glossary

Annual species - They grow one year, seed out and then die. The root system is minimal since they are not alive long. Thus, they are used in temporary cover.

Best Management Practice (BMP) - Any measure, device or practice used to reduce or eliminate the amount of erosion or sediment released from a construction site.

Bonded Fiber Matrix (BFM) - This is a heavy and thick mulch application used on steep slopes and high erosion areas.

Clean Water Act (CWA) - The Federal Water Pollution Control Act enacted in 1972. The Clean Water Act prohibits the discharge of pollutants to Waters of the United States unless said discharge is in accordance with an NPDES permit. The 1987 amendments include guidelines for regulating municipal, industrial, and construction storm water discharges under the NPDES program.

Compliance - Adhering to all provisions, conditions and requirements of permits.

Co-Permittee Certification Statement – Contractor and subcontractors involved in land disturbance for a project or that have a role or responsibility for carrying out and maintaining the BMPs, or if they have potential to discharge a pollutant are required to sign a co-permittee certification statement saying they will adhere to the requirements of the NPDES permit and the PPP. This is Iowa DOT Form 830215.

Critical Areas - Environmentally sensitive or ecologically important areas on or near the project site.

Disturbed Area - An area which is susceptible to erosion because the vegetative soil cover has been removed or altered.

Ditch Check, Silt Fence - A temporary dam constructed of silt fence across a swale or drainage ditch to reduce velocity and to pond water, thereby reducing active erosion and promoting settling of suspended solids behind the ditch check.

Ditch Protection – Provides protection to seed and underlying soils in a ditch, reduces the chance of erosion and sediment movement and enhances moisture retention to allow for growth.

Environmental Protection Agency (EPA) – Government agency that issued the regulations to control pollutants in storm water run-off discharges (Clean Water Act and NPDES permit requirements).

Erosion – Detachment and movement of soil or rock fragments by water, wind, ice, or gravity.

Erosion Control Implementation Plan (ECIP) – Plan to be developed by the contractor showing the stages for erosion and sediment control work to address the contractor's timetable and sequence of major activities on the project contract, including the number of mobilizations.

Erosion Control Technician – Iowa DOT certification required of the prime contractor on projects covered by a storm water permit.

Filter Berm – Dike or berm made of wood mulch, stone, or compost that slows and filters storm water run-off or divert flows.

Filter Sock – A fabric tube filled with a wood chip/compost blend material used to filter sediment from storm water or to reduce velocity of flow in channels and slopes.

Final Stabilization – This is achieved when all soil disturbing activities at the site have been completed and a uniform perennial vegetative cover with a density of 70% for the area has been established or equivalent stabilization measures have been employed.

Floating Silt Curtain – Floating barrier used in water body to isolate the work area from the rest of the water body, which allows sediment to settle out of suspension and controls turbidity.

Flocculant – A chemical agent that causes small particles to group together (flocculate). Also referred to as a polymer.

Gully Erosion – These are deep channels formed from concentrated storm water flow. They cannot be removed or filled with simple plowing techniques.

Infiltration – The passage of water through the soil surface into the ground.

Inlet – An entrance into a ditch, storm drain, or pipe.

MS4 - Municipal Separate Storm Sewer System – Entity that controls a storm sewer system and is regulated under the Clean Water Act.

Mulch – A natural or artificial layer of plant residue or other material that covers the land surface and conserves moisture, holds soil in place, aids in establishing vegetation, and reduces temperature fluctuations.

National Pollutant Discharge Elimination System (NPDES) – The EPA program to control the discharge of pollutants to waters of the United States. NPDES is a part of the federal Clean Water Act (CWA), which requires point and non-point source dischargers to obtain permits. These permits are referred to as NPDES permits.

Notice of Intent (NOI) – A formal notice to the IDNR that a construction project seeking coverage under a General Permit is about to begin. The NOI provides information on the owner, location, and type of project, and certifies that the permittee will comply with conditions of the construction General Permit.

Notice of Discontinuation (NOD) – A formal notice to the IDNR for terminating coverage under the NPDES permit.

Off-site – Beyond the permanent right-of-way or temporary construction easement limits.

Perennial Species – A plant that will grow, establish and spread. They have an extensive root system that maintains their existence and will come back each year. They are considered permanent.

Perimeter Control – Measures installed around the perimeter or edge of the construction site.

Pollution Prevention Plan (PPP) – See Storm Water Pollution Prevention Plan (SWPPP).

Rill Erosion – Created when shallow sheet flow concentrates in low areas and creates shallow grooves or channels of concentrated flow. Rills are shallow enough that they can be removed or filled by disking the area.

Riprap – Rock or broken concrete placed to prevent erosion, scour, or sloughing of a structure or embankment.

Rock Check – Rock placed across a ditch as a means of trapping sediment and/or reducing velocity. Also called Rock Ditch Check if used for a permanent installation or Rock Check Dam if used as a temporary control.

Run-off – Drainage that leaves an area as surface flow, in channels, or as pipeline flow.

Sediment – Soil particles that have become dislodged due to the erosion process and remain mostly suspended in flowing water.

Sediment Control – Controls or devices to trap sediment suspended in storm water by settling or filtration.

Seed Conditioner – Company certified by crop improvement association that is required to mix Iowa DOT permanent rural, permanent urban, urban stabilizing, native grass, wetland grass, and wildflower seed mixtures.

Sheet Erosion – Type of erosion caused by spread out and shallow flowing water over the surface of the soil.

Silt Basin – A device used to trap and remove sediment from storm water by settling or filtration. They are designed for a specific amount of sediment storage and cleaned out when necessary and after the construction project is complete. They are created by building a dam across a waterway or ditch or by excavating a basin or a combination of both. Also called Sediment Trap.

Silt Dike – A dike which is constructed to manage or prevent water from flowing onto specific land regions and retain silt. Standard Road Plan EW-403 indicates these are constructed in no-ditch areas near the ROW.

Silt Ditch – A ditch which is constructed to channel water away from private property and retain silt. Standard Road Plan EW-403 indicates these are constructed in no-ditch areas near the ROW.

Silt Fence – Fabric materials used to filter suspended sediments from storm water. See Standard Road Plan EC-201.

Silt Fence Ditch Check – see Ditch Check, Silt Fence

Site Map – A required piece of the PPP. Iowa DOT's base storm water site map is typically included in the R sheets. This is a picture map that shows where the designer anticipates various erosion and sediment controls will be needed.

Slope – (1) Gradient of a stream or ditch. (2) Inclination of the face of an embankment, expressed as the ratio of horizontal to vertical projection.

Slope Protection – Provides protection to the seed and underlying soils on a slope, reduces the chance of erosion and sediment movement on slopes, and enhances moisture retention to allow for growth. Also referred to as erosion control blanket (ECB) or mat.

Splash Erosion – Caused by raindrop impact on unprotected soil. Also referred to as raindrop erosion.

Stabilization Controls – Temporary and permanent stabilization controls that include seeding, mulching, and matting.

Storm Water Discharge – Any surface run-off from the disturbed areas of the construction site. Construction site storm water run-off results from rainfall run-off, snow melt, or dewatering run-off.

Storm Water Pollution Prevention Plan (SWPPP or PPP) – A plan required by storm water regulations that includes site map(s), an identification of construction/contractor activities that could cause pollutants in the storm water, and a description of measures or practices to control these pollutants. The PPP is located in the project plans (typically in the C, CE, or R sheets).

Structural Controls – May include silt fence, earth dikes, silt basins, inlet/outlet protection or other structural elements to divert, store or limit run-off from exposed areas of the site.

Temporary Slope Drain – Temporary pipe that is used to convey storm water runoff over a steep, disturbed slope.

Temporary Stabilization – Includes temporary seeding, mulching and other temporary measures used to stabilize an area.

Temporary Stream Crossing – Temporary structure to provide construction access along or into a water body. See EW-401 for installation requirements.

Temporary Stream Diversion – Method for contractor to divert flow of a stream or creek around the construction site. See EW-402 for installation requirements.

Transition Mat – Permanent erosion control and energy dissipation used at culvert outlets or bridge end drains.

Turf Reinforcement Mat (TRM) – Permanent type of rolled erosion control products used to reinforce root structure. Primarily used in channels, ditches, or other high velocity flow locations.

Vegetated Buffer – Area of natural or established vegetation used to slow storm water runoff and filter sediment.

Water Pollution Control Manager (WPCM) – An individual from the Prime Contractor that fulfills various storm water management duties and responsibilities as defined in Specifications Section 2602.

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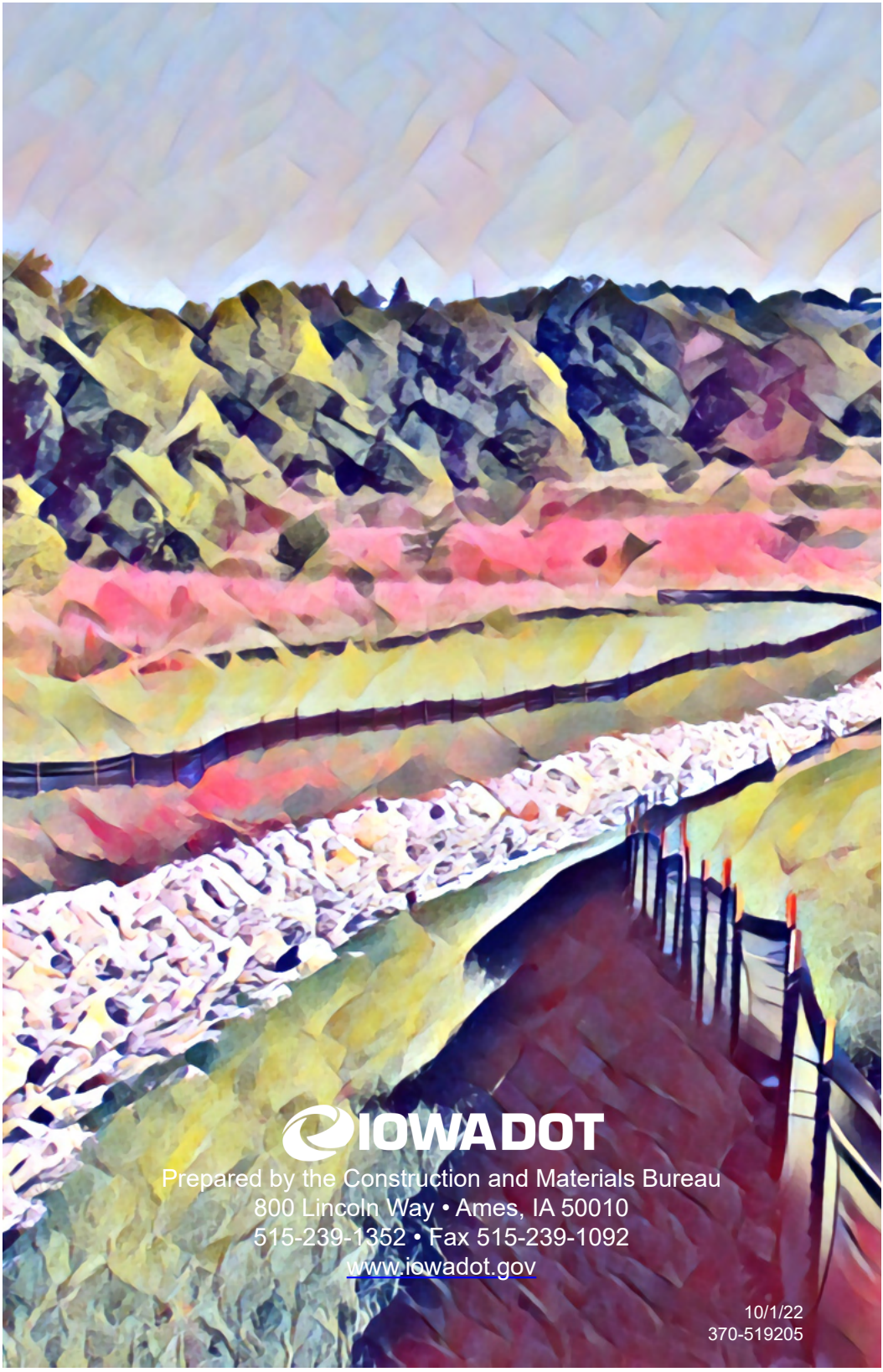

IOWA DOT

Prepared by the Construction and Materials Bureau
800 Lincoln Way • Ames, IA 50010
515-239-1352 • Fax 515-239-1092
www.iowadot.gov

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