CITY OF
Millersburg
A COMMUNITY LINKING
AGRICULTURE AND INDUSTRY

EROSION PREVENTION AND SEDIMENT CONTROL (EPSC) MANUAL

Original Version: 2020
Modified Version: November 2023

Modified for the City of Millersburg
by
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EPSC Appendix C-1: Erosion Prevention and Runoff, Sediment and Pollution Control Measures

EPSC Appendix C-2: Minor and Major EPSC Plan Templates

EPSC Appendix C-3: Plan Notes and Symbols

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List of Acronyms

AOS	Apparent Opening Size
BMPs	Best Management Practices
CPESC	Certified Professional in Erosion and Sediment Control
DEQ	Department of Environmental Quality
DFW	Department of Fish and Wildlife
DMA	Designated Management Agency
DSL	Division of State Lands
EPA	Environmental Protection Agency
EPCM	Erosion and Pollution Control Manager
EPSC	Erosion Prevention and Sediment Control
ESA	Environmental Site Assessment
FEMA	Federal Emergency Management Agency
IECA	International Erosion Control Association
MMC	Millersburg Municipal Code
MS4	Municipal Separate Storm Sewer System
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
ODA	Oregon Department of Agriculture
PCPI	Private Construction of Public Infrastructure
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers

EPSC Manual Revisions:

Date	Revisions
July 2023	Placed BMP details in Appendices and added an Enforcement Chapter
Nov 2023	Updated format, including removing Chapters, update TOC, revise numbering for sections, appendices, and tables to be consistent with other SWMP documents.

1 INTRODUCTION

This Erosion Prevention and Sediment Control (EPSC) Manual (Manual) provides technical guidance for the design, installation, maintenance, and inspection of temporary and permanent erosion prevention and sediment control measures in the City of Millersburg (City). The Manual is intended for use by site designers, developers, contractors, and inspectors during all disturbed earth activities. These include clearing and grubbing, excavation, fill, construction, and any other activities that contribute to erosion and the movement of sediments. This Manual is also intended to provide an educational resource to the public.

1.1 The Manual

The Manual is divided into six sections:

Section 1 Introduction

This section provides an introduction to the Manual with information regarding the background and basis for the City's development of EPSC guidelines. This chapter also contains an overview of erosion processes and the environmental impacts created by erosion from disturbed earth activities.

Section 2 Permitting Process

This section describes the requirements of the City's Erosion Prevention and Sediment Control Program. It defines the City's permitting requirements as set forth in Title 12 of the Millersburg Municipal Code (MMC) and describes the related administrative processes.

Section 3 EPSC Planning and Design

This section discusses the issues important to the planning and design processes for an effective erosion prevention and sediment control plan.

Section 4 Erosion Prevention and Runoff, Sediment, and Pollution Control Best Management Practices

This section describes planning and implementation activity controls that can be used on a construction site.

Section 5 Maintenance and Inspection

This section provides guidelines for the proper implementation, maintenance, and inspection of erosion prevention and sediment control measures.

Section 6 Compliance Assistance and Enforcement

This section describes how the City will escalate enforcement on noncompliant construction site owners / developers in a manner that will ensure the EPSC Permit is being implemented.

1.2 EPSC Manual Goal Statement

Every year, tons of sediment are washed and blown from sites of ground disturbance into streams, rivers, and lakes. The Environmental Protection Agency (EPA) estimates approximately 600 million tons of soil erodes from construction sites in the United States alone each year (1993). As the community continues to grow, our local waterways are at risk of being affected by ground disturbance with the greatest sediment impacts occurring during the land grubbing, clearing, grading and other excavation phases of development.

It is the intent of this Manual to describe proactive practices designed to prevent erosion and the release of sediments and other pollutants generated at a site of ground disturbance. Site planning and good site control are the best practices that can be used to prevent discharges. This manual is organized to emphasize measures preventing erosion and controlling stormwater runoff, as opposed to practices designed to strictly control sediment.

1.3 Disclaimer

This EPSC Manual was developed for the sole purpose of providing erosion prevention and sediment control Best Management Practices (BMPs). The contents of this manual should not be interpreted as necessarily representing the policies or recommendations of other referenced agencies or organizations. The mention of trade names, products, or companies does not constitute an endorsement.

It is intended that this manual and alternative methods acceptable for use in other jurisdictions, will be reviewed on a regular basis, with the Manual updated as needed.

1.4 City of Millersburg's Goals

It is the City's goal to comply with all conditions of federal, state, county, and city regulations and requirements. This Manual is intended to comply with current Willamette Basin Total Maximum Daily Load (TMDL) requirements and the National Pollutant Discharge Elimination System (NPDES) Phase II General Permit issued to the City of Millersburg by the Department of Environmental Quality (DEQ) to require programs that improve water quality of discharges from the City of Millersburg's municipal separate storm sewer system (MS4) to waters of the state. Additionally, this manual is intended to comply with Title 12 of the MMC.

1.5 Total Maximum Daily Loads

In September 2006, the DEQ issued the Willamette River Basin Total Maximum Daily Load (TMDL) Order. The TMDL is a regulatory mechanism required under the Federal Clean Water Act, and TMDLs must be issued for streams that do not meet water quality standards. For the Willamette River, current levels of bacteria, temperature, and mercury exceed state water quality limits. The TMDL issued in 2006 is the beginning of a long-term plan to reduce the pollutant load in the river. It places requirements on cities, counties, state, and federal agencies and will be updated every five years as necessary. Every agency required to respond to the TMDL is labeled a Designated Management Agency (DMA).

The City of Millersburg is a DMA and is required to take steps to reduce the pollutant loads within our jurisdiction that contribute to the Willamette Basin. Because the TMDL is basin-wide, it applies not just to pollutants entering the Willamette River directly, but also to those entering tributaries to the Willamette, such as the creeks within Millersburg. The City's EPSC Program is one component of the City's efforts to meet TMDL requirements.

1.6 NPDES Program for Municipal Separate Storm Sewer Systems (MS4)

The City of Millersburg operates an MS4 in a census defined urbanized area. In 2018, the City was required to obtain a Phase II MS4 General Permit. The City has developed the EPSC program, which included MMC, Title 12, and this Manual to protect water quality consistent with the Willamette Basin TMDL requirements discussed above and the NPDES MS4 General Permit requirements.

1.7 City Municipal Code Title 12

In December 2019 the Millersburg City Council adopted erosion prevention and sediment control requirements as part of Title 12 of the MMC. Specifically, Chapter 12.40 has been dedicated to erosion prevention and sediment control. Details of the City's EPSC program requirements, including permitting and inspection, are included in this manual.

1.8 Erosion and Sedimentation Processes

When land is disturbed and vegetation removed at construction sites, soil erosion rates accelerate dramatically, especially on steep slopes. Erosion at a construction site results in the movement of soil from the site and its eventual impact on water quality in streams, rivers, and wildlife habitat.

Erosion occurs when rain or wind loosen soils from the surface. Rain generated runoff cuts rills and larger gullies into exposed soils to convey sediment laden flows. Wind erosion creates a more consistent, area-wide stripping of soils from the soil surface. Both types of erosive forces are capable of depositing large amounts of sediment, sometimes at great distances, away from the site of ground disturbance.

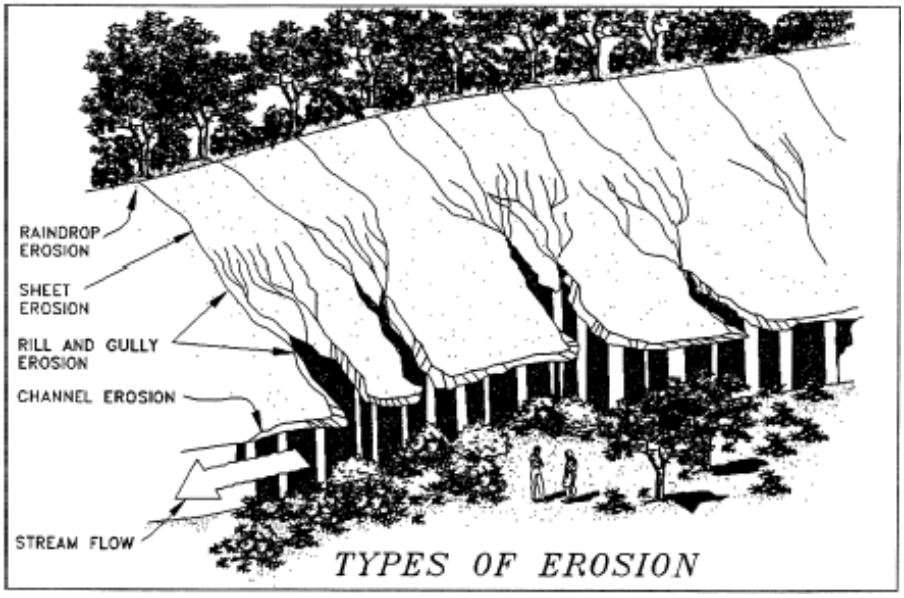
Table 1 illustrates the types of erosion that can occur. Additionally, four main factors influence erosion: Soil Erodibility, Vegetative Cover, Topography, and Climate.

- **SOIL ERODIBILITY**

  Soil characteristics which influence the potential for erosion by rainfall and runoff are those properties which affect the infiltration capacity of a soil and those which affect the resistance of the soil to detachment and being carried away by falling or flowing water. The following four factors are important in determining soil erodibility:

  - Soil texture (particle size and gradation)
  - Percentage of organic content
  - Soil structure
  - Soil permeability

Figure 1: Types of Erosion



Soils containing high percentages of fine sands and silt are normally the most erodible. As the clay and organic matter content of these soils increases, the erodibility decreases. Clays act as a binder to soil particles, thus reducing erodibility. However, while clays have tendency to resist erosion, once eroded, they are easily transported by water. Soils high in organic matter have a more stable structure which improves their permeability. Such soils resist raindrop detachment and infiltrate more rainwater. Clear, well-drained, well-graded gravel, and gravel-sand mixtures are usually the least erodible soils. Soils with high infiltration rates and permeability either prevent or delay and reduce the amount of runoff.

- **VEGETATIVE COVER**

Vegetative cover plays an extremely important role in controlling erosion as it provides the following five benefits:

- Shields soils surface from raindrop and wind erosion
- Provides root systems which hold soil particles in place
- Aides soil in absorbing water
- Slows velocity of runoff
- Evapotranspiration of sub-surface water between rainstorms

By limiting and staging the removal of existing vegetation and by decreasing the area and duration of exposure, soil erosion and sedimentation can be significantly reduced. Special consideration should be given to the maintenance of existing vegetative cover in areas of high erosion potential such as moderately to highly erodible soils, steep slopes, drainageways, and the banks of streams.

- **TOPOGRAPHY**

  Topography (the size, shape, and slope) of a watershed can influence the amount and rate of stormwater runoff. Extended slope lengths and steep gradients increase the rate of runoff (creating a higher probability for erosion) and can limit abilities to establish and maintain vegetative cover.

- **CLIMATE**

  The frequency, intensity, and duration of rainfall are fundamental factors in determining the amounts of runoff produced in a particular area. As both the volume and velocity of runoff increase, the capacity of runoff to detach and transport soil particles also increases. Where storms are frequent, intense, or of long duration, erosion risks are high. Seasonal changes in temperature, as well as variations in rainfall, help to define the high erosion risk period of the year. When precipitation falls as snow, no erosion will take place. However, when the temperature rises, melting snow adds to runoff, and erosion hazards are high. Because the ground is still partially frozen, its absorptive capacity is reduced. Frozen soils are relatively erosion resistant. However, soils with high moisture content are subject to uplift by freezing action and are usually very easily eroded upon thawing. Although both water and wind erosion should be anticipated throughout the year, the likelihood of water erosion increases during the wet weather season (October 1st – April 30th) and wind erosion is more prevalent during the dry weather season.

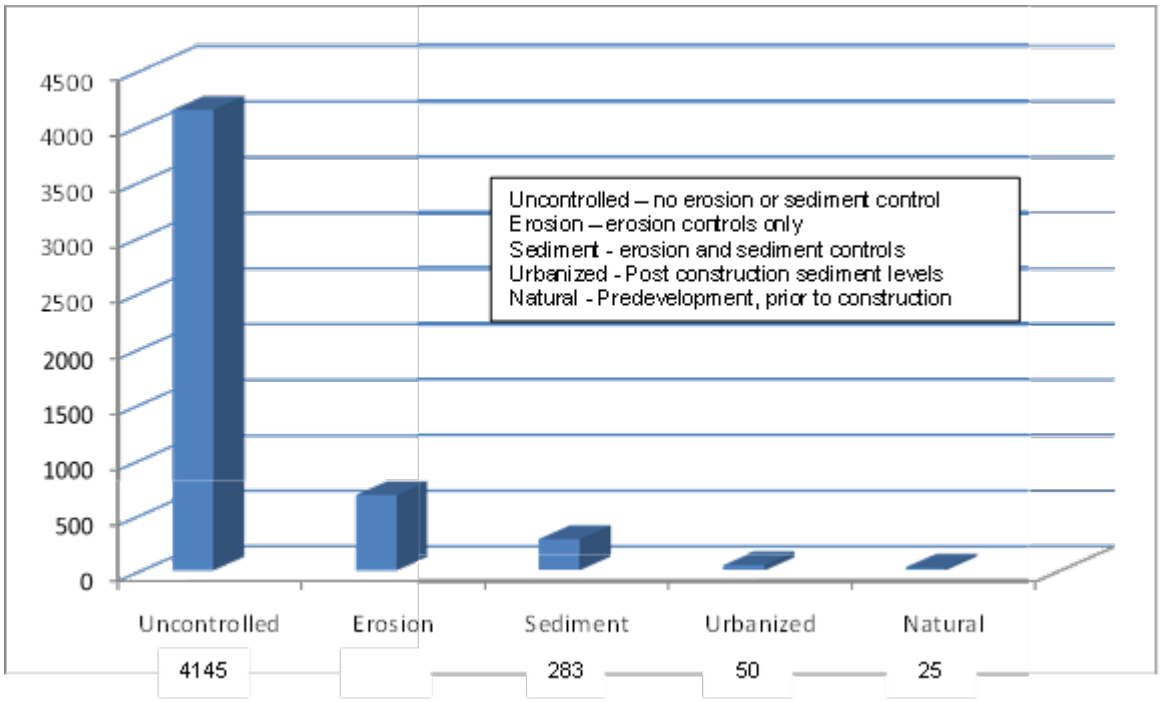
1.9 Impacts of Erosion and Sedimentation

Sediment, resulting from disturbed soils, can move onto neighboring properties and streets or into drainage systems and other bodies of water. Excessive sediment has significant negative impacts on how the natural watershed runoff and soil conveyance system works. Under natural conditions, runoff moves through a watershed as groundwater through infiltration or as surface water by spreading across floodplains and migrating downstream through stable stream and waterway channels. In a natural watershed system, sediment, cobbles, and gravel travel throughout the stream network creating deposition, scour and gravel areas that are important for fish habitat. The natural system survives by its ability to contain flows and balance sediment loads within the stream network.

Responsible development requires that steps be taken to control erosion and sedimentation from construction sites. Figure 2 demonstrates the ability of good erosion and sediment controls, versus no controls, in minimizing the detrimental effects of sedimentation.

This chart also demonstrates the fact that once a naturally vegetated area has been developed, sediment levels can be twice the pre-development rate. It is well known that the erosion and sediment threat is greatest during construction. Once development is complete (stabilization techniques implemented), there is a dramatic decrease in the pollutant level yield.

Figure 2: Storm Median Sediment Concentration (mg/l)



Source: Performance of Current Sediment Control Measures at Maryland Construction Sites, Metropolitan Washington Council of Governments

Erosion and sedimentation, especially from construction sites, cause both environmental and economic impacts. Both are important but it is often only an economic impact that spurs a jurisdiction to act. Environmental impacts are harder to see and quantify as they tend to build slowly and do not produce dramatic results for many years when it may be too late to correct the problem. Erosion and sedimentation can cause expensive site damage and construction delays. Lack of maintenance often results in failure of control practices and costly cleanup and repairs.

Many environmental impacts from sediment pollution are cumulative and the ultimate results and costs may not be evident until years later. Some environmental impacts include:

- Eroded soil contains nitrogen, phosphorus, and other nutrients. When carried into water bodies, these nutrients trigger algal blooms that reduce water clarity, deplete oxygen, lead to fish kills, and create odors.
- Erosion of streambanks and adjacent areas destroys streamside vegetation that provides aquatic and wildlife habitats.
- Excessive deposition of sediments in streams smothers the bottom fauna, seals stream beds, and destroys fish spawning habitat.
- Turbidity from sediment reduces in-stream photosynthesis, which leads to reduced food supply and habitat.

- Turbidity increases the amount of sunlight absorbed in water, raising stream temperatures.
- Suspended sediment abrades and coats aquatic organisms.
- Erosion removes the smaller and less dense constituents of topsoil - those clays, fine silt particles and organic materials that hold nutrients that plants require for healthy establishment. The remaining subsoil is often hard, rocky, infertile, and fails to hold moisture; thus, making reestablishment of vegetation difficult.

Many economic impacts are hard to quantify. How can a dollar value be assigned to loss of aquatic habitat or diminished water clarity? Other impacts may be readily quantified, for example the cost of dredging and disposing of the accumulated sediment in a silted-up reservoir. Some potential economic impacts include:

- Excessive sediment accumulation reduces reservoir storage capacity and more frequent sediment removal is required.
- Sediment deposited into streams reduces flow capacity, interferes with navigation, and increases the risks of flooding.
- Local governments and their taxpayers must pay for removing sediment from streets, sewers, ditches, sumps and culverts, and for dredging sediment from harbors and navigation channels.
- Excess sediment creates cloudy or turbid water conditions, interfering with recreational uses.
- Erosion severely diminishes the ability of the soil to support plant growth. To restore this ability is costly.
- Loss of wildlife habitat due to erosion and sedimentation could lead to additional species being classified as endangered. Additional endangered species listings increase time and fees for permitting, design, and construction in the affected watersheds. Some costs are directly assessed to specific projects while many other costs are distributed statewide by spending additional monies for habitat restoration.
- Litigation is an expensive alternative.

Many of these costs could be largely avoided through implementation of adequate erosion prevention and sediment control practices.

2 PERMITTING PROCESS

Regardless of whether a permit is required, all land disturbing activities must be performed in a manner to prevent or minimize, to the greatest extent practical, soil erosion and the deposition or introduction of sediments upon or into rights-of-way, wetlands, drainage ways, the municipal stormwater system, receiving waters, and/or areas that include or contribute directly to the waters of the state.

2.1 Millersburg Municipal Code, Title 12

Title 12, "Surface Water," of the MMC has been adopted to provide for the health, safety, and general welfare of the citizens of the City and to protect and enhance the water quality and natural functions of watercourses and water bodies through the regulation of stormwater discharges; to set forth uniform requirements for direct and indirect contributors to the MS4; and to enable the City to comply with applicable state and federal laws.

Chapter 12.40 of Title 12 sets forth the requirements of the City's Erosion Prevention and Sediment Control Program. Included in that Chapter is a provision for the development, implementation, and maintenance of this Manual. If any provision of this Manual conflicts with any section of the MMC, the provisions of the MMC shall govern.

2.2 Permit Required

The City requires a Grading Permit on all sites that disturb 50 cubic yards or more of soil as defined in Title 12, Section 35 of the MMC. A Grading Permit is often issued in conjunction with a Right-of-Way Permit, especially in the construction of a single-family residence with sidewalk, in what is considered a Combined Construction Permit.

Larger, more complex construction sites such as subdivisions, commercial, and street projects may also be subject to the Private Construction of Public Infrastructure (PCPI) Permit identified in Title 15 of the MMC. These projects build infrastructure, streets and utilities that will eventually be dedicated to the City and require City oversight to ensure engineering standards are followed and infrastructure is constructed using high quality materials.

Separate from Grading, Right-of-Way, Combined Construction, or PCPI Permits, the City requires an EPSC Permit for any construction activities disturbing an area of 10,000 square feet or greater, cumulatively. The owner of the property on which the activity is proposed must apply for the EPSC Permit. As part of the application, the owner must sign a statement of financial responsibility for damages resulting from noncompliance with EPSC requirements. EPSC Permits are valid for one year and must be renewed annually.

Approval of an EPSC Plan and Permit issuance by the City does not relieve the applicant of his or her responsibility to ensure erosion prevention and sediment control measures are implemented and maintained effectively.

2.2.1 Permit Exemptions

Some land disturbing activities that affect an area greater than 10,000 square feet do not require an EPSC Permit. These include:

- Replacement or re-establishment of an existing lawn on a single lot, not exceeding 10,000 square feet.
- Agricultural activities. This is defined as "private or commercial activities directly engaged in the production of nursery stock, sod, fruits, vegetables, forages, cover crops, field crops

(grain, corn, oats, beans, etc.) timber, and livestock, or other related activities determined by the City Engineer to conform to this definition; but shall not include construction or other activities for structures associated with agricultural activities." This definition includes home gardening.

2.3 EPSC Permit Process

The EPSC Permit Application Form can be found at https://www.millersburgoregon.gov/sites/default/files/fileattachments/building/page/7921/f-p-09a_erosion_prevention-sediment_control_permit_form_fillable.pdf. Upon receipt of an application for an EPSC Permit accompanied by the fee, if applicable, the City Engineer, or his/her designee, will review the submitted application.

An EPSC Plan is required for all land-disturbing activities affecting an area of 10,000 square feet or greater, cumulatively. All projects that disturb one acre or more must obtain a NPDES 1200-C Permit issued by DEQ and provide a copy of that Permit to the City Engineer.

Land disturbing activities may not commence until an EPSC Permit has been issued.

2.4 Work Progress Inspections

During all periods of land-disturbing activities, a representative of the developer or general contractor knowledgeable with the approved EPSC Plan shall routinely inspect the construction site to determine if the EPSC Plan is being implemented, additional control measures are needed, existing control measures should be maintained or replaced, or appropriate waste management practices are being followed. See Section 5 for more information on the Erosion and Pollution Control Manager (EPCM) and frequency of inspections. Documentation of these inspections and information as to site control measures that have been addressed should be maintained with the EPSC Plan. The EPSC Plan should be updated as control measures are implemented.

A municipal EPSC inspector may visit the work site to monitor the effectiveness of the EPSC Plan. The EPSC measures shown on the approved plan are minimum requirements for anticipated site conditions. During construction, it may be necessary for the EPSC Plan to be changed or augmented for changing conditions, and to ensure that sediment and sediment-laden water does not leave the site. The inspector will assess the effectiveness of BMPs, ensure they are being properly maintained, and make recommendations for changes or additions as necessary. The inspector will leave a written notice on-site or otherwise contact the responsible person with any required corrections and a re-inspection date. Site inspections may occur on any frequency as determined by the inspector.

2.5 Permit Duration

An EPSC Permit is valid for a period of one year, or until land disturbing activities are completed, and surface conditions stabilized with permanent measures to prevent future erosion. If land disturbing activities continue beyond the permit's expiration date, or if the land has not been permanently stabilized, the permit holder must make a written request for an extension.

Extensions, if approved, shall be for twelve months and may be subject to administrative fees.

2.6 Permit Close

After the completion of all land disturbing activities and subsequent revegetation, the owner will make a request to the City to perform a final inspection. Upon verification by the inspector that permanent site stabilization measures have been installed and are functioning effectively and all temporary control measures or BMPs have been removed, the EPSC Permit will be closed. No "in lieu of" work may be substituted for permanent stabilization within any public right-of-way.

2.7 EPSC Permit Requirements

Submittal requirements for an EPSC Permit for various types of construction projects are presented below. This information will provide the necessary tools to facilitate City approval and reduce overall environmental risks.

2.8 EPSC Plans Required for Minor and Major Land Disturbing Activities

The City of Millersburg issues EPSC permits for two types of projects: one for minor land disturbing activities and one for major land disturbing activities. Each activity is described in the following sections.

Applicants for an EPSC Permit shall submit an EPSC Plan as a part of their permit application.

For minor land disturbances as defined in Section 2.8.1, the permit application is the EPSC Plan, whereas the developer agrees to implement the listed basic erosion and sediment control practices common to less complicated projects. For more specific information about onsite controls, BMP details are in **EPSC Appendix C-1** and an EPSC Plan Template for a single-family residence is in **EPSC Appendix C-2**.

For major land disturbing activities as defined in Section 2.8.2, a professional EPSC Plan design must be submitted by a person licensed in Oregon as a civil engineer, environmental engineer, landscape architect, geologist, or a certified professional in erosion and sediment control (CPESC). EPSC Plan procedures for planning and design are described in Section 3 of this Manual. Approval of an EPSC Plan by the City does not relieve the applicant of his or her responsibility to ensure the approved EPSC BMPs are constructed and maintained to prevent erosion and contain sediment and pollutants on the construction site. Additional EPSC BMPs beyond those depicted on an approved EPSC plan may be required based on specific site conditions.

Erosion prevention and sediment control BMPs are required during all land disturbing activity until permanent site ground covers are in place. Certain base measures are required for construction sites at all times of the year. Additional cover or BMPs are required during the wet weather season, as indicated in Section 2.9.

2.8.1 Submittal Requirements for Minor Land Disturbing Activities

An EPSC Permit is required for all land-disturbing activities affecting an area of 10,000 square feet or greater, cumulatively. This section provides the submittal requirements to obtain an EPSC Permit for minor land disturbances. Sites meeting the following conditions can be characterized as minor land disturbances:

1. Individual single-family home or duplex construction on existing lots of record, or manufactured home placement on individual lots or in manufactured home parks, and,
2. Land disturbing activities that cumulatively affect less than one acre throughout the duration of the project and meet the following conditions:
   a. Average slopes throughout the disturbed area do not exceed 10 percent, and
   b. Slopes within the disturbed area do not exceed six feet in height at slopes greater than 3:1 (horizontal : vertical), and
   c. Concentrated runoff conveyed through the site does not originate from more than one acre off-site (outside of disturbed area), and
   d. There are no sensitive areas (wetlands, streams, etc.) located on, or adjacent to, the site work.

Table 2 designates the minimum BMPs for minor land disturbances. Each BMP presented in the table is also described in further detail with design, construction, and maintenance criteria in **EPSC Appendix C-1**. Due to site conditions or preferences, the applicant may desire to use different BMPS than those recommended in Table 2. In such cases, the applicant must submit calculations or other supporting information used to determine the sizing and layout of the desired BMP.

Each application for an EPSC Permit for minor land disturbances shall include a completed EPSC Permit Application Form. An EPSC example plan for minor construction activities can be found in **EPSC Appendix C-2**.

If the facilities and techniques listed in the Application Form are not effective or sufficient, the applicant shall:

- Take immediate action to stop eroded material and/or sediment from leaving the site, and
- Immediately implement additional facilities and techniques as approved by the City Engineer or their designee.

2.8.2 Submittal Requirements for Major Land Disturbing Activities

An EPSC Permit is required for all land-disturbing activities affecting an area of 10,000 square feet or greater, cumulatively. Major land-disturbing activities include those sites that:

- Affect one acre or more in size, or
- Contain average slopes throughout the disturbed area that exceed 10 percent, or
- Contain slopes greater than 3:1 which exceed six feet in height, or

- Have concentrated runoff through the disturbed area that comes from over one acre off-site, or
- Contain sensitive areas

Tables 3 and 4 designate the minimum BMPs for major land disturbances. Each BMP presented in the tables is also described in further detail with design, construction, and maintenance criteria in **EPSC Appendix C-1**.

The applicant shall submit the following information with construction plans for approval:

1. Completed Erosion Prevention and Sediment Control Permit Application Form.
2. A copy of any applicable NPDES 1200-C permit issued by the DEQ. If the site is subject to the requirements of an NPDES 1200-C permit, but it has not been issued, the City will not issue an EPSC Permit.
3. Construction schedule with the following information:
   a. Construction start and completion dates
   b. Dates when erosion control measures will be in place
   c. Timing of site clearing and grading, placement of fills, and excavations
   d. Projected date of removal of erosion control measures (after landscaping is established or after establishment of approved vegetation)
4. Submit with the construction plans three sets of the EPSC Plan, drawn to scale, showing the following (See Chapter 3 for EPSC Plan development processes):
   a. Vicinity map, property address, and property owner's name and address
   b. Locations, types, and applicable dimensions of erosion control measures
   c. Applicable details of erosion control measures showing full dimensions and construction information
   d. Existing and proposed ground contours, including a minimum of the first 50 feet of abutting property
   e. Arrows to indicate existing and final flow patterns of surface water on the property. **Note: it is a violation of Oregon Drainage Law to alter the flow of surface water to harm neighboring properties**.
   f. Locations and sizes of existing and proposed channels and drainage pipes (labeled as such and with arrows indicating flow direction) on and for 100 feet upstream and downstream of the site
   g. Location of the 100-year flood plain, if applicable
   h. Site entrances/exits (as approved by the City)
   i. Applicable standard erosion control notes, as provided in **EPSC Appendix C-3**, with additions or changes as required
   j. Other notes including references to timing of placement and removal of erosion control measures, and erosion measure specifications such that types and quantities of materials necessary for the installation of the erosion control measures are fully detailed
   k. Stamped or signed by a certified professional licensed in Oregon as a civil or environmental engineer, landscape architect, geologist, or CPESC

An EPSC example plan for major construction activities can be found in **EPSC Appendix C-2**.

If the site EPSC Plan includes sediment traps or ponds, the applicant shall also submit calculations used for determining trap or pond sizing and pipe orifice sizing.

Due to site conditions or preferences, the applicant may desire in certain cases to use different erosion prevention and sediment control measures than those recommended in Tables 3 or 4. In such cases, the applicant must submit calculations or other supporting information used to determine the sizing and layout of the measures shown on the submitted EPSC Plan.

Cumulative land disturbing activity of one acre or more, or less than one acre but is part of a common plan of development or sale that will ultimately disturb one or more acres of land, requires a NPDES 1200-C Construction Stormwater Discharge Permit, which is a general permit issued by DEQ. As indicated above, a copy of the issued NPDES 1200-C permit is required to be submitted to the City for an EPSC Permit to be approved.

If the facilities and techniques approved in an EPSC Plan are not effective or sufficient, the applicant shall:

- Take immediate action to stop eroded materials and/or sediment from leaving the site.
- Immediately implement additional facilities and techniques as approved by the City Engineer, or their designee.
- Prepare and submit a revision to the EPSC Plan for City approval.

2.9 Wet Weather Permit Conditions

Wet weather erosion prevention measures will be in effect from October 1st through April 30th.

Rain is the driving factor behind most erosion in this region. Rainfall impact and surface water runoff over exposed soil dislodges sediment particles, suspending them in moving water. Saturated soils are more easily tracked off site by equipment. During the wet weather season, additional erosion prevention and sediment control measures are required. These include but are not limited to:

Emphasize prevention.

- Seed exposed soils by September 1st to allow time for proper germination and growth.
- Maintain clean rock in construction entrances to minimize off-site tracking and expensive cleanup.
- Sweep and remove any off-site tracking immediately. *Street flushing is prohibited*.

Cover all exposed soil.

- Stabilize all exposed soil by seeding or covering with plastic sheeting or a two-inch

layer of mulch, bark, wood chips, sawdust, or straw to minimize erosion potential.
- For slopes greater than 3:1 (33 percent), stabilize exposed soil with erosion blankets or matting.
- Use diversion dikes and swales to divert runoff away from exposed soil.

2.10 Owner is Permit Holder

An EPSC Permit must be obtained by the owner of the property. The owner of the property, as permit holder, shall assume responsibility for site conditions, maintenance of the EPSC Plan, and maintenance of BMPs throughout the duration of land disturbing activities, and until such time as the site has been adequately stabilized and the permit has been closed or transferred. Permits may not be transferred to any person or entity except upon transfer of title for the property. Should the property be owned by a corporation, the owner is considered the president, Chief Executive Officer, or their designee.

When ownership of a property with an active EPSC Permit is transferred, the person transferring title for the property is obligated by MMC Section 12.40.033, to inform the person or entity assuming ownership of their obligation to transfer the EPSC Permit, or to obtain a new permit.

The most recent EPSC Permit for a property will supersede all other EPSC Permits that apply to that property. For example, this provision allows for an EPSC Permit to be issued for the development of a subdivision. Subsequently, individuals or entities may obtain a permit for a lot within that subdivision while the subdivision's original EPSC permit is still active. The subsequent permit for the individual lot will then nullify the obligations of the subdivision's developer for that affected lot.

2.11 Enforcement

To enforce the requirements of the City's EPSC program, the City Engineer, or their designee, will implement the procedures outlined in Section 6 using all available enforcement measures, as necessary. Compliance with the EPSC Permit is not optional and must be taken seriously by all permitted parties.

3 EPSC PLANNING AND DESIGN

The purpose of erosion prevention and sediment control planning is to clearly establish the control measures which are intended to prevent erosion and off-site sedimentation during construction. The EPSC Plan should describe the site development and serve as a blueprint for the location, installation, and maintenance of BMPs to control erosion and prevent sediment from leaving the site during construction. It should also be understood that plans are only a blueprint and will require modification throughout the life of the project.

3.1 Erosion Prevention Versus Sediment Control

The driving consideration in creating and implementing an effective EPSC Plan is to provide erosion prevention measures rather than sediment control. Although every EPSC Plan will have elements of both, it is often far more cost effective and practical to emphasize erosion prevention.

Erosion prevention measures are designed to prevent exposed soil particles from becoming dislodged by rain or wind. Such measures include temporary ground covers (mulch, temporary grasses, straw mulch, and tackifier, etc.), matting, plastic sheeting, and numerous other products designed to provide mechanical or physical protection to exposed soil.

Sediment control involves techniques to re-capture transported sediment from runoff. Sediment control measures include sediment traps and basins, sediment fences, check dams, sediment barriers, and / or catch basin filters, and these measures are designed to slow down runoff to settle out sediment.

The benefit of erosion prevention is that it seeks to prevent the problem before it starts. It is often impractical to recover large amounts of sediment after it becomes dislodged and suspended in runoff. On projects where the predominant soil particle size is very small (fine silts and clays, typical of the City), the amount of time required to allow for settling of solids can reach days or even weeks. It is also generally true that erosion prevention measures are more reliable, whereas sediment control measures require continual and costly maintenance.

Because successful erosion prevention requires minimizing disturbed areas, the EPSC Plan should emphasize scheduling and phasing. Project scheduling and phasing is often driven by factors other than erosion control, however, so contingency planning is essential. Most importantly, the EPSC Plan should be designed and implemented as a living, dynamic plan that can be adapted to address changes in the project as work progresses.

3.2 Five Basic Rules

Erosion control measures are required for construction areas where the ground surface will be disturbed by clearing, grading, fills, excavations, and other construction activities. When developing an effective EPSC Plan, there are several important concepts to consider:

- Timing – schedule work to minimize overall impacts
- Stage work – identify and process critical areas first
- Minimize disturbance – create buffers and reduce mass grading
- Pre-construction – during preliminary design and prior to on-site grading activities
- Pictures/Video – documentation throughout the life of the project

The long-term benefits of an effective EPSC Plan are enormous. An important concept to keep in mind when developing EPSC Plans is that practices which minimize the amount of disturbed land area and avoid or minimize work on steep slopes have the greatest potential to reduce erosion. There is less chance of soil washing off the site that could clog streets, drainage systems, and enter adjacent properties or waterways. Further, the number and size of sediment control

measures required will be minimized, the cost of maintaining sediment control facilities is minimized, and topsoil retention on the site is maximized, making revegetation, and landscaping easier to establish.

It is equally important to note that approval of an EPSC Plan by the City does not relieve the applicant's responsibility to ensure erosion prevention and sediment control BMPs are constructed and maintained to prevent sediment from leaving construction site. These requirements are upheld throughout the life of the construction project.

3.3 Designer Responsibilities

A designer generally puts the EPSC Plan together based on information provided from resources obtained from local and regional agencies and a detailed field site visit. In addition, the designer must identify potential erosion and sediment problems, develop design objectives, formulate and evaluate alternatives, select best erosion prevention measures, and develop a plan. A determination is made about what BMPs are appropriate. A variety of BMPs should be included on the plan to provide adequate tools in the field. By following the step-by-step process listed below, designers can improve overall success.

The designated person, whether contractor or EPCM, and ultimately the owner, has a defined responsibility to prevent pollution from leaving the site. They must follow an approved plan, or obtain approval for a revised plan, and ensure the site is stable. Even though the EPSC Plan may be followed in detail and appear to have addressed all issues, there will inevitably be obstacles along the way that will change those plans. Therefore, the best scenario includes a good plan, open lines of communication, and defined responsibilities.

- **Soil Survey Information**

  Knowing the type of soil found on the project site will help the designer decide upon the degree of erosion protection required. Of prime importance are the predictions of soil behavior for selected land uses. As explained in Section 1, the potential for erosion is highly dependent on the type of soil. This will ensure the EPSC Plan is adequate to control soil movement without being overly conservative. The Natural Resource Conservation Service (NRCS) Soil Survey, a mapped inventory with physical properties and characteristics described for each soil type for Linn and Benton Counties, is available at http://www.or.nrcs.usda.gov/pnw_soil/or_data.html.

- **Climate and Precipitation Data**

  The occurrence and intensity of rainfall is important for the designer when placing and sizing erosion control measures. Additionally, all erosion control measures at major land disturbing projects require inspection after any rain event in excess of 0.5 inches in 24 hours. Rain gauges should be used to assist in determining on-site rainfall.

  Oregon's wet weather season extends from October 1st to April 30th. Additional erosion prevention and sediment control measures are required for construction occurring during the wet weather season.

- **Topography**

  The designer should determine the drainage patterns noted by the topography and on-site visit. Does runoff flow from offsite through the construction site? If so, measures should be taken to re-route this water around areas that will have ground disturbance.

  Will areas of ground disturbance occur on long slopes that are greater than two percent grade? If so, the lengths of the uninterrupted flows should be broken up so the rainfall runoff will only flow short distances, thereby decreasing flow velocity and the erosive force. In flat areas, runoff is slow, and soil particles are not moved far from the point of raindrop impact. If the slopes are steep and short, surface cover may be needed to decrease runoff and promote rainfall infiltration into the soil. On steep slopes, soil movement increases dramatically. Constructing very long slopes and especially long, steep slopes should be avoided. Those that already exist should not be disturbed.

- **Sensitive Areas and Waters of the State**

  Sensitive areas include steep slopes (those greater than 10 percent), wetlands, and areas that include or contribute directly to waters of the state. Waters of the state includes "lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Pacific Ocean within the territorial limits of the State of Oregon and all other bodies of surface or underground waters, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface or underground waters), which are wholly or partially within or bordering the state or within its jurisdiction."[1]

  Depending on several factors, an undisturbed corridor buffer of varying width is required adjacent to sensitive areas. The responsible party shall be aware of, and adhere to, any limitations in the work area in the proximity of sensitive areas imposed by permits issued by the Division of State Lands (DSL), the U.S. Army Corps of Engineers (USACE), and the Federal Emergency Management Agency (FEMA). This includes work pertaining to, but not limited to:

  - Work in or over navigable waters of the United States, or which affects the course, location, condition, or capacity of such waters,
  - Removal of material from, or placement of fill material into, the waters of the state, including wetlands, and
  - Work within floodways, as mapped by FEMA.

[1] Construction Stormwater Discharge Permit 1200-C, General Permit, National Pollutant Discharge Elimination System, State of Oregon Department of Environmental Quality, Definitions pg 43, December 15, 2020.

3.4 Project Scheduling

Following a specified work schedule that coordinates the timing and land disturbing activities and the installation of control measures is perhaps the most cost-effective way of controlling erosion during construction. The removal of ground cover leaves a site vulnerable to accelerated erosion. Construction procedures that limit land clearing, provide the timely installation of erosion prevention and sedimentation controls, and restore protective cover quickly can significantly reduce the erosion potential of a site.

Construction projects should be sequenced to reduce the amount and duration of soil exposure to erosion by wind, rain, runoff, and vehicle tracking. A construction schedule is an orderly listing of all major land disturbing activities together with the necessary erosion prevention and sediment control measures planned for a project. This type of schedule guides the contractor on work sequencing so serious erosion and sedimentation problems can be avoided.

The EPSC Plan should indicate, for all the scheduled work, how the proposed erosion prevention and sediment control measures will divert flows, limit runoff from exposed areas, stabilize exposed soil, and filter sediment. The following activities should be included in the schedule, if applicable:

- Clearing and grubbing for perimeter controls
- Installation of perimeter controls
- Construction phasing
- Clearing and grubbing, grading, and trenching for activities other than perimeter control
- Grading (including off-site activities) related to the project
- Final grading, landscaping, and stabilization
- Work on or at bridges and other watercourse structures
- Utility installation and removal
- Work required in any wetland
- Monitoring of rainfall
- Inspection of controls
- Installation and maintenance of permanent controls
- Installation, maintenance, and removal of temporary controls
- Disposal of waste materials generated on-site

Note that the construction activities listed above do not usually occur in a specified linear sequence, and schedules will vary due to weather and other unpredictable factors. Schedules for temporary and permanent erosion control work required in any wetlands, as are applicable for clearing and grubbing, grading, trenching, bridges, and other structures at water courses, construction, and paving should be submitted for review by the City. Plans for erosion control on haul roads and borrow pits and plans for disposal of waste materials should also be submitted. The contractor may submit the EPSC Plan from the project plans if it is correct for the proposed stage of construction, or prepare a modified version, proposing methods, materials, and procedures to be used for the weather and site conditions at the time of construction, if applicable.

3.5 Developing an Erosion Prevention and Sediment Control Plan

An EPSC Plan must be developed and submitted to the City with a completed EPSC Application Form for all major land disturbing activities. See Section 2 for definitions of major land disturbing activities.

Section 4 describes the BMPs for erosion prevention, runoff control, sediment control and pollution control practices and where they are best used. **EPSC Appendix C-1** contains BMP detail drawings and information such as advantages/disadvantages, and design, inspection, and maintenance requirements for each BMP. These resources should help the designer choose the most appropriate measure or control. To maximize the overall benefits of any BMP selection and location, planners and designers must have a thorough understanding of the site characteristics. In addition, preconstruction meetings provide a means of opening lines of communication between all individuals affected by the construction, either directly or indirectly.

The following steps are recommended in the development and implementation of an acceptable EPSC Plan. This information will provide the necessary tools to gain the City's approval and reduce overall environmental risks. After the project site has been assessed, the catch points for cuts and fills, drainage areas and drainage patterns, sensitive areas, size and location of drainage structures, and disturbances should be located on an area base map. Approximate final grades and any known problems such as highly erodible soils or unstable slopes should also be noted. An example of an EPSC Plan may be referenced in **EPSC Appendix C-2**, with required Plan Notes and Symbols in **EPSC Appendix C-3**.

Step 1: Identify Potential Issues

- Federal and State Environmental Regulations
- Public Agencies
- Environmental interest groups
- Public opinion

Step 2: Goals and Objectives

- Meet all regulations
- Enhance the environment
- Higher emphasis on stabilizing steep slopes (2:1 or greater)
- Reduce short- and long-term erosion
- Reduce or eliminate irrigation costs
- Maximize use of on-site materials (cost-effective solutions)
- Reduce overall maintenance
- Decrease liability
- Improve aesthetics
- Minimize negative public opinion

Step 3: Erosion Study

Identify sediment sources

- Review relative sediment sources
    - Maps and aerial photos

  - Distinctive minerals
  - Alluvial
- Review regional factors
  - Temperature
  - Precipitation
  - Wind
  - Freeze/thaw
  - Snow melt
- Review watershed
  - Watershed size
  - Topography
  - Channel density
  - Soil types
  - Ground cover
  - Land use

Step 4: Selection of Erosion and Sediment Control Materials

- Effectiveness
- Environmental impacts
- Regulatory acceptability
- Material Cost
- Long-term cost (maintenance)
- Public acceptability
- Risk/liability
- Aesthetics

Step 5: Developing the EPSC Plan

The following sources can provide substantive information to assist in the development of an EPSC Pan:

- City of Millersburg
  - Regulations and ordinances
  - Prior land use
  - Adjacent and downstream uses
- NRCS/District Conservationist
  - Soils
  - Climate
  - Vegetation/habitat
  - Water management
  - Recreational potential
  - Aerial surveys
- U.S. Geological Survey
  - Topographical maps
  - Major drainage ways
- State Environmental Agencies
  - Stream surveys
  - Wildlife habitat
  - Environmental Site Assessment (ESA)
  - Wetlands

  - Sensitive areas
- Local Flood Control
  - Rainfall data
  - Storm records
  - Flood plains

Step 6: Developing the EPSC Plan Data Collection

- Photo/video documentation
- Field survey and evaluation (existing)
  - Topography and contours
  - Existing drainage upstream and downstream
  - Identify sensitive areas
  - Soil samples
  - Soil survey (NRCS)
- Field survey and evaluation (future)
  - Topography and contour design
  - Site drainage system type and location
  - Impervious areas
- Climate and rainfall information
  - Onsite rain gauges
  - Meteorologists
  - Albany Municipal Airport
- Critical habitat
  - Wetlands vegetation profile
  - Mitigation/enhancement

Step 7: Lay out Pre-Construction Plan & Base Measures

- Adapt the EPSC Plan to the resources available
- Fit the development to the existing terrain whenever possible
- EPSC Plan must be flexible
- Maintain communication lines at all times
- All reports and instructions must be clear
- Determine construction timing and sequence
- Establish primary access point (s) for construction traffic
- Lay out limits of clearing and construction activities
- Restrict all activities in sensitive areas (mark accordingly)
- Establish base measures including sediment control at toe of disturbed area & stabilized construction entrances
- Establish maintenance procedures for EPSC Plan BMPs

Step 8: Identify Measures During Construction

- Install additional base measures as site clearing/disturbances occur, including stockpiles and slope contours
- Determine if construction may occur during wet weather season (October 1st – April 30th)
- Establish and schedule wet weather measures including cover measures over

exposed soils
- Continue to establish maintenance procedures for BMPs

Step 9: Post-Construction Measures

- Establish ground cover or permanent landscaping prior to removing base measures

Step 10: Plans and Specifications

- Project description
- Construction notes
- BMPs standard symbols
- Names of existing roads, waterways, and drainage features
- Boundaries of environmentally sensitive areas such as wetlands
- Rights-of-way and easements
- Statement of existing conditions to include highly erodible areas (steep slopes)
- Existing and proposed contour lines
- Run-off calculations
- Calculations of desired performance standards
- Description of sediment control treatment areas
- Detailed grass establishment instructions
- Detail for each BMP used
- Wind erosion control during/following construction

Step 11: Operations and Maintenance

- Guidelines
- Maintenance instructions
    - Provide operating procedures during/after storm events
- Standards of performance
- Periodic inspection reports w/supported pictures
- Vegetation criteria
- Monitoring
    - Establish procedures for monitoring performance
    - Provide adjustment to mitigation measures as needed
- Monitoring and maintenance plan
- Maps
    - Project boundaries
    - Adjacent areas
    - Existing and final topographic features
    - Drainage areas
    - Location of existing problems
    - Location of potential problems
    - Location and extent of BMPs

3.6 Links to Pertinent Information

Oregon Seed Certification Service https://seedcert.oregonstate.edu/
Natural Resource Conservation Service www.or.nrcs.usda.gov
International Erosion Control Association (IECA) www.ieca.org
Pacific Northwest Chapter IECA https://www.ieca.org
West Coast Weather Observations www.wrh.noaa.gov/index.php
Oregon Coast and Pacific Northwest Weather https://graphical.weather.gov
Oregon Division of State Lands (DSL) https://www.oregon.gov
Oregon Department of Fish and Wildlife (DFW) http://www.dfw.state.or.us/
Oregon Department of Environmental Quality (DEQ) http://www.oregon.gov/deq/wq/
Oregon Department of Agriculture (ODA) http://www.oda.state.or.us

4 EROSION PREVENTION, AND RUNOFF, SEDIMENT, AND POLLUTION CONTROL BEST MANAGEMENT PRACTICES

This Section presents erosion prevention, runoff control, sediment control, and pollution control BMPs for construction sites. To maximize the overall benefits of any BMP selection and location, planners and designers must have a thorough understanding of construction site characteristics. Section 3 describes the steps designers should use when developing an EPSC Plan utilizing the BMPs listed in this Section.

Installation details of BMPs, including information such as advantages/disadvantages, and design, inspection, and maintenance requirements, are provided in **EPSC Appendix C-1**. Although installation details for BMPs should be followed, BMP details may vary in the field depending on the site conditions. Field variations for each type of measure are encouraged. The substitution of other cost-effective products or methods that provide substantially equivalent or superior performance is allowed if approved by the City.

As implied by their name, BMPs are stabilization methods that provide erosion prevention, runoff control, sediment control, and pollution prevention measures that represent commonly accepted practices. Table 1 provides ratings for basic applications of commonly used erosion prevention, runoff control, sediment control, and pollution control measures.

Table 1: Matrix of Temporary and Permanent Erosion Control Measures and Estimated Effectiveness

Ratings: E = Excellent, M = Moderate, P = Poor

BMP APPLICATION	TEMPORARY VS PERMANENT	RATING
1. EROSION PREVENTION		
1.1 Preserve Natural Vegetation	**P**	**E**
1.2 Buffer Zone	**P**	**E**
1.3 Seeding (Temporary/Permanent)	**T/P**	**E**
1.4 Ground Cover	**T**	**E**
1.5 Hydraulic Applications	**T/P**	**E**
1.6 Sod	**P**	**M**
1.7 Matting	**T**	**M**
1.8 Plastic Sheeting	**T**	**M**
1.9 Dust Control	**T**	**M**
2. RUNOFF CONTROL		
2.1 Construction Entrance	**T**	**E**
2.2 Tire Wash Facility	**T**	**E**
2.3 Pipe Slope Drain	**T**	**E**
2.4 Outlet Protection	**T**	**E**
2.5 Surface Roughening	**P**	**E**
2.6 Check Dams	**T**	**M**
2.7 Diversion Dike / Swale	**T**	**M**
2.8 Grass-lined Swale	**T**	**M**
3. SEDIMENT CONTROL		
3.1 Sediment Fence	**T**	**M**
3.2 Biofilter Bags	**T**	**M**
3.3 Sandbags	**T**	**M**
3.4 Filter Berm	**T**	**M**
3.5 Wattles	**T**	**M**
3.6 Sidewalk Subgrade Gravel Barrier	**T**	**M**
3.7 Inlet Protection	**T**	**M**
3.8 Dewatering	**T**	**E**
3.9 Sediment Trap	**T**	**E**
3.10 Sediment Basin	**P**	**E**

4. POLLUTION CONTROL		
4.1 Dewatering Operations	**T/P**	**E**
4.2 Paving Operations	**T**	**E**
4.3 Structural Construction and Painting	**T**	**E**
4.4 Material Delivery and Storage	**T/P**	**E**
4.5 Material Use	**T/P**	**M**
4.6 Spill Prevention and Control	**T**	**E**
4.7 Solid Waste Management	**T/P**	**E**
4.8 Hazardous Waste Management	**T**	**E**
4.9 Contaminated Soil Management	**T**	**E**
4.10 Concrete Waste Management	**T**	**E**
4.11 Vehicle and Equipment Cleaning	**T**	**E**
4.12 Vehicle and Equipment Fueling	**T**	**E**
4.13 Vehicle and Equipment Maintenance	**T**	**E**
4.14 Employee and Subcontractor Training	**T**	**E**

4.1 Erosion Prevention

Tables 2 through 4 are matrices presenting recommended minimum erosion prevention measures for various sites and construction types. Additional measures may be required based on specific site conditions. Table 2 is a matrix summarizing recommended erosion prevention for single family residential and duplex construction activities on single lots of record. Table 3 summarizes recommended erosion prevention measures for larger construction sites including commercial, industrial, and subdivision development and construction. Table 4 is a matrix presenting recommended erosion prevention measures for small, linear utilities construction and ditches/swales.

Erosion prevention measures are divided into two categories:

- Base measures which are always required for construction sites while there is disturbed or unstabilized ground surface on the site, and
- Supplementary wet weather measures which are required from October 1st through April 30th in addition to the base measures.

Base measures are indicated on Tables 2 through 4 with an "X" indicating primary recommended base measures and "A" indicating alternate measures. Wet weather measures are indicated on Tables 2 through 4 with an "*" for primary recommended measures and with an "O" for alternate measures. In the event of unusual weather patterns, the use of wet weather measures may be required at other times of the year. This is particularly true for the use of plastic sheet coverings.

Each erosion control measure presented in the matrices is presented in further detail with design, construction, and maintenance criteria in **EPSC Appendix C-1**.

Table 2: Erosion Prevention Matrix
Single-Family, Duplex Residential, Manufactured Homes

	Construction Site		Stockpiles
Base Measures	Slope < 2%	Slope > 2%	
1. Gravel construction entrance (BMP 2.1)	X	X	
2. Sediment barrier at toe of disturbed area or stockpile (BMP 3.1 to 3.5)	X	X	X
3. Sidewalk subgrade gravel barrier (site slopes to street at < 5%) (BMP 3.6)	A	A	
4. Undisturbed buffer at toe of disturbed areas (site slopes < 10%) (BMP 1.2)	A	A	
5. Storm drain inlet protection barrier (BMP 3.7)	X	X	X
Wet Weather Measures			
6. 6-mil plastic sheet cover (BMP 1.8)			*
7. 2"-minimum straw mulch cover (BMP 1.4)			O
Post Construction			
8. Re-establish permanent ground cover or landscape prior to removing erosion measures (BMP 1.3)	X	X	

Key:

X Base measure
A Alternate to Base Measure 2
* Supplemental wet weather measures (October – April) (Seeding prior to September 1)
- Alternate supplemental wet weather measures, can be used as applicable

Table 3: Erosion Prevention Matrix
Commercial, Subdivision and Large Site Construction

	Site Slope							Stock-piles
	< 2%	< 10%	< 15%	< 20%	< 30%	< 50%	50%	
Base Measures								
1. Gravel construction entrance (BMP 2.1)	X	X	X	X	X	X	X	
2. Sediment barrier at toe of disturbed area (BMP 3.1 to 3.5)	X	X	X	X	X	X	X	X

3. Undisturbed buffer at toe of disturbed area (BMP 1.2)	A	A						
4. Sediment fence installed on contours (spacing) (BMP 3.1)		X(300')	X(150')	X(100')	X(50')	X(25')	X(25')	
5. Temporary interceptor dikes/swales around active work areas (BMP 2.7)	#	#	#	#	#	#	#	
6. Storm drain inlet protection barrier(BMP 3.7)	X	X	X	X	X	X	X	X
Wet Weather Measures								
7. Established grass (BMP 1.3)		*	*	*	*	*	*	
8. 2' minimum straw mulch cover (BMP 1.4)		O	O	O	O	O		O
9. Erosion blankets with anchors (BMP 1.7)		O	O	O	O	O	O	
10. 6-mil plastic sheet cover (BMP 1.8)		O	O	O	O	O	O	*
11. Sediment traps or ponds (BMP 3.9 and 3.10)		O	O	O	O	O		
Post Construction								
12. Reestablish permanent ground cover prior to removing erosion measures (BMP 1.3)	X	X	X	X	X	X	X	

Key:

X Base measure
A Alternate to Base Measure 2
Optional base measure, can use as applicable
* Supplemental wet weather measures (October – April) (Seeding prior to September 1)
O Alternate supplemental wet weather measures, can be used as applicable

Note: If different areas of the site have considerably different slopes, the site may be divided and erosion measures selected for each area for the appropriate columns in the matrix.

Table 4: Erosion Prevention Matrix
Utilities Construction and Stockpiles / Ditches / Swales Protection

	Utilities Construction		Stock-piles	Ditches/ Swales
	Catch Basin drainage	Ditch Drainage		
Base Measures				
1. Sediment fence or barrier at toe (BMP 3.1)				X
2. Check dams (BMP 2.6)		X		X
3. Storm drain inlet protection barrier BMP 3.7)	X		X	
Wet Weather Measures				
4. Established grass (BMP 1.3)				*
5. 6-mil plastic sheet cover (BMP 1.8)			*	
6. 2"-min. straw mulch cover (BMP 1.4)			O	O
7. Erosion blanket with anchors (BMP 1.7)				O
Post Construction				
8. Reestablish permanent ground cover or landscape prior to removing erosion measures (BMP 1.3)	X	X		X

Key:

X Base measure
* Supplemental wet weather measure (October – April) (Seeding prior to September 1)
O Alternate wet weather measure to *

4.2 Runoff Control

Runoff occurs when sediment, resulting from the erosion of disturbed soils, moves onto neighboring properties and streets or into drainage systems and other bodies of water. On any construction site, many avenues may exist for sediment to exit the site. Runoff control BMPs are measures that may be implemented to reduce the impact of sediment leaving the construction site by controlling those typical avenues that may be present.

Table 1 lists common types of runoff controls and whether they are Excellent (E), Moderate (M) or Poor (P) measures to incorporate on a construction site. All runoff controls are considered "Temporary" measures, except surface roughening that may stay in place after vegetation is established.

Prior to land clearing, construction entrances should be established, and those entrance/exit points should be the only acceptable location at which vehicles and equipment enter or leave the site. Further, existing swales/drainages should be protected until such time they are disturbed, when protections such as check dams can be implemented to slow down runoff in these concentrated flow areas.

Details for runoff control BMPs can be found in **EPSC Appendix C-1**.

4.3 Sediment Control

Once soil erosion occurs, sediment trapping or removal techniques can reduce the amount of sediment and associated pollutants that leave the site, thus protecting nearby streams, wetlands, and lakes. Sediment controls are usually placed around the perimeter of a disturbed area and where concentrated water leaves the site.

Sediment control BMPs should be in place before land clearing and grading begins. Sediment controls can become sources of sediment and other pollutants during larger storms if they are poorly maintained.

Table 1 lists the types of sediment controls and whether they are Excellent (E), Moderate (M) or Poor (P) measures to incorporate on a construction site. All sediment controls are considered "Temporary" measures, except the sediment basin, which may or may not remain post-construction.

Details for sediment control BMPs can be found in **EPSC Appendix C-1**.

4.4 Pollution Control

Numerous potential pollutants, other than sediment, are associated with construction activities, such as pollutants associated with the use of concrete and other cement-related mortars, and the handling, application, and disposal of construction products and chemicals such as paints, adhesives, and solvents. The improper use and handling of construction materials can result in contaminated wash water, spills, or wastes being left on the ground. These chemicals can infiltrate into soils causing groundwater contamination or runoff to surface waters during subsequent storms.

Although this manual is not intended to address all aspects of construction site pollution control, some issues must be considered in the overall planning process.

At a minimum the contractor should provide pollution controls for:

- Off-site Tracking of Soils
- Material Management

- Waste Management
- Vehicle and Equipment Management

Each construction project is unique and understanding the pollution risks for each construction activity is essential to successfully selecting and implementing pollution control BMPs. Defining these risks requires careful review of the site characteristics and the nature of the construction project. Once these risks are defined, BMP objectives can be developed and pollution control BMPs selected.

In general, the pollution control BMP objectives for construction projects are as follows:

- **Practice Good Housekeeping** – Perform activities in a manner which keeps potential pollutants from either draining or being transported off-site by managing pollutant sources and modifying construction activities.
- **Contain Waste** – Dispose of all construction waste in designated areas and keep stormwater from flowing on or off these areas.

Table 1 lists common types of pollution controls and whether they are Excellent (E), Moderate (M) or Poor (P) measures to incorporate on a construction site. All pollution controls are considered "Temporary" measures, except dewatering operations, material delivery and storage, material use, and solid waste management.

Table 5 presents disposal and management alternatives for typical potential pollutants associated with construction activities.

Details for pollution control BMPs can be found in **EPSC Appendix C-1**.

Table 5: Quick Reference for Pollution Control

Discharge/Activity	Appendix BMP Detail	BMP/Pollution Control
Painting & Paint Removal		
Excess paint	7, 3, 4	*Oil Based* • Recycle/reuse. • Dispose as hazardous waste. *Water Based* • Recycle/reuse. • Dry residue in cans, dispose as trash. If volume is too much to dry, dispose as hazardous waste.
Paint cleanup	3, 8	Wipe paint out of brushes, then: *Oil Based* • Filter and reuse thinners, solvents. • Dispose as hazardous waste.

		Water Based • Rinse to sanitary sewer.
Paint stripping (with solvent)	3	• Dispose as hazardous waste.
Non-hazardous paint scraping/sand blasting	3	• Dry sweep, dispose as trash.
HAZARDOUS paint scraping/sand blasting (e.g. marine paints or paints containing lead or tributyl tin)	3, 8	• Dry sweep, dispose as hazardous waste.
Concrete saw-cut slurry (wet sawing)	10	• Use dry cutting technique and sweep up residue. • Place a berm on down-slope side of project to collect slurry before it flows off site. • Vacuum slurry and dispose off-site. • Shovel out gutters; dispose residue to dirt area, construction yard or landfill. • Block all storm drains or curb inlets
Construction dewatering (nonturbid, uncontaminated groundwater)	1	• Recycle/reuse. • Discharge to storm drain after receiving City approval. • Settle, pump water to sanitary sewer or vegetated area at least 50 yards from surface water. Discharge to sanitary sewer may require a permit from the POTW.
Construction dewatering(other than nonturbid, uncontaminated groundwater)	1	• Recycle/reuse. • Discharge to filtration system. • Treat prior to discharge to storm drain, requires NPDES permit.
Leaks from garbage dumpsters	6	• Collect, contain leaking material. Eliminate leak, keep covered, return to leasing company for immediate repair. • If dumpster is used for liquid waste, use plastic liner.
Leaks from construction debris bins	6, 4	• Ensure bins are used for dry nonhazardous materials only. (Suggestion: fencing, covering helps prevent misuse).
Dumpster cleaning water	6	• Clean at dumpster owner's facility and discharge waste through grease interceptor to sanitary sewer. • Clean on site and discharge through grease interceptor to sanitary sewer.
Cleaning driveways, paved areas	6	• Sweep and dispose as trash (dry cleaning only).

		• For vehicle leaks, follow this 3-step process: - Clean up leaks with rags or absorbents. - Sweep, using granular absorbent material (cat litter). - Mop and dispose of mop water to sanitary sewer.
Paving Operations	2	• Avoid paving during wet weather. • Protect drainage systems by diverting runoff or trap/filter system. • Place drip pans or absorbent materials under paving equipment when not in use.
Steam cleaning of sidewalks, plazas	6	• Collect all water and properly dispose; do not allow runoff to enter storm sewer. • Follow this 3-step process: - Clean oil leaks with rags or absorbents. - Sweep used absorbent. • Use no soap, discharge to storm.
Aggregate wash from driveway/patio construction	6	• Wash onto dirt area, spade in. • Pour driveway approach last. • Collect and remove to appropriate disposal facility. • Settle, pump water to vegetated area at least 150 feet from surface water.
Landscape/Garden Maintenance		
Pesticides	5, 8, 15	• Use all material in container. Rinse containers and apply rinsate. • Dispose rinsed containers as trash. • Dispose unused pesticide as hazardous waste.
Fertilizer applications	5, 8, 15	• Sweep any "over spray" material from streets, sidewalks, and driveways
Yard & garden clippings	7	• Compost. • Take to landfill.
Tree trimming	7	• Chip before composting or recycling.
Vehicle/Equipment Wastes		
Used motor oil & oil filters	14, 6, 4, 8	• Store in secondary containment and recycle.
Antifreeze	14, 6, 4, 8	• Store in secondary containment and recycle.
Other vehicle fluids / solvents	14, 6, 4, 8	• Dispose as hazardous waste.

Automobile batteries	14, 4, 8	• Store in secondary containment. • Send to auto battery recycler. • Take to recycling center.
Vehicle washing	12, 15	• Wash on pervious surface and use cold water only. • Never allow runoff to directly discharge to storm drainage systems.
Mobile vehicle washing	12	• Collect wash water and discharge to sanitary sewer w/ City approval; never allow wash water to discharge to storm drainage systems.
Rinse water from dust removal at new car fleets	12	• If rinsing dust from exterior surfaces for appearance purposes, do not use soap (cold water only).
Vehicle leaks & equipment fueling	6, 13, 14	• Clean up leaks with rags or absorbents. • Sweep, using granular absorbent material (cat litter). Fuel only in designated area and place a spill kit in the fueling area.
Other Wastes		
Roof drains		• If roof is contaminated with industrial waste products, discharge to sanitary sewer with approval from local sanitary authority (may need a discharge permit). • If no contamination is present, discharge to pervious surface.
Cooling water/Air conditioning condensate		• Recycle/reuse. • Discharge permit may be required, contact local sanitary authority.
Pumped groundwater, infiltration/foundation drainage (contaminated)		• Recycle/reuse (landscaping, etc.). • Discharge permit may be required, contact local sanitary authority.
Firefighting flows		• If contamination is present, Fire Department will attempt to prevent flow to stream or storm drainage system.
Clean-up wastewater from sewer back-up		Follow this procedure: - Block storm drain, contain, collect and return spilled material to the sanitary sewer. - Block storm drain; rinse remaining material to collection point and pump to sanitary sewer. (No rinse water may flow to storm drain.)

5 MAINTENANCE AND INSPECTION

Erosion prevention and sediment control measures are required to be installed on all construction sites prior to any land disturbing activities being performed. Such activities have the potential to impact natural systems deemed worthy of protection. An EPSC Plan is required to be submitted for all construction sites within the City limits where land disturbing activity is performed that meets the requirements identified in Section 2. Inspection and maintenance of EPSC measures throughout the life of the project are imperative to ensure their effective performance. Unless the measures are properly installed and maintained, there is a strong chance of failure during the construction period.

5.1 Erosion and Pollution Control Manager

The owner of the site shall designate a competent person, known as the EPCM, possessing knowledge and experience that, to the City's satisfaction, qualify him or her in erosion and sediment control techniques. Especially on all major land disturbing projects, the EPCM should have a thorough knowledge of the content of this Manual. It is also recommended the EPCM attend a class on erosion and sediment control materials and installation practices which are outlined in this Manual. The EPCM shall be responsible for ensuring the implementation of the EPSC Plan for major land disturbance projects and has the authority to immediately mobilize necessary personnel and equipment to correct and modify erosion prevention and sediment controls when required.

Duties of the EPCM may include:

- Manage and ensure proper implementation of the EPSC Plan
- During periods of active construction, maintain the EPSC Plan at the project site, available for review upon request
- Inspect erosion and sediment controls on active construction sites weekly
- Inspect erosion and sediment controls on inactive sites at least biweekly
- Inspect erosion and sediment controls on both active and inactive sites at least daily during rainy periods where a minimum 0.5 inch of rain has fallen in a 24-hour period
- Mobilize crews to make immediate repairs to the controls or install controls during working and non-working hours
- Record measures taken to clean up significant amounts of sediment
- Complete an erosion control monitoring form after each inspection (An example inspection form is provided in **EPSC Appendix C-4**.)
- Maintain up to date EPSC Plan throughout the life of the project
- Ensure contingency BMPs are onsite in preparation for emergencies and the rainy season (Section 5.6)
- Accompany the City on inspections

5.1.1 Ineffective Controls

The EPCM shall record measures to remove significant amounts of sediment from BMPs, streets, gutters, or inlets. Should a control measure not function effectively, one or more of the following tasks should be performed:

- Immediately repair the control
- Replace the control
- Provide additional controls

5.1.2 Modification to EPSC Plan

All major land disturbing projects that disturb one acre or more will have an EPSC Plan. This plan is a guide and ideally should have addressed all erosion problems for the project adequately. When the EPSC Plan is developed, the contractor's staging and operation methods are unknown. Therefore, it is expected changes to the EPSC Plan will be updated throughout the life of the project. As modifications to the EPSC Plan take place, it is extremely important to secure the interest of all parties. It is the owner's or EPCM's responsibility to propose modifications to the EPSC Plan as site conditions change. Communication between the contractor, designated person, and the inspector is vital.

Depending upon the level of modification, the design engineer should be consulted and changes to the EPSC Plan should be submitted to the City. Minor modifications to the EPSC Plan such as installing small sections of sediment control barriers, can be field adjusted and handwritten on the plans.

5.1.3 Construction Schedule Review

The implementation of the construction schedule should include the following:

- Timing of activities to limit seasonal and weather impacts
- Timing of wet season work and temporary work shut down
- Time of activities to meet "in-water" work restrictions
- Erosion prevention and sediment controls shown on the plans should be installed before ground-disturbing activities begin
- Permanent facilities, such as sediment traps and basins, which will be used during construction as temporary measures should be installed
- Retention of temporary perimeter controls until all upstream areas are finally stabilized
- Timing of seeding operations

5.1.4 Monitoring Form

On all major land disturbing development sites, inspections are to be recorded on an inspection form, an example of which is included as **EPSC Appendix C-4**. The effectiveness of each BMP at every location on site should be documented on the form and general observations on site conditions should also be recorded. The information provided on the form is useful for tracking

repairs and demonstrating permit compliance. It is noteworthy that in the event of permit violations or subsequent enforcement actions, the information recorded on the form, along with photographs and videos, may be used to evaluate the responsibility of involved parties.

5.2 Materials

The purpose of this EPSC Manual is to provide options for the cost effective, environmentally sensitive management of erosion and sediment control. This Manual illustrates materials that have been approved based on geographical controls such as climate and soil type. Materials not listed in this manual may be approved based on equal to or greater than criteria. Specific questions regarding approval of alternative materials and procedures can be answered by calling the City of Millersburg, (458) 233-6300.

5.3 Installation

It must be understood that installation is equally important to the value and success of the materials. If installed incorrectly, even the best materials will fail, causing more damage and additional expense to the project. For this reason alone, installation procedures should be followed very closely.

Installation of all base measures should be inspected, and any deficiencies corrected, prior to the start of land disturbing activities. Subsequent inspections of any additional installations should also be made throughout the life of the project.

The inspector, contractor, and EPCM should be familiar with installation details for each BMP used on the project. Details for the installation of all specified BMPs should be provided in the EPSC Plan. Installation details for BMPs are also provided in **EPSC Appendix C-1** of this Manual.

5.4 Inspection Requirements

For major land disturbing projects, the owner or designated person, EPCM, shall be required to provide ongoing inspection of erosion and sediment control measures throughout the life of the project. Inspections shall be recorded on a monitoring form, an example of which is in **EPSC Appendix C-4**.

Minimum inspection requirements shall be as follows.

- Once per week on active sites
- Once every two weeks on inactive sites
- Within 24 hours following a 0.5-inch rain event

All completed and documented inspections should be maintained onsite for review by City inspectors.

5.4.1 Inspection of Work Restriction Areas

All construction projects are required to restrict certain types of work, which may contribute to sediment-laden water leaving the project boundaries or entering waterways. The following work restrictions need to be inspected prior to the start of work and throughout the life of the project.

- Flag Clearing Limits: Construction site clearing limits will be clearly flagged in accordance with the approved plans. No ground disturbance is permitted beyond the flagged boundary. Flagging should be maintained for the duration of construction.
- Perimeter Controls before Grubbing: All appropriate perimeter controls should be installed prior to any major site grubbing operation. Perimeter controls include interceptor ditches, berms, infill areas, and sediment fences along the banks of existing streams and toes of slopes.
- Wet Season Plan and Schedule: Prior to wet season construction work and before temporary work suspension for winter, the contractor or designated person should meet with the City to review and update the EPSC Plan and to develop a schedule to ensure appropriate controls are implemented and maintained during the wet season and work suspended periods.
- Install BMPs Early: Erosion and sediment control features should be incorporated into the projects as early as practical. All erosion and sediment control measures should be installed according to the approved implementation schedule, using the specifications provided in this EPSC Manual.

5.5 Stabilization Requirements

All soils exposed and disturbed by construction-related activities should be stabilized according to the following time frames.

- All seeding applications must be completed prior to September 1st
- Soils exposed during wet weather season because of construction must be covered at the end of each day. Wet weather season – October 1st through April 30th

5.6 Erosion Control Contingency Items

All construction sites must have materials on hand as a contingency in the event of a failure or when required to shore up BMPs installed as part of the EPSC Plan. The contingency items may also be used at the discretion of the project inspector to strengthen the erosion control measures as needed during construction.

As defined in Section 2 of this Manual, minor land disturbing activities are those that disturb less than one acre, whereas major land disturbing activities are those that disturb one acre or more. Table 6 lists the minimum amount of materials that should be kept on the project.

Table 6: Required Contingency Materials

Minor Land Disturbing Activities	Major Land Disturbing Activities
24 feet of sediment fence	100 feet of sediment fence
250 square feet of plastic sheeting	500 square feet of plastic sheeting
100 feet of rope	1,000 feet of rope
10 empty sandbags (filled as needed)	50 empty sandbags (filled as needed)
2 bales of straw for ground cover	10 bales of straw for ground cover
4 bio-filter bags with stakes	10 bio-filter bags with stakes

5.7 Maintenance

Erosion and sediment controls must always be maintained in good working order to function as intended. These controls must be maintained in place until the City issues notification of acceptance of permanent stabilization.

Typical maintenance activities, guidelines, and failure modes for BMPs are discussed in the BMP details found in **EPSC Appendix C-1** of this Manual. The inspector should be familiar with maintenance requirements for each BMP used on the project. Maintenance activities and frequencies vary among the different BMPs and will depend largely on weather and other site conditions. In general, the more effective erosion prevention measures are, the less maintenance will be required for sediment controls.

Sediment shall be removed, and sediment controls upgraded or repaired as outlined in **EPSC Appendix C-1** under BMP maintenance. In the event of continuous rainfall over a 24-hour period, or other circumstances that preclude equipment operation in that area, additional sediment control shall be hand-carried and installed in accordance with best practices and as approved by the City. Sediment shall be removed from controls such as sediment fences, sediment barriers, check dams, inlet protection, and sediment traps when sediment buildup has reached ⅓ the exposed height of the control or storage depth. Rock filters and filter berm material shall be replaced with new rock material when sediment reduces the filtering capacity by 50 percent. Rock or other material specified shall be added or removed as needed to maintain proper function of the entrance areas. All paved areas shall be kept clean (by mechanical means) for the duration of the project.

Removed sediment shall be placed in a non-erodible area within the construction site or removed and disposed of offsite in accordance with all federal, state, and local laws and ordinances. Sediment-laden water shall not be flushed into the stormwater system.

5.8 Municipal Inspector Checklist

The Municipal Inspector Checklist is included in **EPSC Appendix C-4** and will be used by City representatives when inspecting erosion and sediment controls on a project site. The checklist is intended to summarize the key elements of a successful erosion and sediment control program. Onsite pollution control practices will also be inspected to ensure proper waste management techniques are implemented throughout the site.

5.9 Wet Weather and Winterization

The wet weather period is October 1st through April 30th. For major land disturbing projects, the contractor should meet with the City to review and update the EPSC Plan prior to wet weather period work and before temporary work suspension for winter. A schedule will be developed to assure that appropriate controls are implemented and maintained during wet season and work suspension periods. Winter preparations should begin in August.

6 COMPLIANCE ASSISTANCE AND ENFORCEMENT

The owner of the land on which a project is being constructed is the EPSC Permit holder and, as such, is responsible for assuring that the EPSC Plan is being implemented with BMPs installed, operational, and maintained with no pollutants being discharged offsite. The owner may assign implementation of the EPSC Permit to an EPCM as discussed in Section 5.

In most cases, the EPCM is the person who is critical in making sure stormwater quality is protected at all times at the construction site. It is necessary to have proper documentation, complete inspections, timely BMP maintenance, and employee/contractor training relevant to stormwater protection practices for each site. The EPCM is a vital asset in the success and implementation of EPSC Plans and is responsible for:

1. Ensuring compliance with all water quality permits and requirements in effect during the construction work, and
2. Administering and amending the EPSC Plan, making sure that the plan is followed, and that it reflects the current construction site conditions.

The EPCM should consider the following six questions in determining compliance:

1. Does this project have an EPSC Permit, an approved EPSC Plan, and a 1200C Permit issued by DEQ if needed?
2. Are the BMPs installed as shown on the EPSC Plan?
3. Is the EPSC Plan reflective of the BMPs installed in the field?
4. Is erosion being controlled on the site?
5. Are sediment and pollutant sources being contained on the site?

6. Are any adjacent properties or state waters being impacted by activities at the site?

6.1 Documentation

The site must have all the necessary permits secured and approved before any work begins. Effectively managing the required documentation reflects an organized and most likely compliant site. Poor management of required documentation can represent problems with understanding the EPSC requirements and implementing the program.

1. The EPSC Plan is required to be on-site from the date of project initiation to the date of final stabilization unless the City approves another location, requested by the owner. The EPSC Plan must include all site plans indicating BMP locations and installation details. The EPSC Plan must be kept current and amended as necessary to accurately reflect current site conditions.
2. All field inspections must be documented through an inspection report detailing site conditions, status of the required BMPs, and all other maintenance issues at the site that need to be addressed. These reports also must be kept on-site in an organized fashion, along with the approved plans, copy of permits, and contacts for the particular site, unless the City approves another location requested by the Permittee. It is recommended that applicants take care to ensure that all inspection reports meet minimum inspection requirements.
3. The site should be photo documented to the maximum extent practicable. The EPCM should take photos of the site before construction, during clearing, and during construction. Pictures to document the installation (or non-installation) of the required BMPs, the condition of the BMPs, and those BMPs requiring maintenance should also be maintained. It is also useful to photo record the outflow pipes discharging runoff from the site and the conditions of existing creeks that receive runoff from the site. All photos must also be kept in an organized manner.
4. All records detailing meetings, training efforts, and orders/requests for installation and maintenance of BMPs must be kept.
5. Complaints regarding a project must also be documented, including all the actions that the enforcing official has taken in response to the complaint.
6. Phone calls and site conversations/meetings that are part of the compliance process must also be documented.

6.2 BMP Maintenance

The description of potential pollutant sources, and the BMP and pollution prevention control measures identified in the EPSC Plan, shall be revised and modified based on the results of the inspection as soon as practicable or immediately after such inspection. The maintenance and corrective actions are to be recorded and available for review by the City EPSC compliance inspectors. Inspection records, corrective action logs, and EPSC Plan revisions are considered a

first line BMP ensuring that compliance with Permit requirements are being met.

6.3 Compliance Assistance and Enforcement Overview

The City provides compliance assistance and performs investigatory activities, including site inspections. The City may also, depending upon the results of its investigations, initiate enforcement actions. The City's compliance assistance and enforcement actions achieve multiple objectives including:

- Achieving compliance at the outset of a project,
- Documenting instances of noncompliance,
- Ensuring that EPSC Permitted sites return to compliance, and
- Assessing penalties, as appropriate.

Most importantly, the City's compliance assistance and enforcement actions are pursued to reduce the discharge of pollutants from public and private construction sites.

The objectives of the EPSC compliance assistance and enforcement are:

1. To achieve and maintain voluntary compliance at permitted public and private construction sites by the establishment of consistent permitting standards,
2. To achieve voluntary compliance throughout the duration of a construction project,
3. To demand and whenever necessary, compel through the enforcement process, compliance with the terms and conditions of the EPSC Permit and other requirements, and
4. To establish a credible, fair, and equitable compliance assistance and enforcement presence in the mind of the regulated community so that noncompliance is deterred.

6.4 Compliance Assistance

The City is supportive of providing compliance assistance to permitted construction sites. Compliance assistance is a more direct way to ensure compliance with EPSC Permit requirements and requires less resources than enforcement actions. The City conducts compliance assistance through site visits and ongoing communication with site operators.

6.4.1 Inspections

Each inspection conducted by the City is an opportunity for compliance assistance. The owner or EPCM should accompany the City inspector on any and all compliance oversight inspections, taking that occasion to ask questions and confirming that the site and supporting documentation are being managed in a way that meets or exceeds the EPSC Permit requirements. The same is true for any other oversight inspections that may be conducted by DEQ, EPA, or ACOE.

Once notified of an oversight inspection, the owner or EPCM should conduct a site inspection and make any repairs necessary to onsite control measures. The owner or EPCM should ensure all documentation is complete, updated, and available in an orderly fashion. Finally, any necessary training for onsite personnel should be conducted so they understand the components and importance of compliance inspections.

6.4.2 Ongoing Communication

The City is available to meet with the EPSC Permittee onsite, in City Hall, or virtually to discuss any issues that might arise during project construction. Minor changes to the EPSC Plan are encouraged if the revision improves the performance of erosion prevention and sediment control or improves the control of pollutants onsite. However, prior to making any major changes to the EPSC Plan, the EPSC Permittee should contact the City to request approval of these changes. Meeting with the City, having ongoing discussions with inspectors, and maintaining an effective communication channel will significantly improve the ability to streamline the approval process. Further, should DEQ or EPA become involved in a compliance inspection, having ongoing communications with the City will support a team approach to successfully navigating a state or federal inspection.

6.5 Enforcement

In the event of noncompliance with the terms and conditions of an EPSC Permit, and compliance assistance has not been successful, compliance assurance will be taken. Compliance assurance, otherwise known as enforcement, includes clear communication with the permittee, clear direction as to what is required and a compliance schedule for completing the work. Once enforcement is complete, documentation of the site returning to compliance must be recorded by the City.

Enforcement escalation is conducted by using one or more of the following enforcement actions:

1. Verbal Warning
   A verbal warning is considered to be advisory in nature. A file notation shall be made of the warning.

2. Compliance Advisory
   A compliance advisory includes written recommendation(s) and/or requirement(s) to remedy potential noncompliance(s) that are non-egregious in nature but may result in impairment to waters of the state or minor discharges of sediment. Frequent compliance advisories may result in a determination of recalcitrant or chronic violators/violations.

3. Notice of Violation with Corrective Order
   A Notice of Violation (NOV) with a Corrective Order directs field correction of an identified permit violation. The NOV with Corrective Order may be issued for a violation that results in significant potential and/or observed discharges to the

MS4 which are non-egregious to egregious[2] in nature. An NOV with Corrective Order is issued when a permittee is considered to have permit violations that result in overall site conditions that present potential for significant discharge to the MS4 and/or observed discharges to the MS4 that require reasonable remedial action to restore an impaired segment.

4. Notice of Violation with Stop Work Order
An NOV with a Stop Work Order is designed to halt all construction activity on-site except for those activities associated with bringing the project into compliance with the terms and conditions of the permit. The NOV/Stop Work Order may be issued if/when the requirements of an NOV with Corrective Order have not been timely satisfied, site conditions present significant potential for discharge to the MS4, actual discharges to the MS4 are observed, and/or site operators have begun work prior to obtaining an EPSC Permit. Additionally, the City may place holds on approvals of permits and/or other inspections pending receipt of proof that the permitted project has been returned to compliance.

5. Administrative Orders
An Administrative Order may be issued to those permittees who continue to be out of compliance with BMPs on construction sites even after other enforcement escalation attempts have been exhausted. Penalties may be issued to permittees with single or multiple permitted projects under active construction that are alleged to be knowingly or willfully operating in noncompliance with the terms and conditions of their ESCP Permit, or when observed discharges are egregious in nature. The City Engineer may fine the permitted entity an amount of not less than $250 per violation nor more than $2,500 per violation. Each day a violation occurs or continues constitutes a separate violation. Administrative Orders may also include administrative fees, cost recovery and/or criminal penalties.

6.6 Recalcitrant or Chronic Violators/Violations

For EPSC Permit holders that are determined to be recalcitrant or chronic violators, the City may levy additional restrictions due to the permittee's inability to maintain compliance with EPSC Permit requirements. Recalcitrant violators are those who routinely disregard the warnings, advisories, and orders received from the City. Chronic violators are those who are often in noncompliance because they do not understand the EPSC requirements, do not provide sufficient resources to meet the requirements, or are not managing the site adequately. In either case, recalcitrant and chronic violators may also have the following requirements:

- Suspension of access to the municipal stormwater system: The project would have to identify another method to discharge stormwater from their site that does not involve

[2] "Egregious" is defined as a situation resulting in significant potential for impairment to waters of the state and/or have resulted in discharges of sediment to the MS4 as determined by the City Engineer, or designee.

City streets, curb, gutter or MS4.

- Limit Disturbed Areas: The City may limit the amount of area that can be disturbed at any one time so that the smaller areas can be effectively controlled.
- Undertaking Separate Abatement: At the permit holder's expense, cleaning of the street, curb, gutter, MS4, ponds or offsite waterways may be required.
- Revocation of the EPSC Permit: Without the EPSC Permit coverage, the site may not undergo earth disturbing activities and the project is terminated.

Additional Notes:

- No action taken by the City Engineer, or designee, will be contingent on any requirement for any preceding or qualifying action on the part of the City Engineer, or their designee.
- No enforcement action taken by the City Engineer, or their designee, will limit the authority of the City Engineer from taking any other action available.

Appendices

EPSC Appendix C-1:

Erosion Prevention and Runoff, Sediment and Pollution Control Measures

EROSION PREVENTION AND RUNOFF, SEDIMENT AND POLLUTION CONTROL MEASURES BEST MANAGEMENT PRACTICES

Section 4 of the Erosion Prevention and Sediment Control (EPSC) Manual identified the erosion prevention, runoff control, sediment control, and pollution control best management practices (BMPs) to be used in the development of the and implemented on construction sites. This Appendix presents the details for each of the BMPs noted with information such as advantages, disadvantages, design, inspection, and maintenance requirements.

As presented in Table 1 of this Manual, the BMPs details described in this Appendix are divided into four sections:

Each BMP detail is presented on a separate sheet so that the sheets can be easily incorporated into an EPSC Plan for a construction site. Although installation details for BMPs should be followed, BMP details may vary in the field depending on the site conditions. Field variations for each type of measure are encouraged. The substitution of other cost-effective products or methods that provide substantially equivalent or superior performance is allowed if approved by the City.

A.1 Erosion Prevention BMP Details

The designer should keep in mind when laying out an erosion prevention plan that the purpose of the plan is to maximize erosion prevention and minimize sediment transport from disturbed ground surfaces. Erosion prevention is the most effective and inexpensive method for reducing overall environmental impacts associated with construction activities.

Timing, staging, minimizing the amount of exposed soil, and directing surface water runoff away from exposed soil are all excellent ways to minimize erosion during construction. Erosion prevention practices primarily involve preserving natural vegetation when possible or stabilizing exposed soils with temporary covers or permanent vegetation. Reducing the erosion associated with construction vehicle traffic is also covered in this section. Many of these techniques can reduce erosion by 80 to 95 percent compared with exposed soils.

Table A-1 lists the erosion control BMPs described in this section.

Table A-1 Erosion Prevention BMPs

BMP #	BMP APPLICATION	DESCRIPTION	Page #
A.1.1	Preserve Natural Vegetation	Preserve natural vegetation, especially in wetlands, streams or steep slopes.	3
A.1.2	Buffer Zone	Strip of natural vegetation by a disturbed area	5
A.1.3	Temporary and Permanent Seeding	Mechanism to reestablish vegetation	7
A.1.4	Ground Cover	Layer of material that protects disturbed areas	12
A.1.5	Hydraulic Applications	Mechanical methos of applying materials to disturbed areas to cover and/or establish vegetation	15
A.1.6	Sod	Permanent turf	17
A.1.7	Matting	Blankets that cover disturbed areas until vegetation is established	19
A.1.8	Plastic Sheeting	Waterproof cover over disturbed areas	25
A.1.9	Dust Control	Preventative measures to reduce air-borne transport of silts and soils	27

A.1.1 Preserve Natural Vegetation

This BMP involves preserving natural vegetation to the greatest extent possible during the construction process, and after construction where appropriate. Maintaining natural vegetation is the most effective and inexpensive form of erosion prevention. This method is particularly important in sensitive areas such as wetlands, stream corridors, lakes, and near steep slopes. The project manager, inspector, and contractor should address and discuss preserving natural vegetation. Although this is a proven BMP, it is imperative all exposed soils are covered in a timely manner.

Advantages

- Helps reduce soil erosion and runoff while beautifying an area
- Saves landscaping costs, provides areas for wildlife, and provides visual screening
- Helps maintain water temperature. Temperature moderation is especially important when detention ponds drain to salmonid-bearing streams.
- Retains existing shade and cover habitat
- Conserves or increases property values

Disadvantages

- Retaining older, weak, or diseased trees could create a safety hazard
- May constrict area available for construction activities

Design Criteria

- Coordinate with the Landscape Architect and Environmental Professionals assigned to the project when determining what to save and how to save it
- Vegetation can be preserved in natural clumps or as individual trees, shrubs, and vines
- Clearly establish ground disturbance limits outside the dripline of preserved trees, using orange construction safety fence or flagging if approved
- Protect vegetation from:
    - Construction equipment injury above or below the ground level. Injury occurs from scarring, cutting roots, or compaction.
    - Grade changes, which affect the plants' ability to obtain air, water, or minerals
- Placing a layer of gravel and a tile system over the roots before a major fill allows air to circulate and protects the plant from the fill
- Terracing the area around the plant, or leaving the plants on an undisturbed mound can increase the plants' survival chances.
    - Root exposure can lead to drying, freeze damage, and potentially wind-throw
    - Raising the grade as little as six inches can retard the normal exchange of air and gases
    - Damage caused by excavations for tile, water, and sewer lines.

Inspection and Maintenance

- Inspect once per week on active sites, once every two weeks on in-active sites,

and within 24 hours following a 0.5-inch rain event
- Repair fencing and/or flagging
- Re-cover and/or seal exposed plant roots

A.1.2 Buffer Zone

A buffer zone consists of an undisturbed area or strip of natural vegetation or an established suitable planting adjacent to a disturbed area that reduces erosion and runoff. The rooted vegetation holds soils; acts as a wind break, and filters runoff that may leave the site.

Advantages

- Filters Sediment
- Promotes infiltration
- Provides habitat
- Reduces velocity and quantity of runoff, dissipates energy
- Provides visual screening
- Can be used to stabilize stream banks
- Low maintenance

Disadvantage

- Requires keeping all construction equipment, debris, and soils out of the natural areas
- Extensive buffers can cover large areas of land not available for project development
- Are not adequate in areas of concentrated flows

Design Criteria

- The vegetative buffer zone shall be located along the entire length of the down slope edge of the entire disturbed area.
- The vegetation shall consist of 3- to 12-inch high grassy vegetation that uniformly covers at least 90 percent of a representative one square yard plot. No more than 10 percent of the surface area shall be comprised of woody vegetation.
- Clearly establish buffer zone limits with orange construction safety fence and signs spaced 100 feet apart. Entry on the buffer zone shall be prohibited.
- Vegetative buffer zone widths shall be determined in accordance with the following:
    - Minimum width shall be 10 feet for slopes less than five percent
    - An additional five feet shall be added for each degree of slope above five percent but not exceeding 10 percent. A 10 percent slope would require a 35-foot buffer zone (10' + {5' × 5'})
    - An additional eight feet shall be added for each degree of slope above six percent but not exceeding 15 percent. A 15 percent slope would require a 75-foot buffer zone (35' + {5' × 8'})
    - An additional 10 feet shall be added for each degree of slope above 15 percent but not exceeding 20 percent. A 20 percent slope would require a 125-foot buffer zone (75' + {5' × 10'})
    - Vegetative buffer zones are not an adequate control measure for slopes above 20 percent.
- Vegetative buffer zones for streams, lakes, or other waterways shall be a minimum 100 feet wide. An incremental adjustment in accordance with the instructions

above shall be added to the minimum. A 20 percent slope above a stream would require a 215-foot buffer zone.

Inspection and Maintenance

- Inspect flagging and fencing frequently and repair any rills and replace and/or add additional plants as needed.

A.1.3 Seeding (Temporary/Permanent)

A well-established vegetative cover is one of the most effective methods of reducing erosion. Vegetation should be established on construction sites as the slopes are finished, rather than waiting until all the grading is complete. Equally important and often overlooked is temporary or permanent irrigation. **Temporary or permanent seeding applications must be completed prior to September 1st of each year.**

Advantages

- Eliminates splash erosion
- Traps sediment
- Promotes infiltration
- Improves appearance of the site
- Reduces runoff velocities
- Provides excellent stabilization
- Relatively inexpensive erosion control measure
- Effective for dust control

Disadvantages

- Needs sufficient time for seed to establish
- Requires mulch or other cover until vegetation is established
- May require fertilizer and lime to establish on poor soils
- Requires irrigation
- Must be removed prior to applying fill material

Design Criteria

The following discussion presents general information regarding seeding, bed preparation, mulching, and fertilizing.

Section Criteria

Standard grass and legume seed mixes for erosion control purposes are developed by local or regional distributors for site-specific applications. Often more than one plant species is selected so at least one species will do well given the extreme seasonal fluctuations that occur in nature. Specific plant characteristics are chosen when developing an erosion control seed mix. Grass species are normally used rather than other plant species because of their fibrous root systems and quick establishment.

Seedling vigor is an important plant characteristic to consider for erosion control seeding because the goal is to have rapid establishment and a dense fibrous root system. This holds the soil in place and provides a thick canopy over the soil to break the raindrop velocity. Some grasses do well early in the season and can act as nurse or cover crops until the slower growing species can establish. Seed mixes are developed for specific climatic zones around the state to match the optimum

growing conditions for each species.

One grass seed characteristic considered is the season predominant growth will occur. Grass species are often characterized as being either warm- or cool-season grasses. A warm-season grass, such as bluegrass, will have its predominant growth during the warm months of the year. Conversely, cool-season grasses, like hard fescue, have their predominant growth in the cool weather and produce seeds in the early spring. To obtain optimum establishment, a cool or warm season grass, or both, may be used depending on whether the seed is planted in the spring or fall.

Another plant characteristic of importance in erosion control is the method by which the grass develops, grows, and spreads. Grasses can be either rhizomatous, where the grass plant will send out runners that will start new growth, a bunch grass; or a sod-forming grass. Rooting depth is important and grasses are characterized as being deep, moderate, and shallow rooting for erosion control purposes. The mixture of rooting depths provides optimum support for soils and best enables the removal of water by the roots at the various zones in the soil.

Seed Purity

All seed applied should be those specified in the project plan and should be measured by Pure Live Seed (PLS) weight. Pure live seed refers to the portion of a seed lot that is live seed of the desired kind. The purpose of measuring the application on a PLS basis is so trash and empty seeds do not confuse seeding rate calculations.

The seed lots should be tested and meet the minimum seed standards. Lots showing Oregon prohibited weeds are not approved. Seed must meet minimum viability standards. Oregon State University Extension Service keeps a listing of seed varieties certified in the OSU Extension Certified Seed Handbook.

The seed variety must be approved by the OSU Seed Certification Board to be eligible for certification or meet the standards for certification.

- Temporary grass cover measures must be fully established by October 1st or other ground cover measures will have to be implemented. In order to establish an 80 percent healthy stand of grass, all seeding applications must be completed prior to September 1st.
- Apply permanent seeding when no further disturbances are planned.
- Seed should be applied immediately after seedbed preparation while the soil is loose and moist.
- Apply seed before applying straw mulch or other ground cover applications.
- Hydromulch shall be applied with grass seed at a rate of 2,000 pounds per acre. On slopes steeper than 10 percent, hydroseed and mulch shall be applied with a bonding agent (tackifier). Application rate and methodology shall be in accordance with seed supplier recommendations.
- Dry, loose, weed-free straw used as mulch shall be applied at double the hydromulch application requirement (4,000 pounds per acre). Anchor straw by

working in by hand or with equipment (rollers, cleat tracks, etc.).
- Permanent or temporary irrigation shall be supplied especially in abnormally hot or dry weather or on adverse sites. Water application rates should be controlled to provide adequate moisture without causing runoff.

Site Preparation

- Bring the seedbed area to final grade, remove all rocks and debris, and smooth surface undulations larger than two inches.
- Divert concentrated flows away from the seeded area.
- For optimum seeding conditions preserve topsoil and stockpile material until final grades are established. Spread topsoil over new grades or:
- Conduct soil test to determine pH and nutrient content.
- Roughen the soil by harrowing, tracking, grooving, or furrowing.
- Apply amendments as needed to adjust pH to 6.0-7.5. Incorporate these amendments into the soil.
- The seedbed should be firm but not compact. The top four to six inches of soil should be loose, moist, and free of large clods and stones.
- If the seedbed has been idle long enough for the soil to become compact, the topsoil should be harrowed with a disk, spring tooth drag, spike tooth drag, or other equipment designed to condition the soil for seeding.
- Harrowing, tracking, or furrowing should be done horizontally across the face of the slope, so ridges are along the slope contour.

Seeding

- Seed to soil contact is the key to good germination.
- Apply seed at the rates specified using calibrated seed spreaders, cyclone seeders, mechanical drills, or hydroseeder so the seed is applied uniformly on the site
- Broadcast seed should be incorporated into the soil by raking or chain dragging, and then lightly compacted to provide good seed-soil contact.
- Apply mulch and tackifier or matting, as specified, over the seeded areas.
- To prevent seed from being washed away, confirm installation of all required surface water control measures.
- Double the rate of seed application when mulch and seed is applied in a single application.
- Recommended erosion control grass seed mixes are as follows. Similar mixes designed to achieve erosion control may be substituted with approval

1. Dwarf Grass Mix (low height, low maintenance)
   Dwarf Perennial Ryegrass, 80 percent by weight
   Creeping Red Fescue, 20 percent by weight
   Application rate: 100 pounds minimum per acre
2. Standard Height Grass Mix
   Annual Ryegrass, 40 percent by weight
   Turf-type Fescue, 60 percent by weight
   Application rate: 100 pounds minimum per acre

Fertilizer

- Slow-release fertilizers are more efficient and have fewer environmental impacts.
- Areas being seeded for final landscaping may require soil tests to determine the exact type and quantity of fertilizer needed to prevent the over-application of fertilizer. Use non-phosphorus fertilizer on disturbed areas within 50 feet of water bodies and wetlands.
- The use of stockpiled topsoil or compost reduces the need for fertilizer and improves the overall soil quality.
- Provide project-specific application rates

Mulch

- Refer to Ground Cover and Matting sections of this chapter.
- Straw mulch in loose condition is preferred for seeding during the wet season on slopes 3:1 or flatter.
- Straw mulch may be required during the dry season if:
    - Grass growth is expected to be slow
    - The soils are highly erodible
    - There is a water body close to the disturbed area
    - Significant precipitation is anticipated before the grass will provide effective cover.
- The straw mulch shall not be moldy, caked, decayed, or of otherwise low quality.
- Can be applied on top of the seed or applied with the seed during hydroseeding.
- The application rate of seed per acre should be increased if seed and mulch are applied in a single application.

Hydroseed

- Refer to Hydraulic Application section (BMP A.1.5) of this chapter
- Hydroseeding requires a mulch or green dye tracer as a visual aid during application.
- On slopes steeper than 2:1, hydroseeding requires an increased rate of tackifier to be applied.
- During the dry season, hydroseeding with wood fiber mulch is adequate.

Inspection & Maintenance

- Inspect once per week on active sites, once every two weeks on inactive sites, and within 24 hours following a 0.5-inch rain event
- Newly seeded areas need to be inspected frequently to ensure the grass is growing.
- If the seeded area is damaged due to runoff, additional BMPs may be needed. Re-seed and mulch damaged areas.
- Spot seeding can be done on small areas to fill in bare spots where grass did not grow properly.
- If spot seeding is ineffective, use an alternate method, such as sod or matting.

- Re-seed and protect with mulch any areas affected by erosion. If the erosion is caused by concentrated runoff, fix the runoff problem and then re-seed and mat the area.

A.1.4 Ground Cover

Ground Cover is a protective layer of straw or other suitable material applied to the soil surface. Straw mulch and/or hydromulch are also used in conjunction with seeding of critical areas for the establishment of temporary or permanent vegetation. Ground cover provides immediate temporary protection from erosion. Mulch also enhances plant establishment by conserving moisture; holding fertilizer, seed, and topsoil in place; and moderating soil temperatures.

Advantages

- Provides immediate protection
- Conserves moisture
- Acts as a thermal layer for seed
- If used in conjunction with seed, allows seed growth through the mulch
- Protects seeding from direct heat, moisture loss, and transport due to runoff
- Used for dust control

Disadvantages

- Thick mulches can delay germination.
- Can be blown or washed away if not adequately tackified
- Must be removed prior to applying fill material

Design Criteria

- Divert concentrated runoff from above mulched areas
- Refer to Table A-5; outlines mulch type, quality, and application rate
- The following pages include specific material and application criteria
- Refer to Appendix D for *Mulch Application Rate Worksheet*

Inspection and Maintenance

- Inspect once per week on active sites, once every two weeks on inactive sites, and within 24 hours following a 0.5-inch rain event
- Maintain specified thickness of the cover.
- Re-mulch and/or protect with a net or blanket any areas that experience erosion.
- If the erosion problem is drainage related, fix the drainage problem and re-mulch the eroded area.
- Hydraulically treated areas shall be inspected and monitored after installation and periodically thereafter.
- Hydraulic mulches and tackifiers shall provide the necessary erosion protection until permanent erosion-resistant cover is established. If sheet or rill erosion is evident, prompt re-application of treatments shall be necessary.
- If the hydraulic mulch or tackifiers were applied as stand-alone (without

vegetation) treatments for erosion and dust control, the product longevity must match the length of time that the soil will remain bare or until revegetation occurs. Periodic inspections will assure the intended purposes will be met.

- Areas that fail to establish cover adequate to prevent erosion shall be re-mulched as soon as such areas are identified.
- If mulched areas are damaged by concentrated runoff, the prompt implementation of additional practices and BMPs may be necessary.

Table A-2 Ground Cover Application

Mulch Material	Quality Standards	Application Rate Per Acre	Depth of Material	Considerations
Straw	Air dried, free from unwanted seeds & coarse materials	2-2 ½ tons or 90-120 bales	2 inches minimum uniform spread	Use where the mulching effects is to be maintained < 3 months. When chopped straw is applied, use a tackifier
Yard Debris Compost	Well composted organic matter free of metals, plastics and other foreign matter	3-6 tons	4:1 slopes - use 1 inch; 3:1 slopes - use 2 inches; 2:1 slopes - use 3 inches	Excellent soil amendment. Compost size: ¾ × 0 on 3:1 slopes or less. 1½ × 0 on 2:1slopes.
Wood or Cellulose Fiber	Dyed green, should not contain growth inhibiting factors	2,000 pounds	N/A	Apply with hydromulcher. May need to double the rate depending on soil and slope. Use tackifier as recommended by manufacturer.
Wood Chips or Grindings	Green or air dried free of objectionable coarse materials	5-6 tons	1-3 inches depending on slope	Very durable. Apply with mulch blower, excavation equipment, or by hand. Not suitable for areas that require close mowing.
Gravel or Crushed Rock	Washed ¾-1.5inch	9 yards/1,000 feet [2]	3 inches	Excellent for short slopes and where subject to foot traffic. Larger pit-run can be used on steep slopes prone to sub-surface water (springs).

A.1.5 Hydraulic Application

Hydraulic application is a mechanical method of applying erosion control materials to bare soil in order to establish erosion-resistant vegetation on disturbed areas and critical slopes. By using hydraulic equipment soil amendments, mulch, tackifying agents, Bonded Fiber Matrix (BFM), and liquid co-polymers can be uniformly broadcast as homogenous slurry onto the soil. These erosion and dust control materials can often be applied in one operation.

Advantages

- Provides rapid installation with a one step process
- Generally requires less seedbed preparation. The surface soil may be left irregular with large clods, stones, or rock outcropping exposed.
- Uniformly distributes seed and mulch material
- Increases favorable conditions for quick germination and growth
- Can be used effectively on steep slopes and other areas where access is limited

Disadvantages

- Generally more expensive than broadcast or drilling seed applications
- Thick mulch applications can delay germination
- Can be blown or washed away if not adequately tackified
- Required application rates can vary significantly dependent on site preparation

Design Criteria

- Divert concentrated runoff from above treated areas.
- Seed, fertilizer, mulch, tackifier, soil amendments, Bonded Fiber Matrix, and chemical stabilization can be applied in a one-step procedure.
- Wood fiber mulch or wood/paper mulch should be applied at a rate of 2,000 to 2,500 pounds per acre.
- Bonded Fiber Matrix (BFM) is considered a liquid blanket and can be applied on steep 1:1 slopes. Application rates between 3,000 and 4,000 lbs. per acre, depending upon soil type and irregularities.
- Use hydraulic applications on slopes steeper than 4:1 that cannot receive adequate seedbed preparation and where mulch would be difficult to otherwise anchor.
- On sites where other soil stabilization, seeding, and mulching practices would result in unacceptable levels of ground disturbance.
- Use where site conditions, such as irregular soil surfaces, existing vegetation, and shallow soils preclude the installation of erosion mats.
- If used when seeding, maintain sufficient moisture level using permanent or temporary irrigation.
- On sites where straw mulch has been applied and the straw needs to be anchored using a liquid tacking agent.
- On sites where dust control is desired

- If the hydraulic mulch or tackifiers were applied as stand-alone (without vegetation) treatments for erosion and dust control, the product longevity must match the length of time the soil will remain bare or until re-vegetation occurs.
- Refer to Appendix D Hydraulic Application Tables for seed and mulch.

Inspection and Maintenance

- Inspect once per week on active sites, once every two weeks on in-active sites, and within 24 hours following a 0.5-inch rain event
- Re-mulch and/or protect with an erosion control mating any areas that experience erosion. If the erosion problem is drainage related, fix the drainage problem then make necessary repairs.
- Hydraulic mulches and tackifiers shall provide the necessary erosion protection until permanent erosion-resistant cover is established. If sheet or rill erosion is evident then prompt re-application of treatments shall be necessary.
- Areas that fail to establish 80 percent healthy stand of grass cover to prevent erosion shall be properly covered using one of the selected application.

A.1.6 Sod

Establishes permanent turf for immediate erosion protection and stabilizes drainage ways.

Advantages

- Provides immediate, effective protection, and is aesthetically pleasing
- Provides high-density vegetation, which is superior to a recently seeded area
- Placement can occur any time soil moisture is adequate and the ground is not frozen

Disadvantages

- Expensive
- Availability is seasonal
- Irrigation may be required if installed in summer
- Difficult to mow if installed on slopes steeper than 3:1
- Installations in grassed waterways may roll up if not anchored or drained properly
- Time necessary for roots establishment may be lengthy

Design Criteria

- Use sod as a short- or long-term cover
- Use around inlets located off roadways
- Use sod that is generally weed free, has uniform thickness (approximately 1-inch thick), and dense root mat for mechanical strength.
- Generally inappropriate for bioswales. Sod can be used for lining ditches or waterways carrying intermittent flows.
- The following steps are general recommendations for sod installation:
    3. Shape and smooth the surface to final grade in accordance with the approved grading plan.
    4. Fertilize as per supplier's recommendations. Non-phosphorous fertilizer is required near water bodies and wetlands.
    5. Work lime and fertilizer into soil one to two inches deep and smooth the surface.
    6. Lay sod strips perpendicular to the direction of water flow, beginning at the lowest area to be sodded. Wedge strips securely into place and square the ends of each strip to provide for a close, tight fit. Stagger joints at least 12 inches. Staple sod onto 3:1 and steeper slopes.
        - Roll the sodded area and irrigate
        - Not for use in high velocity channels/ditches

Inspection and Maintenance

- Inspect once per week on active sites, once every two weeks on in-active sites, and within 24 hours following a 0.5-inch rain event
- Inspect sod area frequently for soil moisture content and root establishment.
- Re-tack, re-sod or re-seed as necessary.
- If it is impossible to establish a healthy ground cover due to frequent saturation, instability, or some other cause; remove the sod, seed the area with an appropriate mix, and protect with matting.

A.1.7 Matting

There are numerous erosion control products available that can be described in various ways, such as matting, blankets, fabric, and nets. We will call them all matting. A wide range of materials and combination of materials are used to produce matting including, but not limited to: straw, jute, wood fiber, coir (coconut fiber), plastic netting, and Bonded Fiber Matrix. The selection of matting materials for a site can make a significant difference in the effectiveness of the BMP.

When selecting matting consider these questions:

7. How long will the matting be required to provide protection?
8. How steep is the slope?
9. What is the soil type?
10. What is the shear stress on the channel bottom?

Advantages

- Immediate cushioning against splash erosion from raindrop impact
- Does not generate high-velocity runoff and, therefore, offers temporary slope protection, which is superior to plastic sheeting
- Captures a great deal of sediment due to its open, porous structure
- Usually easy to install
- Provides long-term protection, based on selection

Disadvantages

- Correct installation is critical to the effectiveness of these products. Good ground contact during installation prevents runoff concentrating under the blanket and causing significant erosion (tenting).
- Soil surface must be graded smooth with no surface irregularities
- Limited protection capabilities when used as flexible channel liner

Design Criteria

- Generally used on slopes 3:1 and steeper
- Surface must be graded smooth
- Remove all debris and undulations larger than two inches in any dimension
- Apply seed and fertilizer prior to matting
- Install so matting is in complete contact with soil surface
- See Table A-6 for matting application and staple pattern
- Organic matting materials (excelsior, jute and coir) biodegrade and are useful for applications requiring stabilization for up to three months. Use organic blankets, which retain moisture and provide organic matter to the soil, for slope protection, and short-term waterway protection and to improve the speed and success of re-vegetation.
- Excelsior brand (aspen wood fiber), woven straw, and coir (coconut fiber) blankets may be installed without mulch because they provide complete surface protection.

- Synthetic mats are made from non-biodegradable material and will remain in place for years (some photo degradation does occur). Use purely synthetic blankets for long-term stabilization of waterways.
    - Turf Reinforcement Mats (TRM) are made from polymer netting or monofilaments formed into a Synthetic 3-D mat. TRMs protect seed and increase germination and also act as part of the root structure; giving the turf higher strength.
    - Erosion Control and Revegetation Mats (ECRM), composed of heat-fused monofilaments or monofilaments stitched between netting act as permanent mulch. ECRM allow growth through the mat.
- Channel or swale applications:
    - Lengthwise overlap: Minimum 12 inches
- Crosswise overlap: Minimum six inches
- Avoid joining material in center of ditch or swale
- Slope application:
    - Lengthwise overlap: Minimum 6 inches
    - Crosswise overlap: Minimum 6 inches
    - At top of slope, entrench material in a six-inch × six-inch trench and staple at 12-inch intervals
    - At bottom of slope, extend mat two feet beyond the toe of the slope, turn material under four inches, and staple at 12 inch intervals
    - On 4:1 slopes, rolls can be placed in horizontal strips
    - Mats must be stapled in place as they are installed down the slope face every four feet until the bottom is reached. This keeps the blanket in relaxed position, eliminating the potential for under-rilling.

<u>Inspection and Maintenance</u>

- Inspect once per week on active sites, once every two weeks on in-active sites, and within 24 hours following a 0.5-inch rain event
- Repair any damaged areas of the net or blanket and staple into the ground any areas not in close contact with the ground surface.
- If erosion occurs, repair and protect the eroded area.

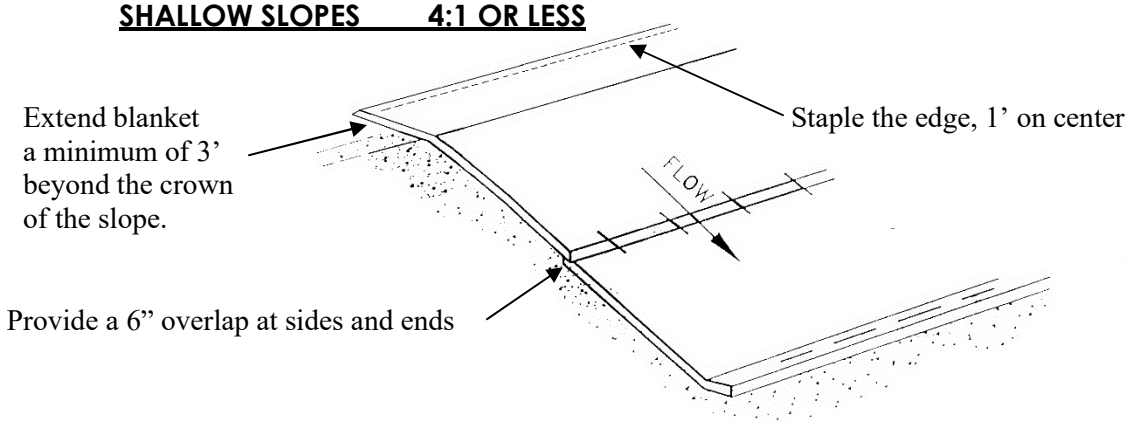
Table A-3 Matting Specifications

Matting Type	Slope/ Channel Application	Netting Type
Straw	3:1 or less	Type 1 - Photo degradable polypropylene top/bottom Type 2 – 100 percent Bio degradable (used near sensitive habitat areas)
Straw/Coconut	2:1 or less	Type 1 – Photo degradable polypropylene top/bottom Type 2 – 100 percent Bio degradable (used near sensitive habitat areas)
Coconut	1:1 or less Low flow channels	Type 1 – Photo degradable polypropylene top/bottom Type 2 – 100 percent Bio degradable (used near sensitive habitat areas)
Jute	3:1 or less Short, 2:1 slopes	100 percent Bio degradable
Excelsior	2:1 or less Low flow channel	Photo degradable extruded plastic mesh top/bottom
Coir fabric	1:1 or less 8-10 fps channel	Type 1 – 1-inch grid 100 percent Bio degradable (4-10 year life) Type 2 – ½-inch grid 100 percent Bio degradable (4-10 year life) Type 3 – ¼-inch grid 100 percent Bio degradable (4-10 year life)
TRM	High flow Channels 8-20 fps	Three dimensional synthetic polyolefin fibers mechanically bonded between two nets.

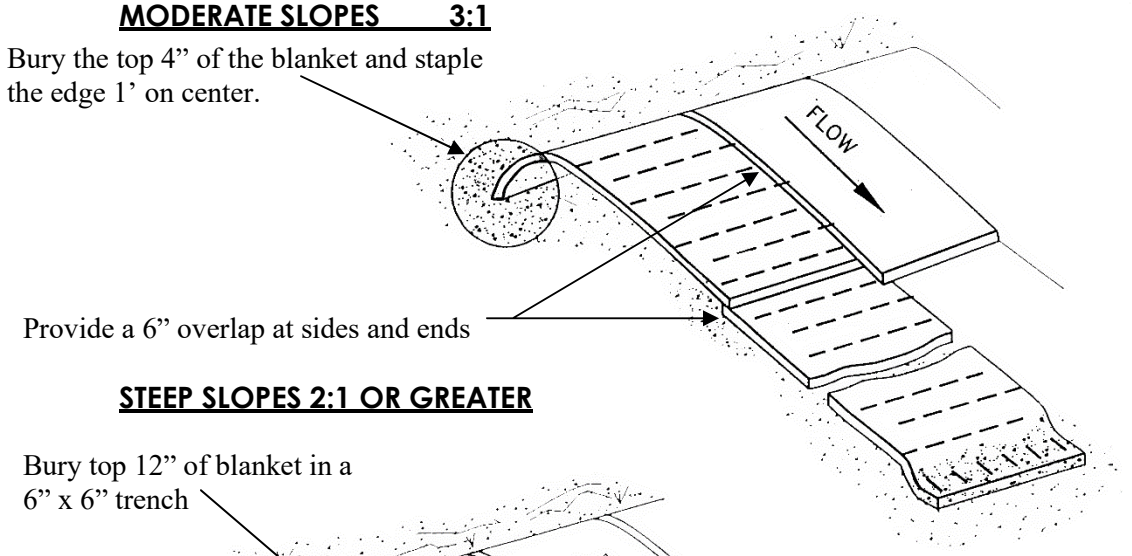
Diagram A.1.7a

MATTING SLOPE INSTALLATION

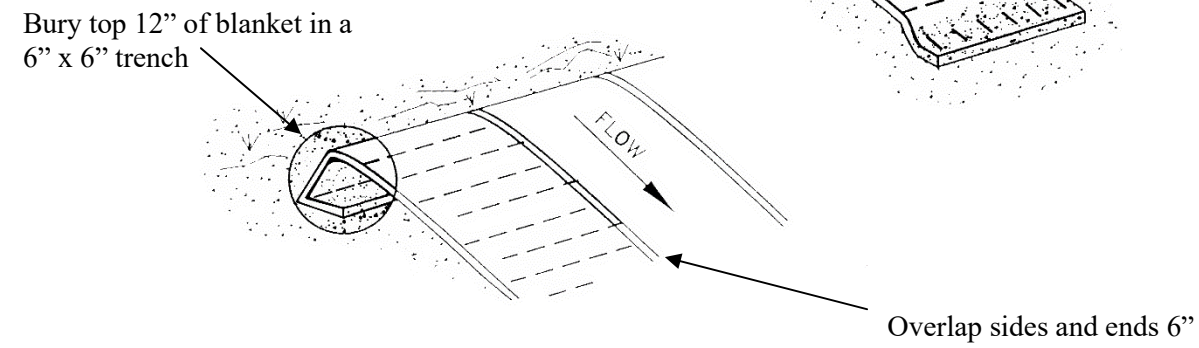
SHALLOW SLOPES 4:1 OR LESS



MODERATE SLOPES 3:1



STEEP SLOPES 2:1 OR GREATER

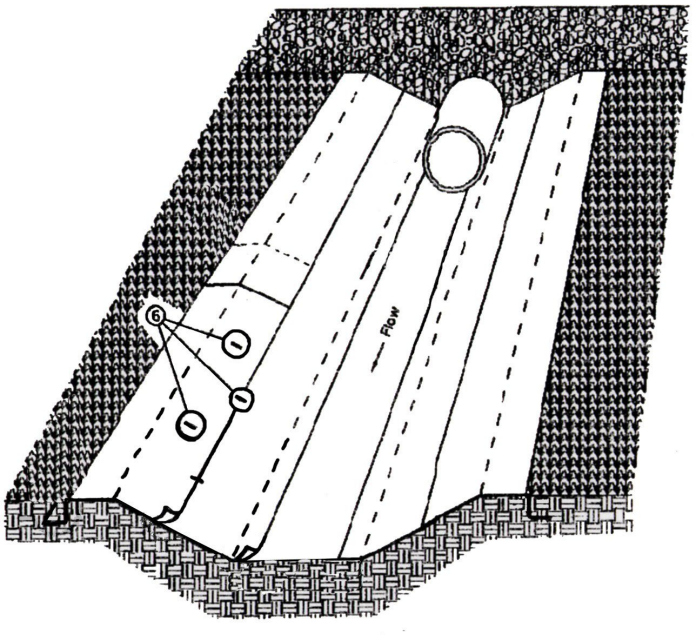


NOTES:

1. On shallow slopes, blankets may be applied across the slope.
2. All Blanket staples required as per table in Diagram A.1.7c

Diagram A.1.7b

MATTING CHANNEL INSTALLATION



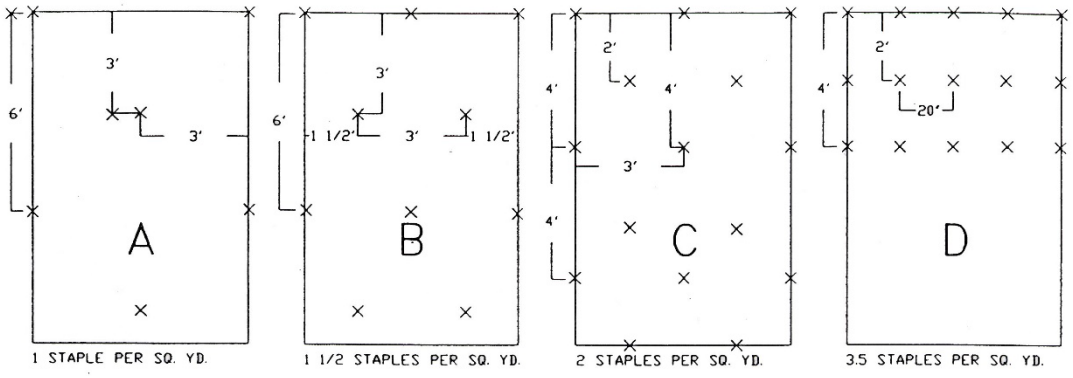
NOTES:

1. Information provided is the minimum protection required. Manufacturer's instructions shall be used where they are more stringent than those provided here.
2. Install mat parallel to flow, centered in channel. For culvert outfalls, place the mat under the culvert or rip rap the outlet over the mat.
3. Overlap sides and ends of blankets a minimum of 12 inches.
4. Refer to Diagram A.1.7a for channel slope applications.
5. Refer to Diagram A.1.7c for staple requirements.
6. The length of staples shall be determined by soil type. Cohesive soils shall use a minimum 6" staple. Non-cohesive soils shall use 8" – 12" staples.

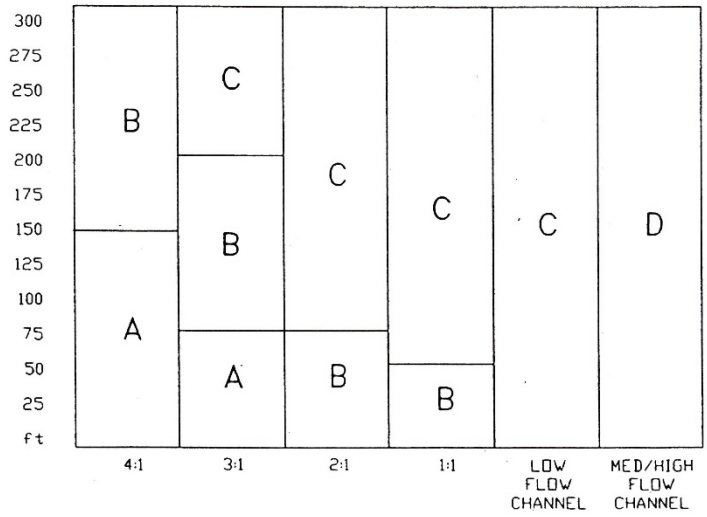
Diagram A.1.7c

MATTING STAPLE REQUIREMENTS

STAPLE PATTERN



LENGTH AND SLOPE TABLE



*MINIMUM STAPLE PATTERN GUIDE AND RECOMMENDATION FOR SLOPE AND CHANNEL APPLICATION.

A.1.8 Plastic Sheeting

Provides immediate protection to slopes and stockpiles. Plastic sheeting has been known to transfer erosion problems because water will sheet flow off the plastic at high velocity. This is usually attributable to poor application, installation and maintenance. Use alternatives to plastic covering whenever possible.

Advantages

- Provides immediate, short-term erosion protection to slopes prone to erosion and to stockpiles.
- Fairly quick and easy to install.

Disadvantages

- Plastic sheeting may concentrate sunrays and burn the vegetation beneath it
- Material generates high velocity runoff
- Plastic breaks down quickly when exposed to ultraviolet radiation
- Plastic, when it is not completely removed, can clog drainage system inlets and outlets
- If not properly anchored, wind may transport plastic onto roadways and create traffic hazard
- Not effective for preventing illegal discharge

Design Criteria

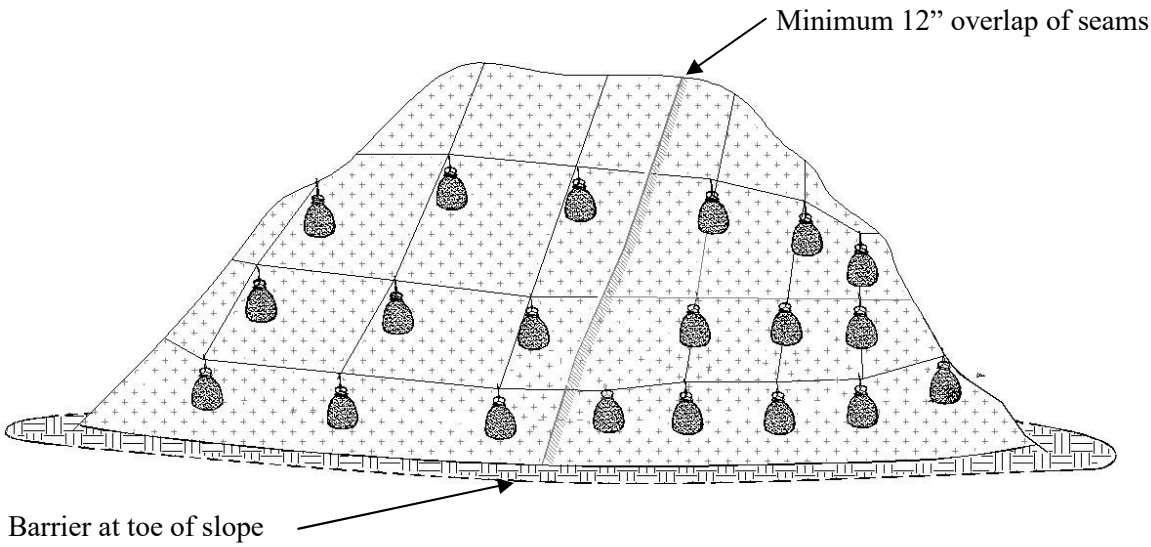
- Do not use plastic covering upslope of areas such as steep and/or unstable slopes that might be adversely affected by concentrated runoff.
- When possible, install an interceptor dike at the top of the plastic to divert flows away from the plastic.
- Toe-in the top of the sheeting in a 6 inch × 6 inch trench backfilled with compacted native material.
- Install a gravel berm, riprap, or other suitable protection at the toe of slope in order to dissipate runoff velocity.
- Anchor the plastic using sandbags or other suitable tethered anchoring system spaced on a 10-foot grid spacing.
- Overlap seams one to two feet, tape, roll, and stake the seams and then weigh down the entire length.

Inspection and Maintenance

- Inspect once per week on active sites, once every two weeks on in-active sites, and within 24 hours following a 0.5-inch rain event
- Replace torn sheets and repair open seams
- Completely remove and replace plastic when it begins to deteriorate
- Completely remove all plastic once it is no longer needed
- Check anchoring system and repair or add anchors

Diagram A.1.8

PLASTIC SHEETING INSTALLATION



NOTES:

11. Minimum 12" overlap of all seams is required
12. A barrier is required to be installed at the toe of the stock pile
13. Covering shall be maintained tightly in place by using sandbags or tires on ropes with a maximum ten-foot grid spacing in all directions

A.1.9 Dust Control

Preventative measures to minimize the wind transport of soil, prevent traffic hazards and reduce sediment transported by wind and deposited in water resources.

Advantages

- Reduces movement of soil to offsite areas
- Increases visibility

Disadvantages

- Over watering may cause erosion
- Most methods require immediate reapplication if disturbed
- Too little watering fails to control dust

Design Criteria

- Install construction entrances and stabilize construction haul roads with crushed rock
- Designer can provide project-specific dust control specifications for the contractor to apply. Measures include:
    - Seeding
    - Mulching
    - Matting
    - Water
    - Tackifier
    - Chemical Soil Stabilizers
- Schedule construction operations so the least amount of project area is disturbed at one time.
- Install temporary or permanent surface stabilization measures immediately after completing land grading.

Inspection and Maintenance

- Maintain dust control measures through dry weather periods until all disturbed areas have been stabilized
- Immediately re-stabilize areas disturbed by contractor's operations or other activities (wind, water, vandalism, etc.)

A.2 Runoff Control BMPs

The greater the volume and velocity of surface water runoff on construction sites, the more sediment and other pollutants are transported to streams, wetlands, and lakes. Diverting runoff away from exposed soils can greatly reduce the amount of soil eroded from a site. Decreasing runoff velocities reduces erosion and the amount of pollutants carried off-site.

Runoff controls divert runoff from exposed areas and reduce runoff velocities. Runoff control BMPs that divert runoff from exposed areas include pipe slope drains and diversion swales. Runoff control BMPs include:

Table A-4 lists the runoff control BMPs described in this section.

Table A-4 Runoff Control BMPs

BMP #	BMP APPLICATION	DESCRIPTION	Page #
A.2.1	Construction Entrance	Stabilized rock pad placed at construction site ingress/egress locations	29
A.2.2	Tire Wash Facility	Designed to remove sediment from vehicle/equipment tires prior to exiting the site	32
A.2.3	Pipe Slope Drain	Safely pipes concentrated flows down steep slopes	35
A.2.4	Outlet Protection	Dissipates the energy of flows at the end of pipe	38
A.2.5	Surface Roughening	Roughening slopes with track equipment to reduce erosion	41
A.2.6	Check Dams	Small dams constructed across swales or ditches	45
A.2.7	Diversion Dike / Swale	A ridge or swale designed to intercept smaller flows	49
A.2.8	Grass-lined Swale	Vegetated channel constructed to convey flows	52

A.2.1 Construction Entrance

A construction entrance consists of a stabilized rock pad placed at construction site ingress/egress locations that reduces the amount of sediment transported onto paved roads by vehicles or runoff. The Construction Entrance also includes a curb ramp designed out of wood.

Advantages

- Reduces traffic hazards caused by debris on public roadways
- Reduces sediment and other debris from entering roadways, which can then be washed into the storm drainage system

Disadvantages

- Only effective if erosion and sediment control employed elsewhere onsite
- Only works if installed at every location where significant construction traffic leaves the site
- Fills with sediment quickly and requires frequent maintenance and/or replacement of rock

Design Criteria

- Install construction entrance prior to any site work.
- Whenever possible, construct the pad on a firm, compacted subgrade.
- Install geotextile under rock when subgrade is not stable or is "pumping" up into the pad.
- **Minimum length:**
  - 20 feet - all single family sites.
  - 50 feet – all other development sites.
- **Minimum width:**
  - 20 feet – all construction sites.
- **Minimum Depth:**
  - 8 inches – all construction sites.
- **Rock Size:**
  - 1" minus – all single family sites
  - 3"-6" – all other construction sites
- Do not install rock on paved surfaces. (Use wood curb ramps.)
- Wood Curb ramps should be made out of 2 × 6 material, nailed together
- Include a tire wash facility if the entrance does not prove effective in retaining sediment onsite

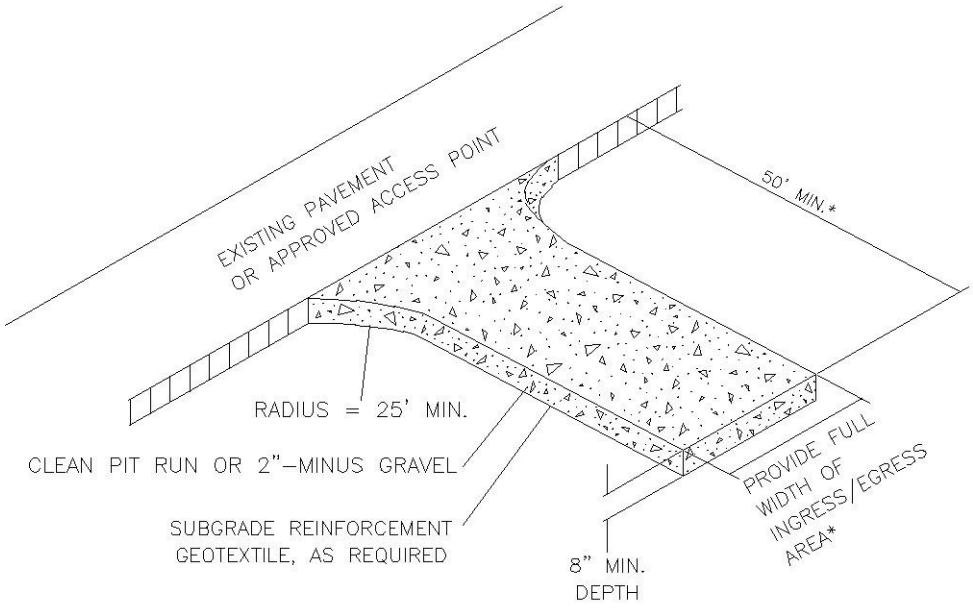
Inspection and Maintenance

- Requires ongoing inspection
- Immediately sweep up and remove or stabilize onsite any sediment that is tracked onto pavement

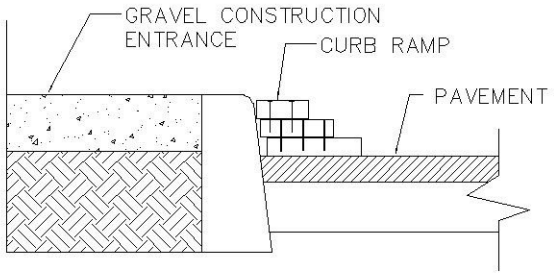
- If the sediment poses a threat to public safety and street sweeping proves ineffective, consider washing the street and collecting the water in a sediment pond or sump before it leaves the site.
- Add or replace rock as needed to maintain the specified dimensions.
- Immediately remove any rock, which gets carried from the pad to the roadway.

Diagram A.2.1

CONSTRUCTION ENTRANCE



*20' MIN. FOR SINGLE FAMILY AND DUPLEX RESIDENTIAL



NOTES:

DIMENSIONS

SINGLE FAMILY

20' LONG BY 20' WIDE

8" DEEP OF ¾" MINUS CLEAN ROCK.

COMMERCIAL

50' LONG BY 20' WIDE

3–6" CLEAN ROCK,

GOVERNING AUTHORITY MAY REQUIRE GEOTEXTILE FABRIC TO PREVENT SUB–SOIL PUMPING.

A.2.2 Tire Wash Facility

Two types of tire wash facilities are available depending on the severity of sediment tracking and the size and duration of project. Type 1 can be retro-fitted in the field, using geotextile fabric and rock. Like a stabilized construction entrance it is graded so collected wash water is conveyed to a sediment trap, basin, or other suitable treatment facility. Type 2 consists of a shallow concrete-lined basin partially filled with water, through which exiting vehicles drive.

Advantages

- Reduces traffic hazards caused by debris on public roadways
- Reduces sediment on roadways, which can wash into the storm sewer system
- Type 1 is easy to construct and is relatively inexpensive
- Type 2 is useful for high traffic volumes or large projects of long duration

Disadvantages

- Only works if installed at every location where construction traffic leaves the site
- Fills with sediment quickly and requires frequent maintenance
- Requires a source of wash water
- Requires a turnout or doublewide exit to avoid entering vehicles having to drive through wash area
- Type 2 is costly to construct
- Both facilities will generate large volumes of sediment-laden water, requiring treatment elsewhere on site

Design Criteria

Type 1 (temporary)

- Minimum length: 40 feet
- Minimum width: 10 feet
- Minimum rock depth: 8 inches
- Average tire wash sump: 18 inches
- Install subgrade geotextile fabric as a liner
- Use 4"-6" rock over geotextile fabric
- **Alternate:** 3" asphalt lift over a stable base coarse
- Grade the pad to drain to suitable collection and treatment facility.
- Install fencing as necessary to restrict exiting construction vehicle traffic to the tire wash.

Type 2 (permanent)

- Minimum length: 40 feet with sloping ingress and egress
- Minimum width: 10 feet
- Minimum rock depth: 8 inches
- Average tire wash sump: 18 inches

- Run out impervious area should be a minimum of 50 feet, graded back to facility

- Line bottom of basin with geotextile and 12 inches of rock base coarse
- Construct basin out of 12". concrete with steel reinforcement
- Provide water supply
- Provide outlet for sediment-laden water discharge to treatment facility or provide pumps and tanks for water treatment

Inspection and Maintenance

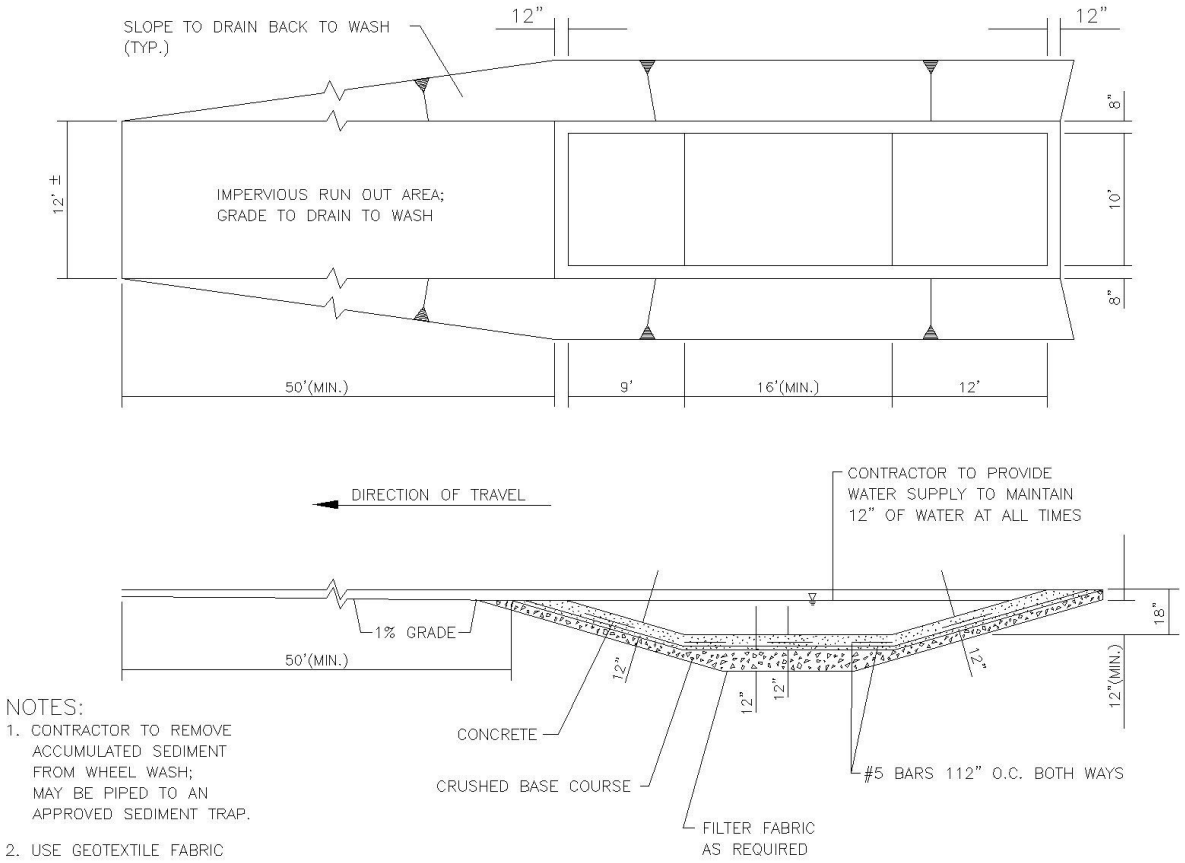
- Inspect weekly minimum, or more frequently depending upon use.

Type 1
- Clean or replace rock clogged with sediment
- Re-grade rock as needed
- Maintain tire wash sump depth
- Maintain a clean run-out pad
- Immediately remove any rock that gets carried from the pad to the roadway
- Ensure that wash water drainage, collection and treatment system is functioning

Type 2
- Remove/discharge wash water as needed
- Remove accumulated sediment from tire wash facility in order to maintain tire wash sump
- Ensure that wash water collection and treatment system is functioning

Diagram A.2.2

TIRE WASH FACILITY



NOTES:

1. CONTRACTOR TO REMOVE ACCUMULATED SEDIMENT FROM WHEEL WASH; MAY BE PIPED TO AN APPROVED SEDIMENT TRAP.
2. USE GEOTEXTILE FABRIC WITH AGGREGATE FOR A TEMPORARY TIRE WASH.

A.2.3 Pipe Slope Drain

A pipe slope drain is created by extending a pipe from the top to the bottom of a cut or fill and discharging into a stabilized watercourse, sediment trapping device, or onto a stabilized area. The pipe slope drain carries concentrated runoff down steep slopes without causing gullies, erosion, or saturation of slide-prone soils.

Advantages

- Effective method of conveying water down steep slopes
- Reduces or eliminates erosion
- Easy installation and little maintenance

Disadvantages

- Drain can be under-designed or incorrectly located
- Area cleared for drain installation requires stabilization to prevent erosion occurring under the pipe
- Outfall systems constructed of pipe segments, which are banded and/or gasketed together, could develop leaks causing erosion and failure of the system. Failures on erodible or steep slopes can cause downstream sedimentation or even mudflows.
- Adjustment of pipe lengths is necessary as cut and fill slopes are extended.

Design Criteria

- Capacity – Peak runoff from a 10-year storm. Inlet control is a critical factor when sizing pipes. Unless they are individually designed, size drains according to Table A-7.
- On any slope where a large amount of flow must be collected and conveyed to avoid erosion
- Areas where clean water should be kept separate from sediment-laden water
- If a permanent measure is needed it should be designed as part of the drainage facilities

Figure A.1 Pipe Slope Drain

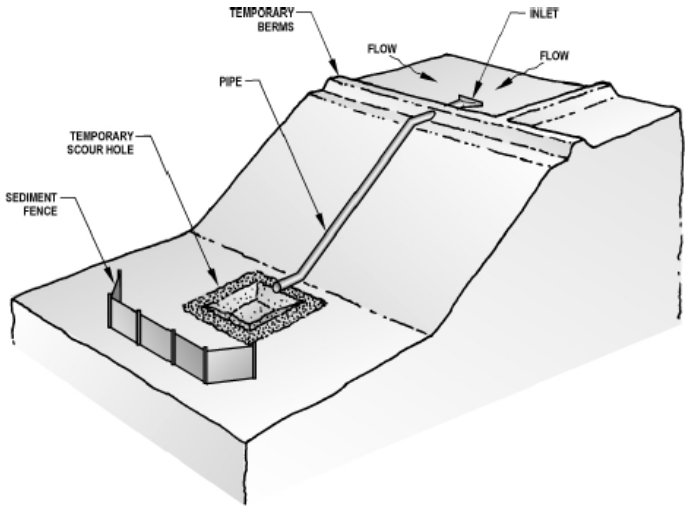


Table A-5 Slope Drain Sizes

Contributing Drainage Area (Maximum)	Pipe Diameter
0.50 acre	12 inch
0.75 acre	15 inch
1.00 acre	18 inch

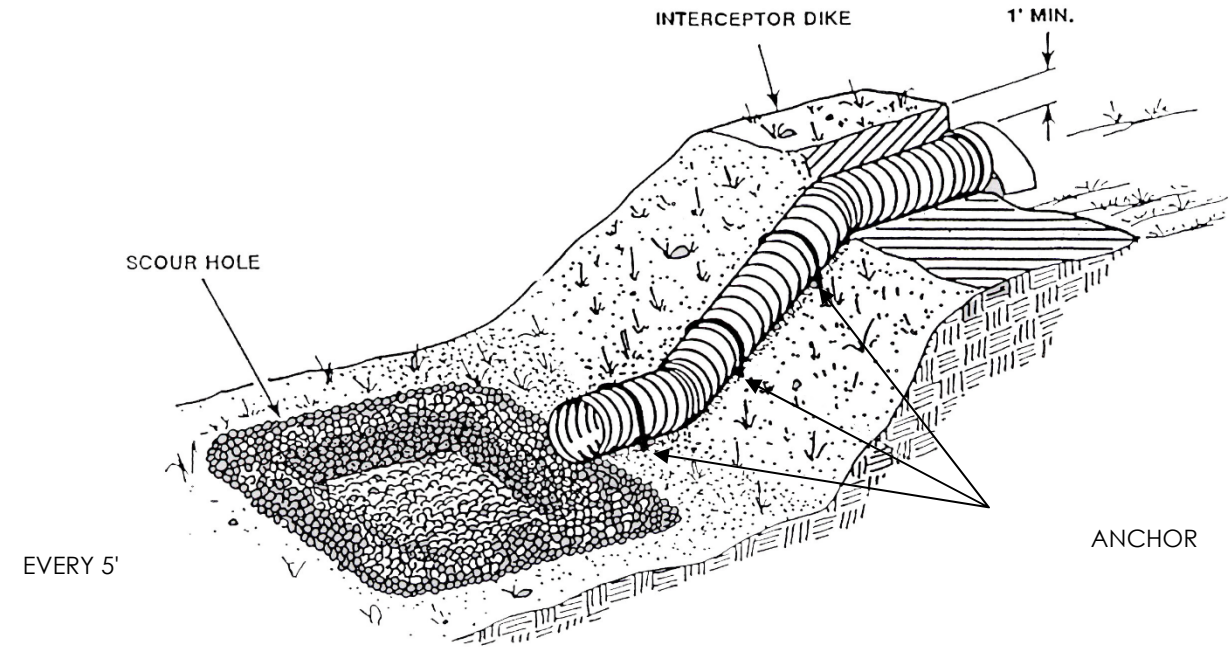
- Consider using continuously fused, welded, or flange-bolted mechanical joint systems with proper anchoring or HDPP (high-density polyethylene pipe) for outfalls on steep slopes.
- Show the entrance sloped toward the pipe inlet.
- At the inlet, show interceptor dikes that are at least 12 inches higher at all points than the top of the inlet pipe and placed to direct water into the pipe.
- If the pipe slope drain will convey sediment-laden runoff, direct the runoff to a sediment retention facility.
- If the runoff is not from a disturbed area or is conveyed from a sediment trap or pond, convey the runoff to a stabilized discharge point.
- Energy Dissipation – Scour holes or riprap-lined stilling basins prevent most scour problems at outfalls.
- Consider site conditions to determine if a more complex energy dissipater may be required.
- The special provisions and typical notes should include the following installation directions:
    - Minimize disturbance during installation. In some circumstances this requires HDPP installed by hand.
    - Slope anchor details.
    - Immediately stabilize any area disturbed during installation or maintenance.
    - Securely connect the standard flared end section at the entrance to the slope drain, using watertight connecting bands.
- Pipe should be staked securely to prevent movement.
    - Securely fasten together the slope drain sections with gasketed watertight fittings, and securely anchor the sections into the soil.
    - Stabilize the area below the outlet following the energy dissipater.

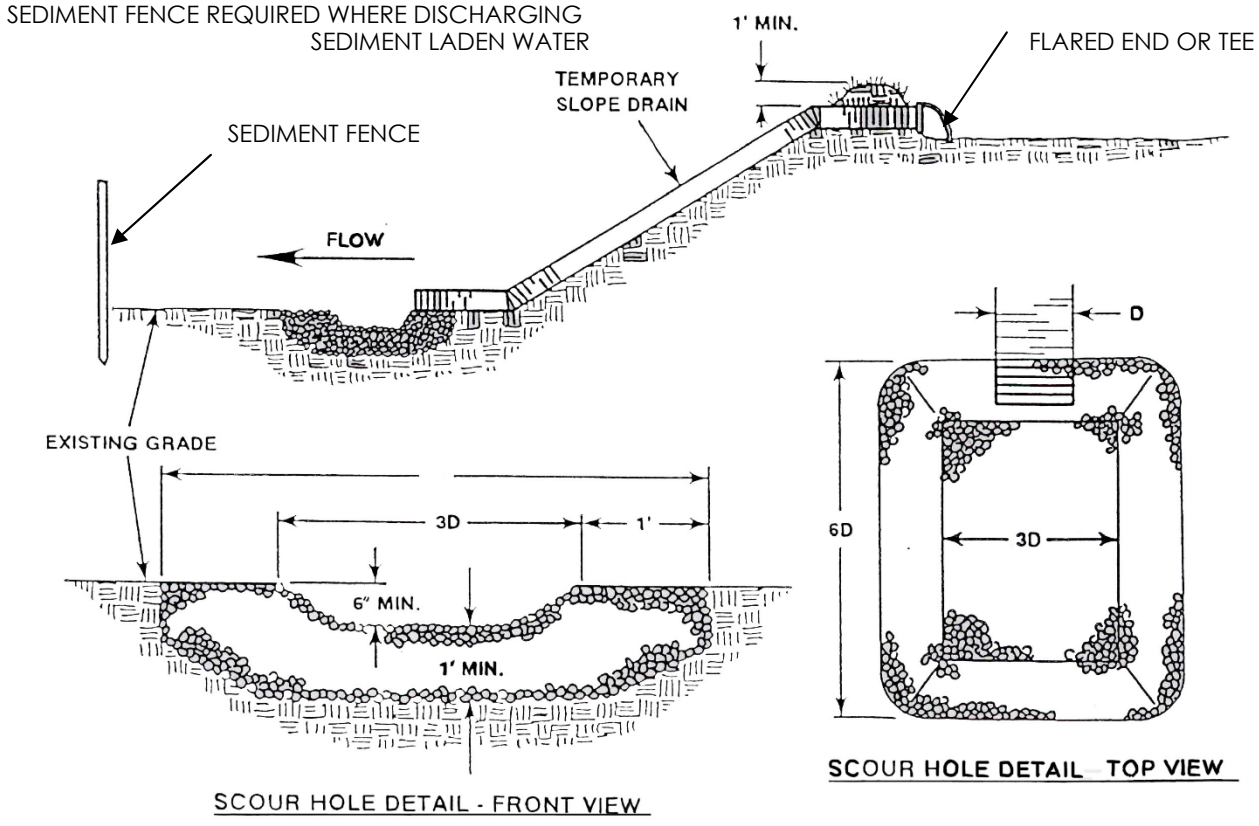
<u>Inspection & Maintenance</u>

- Inspect once per week on active sites, once every two weeks on in-active sites, and within 24 hours following a 0.5-inch rain event
- Adjust lengths of pipe when cut and fill slopes are extended.
- Regularly check the inlet and outlet points, especially following heavy rains. If there are signs of undercutting or water is going around the point of entry, reinforce the head wall with compacted earth or sand bags.
- Regularly check at connection points for signs of erosion. Tighten fittings and repair erosion as needed.
- Immediately repair and install appropriate protection if erosion occurs at the outlet.

Diagram A.2.3

PIPE SLOPE DRAIN





A.2.4 Outlet Protection

Outlet protection reduces the speed of concentrated flow, thereby preventing scour at conveyance outlets. By dissipating energy, outlet protection lowers the potential for downstream erosion. Outlet protection includes rip-rap-lined basins, concrete aprons, and settling basins. Outlet protection prevents scour at stormwater outlets and minimizes the potential for downstream erosion.

Advantages

- Many techniques are effective and relatively inexpensive and easy to install.
- Removes sediment and reduces velocity

Disadvantages

- Can be unsightly
- May be difficult to remove sediment without removing and replacing the structure itself
- Rock outlets with high velocity flows may require frequent maintenance.

Design Criteria

At a minimum, all outfalls shall be provided with a rock splash pad (see Figure A.2.4), except as specified below and in Table A-8:

1. For outfalls with a velocity at design flow greater than 10 fps, gabion dissipater or engineered energy dissipater shall be required. Note that a design engineered to specific site conditions is required.
2. Engineered energy dissipaters, including stilling basins, drop pools, hydraulic jump basins, baffled aprons, and bucket aprons, are required for outfalls with velocity at design flow greater than 20 fps. These should be designed using published or commonly known techniques found in such references as *Hydraulic Design of Energy Dissipaters for Culverts and Channels*, published by the Federal Highway Administration of the United States Department of Transportation; *Open Channel Flow*, by V. T. Chow; *Hydraulic Design of Stilling Basins and Energy Dissipaters, EM 25*, Bureau of Reclamation (1978); and other publications, such as those prepared by the Soil Conservation Service (now Natural Resource Conservation Service). Alternate mechanisms, such as bubble-up structures (which will eventually drain) and structures fitted with reinforced concrete posts, may require an approved adjustment and must be designed using sound hydraulic principles and considering constructability and ease of maintenance.

Table A–6 Rock Protection at Outfalls

Discharge Velocity at design Flow (fps)		REQUIRED PROTECTION				
Greater than	Less than or equal to	Minimum Dimensions				
		Type	Thickness	Width	Length	Height
0	5	Rock lining(1)	1 foot	Diameter + 6 feet	Greater of: 8 feet or 4x diameter	Crown + 1 foot
5	10	Riprap(2)	2 feet	Greater of: Diameter + 6 feet or 3x diameter	Greater of: 12 feet or 4x diameter	Crown + 1 foot
10	20	Gabion Outfall	As required	As required	As required	Crown + 1 foot
20	N/A	Engineered energy dissipater required				

(1) Rock lining shall be quarry spalls with gradation as follows:

Passing 8-inch square sieve: 100%
Passing 3-inch square sieve: 40 to 60% maximum
Passing 3/4-inch square sieve: 0 to 10% maximum

(2) Riprap shall be reasonably well graded with gradation as follows:

Maximum stone size: 24 inches (nominal diameter)
Median stone size: 16 inches
Minimum stone size: 4 inches

Note: Riprap sizing governed by side slopes on outlet channel is assumed to be approximately 3: 1.

- **Other Recommended Outfall Features** – Mechanisms which reduce velocity prior to discharge from an outfall are encouraged. Some of these are drop manholes and rapid expansion into pipes of much larger size. New pipe outfalls can provide an opportunity for low-cost fish habitat improvements. For example, an alcove of low-velocity water can be created by constructing the pipe outfall and associated energy dissipater back from the stream edge and digging a channel, over-widened to the upstream side, from the outfall to the stream. Overwintering juvenile and migrating adult salmonids may use the alcove as shelter during high flows.

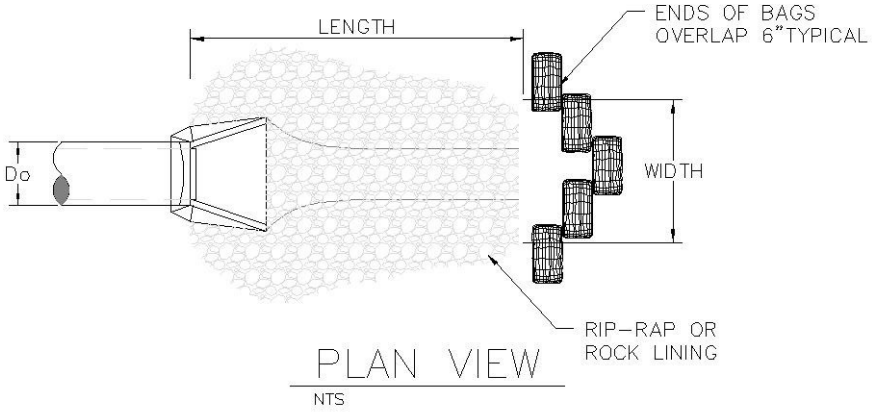
Inspection and Maintenance

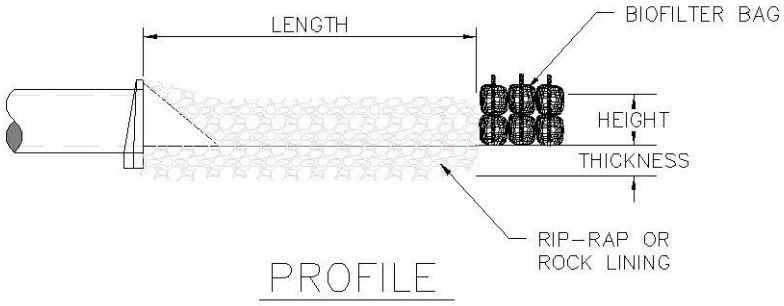
- Inspect once per week on active sites, once every two weeks on in-active sites, and within 24 hours following a 0.5-inch rain event

- If there is scour at the outlet, protect the eroded area by increasing the size of the energy dissipater facility
- Remove accumulated sediment frequently.

Diagram A.2.4

OUTLET PROTECTION





NOTE:
1. BIO BAGS ONLY REQUIRED WHEN DISCHARGING SEDIMENT LADEN WATER.
2. STAKING OF BAGS REQUIRED WITH EITHER METHOD USING (2) 1"x 2" WOOD STAKES OR APPROVED EQUAL PER BAG.

A.2.5 Surface Roughening

Leaving the slopes in a roughened condition after clearing or creating a rough soil surface with horizontal depressions or grooves will trap seed and reduce runoff velocity. Roughening can be accomplished by "track walking" slopes with tracked equipment, by using a serrated wing blade attached to the side of a bulldozer, or by other agricultural equipment.

Advantages

- Grooves trap seed
- Increased vegetation establishment
- Reduces runoff velocity, increases infiltration
- Provides some instant protection from sheet erosion
- Traps soils eroded from the slopes above

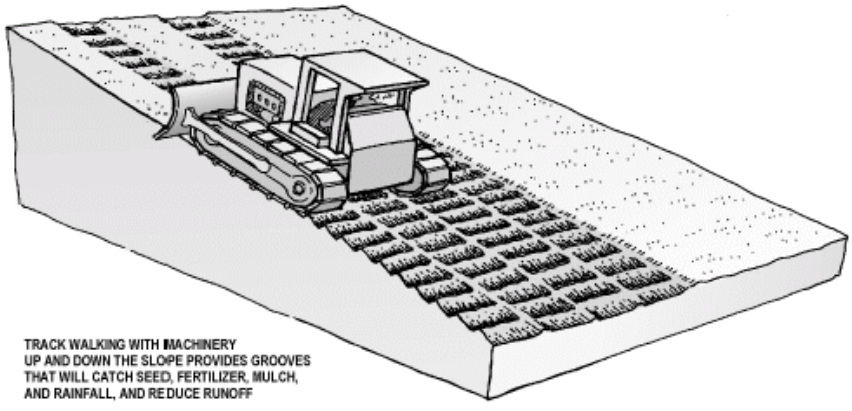
Disadvantages

- Tracking with a bulldozer/heavy equipment may compact the soil
- May increase time to finish slopes
- Should not be relied on as role means of erosion control

Design Criteria

- All slopes to be seeded
- On slopes 3:1 or less, but can be used on steeper slopes in conjunction with the addition of staging sediment barriers.
- Immediately seed and mulch roughened areas to obtain optimum seed germination and growth
- Height of track grousers should be 1 ½ inches or greater
- Tracking should be accomplished by driving equipment up and down slope to create horizontal depressions/grooves

Figure A.2 Surface Roughening



Cut Slope Roughening

- Stair-step grade or groove cut slopes that are steeper than 3:1.
- Use stair-step grading on all erodible material soft enough to be ripped with a bulldozer. Slopes consisting of soft rock with the same subsoil are particularly suited to stair-step grading.
- Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the "step" in toward the vertical wall.
- Do not make individual vertical cuts more than 2 feet high in soft materials or more than 3 feet in rocky materials.
- Groove the slope using machinery to create a series of ridges and depressions that run across the slope, on the contour.

Fill Slope Roughening

- Place fill slopes with a gradient steeper than 3:1 in lifts not to exceed ½ foot, and make sure each lift is properly compacted.
- Ensure that the face of the slope consists of loose, uncompacted fill four to six inches deep.
- Use horizontal grooving along the contour or tracking to roughen the face of the slopes, if necessary.
- Apply seed, fertilizer and straw mulch, and then track or punch the mulch with a bulldozer.
- Do not blade or scrape the final slope face

Cuts, Fills, and Graded Areas

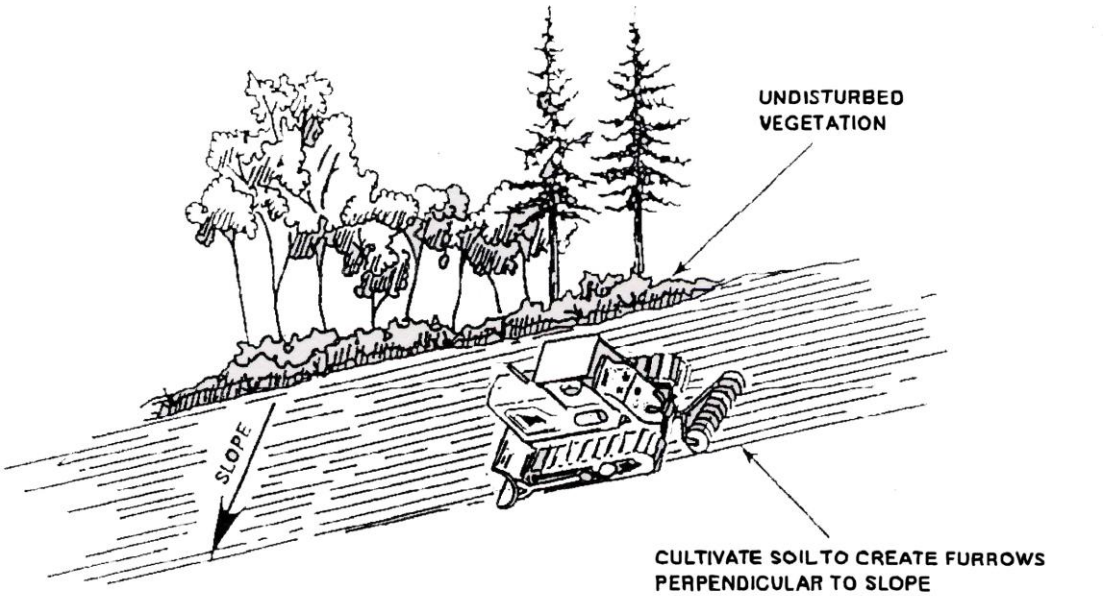
- Make mowed slopes no steeper than 3:1.
- Roughen these areas to shallow grooves by normal tilling, disking, harrowing, or use a cultipacker-seeder. Make the final pass of any such tillage on the contour.
- Excessive roughness is undesirable where mowing is planned.

Inspection & Maintenance

- Inspect once per week on active sites, once every two weeks on in-active sites, and within 24 hours following a 0.5-inch rain event
- Check the seeded slopes for rills and washes. Fill these areas slightly above the original grade, then re-seed, mulch, or mat as soon as possible.

Diagram A.2.5a

SURFACE ROUGHENING – CAT TRACKING



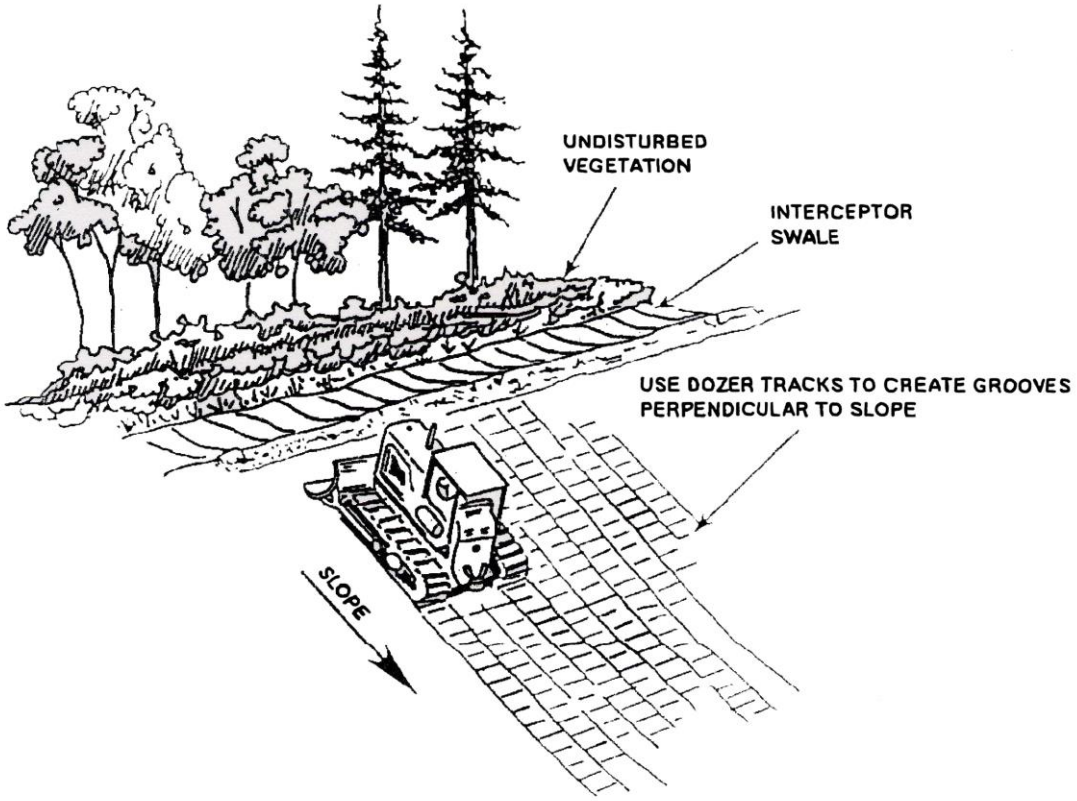
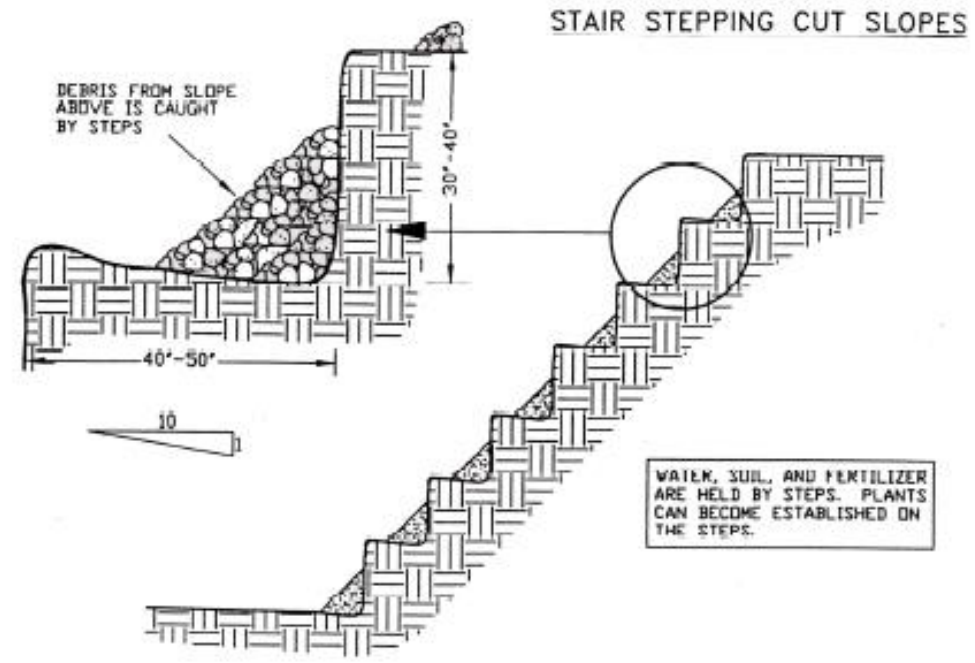
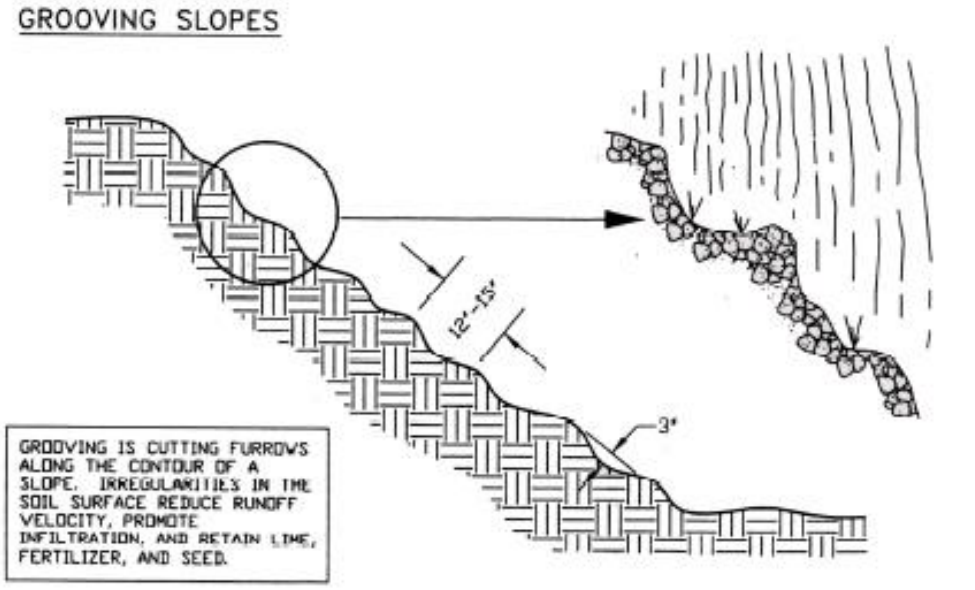


Diagram A.2.5b

SURFACE ROUGHENING – STAIR STEPPING/GROOVING SLOPES





A.2.6 Check Dams

Small dams constructed across a swale or ditch to reduce velocities of concentrated flows, thereby reducing erosion in the swale or ditch. Check dams not only prevent gully erosion from occurring before vegetation is established, but also allow a significant amount of suspended sediment to settle out.

- Check Dams can be constructed from a variety of materials.
  - Rock: Rock material only
  - Bio-filter Bags: Bio-filter bags staked to the ground
  - Sand Bags
  - Pre-fabricated Check Dam System: A manufactured system specifically designed to slow water so that suspended particles settle out. Field fabricated systems are not allowed.

Advantages

- Prevent erosion and promote settling of sediment in runoff
- When carefully located and constructed, check dams may function as permanent installations
- Reduces flow velocity
- Inexpensive and easy to install
- Rock can be spread into ditch and used as a channel lining when the check dam is no longer necessary
- Some pre-fabricated check dams are reusable.

Disadvantages

- Removal may be costly for some types of check dams
- Suitable only for a limited drainage area
- May reduce hydraulic capacity of the channel
- May create turbulence downstream, causing erosion of the channel banks
- Ponded water may kill grass in grass-lined channels
- May be an obstruction to construction equipment

Design Criteria

- Space check dams according to the following table

Table A-7 Spacing for Check Dams

Ditch Grade	Minimum Weir Depth		
	6 inch	**12 inch**	**18 inch**
6%	**	16 feet O.C.	26 feet O.C.
5%	**	20 feet	30 feet
4%	**	26 feet	40 feet
3%	15 feet	33 feet	50 feet
2%	25 feet	50 feet	80 feet

** Not Allowed

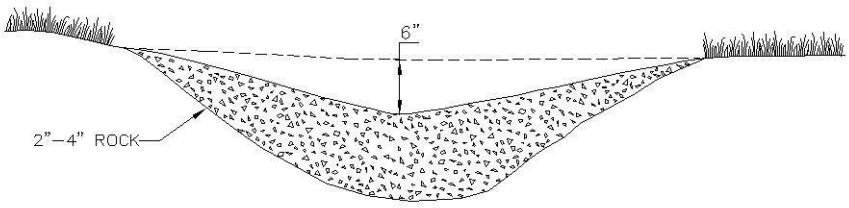
- In temporary or permanent channels not yet vegetated when installing channel lining is not feasible
- In small open channels that drain 10 acres or less
- Not for use in streams or rivers
- Construct rock check dams sized to stay in place given the expected design flow velocity. Typical rock size of three-six-inch. Place rock by hand or by mechanical means rather than dumping the rock.
- Bridge entire ditch or swale width and ensure the center of the dam is six inches lower than the outer ends
- Remove check dams from grass-lined ditches and swales when the grass is established
- Seed, mulch, or mat the area where the check dams were, immediately following removal

<u>Inspection and Maintenance</u>

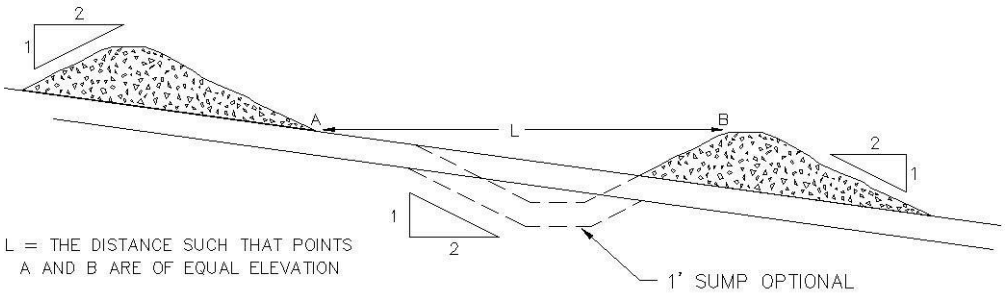
- Inspect once per week on active sites, once every two weeks on in-active sites, and within 24 hours following a 0.5-inch rain event
- Remove sediment once it reaches one-third the depth of the rock weir.
- Replace rock weir when filtering capacity is reduced by one-half.

Diagram A.2.6a

CHECK DAM - ROCK



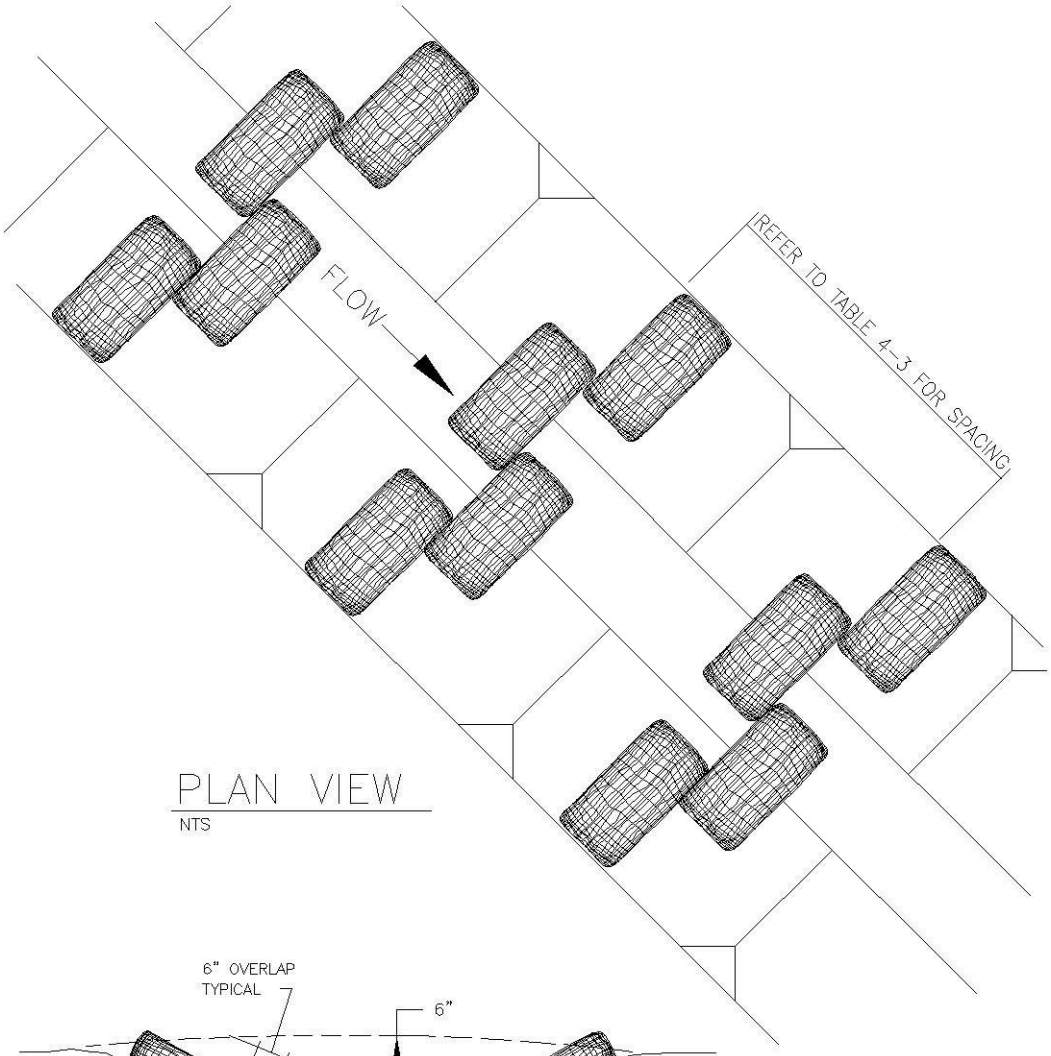
ROCK CHECK DAM



SPACING BETWEEN CHECK DAMS

Diagram A.2.6b

CHECK DAM – BIO FILTER BAG



NOTES:

1. STAKING OF BAGS REQUIRED USING (2) 1"X2" WOOD STAKES OR APPROVED EQUAL PER BAG.
2. SURFACE MUST BE SMOOTH BEFORE APPLICATION.

A.2.7 Diversion Dike/ Swale

A ridge of compacted soil or a lined swale with vegetative lining located at the top, base, or somewhere along a sloping disturbed area. The dike or swale intercepts and conveys smaller flows along low-gradient drainage ways to larger conveyances such as ditches or pipe slope drains or to a stabilized outlet. Dikes and swales may be used singly or in combination with each other.

Advantages

- Provides a practical, inexpensive method to divert runoff
- Can handle flows from large drainage areas
- Use on-site material and equipment to construct

Disadvantages

- If improperly constructed, can contribute to erosion caused by concentrating the flow
- High flow velocity can damage vegetation
- Not effective for preventing illegal discharge

Design Criteria

- Refer to Table 4-10, "Dike Design Criteria" and Table A-11, "Swale Design Criteria."
- Install the dike and/or swale horizontally at intervals across a disturbed slope. Space horizontal interceptor dikes and swales according to Tables A-10 and A-11.
- For slopes of erodible soils, steeper than 2:1 with more than 10 feet of vertical relief, construct benches or shorten distance between dikes or swales.
- If the dike or swale intercepts runoff from disturbed areas, discharge the runoff to a stable conveyance that routes the runoff to a sediment trap or basin.
- If the dike or swale intercepts runoff that originates from undisturbed areas, discharge the runoff to a stable conveyance that will route the runoff downslope of any disturbed areas and release the water at a stabilized outlet.
- May need matting to protect seed bed and channel from erosion.

Inspection & Maintenance

- Inspect once per week on active sites, once every two weeks on inactive sites, and within 24 hours following a 0.5-inch rain event
- Immediately repair damage resulting from runoff or construction activity.
- If the dike or swale regularly overflows, increase the capacity and/or frequency of the dikes/swales.
- Inspect and repair as necessary after every major storm.
- Minimize construction traffic over temporary dikes and swales.
- Clean out clogged pipes (as part of the swale system) under roads.

Table A-8 Diversion Dike Design Criteria

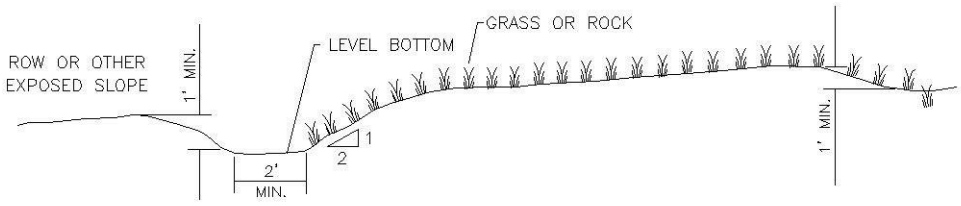
Top Width	24 inch minimum	
Height	20 inch minimum Measured from upslope toe and at a 90% standard proctor compaction ASTM D698.	
Side Slopes	2:1 or flatter	
Grade	Topography Dependent	
Dike grade	Between 0.5-1%	
Slope of Disturbed Area vs. Horizontal Spacing	< 5%	300 feet
	5-10%	200 feet
	10-25%	100 feet
	25-50%	50 feet
Slope Stabilization	<5% Seed and mulch within 5 days following dike construction	
	5-40% Stabilize immediately using either sod or riprap.	
Outlet	Upslope side of dike provides positive drainage to the outlet. Provide energy dissipation as necessary to prevent erosion. Release sediment-laden runoff to a sediment trapping facility.	

Table A-9 Diversion Swale Design Criteria

Bottom Width	24 inch. The bottom should be level across the swale.	
Depth	12 inch	
Side Slopes	2:1 or flatter	
Grade	Maximum 5% with positive drainage to a suitable outlet.	
Slope of Disturbed Area vs. Horizontal Spacing	<5%	300 feet
	5-10%	200 feet
	10-25%	100 feet
	25-50%	50 feet
Slope Stabilization	Temporarily seed or line with riprap 12 inch thick and press into the bank approximately 3-4 inch	
Outlet	Level spreader or riprap to stabilized outlet/sedimentation pond.	

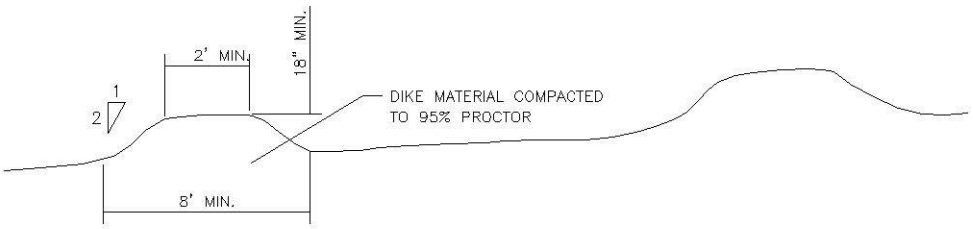
Diagram A.2.7

DIVERSION DIKE / SWALE



BOTTOM WIDTH	2 FEET MINIMUM; THE BOTTOM WIDTH SHALL BE LEVEL
DEPTH	1 FOOT MINIMUM
SIDE SLOPE	2H:1V OR FLATTER
GRADE	MAXIMUM 5 PERCENT, WITH POSITIVE DRAINAGE TO A SUITABLE OUTLET (SUCH AS SEDIMENTATION POND)

DIVERSION SWALE



TEMPORARY DIVERSION DIKE

Slope	Spacing
<5%	300 feet
5–10%	200 feet
10–40%	100 feet

NOTE:
IMMEDIATELY UPON CONSTRUCTION, ESTABLISHED VEGETATION OR EROSION CONTROL BLANKETS ARE REQUIRED.

A.2.8 Grass-lined Swale

A channel with vegetative lining constructed to convey and dispose of concentrated surface runoff without damage from erosion, deposition, or flooding.

Advantages

- Does not generate high velocity runoff and offers temporary slope protection, which is superior to plastic sheeting
- Capture a great deal of sediment due to the filtering effect of vegetation
- Usually easy to install

Disadvantages

- Requires temporary irrigation to establish vegetation
- Cannot be used until vegetation is established

Design Criteria

- As a minimum, grass-lined channels should carry a peak runoff from a 10-year storm event without eroding. Where flood hazards exist, increase the capacity according to the potential damage. The allowable design velocity for grassed-lined channels is based on soil conditions, type of vegetation, and the method of establishment. The channel shape may be parabolic, trapezoidal, or v-shaped, depending on the need and site conditions. Small check dams or flow spreaders may be necessary to minimize channelization.

Inspection and Maintenance

- Inspect once per week on active sites, once every two weeks on inactive sites, and within 24 hours following a 0.5-inch rain event
- During the initial establishment, grass-lined channels should be repaired and grass re-established if necessary.
- After grass has become established, the channel should be checked periodically to determine if the channel is withstanding flow velocities without damage.
- Check the channel for debris, scour, or erosion and immediately make repairs. It is particularly important to check the channel outlet and all road crossings for bank stability and evidence of piping or scour holes and make repairs immediately.
- Remove all significant sediment accumulations to maintain the designed carrying capacity.
- Keep the grass in a healthy, vigorous condition at all times, since it is the primary erosion protection for the channel.
- Permanent grassed waterways should be seasonally maintained by mowing and/or irrigating, depending on the type of vegetation selected.
- Newly seeded areas need to be inspected frequently to ensure the grass is growing.
- If the seeded area is damaged due to runoff, additional stormwater measures such as check dams or matting may be needed.

A.3 Sediment Control Practices

Once soil erosion occurs, sediment trapping or removal techniques can reduce the amount of sediment and associated pollutants that leave the site, thus protecting nearby streams, wetlands, and lakes. Sediment controls are usually placed around the perimeter of a disturbed area and where concentrated water leaves the site and are designed to slow down the velocity of runoff and settle out sediment. Sediment control BMPs should be in place before land clearing and grading begins. It is important to note that sediment controls, if poorly maintained, can become sources of sediment and other pollutants during larger storms. Table A-10 lists the sediment control BMPs described in this section.

Table A-10 Sediment Control BMPs

BMP #	BMP APPLICATION	DESCRIPTION	Page #
A.3.1	Sediment Fence	Entrenched geotextile fabric supported by stakes	54
A.3.2	Biofilter Bags	Elongated plastic net bags filled with 100% recycled wood	57
A.3.3	Sandbags	Tightly woven Geotextile fabric bags filled with packed sand	59
A.3.4	Filter Berm	Compacted gravel or crushed rock berm	60
A.3.5	Wattles	Elongated, tubular plastic netting filled with straw, coconut, or other material	61
A.3.6	Sidewalk Subgrade Gravel Barrier	Depressed area to capture runoff	63
A.3.7	Inlet Protection	Controls surrounding storm inlets	65
A.3.8	Dewatering	Gravity or pressure infiltration system	72
A.3.9	Sediment Trap	Small ponding area, with a rock weir or perforated riser pipe at the outlet	74
A.3.10	Sediment Basin	Basin with inflow points, baffles, wet and dry storage, a riser pipe, dewatering device, and an emergency overflow spillway.	77

A.3.1 Sediment Fence

Temporary sediment trap consisting of an entrenched geotextile stretched across and attached to supporting posts. Sediment fences are adequate to treat flow depths consistent with overland or sheet flow. Standard or heavy-duty sediment fence fabric must meet specific ASTM requirements, outlined in Table A-13.

Advantages

- Reduces runoff velocity
- Requires minimal ground disturbance to install
- Relatively inexpensive

Disadvantages

- Applicable to small drainage areas and overland flow; not applicable to concentrated flows
- Incorrect geotextile or installation decreases sediment fence performance
- Requires frequent maintenance and inspection

Design Criteria

- See Table A-13 for Sediment Fence Fabric Specifications
- Show sediment fence installed along ground contours according to Table A-12

- Sediment fence should only be used for sheet and rill erosion
- Standard or heavy-duty sediment fence filter fabric shall have manufactured stitched loops with 2" × 2" × 4' posts. Stitched loops shall be installed on the uphill side of the sloped area.
- Sediment fences should be installed a minimum of 3 feet from toe of slope in order to maximize storage.
- A trench should be excavated 6 inches deep along the line of the posts.
- Trench should be backfilled, and the soil compacted on both sides of the sediment fence.
- Posts should be spaced a maximum of 6 feet apart and driven securely into the ground a minimum of 12 inches.
- When sediment fence approaches its termination point, turn fence uphill and extend one full panel (6 ft.).
- When joining two or more sediment fences together, join the two end stakes by wrapping the two ends at least one and one half turns and driving the joined stakes into the ground together.
- Height of a sediment fence should not exceed 3 feet. Storage height and ponding height should never exceed 1.5 feet.

Table A-11 Barrier Spacing for General Application of Sediment Fence

BARRIER SPACING FOR GENERAL APPLICATION

INSTALL PARALLEL ALONG CONTOURS AS FOLLOWS		
% Slope	Slope	Maximum Spacing on Slope
10 % Flatter	10:1 or Flatter	300 ft.
10 > % < 15	10:1 > x < 7.5:1	150 ft.
15 > % < 20	7.5:1 > x < 5:1	100 ft.
20 > % < 30	5:1 > x < 3.5:1	50 ft.
30 > % < 50	3.5:1 > x < 2:1	25 ft.

Table A-12 Sediment Fence Fabric Specifications

WOVEN POLYPROYLENE SEDIMENT FENCE FABRIC

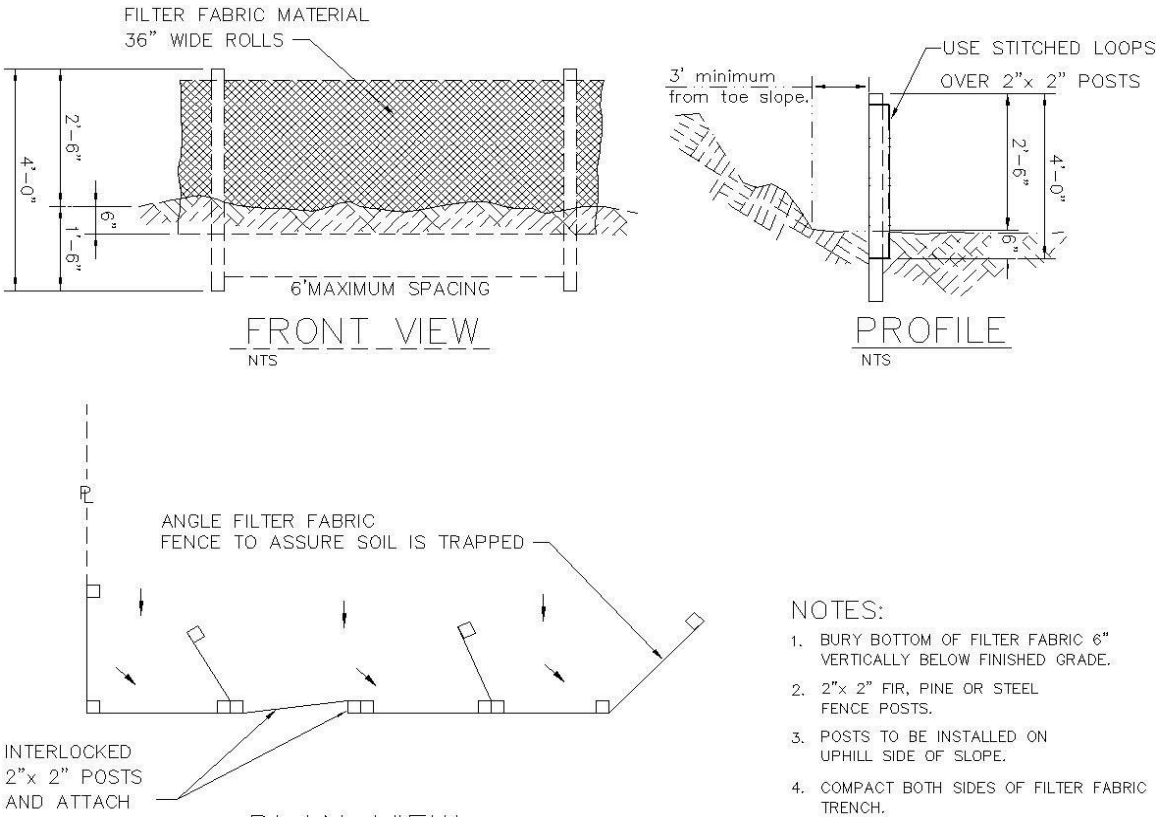
PROPERTY	TEST PROCEDURE	MINIMUM FABRIC VALUE
Grab Tensile Strength	ASTM D-4632	180 lbs.
Grab Elongation	ASTM D-4632	15%
Trapezoid Tear	ASTM D-4533	70 lbs.
Mullen Burst	ASTM D-3786	300 psi
Puncture	ASTM D-4833	80 lbs.
Permittivity	ASTM D-4491	.07 sec -1
Permeability	ASTM D-4491	.005 cm/sec
Apparent Opening Size (AOS)	ASTM D-4751	50 U.S. Sieve
UV Resistance (500 hrs.)	ASTM D-4355	90%

Inspection & Maintenance

- Inspect once per week on active sites, once every two weeks on inactive sites, and within 24 hours following a 0.5-inch rain event
- Immediately repair any damage.
- Remove accumulated sediment once it has reached ⅓ the height of the sediment fence or 1 ft. maximum.
- Inspect for channel formation parallel to the fence, which indicates the geotextile is acting as a flow barrier.
- Replace deteriorated or clogged geotextile.
- Check for under cutting or piping under fence.

Diagram A.3.1

SEDIMENT FENCE



A.3.2 Biofilter Bags

Biofilter bags are manufactured from 100 percent recycled wood-product waste placed in plastic mesh bags.

Advantages

- Relatively low cost
- Can be used in place of sediment fences at toe of slope, without trenching in
- Wood-product can be recycled or used on site when no longer needed
- Installation is simple, can be done by hand
- Bags are easy to move, replace, and reuse on paved surfaces
- Are good short-term solution in situations where concentrated flows are causing erosion.

Disadvantages

- Generally effective for only a few months
- Can be easily damaged by construction equipment or by traffic in paved areas
- Can become clogged with sediment and cease to filter runoff
- If improperly installed can allow undercutting or end-flow
- Not effective where water velocities or volumes are high
- Light weight results in higher buoyancy if not properly installed
- Low sediment retention capacity may require frequent maintenance

Design Criteria

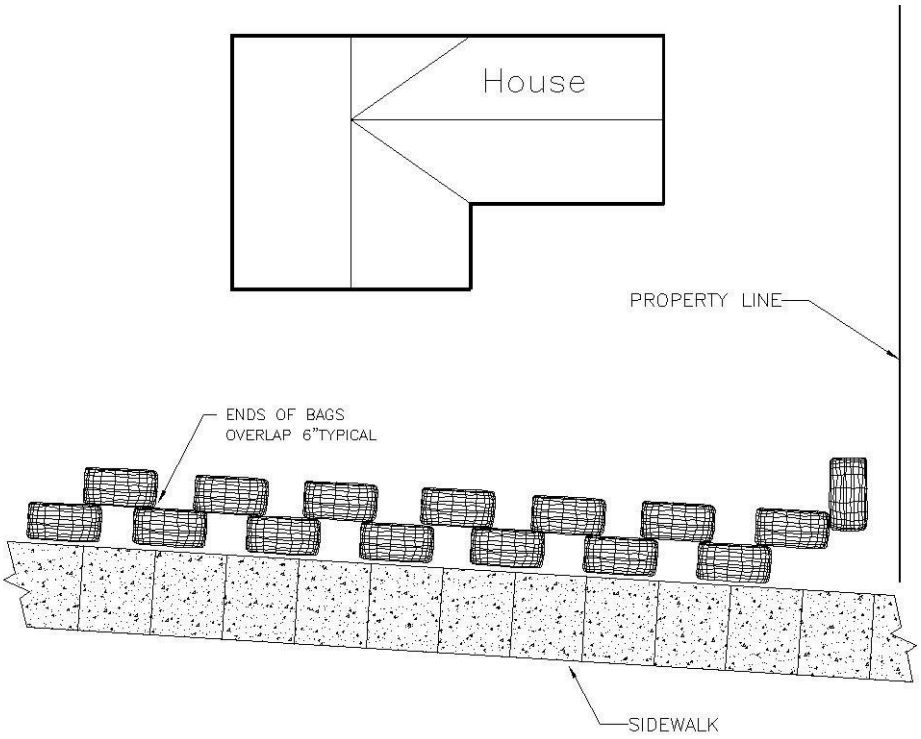
- Bio-filter bags should be clean 100 percent recycled wood product waste. Standard size 10 × 8 × 30 inches, weight approximately 45 pounds, with ½-inch plastic netting
- May be left in place or used as mulch once they have served their purpose
- Surface area should be smooth
- Use (2) 1 × 2 inch stakes per bag, driven 12 inches into ground.
- Ends of bags must be overlapped six inches to prevent piping between joints.

Inspection and Maintenance

- Requires routine inspection
- Check that stakes are secure and ends of bags are tightly overlapped. Check that undercutting or end-flow is not occurring.
- Inspect plastic mesh bags for tears
- Remove sediment when 1/3 height of bag has accumulated
- Replace damaged bags as needed.

Diagram A.3.2

BIOFILTER BAGS



PLAN VIEW

NTS

NOTE:

1. STAKING OF BAGS REQUIRED USING (2) 1"x 2" WOOD STAKES OR APPROVED EQUAL PER BAG.
2. BAGS ARE USED AS ALTERNATE FOR SEDIMENT FENCE FOLLOWING INSTALLATION OF SIDEWALK ON SINGLE FAMILY CONSTRUCTION ONLY.

A.3.3 Sandbags

Sandbags are manufactured from durable, weather-resistant, tightly-woven, Geotextile fabric material sufficient to prohibit leakage of the filler material. The bags should measure 24 × 12 × 6 inches and be filled with firmly packed sand weighing at least 75 pounds.

Advantages

- Relatively low cost
- Installation is simple, can be done by hand
- Bags are easy to move, replace, and reuse on paved surfaces
- Are good short-term solution in situations where concentrated flows are causing erosion
- Can be used to divert and slow velocity of small flows
- Can be used in concrete lined ditches to capture sediment and reduce water velocity

Disadvantages

- Generally effective for only a few months
- Can be easily damaged by construction equipment or by traffic in paved areas
- Can contribute sediment to runoff if bags rupture
- Cannot be staked and are not appropriate on steep slope applications
- Not effective in steep swales, channels, or ditches
- If improperly installed can allow undercutting or end-flow
- Not effective where water velocities or volumes are high, can get washed away

Design Criteria

- Generally used in ditches and/or swales as a check dam
- Can be used on highway or road projects to divert run-off
- Ends of bags must be tightly abutted and overlapped to direct flow away from bag joints

Inspection and Maintenance

- Inspect once per week on active sites, once every two weeks on in-active sites, and within 24 hours following a 0.5-inch rain event
- Check that ends of bags are tightly abutted. Check that undercutting or end-flow is not occurring.
- Remove sediment accumulated behind bags when sediment reaches one-third of the barrier height.
- Replace damaged bags as needed.

A.3.4 Filter Berm

Sediment is retained in gravel or crushed rock berm.

Advantages

- Very efficient method for sediment removal.
- Reduces runoff velocity.

Disadvantages

- More expensive than some other measures because requires clean gravel or crushed rock rather than materials found onsite.
- Clogging from mud and soil may make maintenance difficult.
- Has a limited lifespan.

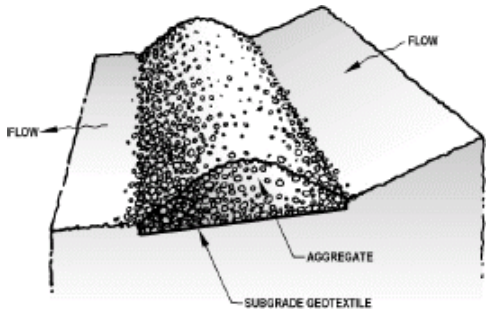
Design Criteria

- Use two-inches maximum washed and well-graded gravel or crushed rock with less than five percent fines.
- Berm Dimensions:
  - Height and side slopes: one-foot high with 3:1 side slopes
  - Length: Eight feet per one cubic foot per second flow, based on the peak flow for the 10-year storm.
  - If used as slope application, use Table A-12 for spacing.
  - Used primarily as a base measure (toe of slope)

Inspection and Maintenance

- Inspect once per week on active sites, once every two weeks on in-active sites, and within 24 hours following a 0.5-inch rain event
- Remove and replace rock when filtering capacity is reduced by half to maintain performance.
- Removed sediment accumulation when it reaches one-third of the barrier height.

Figure A.3 Filter Berm



A.3.5 Wattles

Wattles are manufactured from straw, coconut, or other material wrapped in tubular plastic netting. They are approximately eight- to nine-inches diameter by seven to 25 feet long. Wattles are placed in shallow trenches and staked along the contour of newly constructed or disturbed slopes.

Advantages

- They can often replace sediment fences on steep slopes
- Wattles store moisture for vegetation planted immediately upslope
- May be left in place to biodegrade and/or photodegrade, adding organic material to the soil
- Reduces runoff velocity
- Light weight and easy to install

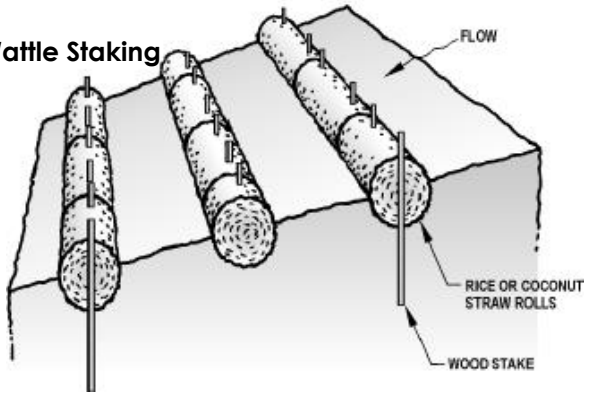
Disadvantages

- Wattles only function for one or two seasons.
- If not installed properly with sufficient trench, wattles may fail during the first rain event
- Wattles may require maintenance to ensure the stakes are holding and the wattles are still in contact with the soil. This is especially true on steep slopes in sandy soil.
- Low sediment retaining capacity may require frequent maintenance

Design Criteria

- Wattles can be made from straw, coconut, or other approved material.
- Slope requires minor preparation prior to installation.
- Rills and shallow gullies should be smoothed as work progresses.
- Wattles should be installed on contours. Trench should be deep enough to accommodate half the thickness of the wattle.
- Wattles should be installed from the bottom of the slope up.
- Wattle must be tight against the soil with no gaps between the soil and the wattle in the trench.
- If live willow stakes are installed, use a straight bar to drive holes through wattles.
- Stakes must be driven a minimum of 12 inches into undisturbed material.
- Install stakes every four feet. Additional stakes may be needed on highly erosive or very steep slopes.

FigureA.4 Wattle Staking

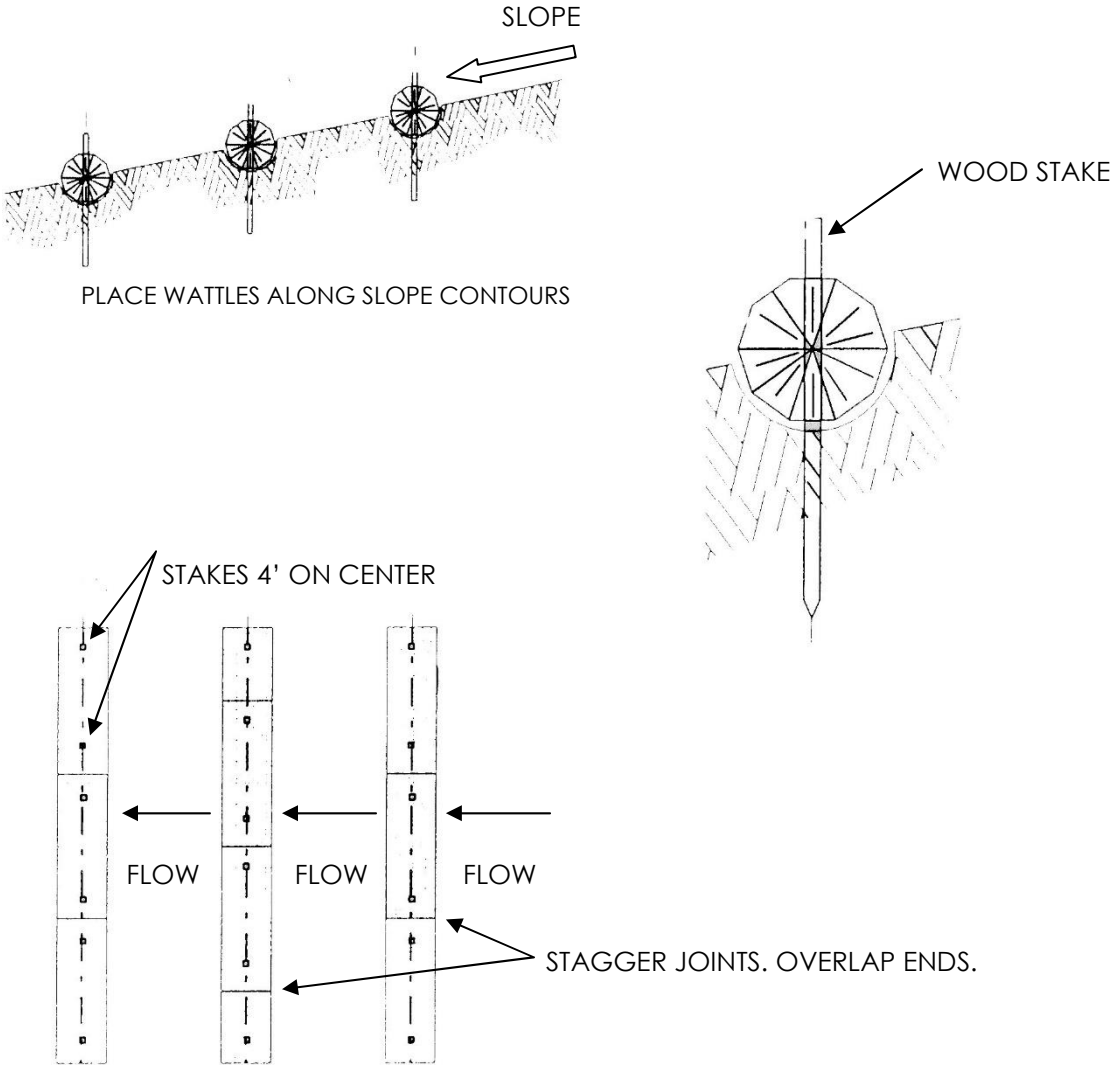


Inspection and Maintenance

- Inspect once per week on active sites, once every two weeks on in-active sites, and within 24 hours following a 0.5-inch rain event
- Make sure the wattles are in contact with the soil.

Diagram A.3.5

WATTLES



PLAN VIEW

A.3.6 Sidewalk Subgrade Gravel Barrier

A sidewalk sub-grade gravel barrier is an application that provides storage and filtration from run-off on sites with mild slopes. It can be used on all types of projects but generally on single family dwellings. Normal installation occurs when excavating for footing and foundation.

Advantages

- Easy to install
- Very economical
- Can retain suspended soils

Disadvantages

- May require additional measure depending upon soil type
- May need periodic maintenance for removal of suspended materials
- May not be an adequate sediment barrier for steep lots or concentrated flows

Design Criteria

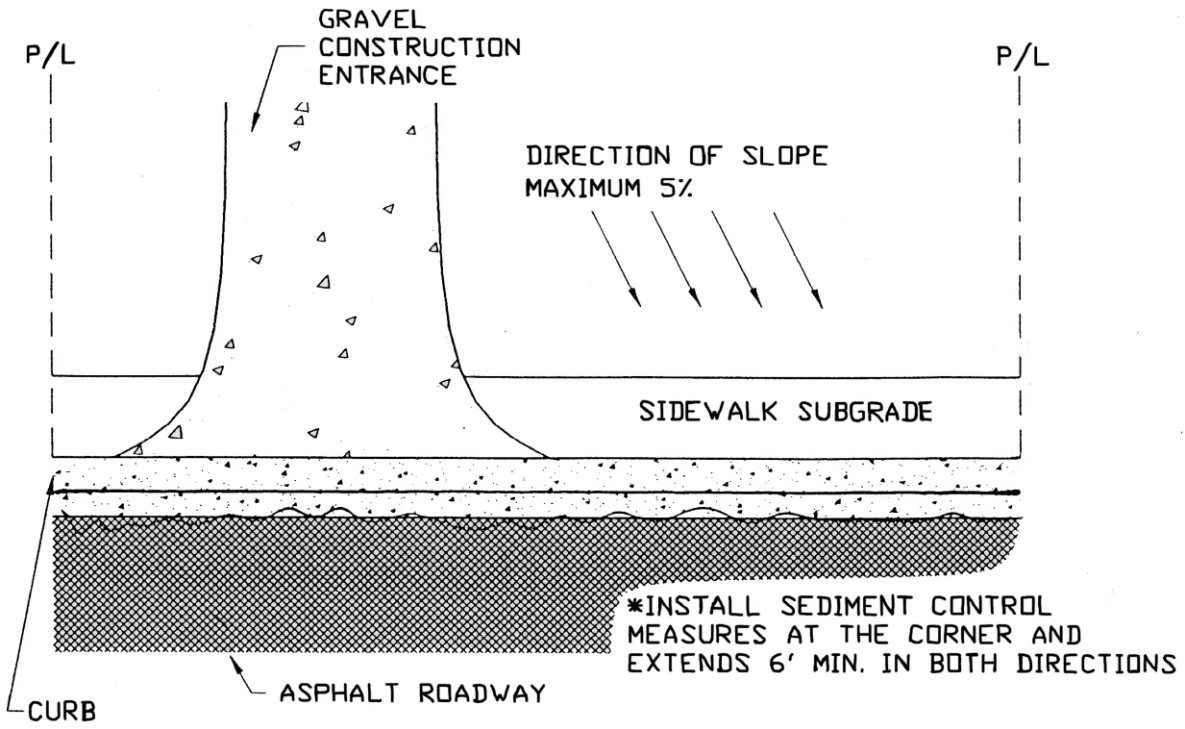
- Install where the site slopes to a street with curbs and slopes are five percent or less
- Plug all weep holes in curb
- Sidewalk sub-grade must have a minimum four-inch depth and a four-foot width.
- A two-inch layer of approved sub-base material must be installed
- A gravel filter berm may be installed along the inside edge, or toe of slope to increase filtration
- Install sediment barrier on the downhill corner of property to intercept run-off
- On development sites, install sidewalk sub-grade as part of post construction
- On single family sites, install as part of the footing/foundation excavation
- If sidewalk concrete is to be poured prior to establishment of permanent site cover, approved sediment barriers must be installed prior to pouring sidewalk
- Sidewalk construction is required to conform to the City of Millersburg *Standard Construction Specifications*, in addition to measures undertaken in this section.

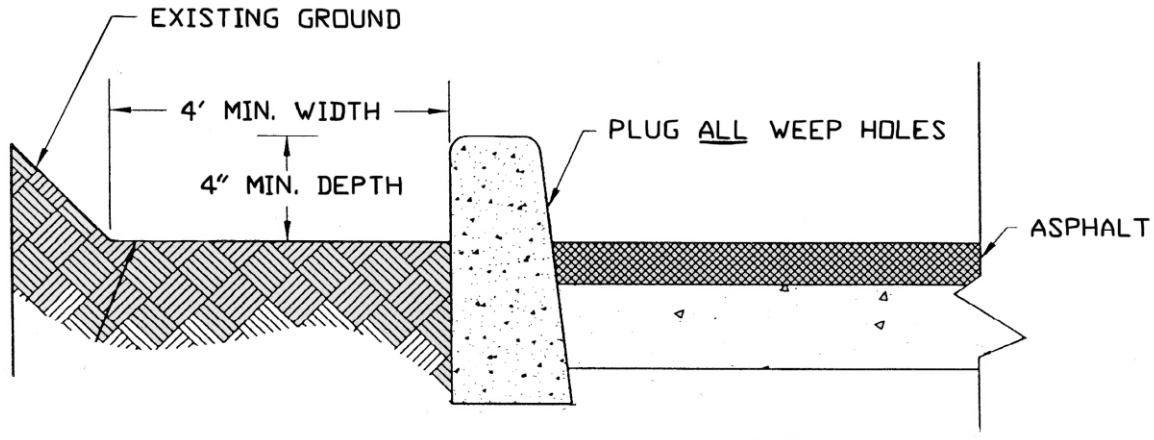
Inspection and Maintenance

- Inspect once per week on active sites, once every two weeks on in-active sites, and within 24 hours following a 0.5-inch rain event
- Remove and replace gravel when filtering capacity is reduced by half, to maintain performance

Diagram A.3.6

SIDEWALK SUBGRADE GRAVEL BARRIER





A.3.7 Inlet Protection

This BMP prevents coarse sediment from entering the storm drainage system by filtering runoff and retaining sediment before it reaches a drainage inlet or the storm sewer system. There are many options and variations of inlet protection available.

Advantages

- Prevents sediment from entering the storm drain system
- Reduces amount of sediment leaving the site

Disadvantages

- May result in ponding of water above the catch basin
- Sediment removal may be difficult under high-flow conditions
- May result in a traffic hazard
- Short-circuiting of flow may occur if not properly installed
- Useful only for low flows having low sediment loading
- Improper installation, maintenance, or removal may introduce sediment into the storm drain system

Design Criteria

- Place inlet protection in areas where water can pond, and where ponding will not have adverse impacts.
- Inlet protection must allow for overflow in a severe storm event.
- Addition measures must be considered depending upon soil type.
- Inlet protection types include:
- Type 1 – Rock and wire mesh
- Type 2 – Masonry and rock
- Type 3 – Sediment fence
- Type 4 – Biofilter bags
- Type 5 – Catch basin insert

Inspection and Maintenance

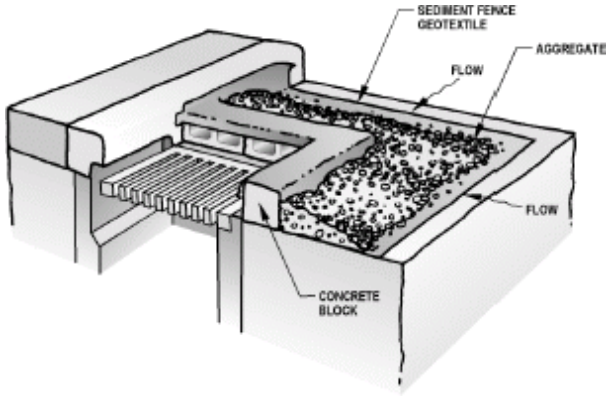
- Inspect once per week on active sites, once every two weeks on in-active sites, and within 24 hours following a 0.5-inch rain event
- Clean inlet protection during and after each significant storm and remove sediment from behind structure after every storm.
- If the rock becomes clogged with sediment, it must be carefully removed from the inlet and either cleaned or replaced.
- Assess the impacts of allowing water to pond at the inlet and provide an overflow weir or some other type of relief as needed.
- Consider the effect of placing obstructions at inlets on grade may have on their efficiency.
- Use mechanical means to remove sediment deposits (shovel, broom,

sweeper/vactor unit.

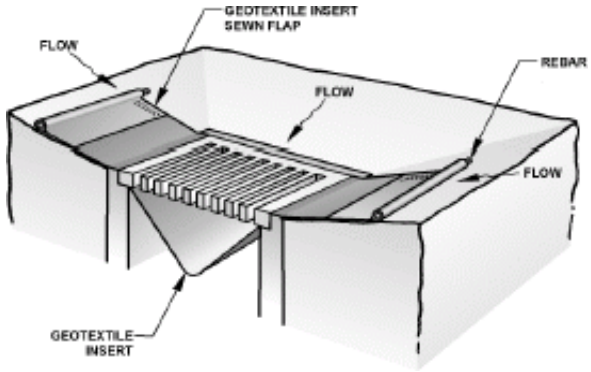
- Remove sediment accumulated on or around the protection as needed to maintain intended functions.
- Repair or replace materials as needed to ensure proper functioning.

Figure A.5 Inlet Protection Options

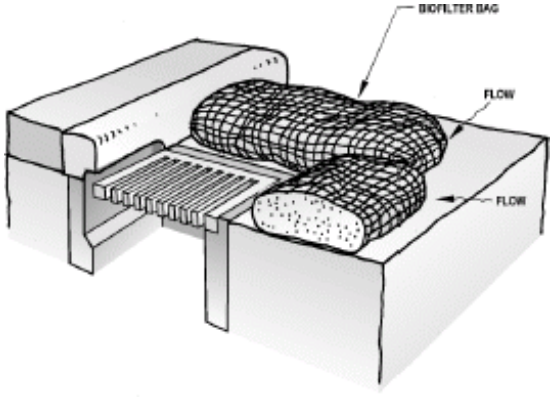
Masonry / Aggregate
Type 2



Prefabricated Filter Insert
Type 5



Biofilter Bags Around Catch Basin
Type 4



Biofilter Bags Around Area Drain
Type 4

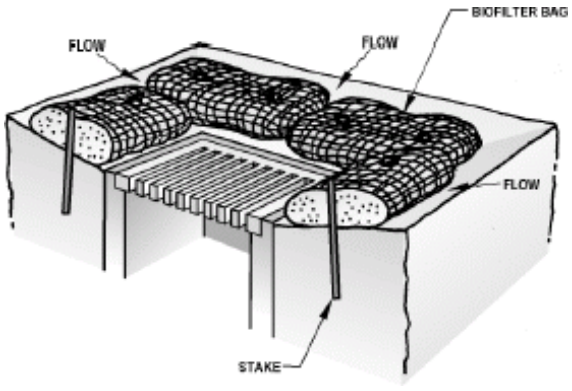
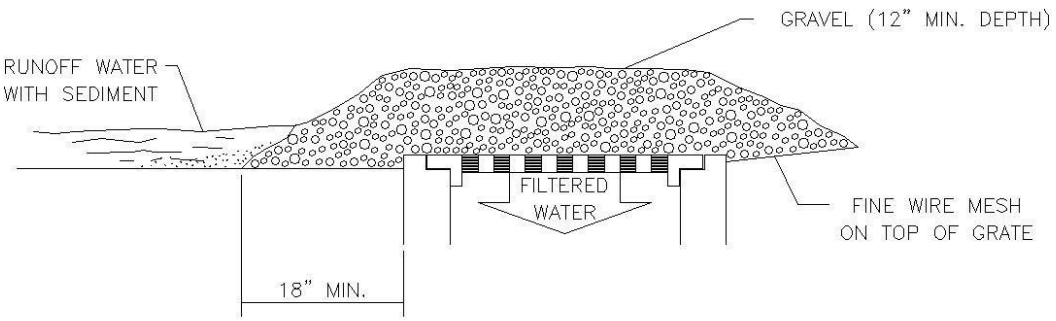


Diagram A.3.7a

INLET PROTECTION TYPE 1



GRAVEL & WIRE MESH

Diagram A.3.7b

INLET PROTECTION TYPE 2

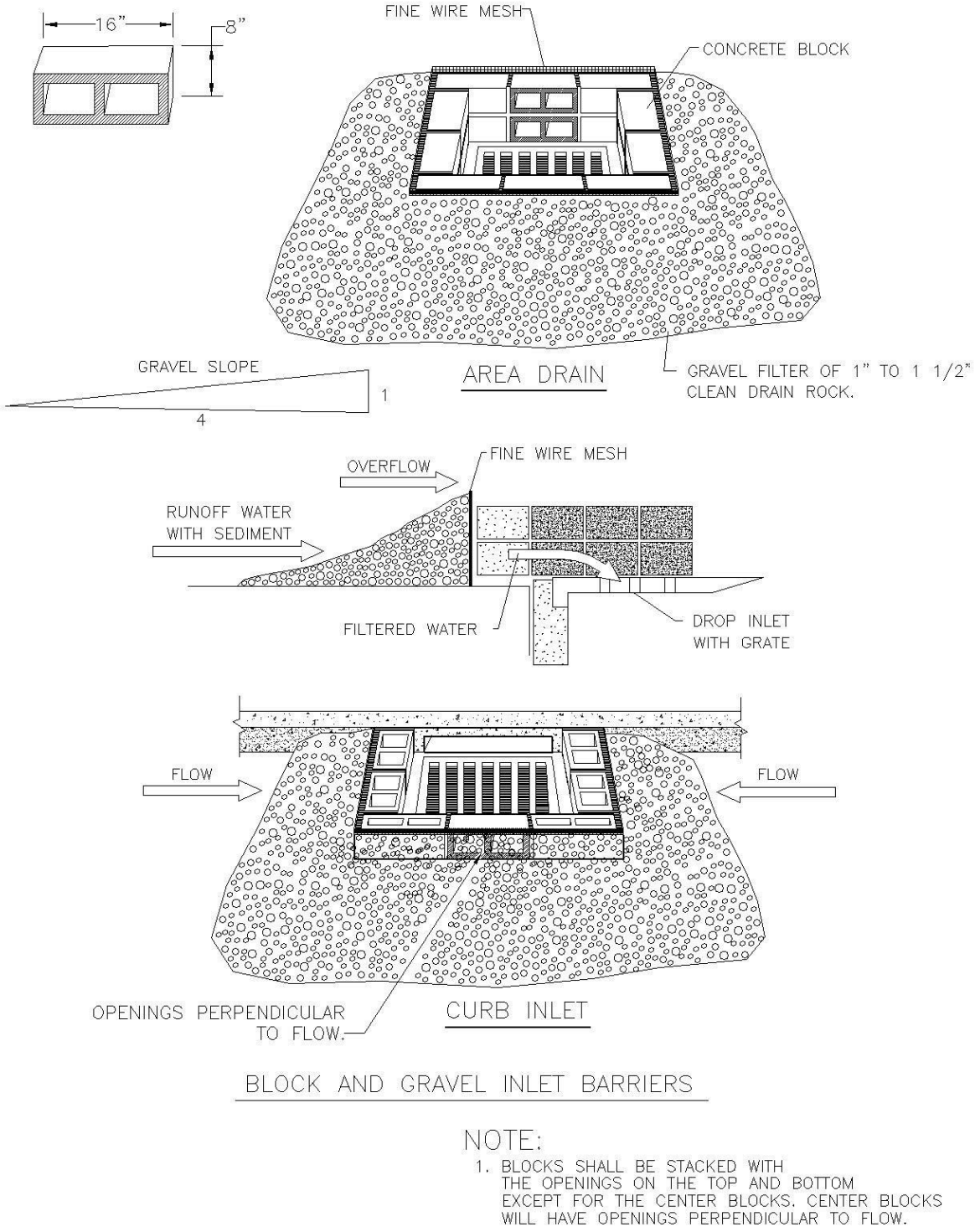
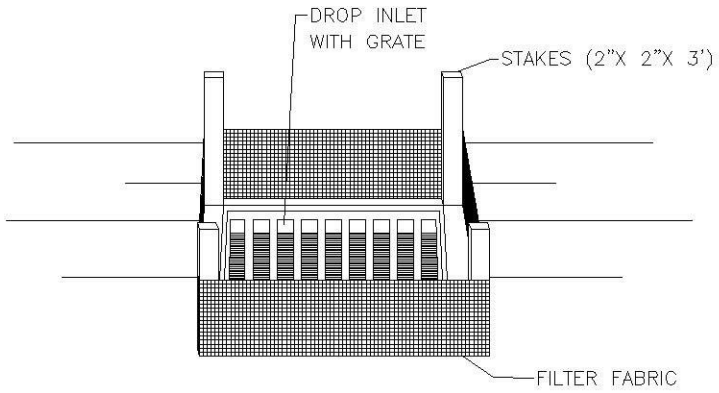
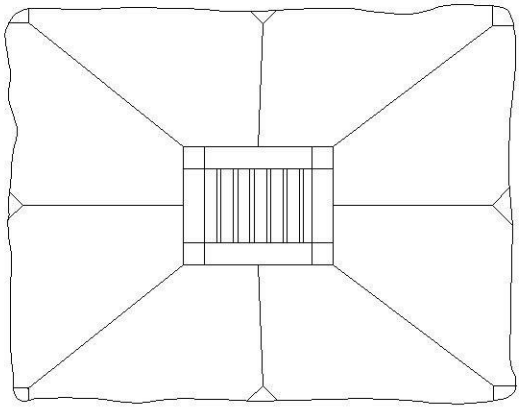


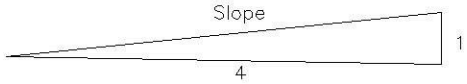
Diagram A.3.7c

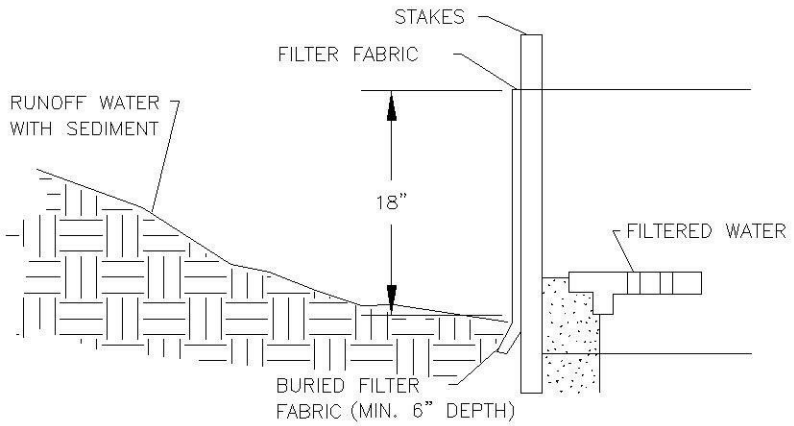
INLET PROTECTION TYPE 3





PLAN VIEW
Slope 4:1

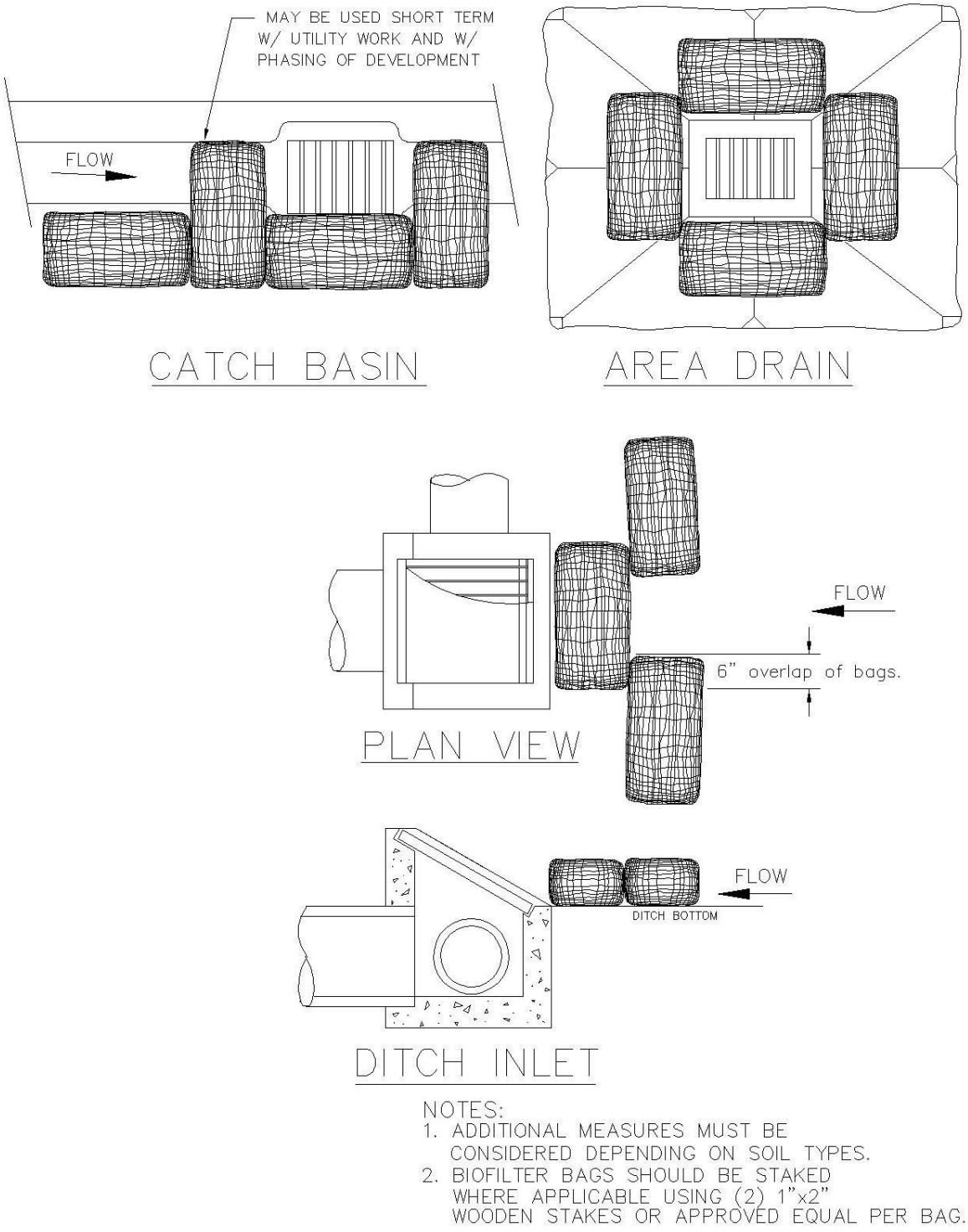




PROFILE

Diagram A.3.7d

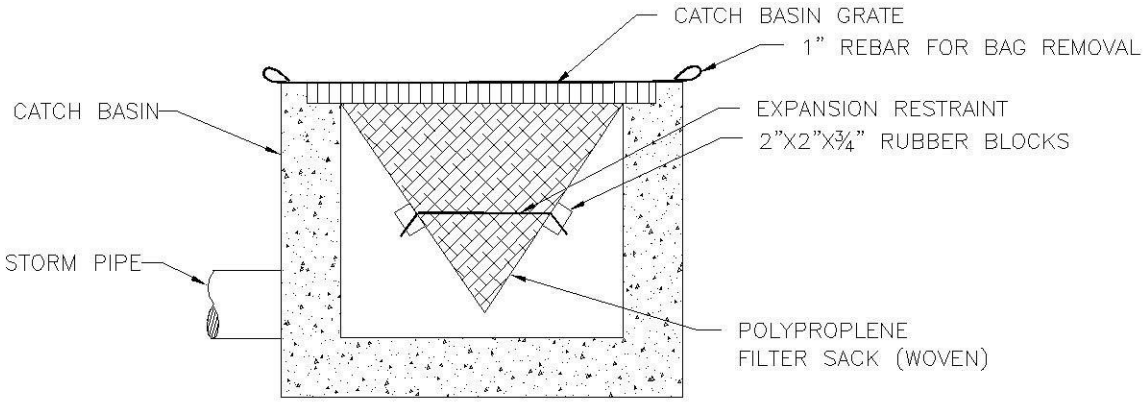
INLET PROTECTION TYPE 4



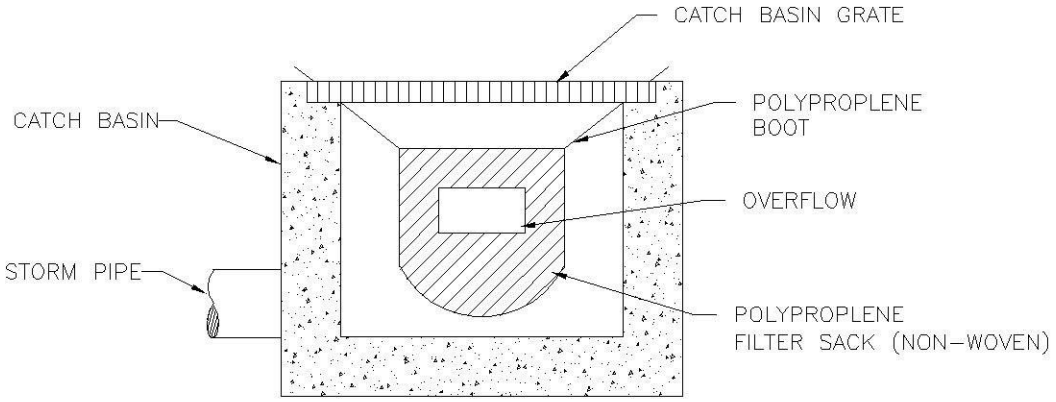
NOTES:
1. ADDITIONAL MEASURES MUST BE CONSIDERED DEPENDING ON SOIL TYPES.
2. BIOFILTER BAGS SHOULD BE STAKED WHERE APPLICABLE USING (2) 1"x2" WOODEN STAKES OR APPROVED EQUAL PER BAG.

Diagram A.3.7e

INLET PROTECTION TYPE 5



WOVEN POLYPROPLENE SACK



NON–WOVEN POLYPROPLENE SACK

NOTE:
1. RECESSED CURB INLET CATCH BASINS MUST BE BLOCKED WHEN USING FILTER FABRIC INLET SACKS. SIZE OF FILTER FABRIC INLET SACKS TO BE DETERMINED BY MANUFACTURER.

A.3.8 Dewatering

Temporary settling and/or filtering devices for water which is discharged from dewatering operations. Filtration is the separation of sediment from a fluid by passing the fluid through a permeable medium that will trap a high percentage of the particles. This is not a new concept; it has been employed in all types of industries, for various type of liquids, including water. The equipment necessary for filtration applications associated with water containing sediment would be weir tanks, gravity boxes, non-contained sediment bags, sand media filtration, and bag/cartridge chambers. There are two types of filtration systems, gravity and pressure.

Advantages

- Excellent for utility work such as repairs, replacements, or new installations
- Depending upon the choice of filtration systems, can remove small particles of silt and clays
- Can be used as an alternate to sediment trap/basin on smaller sites
- Can hold large amounts of sediment which reduces overall maintenance
- Can be used in conjunction with other types of filters as a pre-filter
- Can be easily mobilized from site to site

Disadvantage

- Limited storage capacity depending upon the site
- Have limitations in removing silts and clays, depending upon selection
- May require heavy equipment to load and unload system
- May be cost inhibitive

Design Criteria

- Determine soil type prior to selecting type of Dewatering system.
- Select an appropriate location that will reduce overall impacts.
- Weir tanks, Filter Boxes are effective for removal of large particles such as sand.
- Sand Media Filters are effective for removal of smaller particles such as sand and silt.
- Filter bags can remove large particles until fabric pores start to fill in or cake over, then filter capacity increases to smaller sand and silt.
- Filter bags should be placed in a heavily vegetated area to increase their efficiency.
- Cartridge Filter Units will remove smaller particles such as silt and clay.
- Rock Berms, Bio-filter Bags, or Sediment Fence shaped in a half circle and stages in a series of three can be installed as an alternate, or in conjunction with other systems.

Inspection and Maintenance

- Ongoing inspection is necessary to detect any malfunctions or operation of

equipment.
- Periodic inspection of discharge areas.
- Remove sediment when it reaches 1/3 capacity of a sediment barrier.
- Material must be placed in an approved location on site or exported from site.

A.3.9 Sediment Trap

A sediment trap consists of a small, temporary ponding area, with a rock weir or perforated riser pipe at the outlet, formed by excavation or by constructing a weir. The sediment trap serves drainage areas five acres and smaller. They are a retention structure designed to remove sediment from runoff by holding a volume of water for a length of time, allowing particles 0.02 mm and large to settle out. Sediment retention should be used as a last line of defense when included in a ESCP and never used by itself.

Combining with Permanent Drainage Facilities

- If a project includes a permanent stormwater retention/detention pond, the rough-graded or final-graded facility could function as a trap during construction. Design features of the permanent structure, such as surface area, retention time, and outlet control, should meet the design requirements of the temporary facility. Completion of the permanent facility should occur only when all upstream control structures are in place and stabilization of contributing drainage areas is complete.
- If a project includes an infiltration facility, the roughly excavated facility could be used as a trap or basin providing the facility provides the surface area and retention time required by the trap or basin. Excavate the sides and bottom of the facility to a minimum of three feet above final grade with a backhoe working at "arm's length" to minimize disturbance and compaction of the infiltration surface.
- Additionally, any required pretreatment facilities should be fully constructed prior to any release of sediment-laden water to the facility. Pretreatment and shallow excavations are intended to prevent the clogging of soil with fines.

Advantages

- Protects downstream riparian properties from sediment deposits
- Prevents reduced downstream capacity due to sediment deposition in a stream channel
- Prevents clogging of downstream facilities
- Removes particles up to medium silt size (0.02 mm)
- Surface water conveyances can be connected to the facility as site development proceeds. The designer may want to route surface water collected from disturbed areas of the site through a sediment trap prior to release from the site.

Disadvantages

- May become an attractive nuisance. Care must be taken to adhere to all safety practices.
- Maintenance and sediment removal is essential for adequate performance
- Serves limited areas
- Does not reduce turbidity resulting from fine silts and clays in runoff. Traps are more effective when used in conjunction with other measures such as seeding and mulching.

Design Criteria

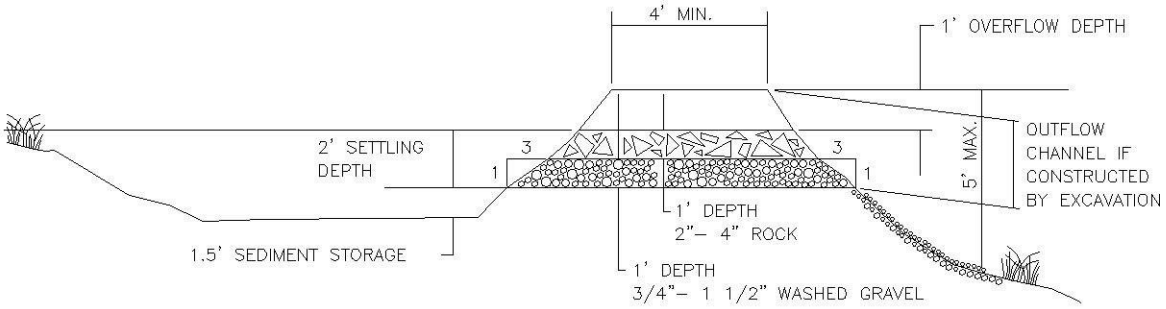
- Construct prior to any upslope clearing and grading
- Locate in a low area where the trap will intercept all or most of the runoff from the disturbed area before it enters a waterway, considering safety in case structure fails.
- Locate the trap so that it is readily accessible for maintenance
- Provide for diversion dikes and ditches, as needed, to collect and divert water toward the trap. Sediment storage volume can be calculated using the USLE assuming a minimum one-year sediment accumulation period for design purposes. To convert tons of sediment as calculated to cubic feet, multiply 0.05 tons per cubic foot.
- Determine the bottom surface area of the sediment trap using the calculated sediment volume and the maximum 1½ depth.
- Determine the total trap dimensions by adding an additional two feet of depth for settling volume (before overtopping of spillway) above the sediment storage volume, while not exceeding 3:1 side slopes.
- Design the trap with a level bottom, 3:1 or flatter side slopes and a L:W ratio of 3.
- Construct the trap as the first step in the clearing and grading of the site.
- Form the trap by excavation or by construction of compacted embankment. If the trap is formed by embankment, the designer should note that dam safety regulation may apply to heights exceeding five feet. The embankment should be stabilized using a cover method such as seeding, mulching, or erosion control matting.
- Water temperature in the trap may be too high for direct release. Always moderate the water temperature before it drains into a lake, stream, wetland, or waterway. Whenever possible, release the trap discharge onsite onto a relatively level, densely grassed area at least 50 feet from a waterway or wetland.
- Evaluate the release areas on a site-by-site basis to determine appropriate locations for and methods of releasing runoff. Do not use vegetated wetlands for this purpose.

Inspection and Maintenance

- Inspect once per week on active sites, once every two weeks on in-active sites, and within 24 hours following a 0.5-inch rain event
- Constant maintenance is essential for proper functioning.
- Remove sediment from the trap when it reaches one-third the storage capacity.
- Repair any damage to the trap, the embankments or the slopes.

Diagram A.3.9

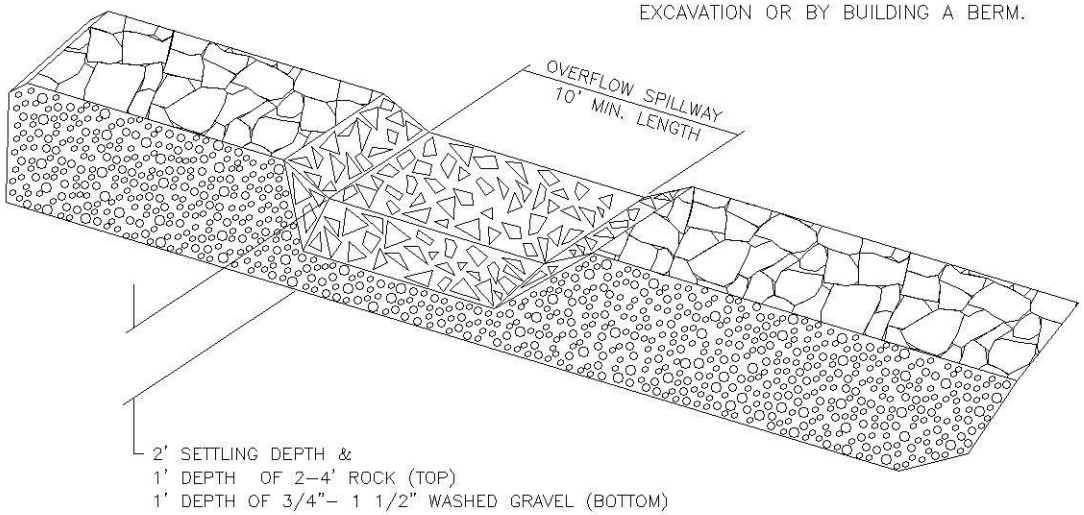
SEDIMENT TRAP



CROSS SECTION

NTS

NOTE: MAY BE CONSTRUCTED BY EXCAVATION OR BY BUILDING A BERM.



SEDIMENT TRAP OUTLET

NTS

NOTE:
A FILTER FABRIC FENCE OR SIMILAR FILTER MUST BE CONSTRUCTED TO FILTER RUNOFF FROM THE SEDIMENT TRAP PRIOR TO DISCHARGE FROM THE CONSTRUCTION SITE.

A.3.10 Sediment Basin

A temporary sediment basin has one or more inflow points and baffles to spread the flow, wet and dry storage, a securely anchored riser pipe, a dewatering device, and an emergency overflow spillway. The sediment basin serves drainage areas less than 10 acres and has a design life of approximately one year.

Basins are large facilities that treat runoff from large drainage areas. Because of this, basins have limited application on linear construction projects. The applications, advantages, and disadvantages of basins are included here for the designer's edification.

Combining with Permanent Drainage Facilities

- If a project includes a permanent stormwater retention/detention pond, the rough-graded or final-graded facility could function as a basin during construction. Design features of the permanent structure, such as surface area, retention time, and outlet control, should meet the design requirements of the temporary facility. Completion of the permanent facility should occur only when all upstream control structures are in place and stabilization of contributing drainage areas is complete.
- If a project includes an infiltration facility, the roughly excavated facility could be used as a basin, providing the facility provides the surface area and retention time required by the basin. Excavate the sides and bottom of the facility to a minimum of two feet above final grade with a backhoe working at "arm's length" to minimize disturbance and compaction of the infiltration surface.
- Any required pretreatment facilities should be fully constructed prior to any release of sediment-laden water to the facility. Pretreatment and shallow excavations are intended to prevent the clogging of soil with fines.

Advantages

- Protect downstream riparian properties from sediment deposits
- Prevent reduced downstream capacity due to sediment deposition in a stream channel
- Prevents clogging of downstream facilities
- Remove particles up to medium silt size 0.02 mm
- Surface water conveyances can be connected to the facility as site development proceeds

Disadvantage

- May become an attractive nuisance. Care must be taken to adhere to all safety practices.
- Failure of a basin which is not properly located could result in loss of life, damage to homes or buildings or interruption of services such as transportation or power.
- Maintenance and sediment removal is essential for adequate performance.
- Does not reduce turbidity resulting from fine silts and clays in runoff. Basins are

more effective when used in conjunction with other measures such as seeding and mulching.

Design Criteria

- Water temperature in the basin may be too high for direct release. Always moderate the water temperature before it drains into a lake, stream or waterway. Whenever possible, release the trap discharge onsite onto a relatively level, densely grassed area at least 50 feet from a waterway or wetland.
- Require installation of a staff gauge to aid in determining sediment depth.
- The designer may want to route surface water collected from disturbed areas to a sediment basin prior to release from the site.
- A qualified engineer should design temporary sediment basins.

Inspection and Maintenance

- Inspect once per week on active sites, once every two weeks on in-active sites, and within 24 hours following a 0.5-inch rain event
- All damages caused by soil erosion or construction equipment shall be repaired before the end of each working day.
- Remove sediment when the sediment storage zone is half full. This sediment shall be placed in such a manner that it will not erode from the site. The sediment shall not be deposited downstream from the embankment or adjacent to a stream or floodplain.
- When temporary structures have served their intended purpose and the contributing drainage area has been properly stabilized, the embankments and resulting sediment deposit shall be leveled or otherwise disposed of in accordance with the approved erosion and sediment control plan.

Figure A.6 Sediment Basin

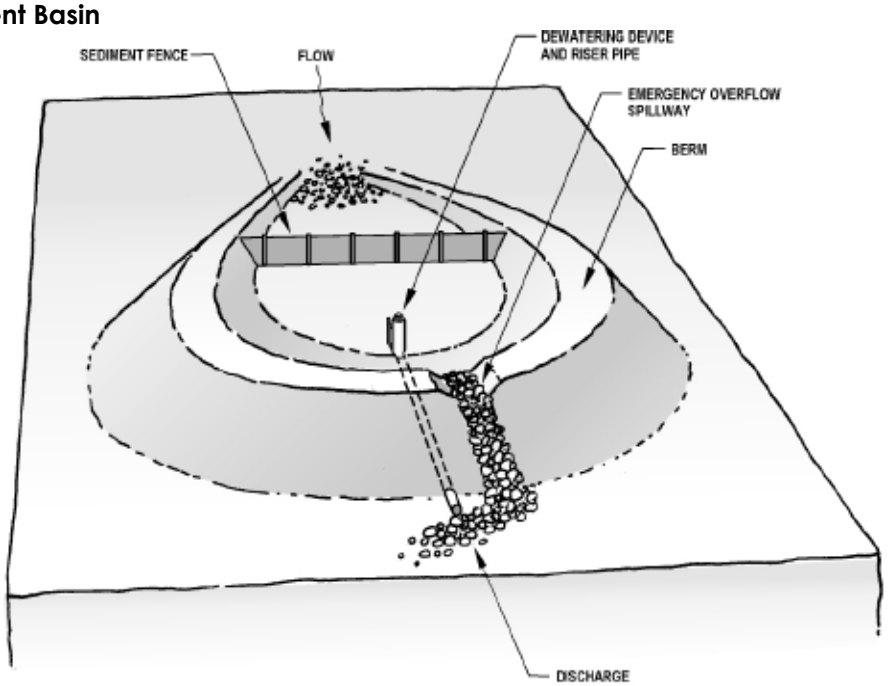
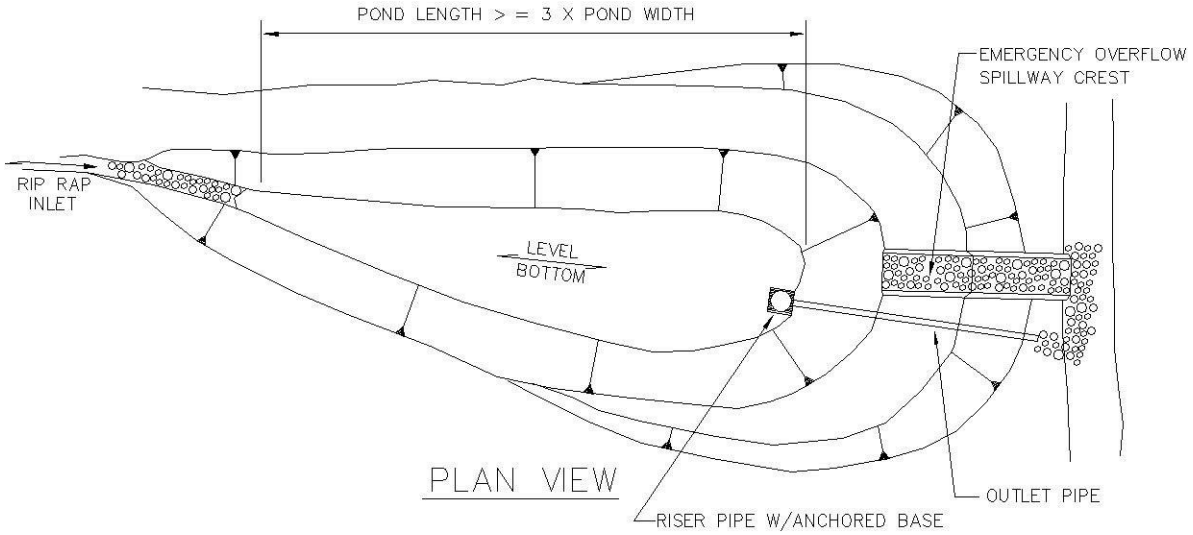
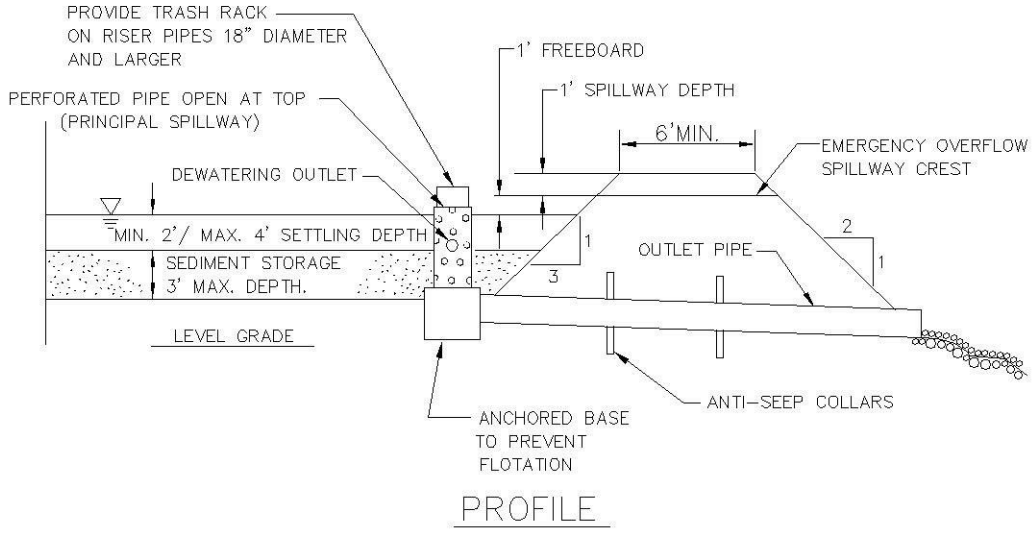


Diagram A.3.10

SEDIMENT BASIN





NOTE:

1. 50' MINIMUM OF HIGHLY VEGETATED AREA AND OR SEDIMENT FENCE IS REQUIRED PRIOR TO DISCHARGING TO STREAM OR WETLAND.

A.4 Pollution Control Practices

This section of Appendix A describes common construction activities that may pollute stormwater and practices that can reduce the potential of discharging polluted runoff. The BMPs listed are not an exhaustive list, nor will every BMP be appropriate for every situation. Therefore, suggested BMPs that are inappropriate may be deleted and additional BMPs for specific site conditions should be added. In addition, the selection and implementation of BMPs should be reviewed on a regular basis to match the changing conditions at construction sites.

Fact Sheets for each of the pollution control practices listed in Table A.13 below are included in this Appendix and were adapted from the Construction Methods Handbook developed in 1993 by California's Storm Water Quality Task Force. Table A.13 also shows how effective each practice is at controlling certain contaminants commonly found on construction sites. Those contaminants shown with an "H" indicate the BMP has a high chance of controlling the pollutant. Those indicated with a "M" show a medium chance at controlling the pollutant, and those with a L/U indicate that the pollutant is either not well-controlled by the BMP or the effectiveness of the BMP at controlling the pollutant is unknown.

Table A-13 Target Pollutants and Impact Significance

BMP	Sediment	Nutrients	Toxic Materials	Oil and Grease	Floatable Materials	Other Constr. Waste
Dewatering Operations	H	L/U	M	L/U	L/U	L/U
Paving Operations	M	L/U	M	M	L/U	L/U
Structure Construction and Painting	L/U	L/U	M	L/U	H	H
Material Delivery and Storage	M	M	M	M	M	L/U
Material Use	L/U	M	M	M	M	L/U
Spill Prevention and Control	L/U	L/U	M	M	L/U	L/U
Solid Waste Management	M	L/U	L/U	L/U	H	H
Hazardous Waste Management	L/U	L/U	M	L/U	L/U	L/U
Contaminated Soil Management	M	L/U	M	L/U	L/U	L/U
Concrete Waste Management	M	L/U	L/U	L/U	L/U	M

Vehicle and Equipment Cleaning	M	L/U	M	M	L/U	L/U
Vehicle and Equipment Fueling	L/U	L/U	M	M	L/U	L/U
Vehicle and Equipment Maintenance	L/U	L/U	M	M	L/U	L/U
Employee and Subcontractor Training						

Table A-14 lists the pollution control practices described in this section.

Table A-14 Pollution Control Practices

BMP #	BMP APPLICATION	DESCRIPTION	Page #
A.4.1	Dewatering Operations	Use sediment controls and test groundwater	83
A.4.2	Paving Operations	Prevent run-on and runoff pollution, properly dispose of wastes, and training	84
A.4.3	Structure Construction and Painting	Enclose, cover, or add a berm around storage areas, practice good housekeeping, use safer alternatives, and training	85
A.4.4	Material Delivery and Storage	Minimize storage of hazardous materials, designate material storage areas with secondary containment, and training	86
A.4.5	Material Use	Minimize hazardous materials, use alternative products, and training	88
A.4.6	Spill Prevention and Control	Reduce the chance for spills, stop the source of spills, contain and clean up spills, properly dispose of spill materials, and training	89
A.4.7	Solid Waste Management	Provide designated waste collection areas / containers, arrange for regular disposal, and training	91

BMP #	BMP APPLICATION	DESCRIPTION	Page #
A.4.8	Hazardous Waste Management	Conduct proper material use, waste disposal, and training	92
A.4.9	Contaminated Soil Management	Conduct pre-construction surveys, inspect excavations regularly, and remediate contaminated soil promptly	94
A.4.10	Concrete Waste Management	Conduct washout off-site or designate area on-site, and training	95
A.4.11	Vehicle and Equipment Cleaning	Designate washing areas, infiltrate or recycle wash water, and training	96
A.4.12	Vehicle and Equipment Fueling	Designate fueling areas, enclose or cover stored fuel, implement spill controls, and training	97
A.4.13	Vehicle and Equipment Maintenance	Designate maintenance areas, providing cover for materials, check for leaks and spills, clean up spills, and training	98
A.4.14	Employee and Subcontractor Training	Defines objectives and approaches for construction site pollution control training	99

A.4.1 Dewatering Operations

Description

Prevent or reduce the discharge of pollutants to stormwater from dewatering operations by using sediment controls and by testing the groundwater for pollution.

Approach

There are two general classes of pollutants that may result from dewatering operations: sediment and toxic products (including petroleum products). High sediment content in dewatering discharges is common because of the nature of the operation. On the other hand, toxics and petroleum products are not commonly found in dewatering discharges unless the site or surrounding area has been used for industrial activities, or the area has a history of groundwater contamination. The following steps will help reduce stormwater pollution from dewatering discharges:

Sediment

- Use sediment controls to remove sediment from water generated by dewatering.
- Use filtration to remove sediment from a sediment trap or basin. Filtration can be achieved with:
  - Sump pit and a perforated or slit standpipe with holes and wrapped in filter fabric. The standpipe is surrounded by stones, which filter the water as it collects in the pit before being pumped out. Wrapping the standpipe in filter fabric may require an increased suction inlet area to avoid clogging and unacceptable pump operation.
  - Floating suction hose to allow cleaner surface water to be pumped out.

Toxics Products (including Petroleum Products)

- In areas suspected of having groundwater pollution, sample the groundwater near the excavation site and have the water tested for known or suspected pollutants at a certified laboratory. Check with the Department of Environmental Quality (DEQ) and the local wastewater treatment plant for their requirements for dewatering, additional water quality tests, and disposal options.
- With a permit, you may be able to recycle/reuse pumped groundwater for landscape irrigation, or discharge to the storm sewer. With a permit from the DEQ and/or an approval of the City of Millersburg, you may be able to treat pumped groundwater and discharge it to the municipal wastewater treatment plant via the sanitary sewer.
- For a quick reference on disposal alternatives for specific wastes, see Table 4-1, Quick Reference – Disposal Alternatives.

A.4.2 Paving Operations

Description

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent run-on and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

Approach

- Avoid paving during wet weather.
- Store materials away from drainage courses to prevent stormwater run-on (see BMP 4, Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or trap/filter sediment.
- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drop pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials rather than burying. See BMP 13 (Vehicle and Equipment Maintenance) and BMP 6 (Spill Prevention and Control) in this chapter.
- Cover catch basins and manhole when applying seal coat, track coat, slurry seal, fog seal, etc.
- Shovel or vacuum saw cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- If paving involves Portland Cement Concrete, see BMP 10 (Concrete Waste Management).
- If paving involves asphaltic concrete, the following precautions may help prevent pollutant from entering stormwater:
  - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks by sweeping. Properly dispose of this waste by referring to BMP 7 (Solid Waste Management) in this chapter.
  - Old asphalt must be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.
  - If paving involves on-site mixing plant, follow the stormwater permitting requirements for industrial activities.
- Train employees and subcontractors.

A.4.4 Structural Construction and Painting

Description

Prevent or reduce the discharge of pollutants to stormwater from structure construction and painting by enclosing or covering or adding a berm around building material storage areas, using good housekeeping practices, using safer alternative products, and training employees and subcontractors.

Approach

- Keep the work site clean and orderly. Remove debris in a timely fashion. Sweep the area.
- Use soil erosion control techniques if bare ground is exposed.
- Buy recycled or less hazardous products to the maximum extent practicable.
- Conduct painting operations consistent with local air quality and OSHA regulations.
- Properly store paints and solvents. See BMP 4 (Material Delivery and Storage) in this chapter.
- Properly store and dispose waste materials generated from the activity. See the waste management BMPs (BMP 7 to BMP 10) in this chapter.
- Recycle residual paints, solvents, lumber, and other materials to the maximum extent practical.
- Make sure that nearby storm drains are well marked to minimize the chance of inadvertent disposal of residual paints and other liquids.
- Clean the storm drain in the immediate construction area after construction is completed.
- Educate employees who are doing the work.
- Inform subcontractors of company policy on these matters and include appropriate provisions in their contract to make certain proper housekeeping and disposal practices are implemented.
- For a quick reference on disposal alternatives for specific wastes, see Table 4-1.

A.4.4 Material Delivery and Storage

Description

Prevent or reduce the discharge of pollutants to stormwater from material delivery and storage by minimizing the storage of hazardous materials on-site, storing materials in a designated area, installing secondary containment, conducting regular inspection, and training employees and subcontractors.

The best management practice covers only material delivery and storage. For other information on materials, see BMP 5 (Material Use), or BMP 6 (Spill Prevention and Control). For information on wastes, see the waste management BMPs in this chapter.

Approach

The following materials are commonly stored on construction sites:

- Soil
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster or other products
- Petroleum products such as fuel, oil, and grease
- Other hazardous chemicals such as acids, lime, glues, paints, solvents, and curing compounds

Storage of these materials on-site can pose the following risks:

- Stormwater pollution
- Injury to workers or visitors
- Groundwater pollution
- Soil contamination

The following steps should be taken to minimize risk of pollution:

- Designate areas of the construction site for material delivery and storage.
  - Place near the construction entrances, away from waterways
  - Avoid transport near drainage paths or waterways
  - Surround with earth berms
  - Place in an area that will be paved
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes for your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements.
- For a quick reference on disposal alternatives for specific wastes, see Table 4-1, Quick Reference – Disposal Alternatives.
- Keep an accurate, up-to-date inventory of materials delivered and stored on-site.
- Keep your inventory down.
- Minimize hazardous materials on-site storage.
- Handle hazardous materials as infrequently as possible.
- During the rainy season, consider storing materials in a covered area. Store materials in secondary containments such as an earthen dike, horse trough, or even a child's wading pool for non-reactive materials such as detergents, oil, grease, and paints.

Small amounts of material may be secondarily contained in "bus boy" trays or concrete mixing trays.

- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, in secondary containment.
- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids and to reduce corrosion.
- Try to keep chemicals in their original containers and keep them well labeled.
- Train employees and subcontractors.
- Employees trained in emergency spill cleanup procedures should be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove materials and any contaminated soil (See BMP 9). If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

A.4.5 Material Use

Description

Prevent or reduce the discharge of pollutants to stormwater from material use by using alternative products, minimizing hazardous material use on-site, and training employees and subcontractors.

Approach

The following materials are commonly used on construction sites:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster or other products
- Petroleum products such as fuel, oil, and grease
- Other hazardous chemicals such as acids, lime, glues, paints, solvents, and curing compounds.

Use of these materials on-site can pose the following risks:

- Stormwater pollution
- Injury to workers or visitors
- Groundwater pollution
- Soil contamination

The following steps should be taken to minimize the risk:

- Use less hazardous, alternative materials as much as possible
- Minimize use of hazardous materials on-site
- Use materials only where and when needed to complete the construction activity
- Follow manufacturer's instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Personnel who use pesticides should be trained in their use.
- Do not over-apply fertilizers, herbicides, and pesticide. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydroseeding. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried off-site by runoff. Do not apply these chemicals just before it rains.
- Train employees and subcontractors in proper material use.

A.4.6 Spill Prevention and Control

Description

Prevent or reduce the discharge of pollutants to stormwater from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This BMP covers only spill prevention and control. However, BMP 4 (Material Delivery and Storage) and BMP 5 (Material Use), also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this chapter.

Approach

The following steps will help reduce the stormwater impacts of leaks and spills:

Define "Significant Spill"

- Different materials pollute in different amounts. Make sure each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.

General Measures

- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals.

Cleanup

- Clean up leaks and spills immediately.
- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this chapter for specific information.

Reporting

- Report significant spills to local agencies, such as the City of Millersburg (458) 233-6300.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur on-site, use a designated area and /or a secondary containment, located away from drainage courses, to prevent the run-on of stormwater and the runoff of spills.
- Regularly inspect on-site vehicles and equipment for leaks, and repair immediately.
- Check incoming vehicles and equipment (including delivery trucks and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment on-site.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use adsorbent materials on small spills rather than hosing down or burying the spill. Remove the adsorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Do not leave full drip pans or other open containers lying around.
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur on-site, use designated areas, located away from drainage courses, to prevent the run-on of stormwater and the runoff of spills.
- Discourage "topping-off" of fuel tanks; an increase in temperature can cause fuel to expand and overflow.
- Always use secondary containment such as a drain pan to catch when fuel spills/leaks.

A.4.7 Solid Waste Management

Description

Prevent or reduce the discharge or pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Approach

Solid waste is one of the major pollutants resulting from construction. Construction debris includes:

- Solid waste generated from trees and shrubs removed during land clearing, demolition or existing structures (rubble), and building construction
- Packaging materials including wood, paper and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces, and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas on-site
- Inform trash-hauling contractors that you will accept only watertight dumpsters for on-site use. Inspect dumpsters for leaks and repair any dumpster that is not watertight
- Locate containers in a covered area and/or in a secondary containment
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions
- Erosion and sediment control devices tend to collect litter. Remove this solid waste promptly
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris
- Salvage or recycle any useful material. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- If a container does spill, clean up immediately.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.
- Train employees and subcontractors in proper solid waste management.
- For a quick reference on disposal alternatives for specific wastes, see Table 4-1.

A.4.8 Hazardous Waste Management

Description

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Approach

Many of the chemicals used on-site can be hazardous materials that become hazardous waste upon disposal. These wastes may include:

- Paints and solvents
- Petroleum products such as oils, fuels, and grease
- Herbicides and pesticides
- Acids for cleaning masonry
- Concrete curing compounds

In addition, sites with existing structures may contain wastes that must be disposed of in accordance with Federal, State, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints;
- Asbestos
- PCBs (particularly in older transformers)

The following steps will help reduce stormwater pollution from hazardous wastes:

Material Use

- Use the entire product before disposing of the container.
- Do not remove the original product label, it contains important safety and disposal information.
- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instruction. Over-application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried off-site by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with Federal and State regulations.
- Do not clean brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. "Paint out" brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and re-use thinners and solvents. Dispose of excess oil-based paint and sludge as hazardous waste.

Waste Recycling/Disposal

- Select designated hazardous waste collection areas on-site.
- Hazardous materials and wastes should be stored in covered containers and

protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes. This can cause chemical reactions, make recycling impossible, and complicate disposal.
- Recycle material such as used oil or water-based paint.
- Make sure toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds, etc.) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at an authorized disposal area.
- For a quick reference on disposal alternatives for specific wastes, see Table 4-1.

Training

- Train employees and subcontractors in proper hazardous waste management.
- Warning signs should be placed in areas recently treated with chemical.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

A.4.9 Contaminated Soil Management

Description

Prevent or reduce the discharge of pollutants to stormwater from contaminated soil and highly acidic or alkaline soils by conducting pre-construction surveys, inspecting excavations regularly, and remediating contaminated soil promptly.

Approach

Contaminated soils may occur on your site for several reasons including:

- Past site uses and activities
- Detected or undetected spills and leaks
- Acid alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements.

Most developers conduct pre-construction environmental assessments as a matter of routine. Recent court rulings holding contractors liable for cleanup costs when they unknowingly move contaminated soil highlight the need for contractors to confirm a site assessment is complete before earth moving begins.

The following steps will help reduce stormwater pollution for contaminated soil:

- Conduct thorough site planning including pre-construction geologic surveys.
- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
- Prevent leaks and spills to the maximum practical extent. Contaminated soil can be expensive to treat and/or dispose of properly. However, addressing the problem before construction is much less expensive than after the structures are in place.
- Test suspected soils at a certified laboratory.
- If the soil is contaminated, work with the local regulatory agencies to develop options for treatment and/or disposal.
- For a quick reference on disposal alternatives for specific wastes, see Table 4-1.

A.4.10 Concrete Waste Management

Description

Prevent or reduce the discharge of pollutants to stormwater from concrete waste by conducting washout off-site, performing on-site washout in a designated area, and training employees and subcontractors.

Approach

The following steps will help reduce stormwater pollution form concrete wastes:

- Store dry and wet materials under cover, away from drainage areas.
- Avoid mixing excess amount of fresh concrete or cement on-site.
- Perform washout of concrete trucks off-site or in designated areas only.
- Do not wash out concrete trucks into storm drains, open ditches, streets, or streams.
- Do not allow excess concrete to be dumped on-site, except in designated areas.
- For on-site washout:

Locate washout area at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste;

Wash out wastes into the temporary pit where the concrete can be set, be broken up, and then disposed of properly.

- When washing concrete to remove fine particles and expose the aggregate, avoid creating runoff by draining the water to a bermed or level area.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.
- Train employees and subcontractors in proper concrete waste management.
- For a quick reference on disposal alternatives for specific wastes, see Table 4-1.

A.4.11 Vehicle and Equipment Cleaning

Description

Prevent or reduce the discharge of pollutants to stormwater from vehicles and equipment by using off-site facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating or recycling the wash water; and/or training employees and subcontractors.

Approach

- Use off-site commercial washing business as much as possible. Washing vehicles and equipment outdoors or in areas where wash water flows onto paved surfaces or into drainage pathways can pollute stormwater. If you wash a large number of vehicles or pieces of equipment, consider conducting this work at an off-site commercial business. These businesses are better equipped to handle and dispose of the wash waters properly. Performing this work off-site can also be economical by eliminating the need for a separate washing operation at your site.
- If washing must occur on-site, use designated bermed wash areas to prevent wash water contact with stormwater, creeks, rivers, and other water bodies. The wash area can be sloped for wash water collection and subsequent infiltration into the ground.
- Use as little water as possible to avoid having to install erosion and sediment control for the wash area.
- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning on-site. Steam cleaning can generate significant pollutant concentrations.
- For a quick reference on disposal alternatives for specific wastes, see Table 4-1.

A.4.12 Vehicle and Equipment Fueling

Description

Prevent fuel spills and leaks and reduce their impacts to stormwater by using off-site facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors.

Approach

- Use off-site fueling stations as much as possible. Fueling vehicles and equipment outdoors or in areas where fuel may spill/leak onto paved surfaces or into drainage pathways can pollute stormwater. If you fuel a large number of vehicles or pieces of equipment, consider using an off-site fueling station. These businesses are better equipped to handle fuel and spills properly. Performing this work off-site can also be economical by eliminating the need for a separate fueling area at your site.
- If fueling must occur on-site, use designated areas, located away from drainage.
- Discourage "topping-off" of fuel tanks.
- Always use secondary containment, such as a drain pan or drop cloth, when fueling to catch spills/leaks.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Use adsorbent material on small spills rather than hosing down or burying the spill. Remove the adsorbent materials promptly and dispose of properly.
- Carry out all Federal and State requirements regarding stationary above-ground storage tanks.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and perhaps forklifts, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- For a quick reference on disposal alternatives for specific wastes, see Table 4-1.

A.4.13 Vehicle and Equipment Maintenance

Description

Prevent or reduce the discharge of pollutants to stormwater from vehicle and equipment maintenance by running a "dry site." This involves using off-site facilities, performing work in designated areas only, providing cover for materials stored outside, checking for leaks and spills, containing and cleaning up spills immediately, and training employees and subcontractors.

Approach

- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Use off-site repair shops as much as possible. Maintaining vehicles and equipment outdoors or in areas where vehicles or equipment fluids may spill or leak into the ground can pollute stormwater. If you maintain a large number of vehicles or pieces of equipment, consider using an off-site repair shop. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work off-site can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur on-site, use designated areas, located away from drainage courses, to prevent the run-on of stormwater and the runoff of spills.
- Always use secondary containment, such as a drain pan or drop cloth, to catch sills or leaks when removing or changing fluids.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Use adsorbent materials on small spills rather than hosing down or burying the spill. Remove the adsorbent materials promptly and dispose of properly.
- Regularly inspect on-site vehicles and equipment for leaks, and repair immediately.
- Check incoming vehicles and equipment (including delivery trucks and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment on-site.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic, and transmissions fluids.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- For a quick reference on disposal alternatives for specific wastes, see Table 4-1.

A.4.14 Employee and Subcontractor Training

Description

Employee/subcontractor training, like maintenance on a piece of equipment, is not so much a best management practice as it is a method by which to implement BMPs. This fact sheet highlights the importance of training and of integrating the elements of employee/subcontractor training from the individual source controls into a comprehensive training program as part of the EPSC plan.

The specific employee/subcontractor training aspects of each of the source controls are highlighted in the individual fact sheets. The focus of this fact sheet is more general, and includes the overall objectives and approach for assuring employee/subcontractor training in stormwater pollution prevention. Accordingly, the organization of this fact sheet differs from the other fact sheets in the chapter.

Objectives

Employee/subcontractor training should be based on four objectives:

- Promote a clear identification and understanding of the problem, including activities with the potential to pollute stormwater
- Identify solutions (BMPs)
- Promote employee/subcontractor ownership of the problems and the solutions
- Integrate employee/subcontractor feedback into training and BMP implementation

Approach

- Integrate training regarding stormwater quality management with existing training programs that may be required by other regulations, the Hazardous Waste Operations and Emergency Response standard (29CFR 1910.120), or the Spill Prevention Control and Countermeasure Plan (40CFR 112).
- Train employees/subcontractors in standard operating procedures and spill cleanup techniques described in the Pollution Control Plan. Employee/subcontractors trained in spill containment and cleanup should be present during the loading/unloading and handling of materials.
- Personnel who use pesticides should be trained in their use.
- Educating off-site contractors and subcontractors supports the efforts of well-trained employees.
- Consider posting the quick reference table around the job site or in the on-site office trailer to reinforce training.
- Train employees/subcontractors in standard operating procedures and spill cleanup techniques described in the fact sheets. Employees/subcontractors trained in spill containment and cleanup should be present during the loading/unloading and handling of materials.
- Personnel who use pesticides should be trained in their use. The Oregon Department of Pesticide Regulation and county agricultural commissioner's license pesticide dealers, certify pesticide applicators, and conduct on-site inspections.
- Proper education of off-site contractors is often overlooked. The conscientious efforts

of well-trained employee/subcontractors can be lost by unknowing off-site contractors, so make sure they are well informed about what they are expected to do on-site.

REFERENCES FOR POLLUTION CONTROL PRACTICES SECTION

Blueprint for a Clean Bay-Construction-Related Industries: Best Management Practices for Storm Water

Pollution Prevention; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992

Erosion Prevention and Sediment Control Manual, City of Corvallis, September 2005

Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Hot-mix Asphalt Paving Handbook, U.S. Army Corps of Engineers, Ac 150/5370-14, Appendix July 1991

Best Management Practices and Erosion Control Manual for Construction Sites; Flood Control District of Maricopa County, AZ. September 1992

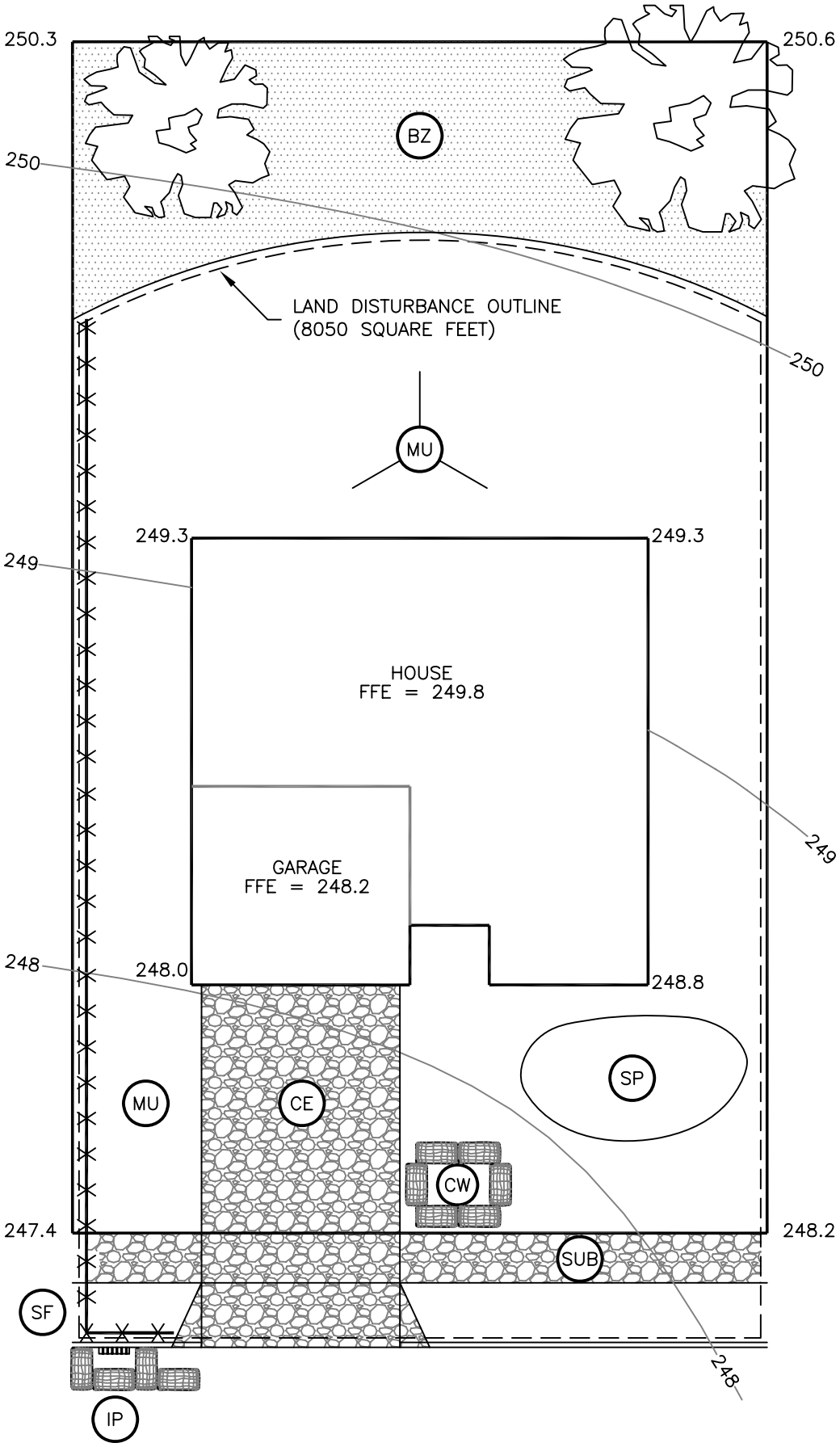
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992

Processes, Procedures, and Methods to Control Pollution Resulting from all Construction Activity; USEPA, 430/0-73-007, 1973.

Swisher, R.D., 1987. Surfactants Biodegradation, Marcel Decker Corporation

EPSC Appendix C-2:

Minor and Major EPSC Plan Templates



CE GRAVEL CONSTRUCTION ENTRANCE

SF SEDIMENT FENCE (OR EQUIV.)

SUB SIDEWALK SUBGRADE GRAVEL BARRIER

IP INLET PROTECTION

BZ BUFFER ZONE–DO NOT DISTURB

MU MULCH–ESTABLISH GRASS

SP SOIL STOCKPILE

CW CONCRETE WASHOUT

EROSION CONTROL NOTES:

1. AREAS DELINEATED ON THE PLAN AS A "BUFFER ZONE" SHALL BE CLEARLY MARKED IN THE FIELD WITH ORANGE CONSTRUCTION FENCING PRIOR TO THE START OF ANY GROUND DISTURBING ACTIVITIES.

2. A STABILIZED GRAVEL CONSTRUCTION ENTRANCE SHALL BE INSTALLED AS FIRST SITE ACTIVITY.

3. EROSION CONTROL MEASURES SHALL BE INSPECTED DAILY AND MAINTAINED AS NECESSARY TO ENSURE THEIR FUNCTION.

4. EROSION CONTROL MEASURES SHALL BE KEPT IN PLACE UNTIL PERMANENT GROUND COVER IS ESTABLISHED.

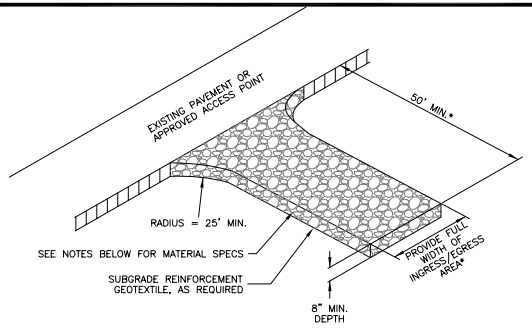
WET WEATHER EROSION NOTES:

1. DURING WET WEATHER SEASON (OCTOBER 1 – APRIL 30) ALL SOILS EXPOSED FOR MORE THAN 2 DAYS SHALL BE COVERED WITH PLASTIC SHEETING, OR A 2–INCH LAYER OF MULCH, BARK, WOOD CHIPS, SAWDUST, OR STRAW TO MINIMIZE EROSION POTENTIAL.

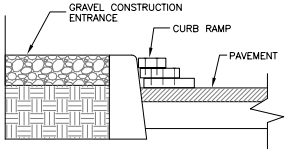
2. EXPOSED SOILS SHALL BE SEEDED NO LATER THAN SEPTEMBER 1.

NORTH

SINGLE FAMILY RESIDENCE
TYPICAL EROSION PREVENTION AND SEDIMENT CONTROL PLAN

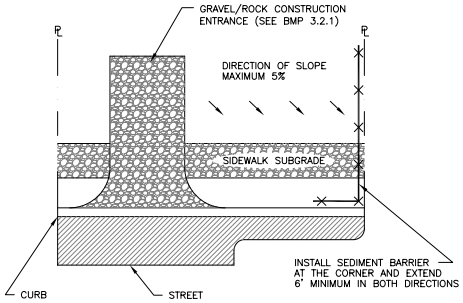


*20' MIN. FOR SINGLE FAMILY AND DUPLEX RESIDENTIAL

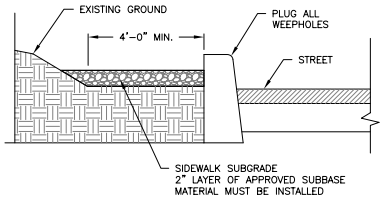


NOTES:
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEAN OUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.
4. WHERE RUNOFF CONTAINING SEDIMENT-LADEN WATER IS LEAVING THE SITE VIA THE CONSTRUCTION ENTRANCE, OTHER MEASURES SHALL BE IMPLEMENTED TO DIVERT RUNOFF THROUGH AN APPROVED FILTERING SYSTEM.
5. DIMENSIONS:
   SINGLE FAMILY AND DUPLEX
   20' LONG BY 20' WIDE, 8" DEEP OF 3/4" MINUS CLEAN ROCK.
   COMMERCIAL
   50' LONG BY 20' WIDE, 3-6" DEEP CLEAN ROCK.
   GOVERNING AUTHORITY MAY REQUIRE GEOTEXTILE FABRIC TO PREVENT SUB-SOIL PUMPING.

CONSTRUCTION ENTRANCE

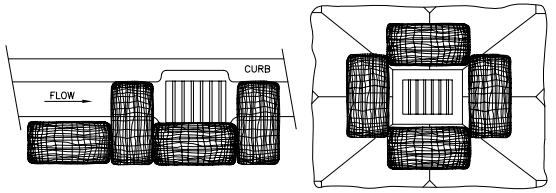


PLAN VIEW



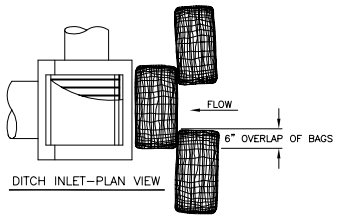
PROFILE

SIDEWALK SUBGRADE GRAVEL BARRIER

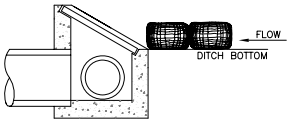


CATCH BASIN/CURB INLET

AREA DRAIN



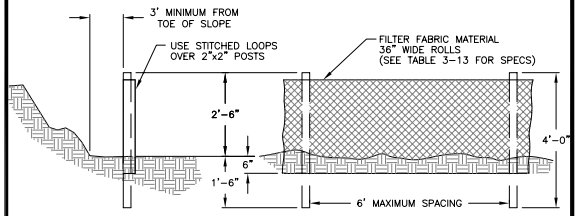
DITCH INLET-PLAN VIEW



DITCH INLET-PROFILE

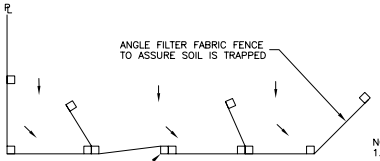
NOTES:
1. ADDITIONAL MEASURES MUST BE CONSIDERED DEPENDING ON SOIL TYPES.
2. BIOFILTER BAGS SHOULD BE STAKED WHERE APPLICABLE USING (2) 1"x2" WOODEN STAKES OR APPROVED EQUAL PER BAG.

INLET PROTECTION TYPE 4 - BIOFILTER BAGS



PROFILE
NTS

FRONT VIEW
NTS



PLAN VIEW
NTS

NOTES:
1. BURY BOTTOM OF FILTER FABRIC 6" VERTICALLY BELOW FINISHED GRADE.
2. 2"x2" FIR, PINE, OR STEEL FENCE POSTS.
3. POST TO BE INSTALLED ON UPHILL SIDE OF SLOPE.
4. COMPACT BOTH SIDES OF FILTER FABRIC TRENCH.
5. PANELS MUST BE PLACED ACCORDING TO SPACING TABLE 3-12.

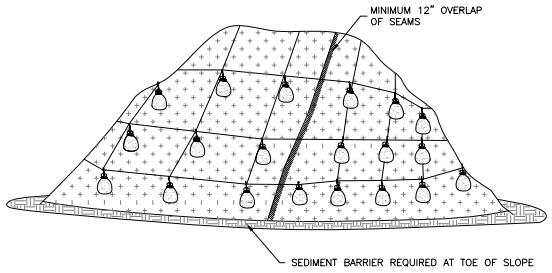
TABLE 3-13 WOVEN POLYPROYLENE SEDIMENT FENCE FABRIC SPECIFICATIONS

PROPERTY	TEST PROCEDURE	MINIMUM FABRIC VALUE
Grab Tensile Strength	ASTM D-4632	180 lbs.
Grab Elongation	ASTM D-4632	15%
Trapezoid Tear	ASTM D-4533	70 lbs.
Mullen Burst	ASTM D-3786	300 psi
Puncture	ASTM D-4833	80 lbs
Permitivity	ASTM D-4491	0.07 sec-1
Permeability	ASTM D-4491	0.005 cm/sec
Apparent Opening Size (AOS)	ASTM D-4751	50 U.S. Sieve
UV Resistance (500 hrs)	ASTM D-4355	90%

TABLE 3-12 BARRIER SPACING FOR GENERAL APPLICATION

% SLOPE	SLOPE	MAX SPACING ON SLOPE
<10%	<10:1	300 ft
10-15%	10:1 to 7.5:1	150 ft
15-20%	7.5:1 to 5:1	100 ft
20-30%	5:1 to 3.5:1	50 ft
30-50%	3.5:1 to 2:1	25 ft

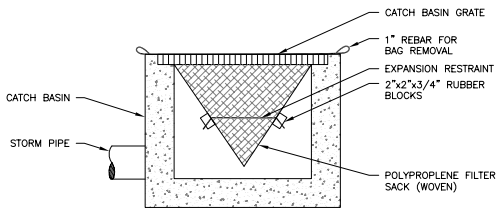
SEDIMENT FENCE



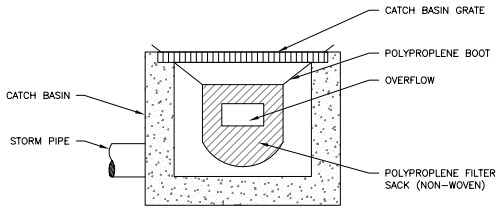
PLASTIC SHEETING

NOTES:
1. MINIMUM 12" OVERLAP OF ALL SEAMS REQUIRED.
2. BARRIER REQUIRED AT TOE OF STOCKPILE.
3. COVERING MAINTAINED TIGHTLY IN PLACE BY USING SANDBAGS OR TIRES ON ROPES WITH A MAXIMUM 10' GRID SPACING IN ALL DIRECTIONS.

PLASTIC SHEETING



WOVEN POLYPROPLENE SACK

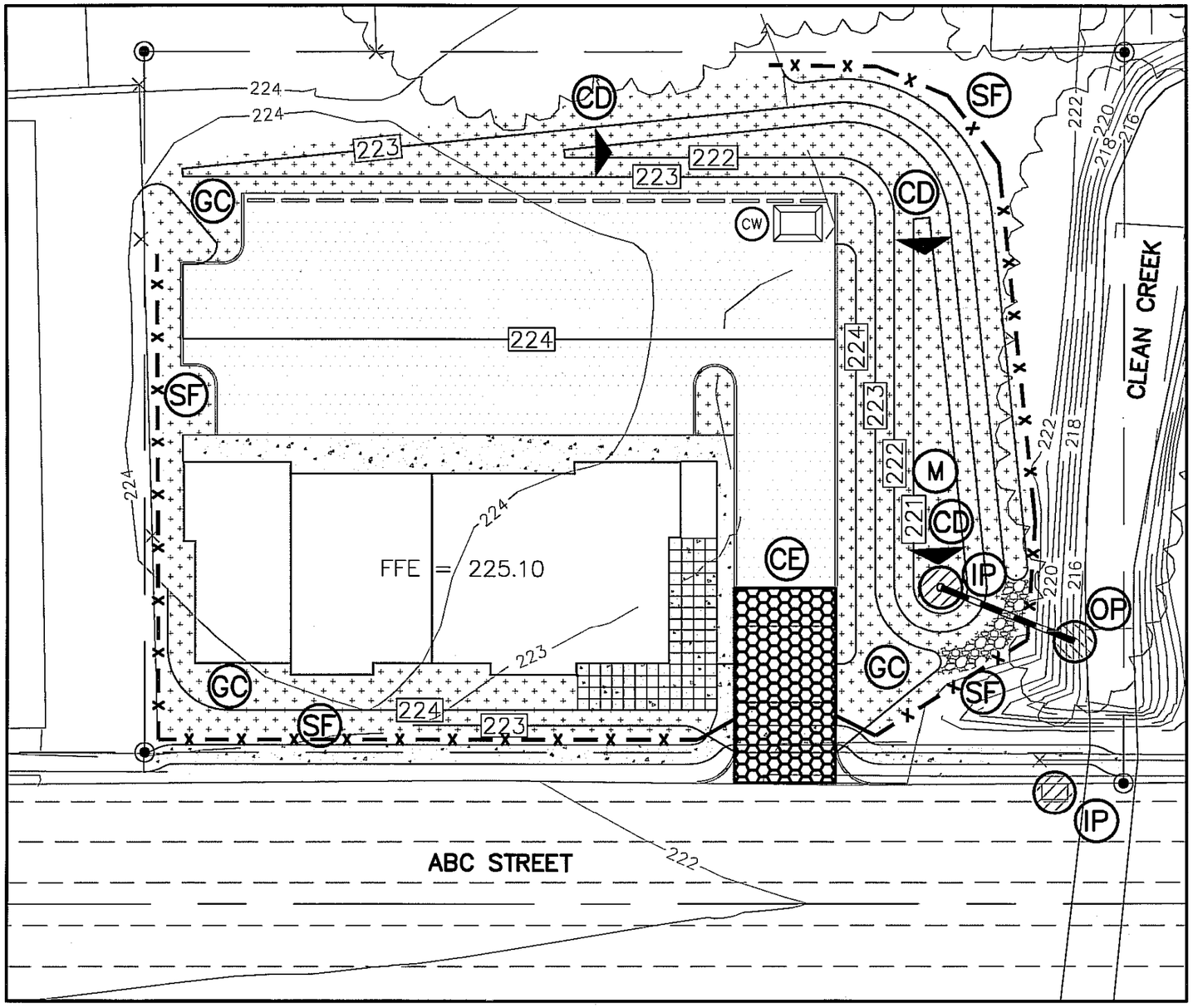


NON-WOVEN POLYPROPLENE SACK

NOTE:
1. RECESSED CURB INLET CATCH BASINS MUST BE BLOCKED WHEN USING FILTER FABRIC INLET SACKS. SIZE OF FILTER FABRIC INLET SACKS TO BE DETERMINED BY MANUFACTURER.

INLET PROTECTION TYPE 5 - CATCH BASIN INSERT

SAMPLE EPSC SITE PLAN FOR MAJOR LAND DISTURBING ACTIVITIES



EROSION & SEDIMENT CONTROL PLAN
NTS

REFER TO SHEET CS-6 FOR NOTES AND DETAILS.

EPSC LEGEND

- CE — CONSTRUCTION ENTRANCE
- SF — SEDIMENT FENCE
- IP — INLET PROTECTION
- OP — OUTLET PROTECTION
- M — MATTING
- CD — CHECK DAM
- GC — GROUND COVER
- CW — CONCRETE WASHOUT FACILITY

NOTE: THIS PROJECT SHALL BE CONSTRUCTED AND MAINTAINED IN ACCORDANCE WITH THE LATEST VERSION OF THE MILLERSBURG EROSION PREVENTION AND SEDIMENT CONTROL MANUAL.

DEVELOPER:
ELITE, LLC
1234 NONAME STREET
NOWHERE, OREGON 97000
(541) 555-1234

XY&Z
ENGINEERS • SURVEYORS
PLANNERS • GEOLOGISTS
4321 SALEM HWY.
CORVALLIS, OREGON 97330
(541) 555-5555

EROSION & SEDIMENT CONTROL PLAN

ELITE RETAIL OF CORVALLIS, OREGON
123 ABC STREET

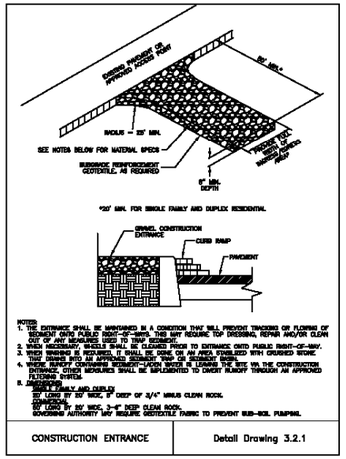
PROJ No: 0021704C | DRAWN BY: ETC | CHECKED BY: ETC

ORIGINAL ISSUE DATE:

PERMIT SET ISSUE DATE:

CONSTRUCTION SET ISSUE DATE:

DRAWING NUMBER:
CS-5
OF 11



CONSTRUCTION ENTRANCE | Detail Drawing 3.2.1

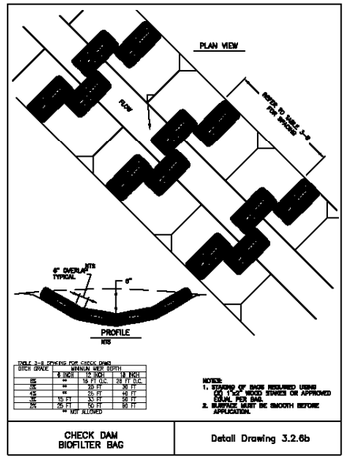
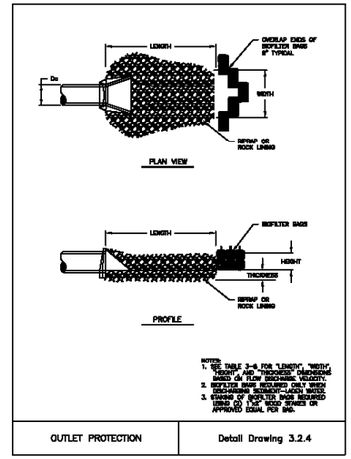


TABLE 3-8 SPACING FOR CHECK DAMS

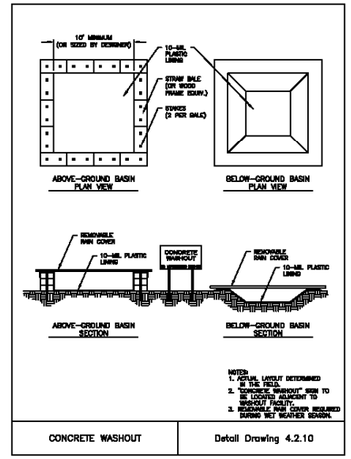
STEEP SLOPE	MAXIMUM HEIGHT OF DAM AT CENTER	SPACING BETWEEN DAMS	
		FT.	M
5%	1'	50 FT	15 M
10%	"	25 FT	8 M
15%	"	16 FT O.C.	5 M O.C.
20%	"	12 FT	4 M
25%	"	10 FT	3 M
30%	18 IN	10 FT	3 M
35%	18 IN	10 FT	3 M
40%	18 IN	10 FT	3 M

" NOT ALLOWED

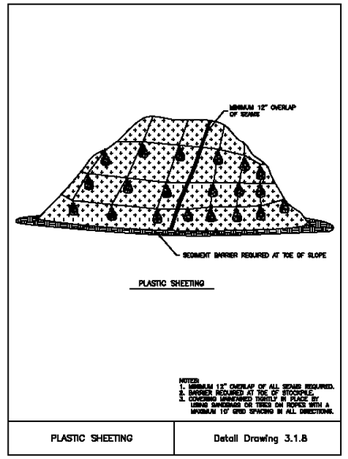
CHECK DAM
BIOFILTER BAG | Detail Drawing 3.2.6b



OUTLET PROTECTION | Detail Drawing 3.2.4



CONCRETE WASHOUT | Detail Drawing 4.2.10



PLASTIC SHEETING | Detail Drawing 3.1.8

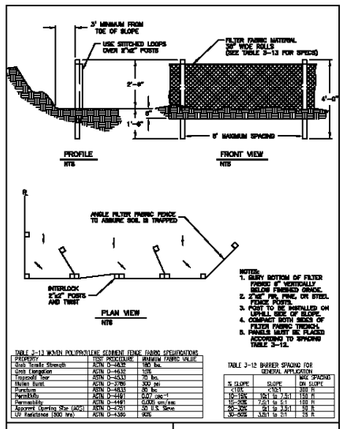


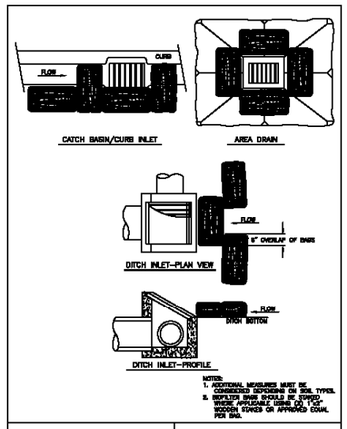
TABLE 3-13 WOVEN POLYPROPYLENE SEDIMENT FENCE FABRIC SPECIFICATIONS

Property	ASTM Test Procedure	Required Fabric Value
Grab Tensile Strength	ASTM D-4632	180 lbs.
Grab Elongation	ASTM D-4632	30%
Hydrostatic Burst	ASTM D-3786	300 PSI
Tensile Test	ASTM D-4632	90 lbs.
Permittivity	ASTM D-4491	0.07 sec-1
Permeability	ASTM D-4491	0.07 cm/sec
Apparent Opening Size (AOS)	ASTM D-4751	50 U.S. Sieve
UV Resistance (500 hrs)	ASTM D-4355	90%

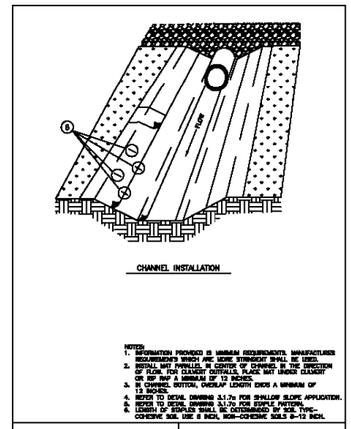
TABLE 3-12 BARRIER SPACING FOR SENSITIVITY APPLICATIONS

% SLOPE	SLOPE	SPACING ON SLOPE
<10%	10:1	125 ft
10-20%	10:1 to 5:1	100 ft
20-33%	5:1 to 3:1	75 ft
33-50%	3:1 to 2:1	50 ft
50-100%	2:1 to 1:1	25 ft

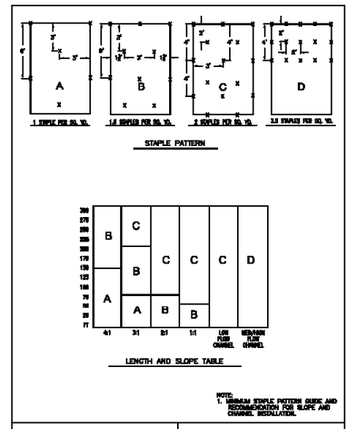
SEDIMENT FENCE | Detail Drawing 3.3.1



INLET PROTECTION
TYPE 4 – BIOFILTER BAGS | Detail Drawing 3.3.7d



MATTING CHANNEL INSTALLATION | Detail Drawing 3.1.7b



MATTING STAPLE PATTERN | Detail Drawing 3.1.7c

SEEDBED PREPARATION

1. TILL TWO INCHES (MINIMUM) OF WELL-ROTTED COMPOST INTO THE UPPER 6-INCHES OF THE ENTIRE SWALE TREATMENT AREA TO ACHIEVE AN ORGANIC CONTENT OF 1 PERCENT OR GREATER. COMPOST SHALL NOT CONTAIN ANY SAWDUST, STRAW, GREEN OR UNDER-COMPOSTED ORGANIC MATTER, OR UNSTERILIZED MANURE.

2. BRING THE SEEDBED AREA TO FINAL GRADE, REMOVE ALL ROCKS AND DEBRIS, AND SMOOTH SURFACE UNDULATIONS LARGER THAN 2 INCHES.

3. THE SEEDBED SHOULD BE FIRM BUT NOT COMPACT. THE TOP 4-6 INCHES OF SOIL SHOULD BE LOOSE, MOIST AND FREE OF LARGE CLODS AND STONES.

4. SEED WATER QUALITY SWALE WITH KING COUNTY SURFACE WATER DESIGN MANUAL – BIOFILTRATION SWALE SEED MIX #1:
100 LBS/ACRE:
75-80% TALL OR MEADOW FESCUE
10-15% SEASIDE CREEPING BENTGRASS OR COLONIAL BENTGRASS
5-10% REDTOP
(NOTE: ALL PERCENTAGES ARE BY WEIGHT.)

5. IF SWALE OUTLET TO CREEK IS ESTABLISHED DURING THE WET WEATHER SEASON OF OCTOBER 1 THROUGH APRIL 30, INSTALL CHECK DAMS AND EXCELSIOR MATTING ALONG SWALE BOTTOM AND SIDE SLOPES FOR TEMPORARY EROSION PREVENTION.

6. PROVIDE TEMPORARY IRRIGATION AS NECESSARY FOR SEED GERMINATION AND GROWTH.

7. INSPECT SEEDED AREAS FREQUENTLY TO VERIFY ADEQUATE MOISTURE AND GRASS ESTABLISHMENT. REPAIR ANY DAMAGE FROM RUNOFF AND INSTALL ADDITIONAL EROSION PREVENTION MEASURES AS NECESSARY. RE-SEED AND MULCH DAMAGED OR BARE SPOTS.

DUST CONTROL PLAN

1. SURFACE WATER APPLICATION TO BE USED FOR DUST CONTROL OF EXPOSED SOILS. ONE WATER TRUCK TO BE AVAILABLE DURING DRY WEATHER CONSTRUCTION. WATER TO BE OBTAINED FROM EXISTING FIRE HYDRANT AT SW CORNER OF SITE, ADJACENT TO ABC STREET,

2. NO ON-SITE STOCKPILING OF SOIL IS ANTICIPATED. IN THE EVENT THAT SOILS ARE STOCKPILED ON-SITE, COVER WITH 6-MIL PLASTIC SHEETING FOR WIND AND WATER EROSION PREVENTION.

3. ALL MASONRY BLOCKS USED IN BUILDING CONSTRUCTION TO BE WET-CUT FOR DUST CONTROL. AREA AROUND CONCRETE SAW TO BE BERMED AND ACCUMULATED SLURRY DISPOSED OF IN ON-SITE CONCRETE WASHOUT FACILITY.

EROSION CONTROL NOTES

1. OWNER OR DESIGNATED PERSON SHALL BE RESPONSIBLE FOR PROPER INSTALLATION AND MAINTENANCE OF ALL EROSION PREVENTION AND SEDIMENT CONTROL (EPSC) MEASURES, IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.

2. THE IMPLEMENTATION OF THESE EPSC PLANS AND CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE EPSC MEASURES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED BY THE LOCAL JURISDICTION, AND VEGETATION/LANDSCAPING IS ESTABLISHED. THE DEVELOPER SHALL BE RESPONSIBLE FOR MAINTENANCE AFTER THE PROJECT IS APPROVED UNTIL THE LOTS ARE SOLD.

3. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY MARKED IN THE FIELD PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE CLEARING LIMITS SHALL BE PERMITTED. THE MARKINGS SHALL BE MAINTAINED BY THE APPLICANT/CONTRACTOR FOR THE DURATION OF CONSTRUCTION.

4. THE EPSC MEASURES SHOWN ON THIS PLAN MUST BE CONSTRUCTED IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO INSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DOES NOT ENTER THE DRAINAGE SYSTEM, ROADWAYS, OR VIOLATE APPLICABLE WATER STANDARDS.

5. THE EPSC MEASURES SHOWN ON THIS PLAN ARE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE EPSC MEASURES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DOES NOT LEAVE THE SITE.

6. THE EPSC MEASURES SHALL BE INSPECTED DAILY BY THE APPLICANT/CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONING.

7. AT NO TIME SHALL SEDIMENT BE ALLOWED TO ACCUMULATE MORE THEN 1/3 THE BARRIER HEIGHT. ALL CATCH BASINS AND CONVEYANCE LINES SHALL BE CLEANED PRIOR TO PAVING. THE CLEANING OPERATIONS SHALL NOT FLUSH SEDIMENT-LADEN WATER INTO THE DOWNSTREAM SYSTEM.

8. STABILIZED ROCK ENTRANCES SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES MAY BE REQUIRED TO INSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.

9. STORM DRAIN INLETS, BASINS, AND AREA DRAINS SHALL BE PROTECTED UNTIL PAVEMENT SURFACES ARE COMPLETED AND/OR VEGETATION IS RE-ESTABLISHED.

10. PAVEMENT SURFACES AND VEGETATION ARE TO BE PLACED AS RAPIDLY AS POSSIBLE.

11. SEEDING SHALL BE PERFORMED NO LATER THAN SEPTEMBER 1 FOR EACH PHASE OF CONSTRUCTION.

12. IF THERE ARE EXPOSED SOILS OR SOILS NOT FULLY ESTABLISHED FROM OCTOBER 1 THROUGH APRIL 30, THE WET WEATHER EROSION PREVENTION MEASURES WILL BE IN EFFECT.

13. THE DEVELOPER SHALL REMOVE EPSC MEASURES ONLY AFTER VEGETATION IS FULLY ESTABLISHED.

DEVELOPER:
ELITE, LLC
1234 NONAME STREET
NOWHERE, OREGON 97000
(541) 555-1234

XY&Z
ENGINEERS • SURVEYORS
PLANNERS • GEOLOGISTS
4321 SALEM HWY.
CORVALLIS, OREGON 97330
(541) 555-5555

EROSION & SEDIMENT CONTROL PLAN

ELITE RETAIL OF CORVALLIS, OREGON
123 ABC STREET

PROJ No: 0021704C | DRAWN BY: ETC | CHECKED BY: ETC

ORIGINAL
ISSUE DATE: 03/01/04

PERMIT SET
ISSUE DATE: 04/12/04

CONSTRUCTION SET
ISSUE DATE: 04/12/04

DRAWING NUMBER:
CS-6
OF 11

EPSC Appendix C-3:

Plan Notes and Symbols

EROSION CONTROL NOTES

1. Owner or designated person shall be responsible for proper installation and maintenance of all erosion prevention and sediment control (EPSC) measures, in accordance with local, state, and federal regulations.
2. The implementation of these EPSC plans and construction, maintenance, replacement, and upgrading of these EPSC measures is the responsibility of the contractor until all construction is completed and approved by the local jurisdiction, and vegetation/landscaping is established. The developer shall be responsible for maintenance after the project is approved until the lots are sold.
3. The boundaries of the clearing limits shown on this plan shall be clearly marked in the field prior to construction. During the construction period, no disturbance beyond the clearing limits shall be permitted. The markings shall be maintained by the applicant/contractor for the duration of construction.
4. The EPSC measures shown on this plan must be constructed in conjunction with all clearing and grading activities, and in such a manner as to ensure that sediment and sediment-laden water does not enter the drainage system, roadways, or violate applicable water standards.
5. The EPSC measures shown on this plan are minimum requirements for anticipated site conditions. During the construction period, these EPSC measures shall be upgraded as needed for unexpected storm events and to ensure that sediment and sediment-laden water does not leave the site.
6. The EPSC measures shall be inspected daily by the applicant/contractor and maintained as necessary to ensure their continued functioning.
7. At no time shall sediment be allowed to accumulate more then 1/3 the barrier height. All catch basins and conveyance lines shall be cleaned prior to paving. The cleaning operations shall not flush sediment-laden water into the downstream system.
8. Stabilized rock entrances shall be installed at the beginning of construction and maintained for the duration of the project. Additional measures may be required to ensure that all paved areas are kept clean for the duration of the project.
9. Storm drain inlets, basins, and area drains shall be protected until pavement surfaces are completed and/or vegetation is re-established.
10. Pavement surfaces and vegetation are to be placed as rapidly as possible.
11. Seeding shall be performed no later than September 1 for each phase of construction.
12. If there are exposed soils or soils not fully established from October 1 through April 30, the wet weather erosion prevention measures will be in effect. See the City of Millersburg Erosion Prevention and Sediment Control Manual (Chapter 2) for requirements.
13. The developer shall remove EPSC measures only after vegetation is fully established.

SWALE SEEDBED PREPARATION

1. Till two inches (minimum) of well-rotted compost into the upper 6-inches of the entire swale treatment area to achieve and organic content of 1 percent or greater. Compost shall not contain any sawdust, straw, green or under-composted organic manure.
2. Bring the seeded area to final grade, remove all rocks and debris, and smooth surface undulations larger than 2 inches.
3. The seedbed should be firm but not compact. The top 4-6 inches of soil should be loose, moist and free of large clods and stones.
4. Seed water quality swale with King County Surface Water Design manual – Biofiltration swale seed mix #1 at 100 lbs/acre:

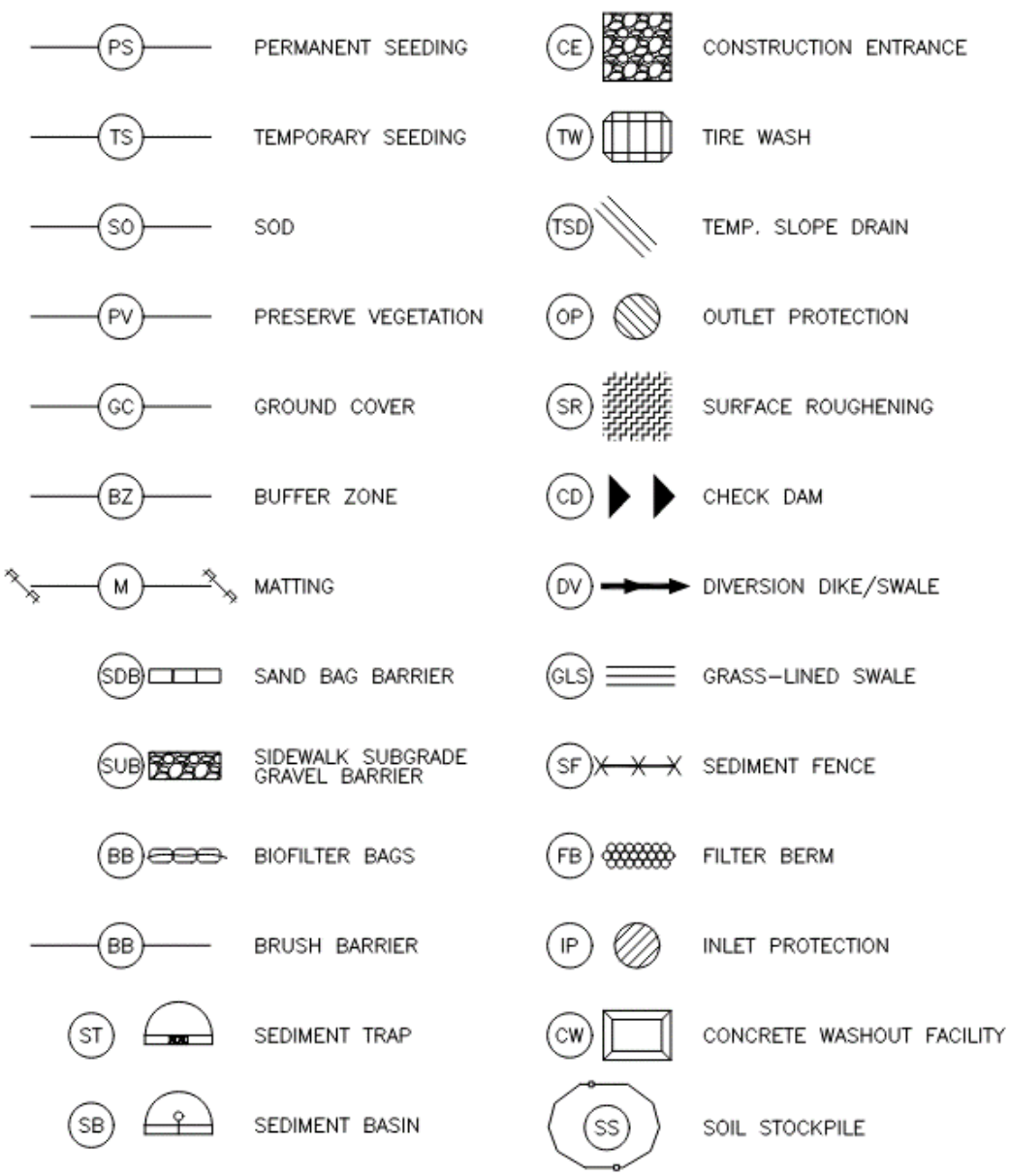
    75-80% Tall or Meadow Fescue
    10-1% Seaside Creeping Bentgrass or Colonial Bentgrass
    5-10% Redtop
    (Note: All percentages are by weight.)

5. If swale outlet to creek is established during the wet weather season of October 1 through April 30, install check dams and excelsior matting along swale bottom and side slopes for temporary erosion prevention.
6. Provide temporary irrigation as necessary for seed germination and growth.
7. Inspect seeded areas frequently to verify adequate moisture and grass establishment., Repair any damage from runoff and install additional erosion prevention measures as necessary. Re-seed and mulch damaged or bare spots.

DUST CONTROL

1. Surface water application to be used for dust control of exposed soils. One water truck to be available during dry weather construction. Water to be obtained from existing fire hydrant (add location).
2. No on-site stockpiling of soil is anticipated. In the event that soils are stockpiled on-site, cover with 6-mil plastic sheeting for wind and water erosion prevention.
3. All masonry blocks used in building construction to be wet-cut for dust control. Area around concrete saw to be bermed and accumulated slurry disposed of in on-site concrete washout facility.

EPSC PLAN SYMBOLS



EPSC Appendix C-4:

Plan Review Checklist

CITY OF MILLERSBURG MINOR DEVELOPMENT CONSTRUCTION SITE PLAN REVIEW CHECKLIST

The City of Millersburg (the City) uses the following form to determine whether a minor EPSC submittal is complete. Minor developments are those that meet the following criteria:

- Affect an area over 10,000 square feet and less than an acre in size, and
- Do not contain average slopes throughout the disturbed area that exceed 10 percent, and
- Do not contain slopes greater than 3:1 which exceed six feet in height, and
- Do not have concentrated runoff through the disturbed area that comes from over one acre off-site, and
- Do not contain sensitive areas

Documentation requirements for minor developments are listed in Title 12 of Millersburg Municipal Code and Division E of the Millersburg Engineering Standards.

Project Name:			
Address:			
Owner Name:			
Contractor Name:			
Email / Phone:			
Millersburg Project #:	_____	Reviewer Initials:	_____
Area Disturbed:	_____	Dates of Construction:	_____

Inventory of Submittals

☐ EPSC Permit Application

☐ EPSC Plan

☐ EPSC BMP Details

EPSC Permit Application

A completed EPSC Permit Application form is required.

Yes	No	
☐	☐	Is the EPSC Permit Application form complete?
☐	☐	Is the EPSC Permit Application form accurate?
☐	☐	Is the EPSC Permit Application form signed?

EPSC Plan

The site-specific EPSC Plan illustrates the erosion prevention and sediment control best management practices (BMPs) that are proposed to prevent offsite discharge of sediment and other potential pollutants. EPSC Plan Sheets must include the following:
An EPSC Plan template has been developed and should be used to ensure that the EPSC Plan includes the following:

Yes	No	
		<u>Site Plan drawn to scale, showing the following:</u>
☐	☐	Property lines, easements (with widths), and north arrow. Show lengths along property lines. Show the distances to buildings and structures.
☐	☐	Elevations on the property to indicate the amount of fall and/or grades across the property.
☐	☐	Contour lines showing the existing and final grades/topography of the site.
☐	☐	Flow arrows showing existing (light) and proposed (dark) drainage patterns. It is the permit holder's responsibility not to alter the flow of surface water to harm neighboring properties.
☐	☐	Proximity to sensitive areas, if applicable.
☐	☐	Location of the 100-year flood plain, if applicable
☐	☐	Location and size of drainage ways, swales, ditches, etc.
☐	☐	Location of utilities on the property (sewer, water, etc.).
☐	☐	All areas of disturbance on the site, including areas that will be cleared, graded, or excavated.
☐	☐	Location for storage of soils and/or wastes.
		<u>Show the location of Erosion Prevention and Sediment Control Measures</u>
☐	☐	Place EPSC measures in accordance with the Best Management Practices shown in the City of Millersburg Erosion Prevention and Sediment Control Manual. Examples include: • Gravel construction entrance; • Sediment fence; • Mulch berms and/or wattles of straw or coir; • Undisturbed buffer zones (10-foot minimum width for slopes < 5 percent, fence off with orange construction fencing).
☐	☐	Clearly designate a concrete wash-out area for all concrete trucks, mortar, and concrete tools.

Yes	No	
Schedule		
☐	☐	Installation date for EPSC measures.
☐	☐	Commencement date for land disturbing activities.
☐	☐	Construction completion date.
☐	☐	Site stabilization date.

CITY OF MILLERSBURG MAJOR DEVELOPMENT CONSTRUCTION SITE PLAN REVIEW CHECKLIST

The City of Millersburg (the City) uses the following form to determine whether a major development submittal is complete. Major developments are those that meet the following criteria:

- Affect an area over an acre in size, or
- Contain average slopes throughout the disturbed area that exceed 10 percent, or
- Contain slopes greater than 3:1 which exceed six feet in height, or
- Have concentrated runoff through the disturbed area that comes from over one acre off-site, or
- Contain sensitive areas

Documentation requirements for major developments are listed in Title 12 of Millersburg Municipal Code and Division E of the Millersburg Engineering Standards.

Development Name:			
Address:			
Developer Name:			
Company Name:			
Email / Phone:			
Millersburg Project #:	_____	Reviewer Initials:	_____
Acres Disturbed:	_____	Dates of Construction:	_____
DEQ 1200C #: [1]	_____	Dates of Clearing / Grading:	_____

	Yes	No
Is an Army Corps of Engineers Permit required?	☐	☐
Is a Department of State Land Permit required?	☐	☐

Inventory of Submittals

☐ EPSC Permit Application

☐ EPSC Plan Sheets

☐ EPSC BMP Details

☐ EPSC Plan

[1] Cumulative land disturbing activity of one acre or more requires a NPDES 1200-C stormwater general permit issued by the Oregon Department of Environmental Quality (DEQ). Prior to land disturbing activities, a copy of the NPDES 1200-C Permit must be submitted to the City.

EPSC Permit Application

A completed EPSC Permit Application form is required.

Yes	No	
☐	☐	Is the EPSC Permit Application form complete?
☐	☐	Is the EPSC Permit Application form accurate?
☐	☐	Is the EPSC Permit Application form signed?

EPSC Plan Sheets

Site-specific EPSC Plan Sheets illustrate the erosion prevention and sediment control best management practices (BMPs) that are proposed to prevent offsite discharge of sediment and other potential pollutants. EPSC Plan Sheets must include the following:

Yes	No	
☐	☐	Vicinity map, property address, and property owner's name and address.
☐	☐	Scale, north arrow, property boundaries, sheet number and limits of disturbance.
☐	☐	Existing and proposed ground contours, including a minimum of the first 50 feet of abutting property.
☐	☐	Arrows to indicate existing and final flow patterns of surface water on the property.
☐	☐	Locations and sizes of existing and proposed channels and drainage pipes (labeled as such and with arrows indicating flow direction) on and for 100 feet upstream and downstream of the site.
☐	☐	Location of all springs, wetlands, surface waters and the 100-year flood plain, if applicable.
☐	☐	Site entrances/exits (as approved by the City) .
☐	☐	Locations, types, and applicable dimensions of erosion prevention, sediment control, and pollution control measures.[2]
☐	☐	Applicable standard erosion control notes, with additions or changes as required.
☐	☐	Dates for placement of erosion control measures and dates of removal once vegetation is established.

[2] Approved erosion prevention and sediment control measures can be found in Chapter 4 of the EPSC Manual. Pollution control measures can be found in Chapter 5 of the EPSC Manual.

☐ ☐ Landscape plan showing areas of temporary stabilization and proposed vegetation for final stabilization

☐ ☐ Stamped or signed by a certified professional licensed in Oregon as a civil or environmental engineer, landscape architect, geologist, or certified professional in erosion and sediment control (CPESC)

Wet Weather

Wet weather erosion prevention is in effect from October 1st through April 30th.

☐ ☐ Will grading be conducted during wet weather?

☐ ☐ Are erosion prevention measures proposed that satisfy Section 2.5 of the EPSC Manual?

EPSC BMP Details

BMP details for the proposed control measures must be included in the EPSC Plan, including sizing criteria, performance criteria, design specifications, guidance on selection and placement of controls, and specifications for long-term operation and maintenance, including appropriate inspection interval and self-inspection checklists for use by the construction site operator.

Applicable details of erosion control measures must show:

Yes **No**

☐ ☐ Type of control and installation requirements

☐ ☐ Full dimensions of the controls and construction information

☐ ☐ If a sediment trap or pond is proposed, calculations used for determining trap or pond sizing and pipe orifice sizing.

☐ ☐ Operation and Maintenance Requirements

Tables 4-2 or 4-3 in the EPSC Manual lists the control measures approved by the City. The applicant may request different control measures and must submit calculations or other supporting information used to determine the sizing and layout of the measures shown on the submitted erosion control plan.

☐ ☐ Are control measures proposed that are not in Tables 4-2 or 4-3?

☐ ☐ Are calculations included that provide adequate sizing and layout of the controls?

EPSC Plan

The EPSC Plan is a written summary of the construction project that describes the site, the project being constructed, and the erosion prevention and sediment control measures that will be used throughout all phases of construction to reduce the potential for contaminated stormwater runoff to discharge offsite. An EPSC Plan template has been developed and should be used to ensure that the EPSC Plan includes the following:

Yes	No	
		<u>Contact Information</u>
☐	☐	EPSC Plan author and contact information, date, preparer's signature and stamp.
☐	☐	Project name, address, property owner's name and address, and design engineer, developer, and general contractor contact information.
☐	☐	Name, contact information, and qualifications of the EPSC Manager who will maintain site Plan Sheets, conduct inspections, and determine installation and maintenance needs of onsite BMPs.
		<u>Site Description</u>
☐	☐	A description of the construction activities, including structures that are planned for demolition.
☐	☐	The size of the property (in acres and length in miles if a linear construction site).
☐	☐	Any waterbodies to be impacted by construction activities and reference any 401 water quality certifications, USACE permit, DSL permit, and/or any other applicable agency authorization.
☐	☐	The total area expected to be disturbed by the construction activities (to the nearest quarter acre or nearest quarter mile if a linear construction site).
☐	☐	A description of any on-site and off-site construction support activity areas such as staging areas.
☐	☐	The maximum area expected to be disturbed at any one time.
☐	☐	Onsite soils using Natural Resource Conservation Service soil survey data.

Yes	No	
		Schedule
☐	☐	A description and projected schedule including start and completion dates for: • Clearing and Grubbing / Demolition • Creation of soil and vegetation stockpiles • Mass Grading • Site Preparation • Final Grading • Construction (utilities, streets, stormwater facilities, buildings) • Site Stabilization
		Control Measures
☐	☐	Identification of all pollution-generating activities and control measures to be utilized for each activity.
☐	☐	Construction dewatering dates and control measures to be utilized.
☐	☐	If used, a description of any cationic treatment chemicals to be utilized and assurances that use of these chemicals will not result in an exceedance of water quality standards.
		Spill Prevention / Control
☐	☐	A description of spill prevention procedures. Spill kits onsite?
		Inspections
☐	☐	Description of inspection frequency.
☐	☐	Inspection form to be utilized.
		Stabilization
☐	☐	Location where onsite fertilizers will be applied.
☐	☐	Temporary and permanent seed mixes to establish cover.

EPSC Appendix C-5:

Inspector Monitoring Forms

EROSION AND SEDIMENT CONTROL MONITORING FORM

PROJECT NAME:	PERMIT #
LOCATION:	RECEIVING WATER:
CONTRACTOR:	

EROSION CONTROL MEASURES

LOCATION	DESCRIPTION	EFFECTIVENESS	DATE

VISIBLE OR MEASURABLE EROSION LEAVING SITE

LOCATION	CORRECTIVE & CLEAN-UP MEASURES	EFFECTIVENESS	DATE

COMMENTS AND GENERAL SITE CONDITIONS:

PREPARED BY:	PERIOD:

Minimum Monitoring and Reporting Requirements: Inspect all erosion control measures a minimum of once per week on active sites, once every two weeks on in-active sites, and within 24 hours following a 0.5 inch rain event.

MUNICIPAL INSPECTOR
EROSION AND SEDIMENT CONTROL MONITORING

PROJECT NAME:	**PERMIT #:**
REVIEWER:	**DATE:**
CONTRACTOR:	

INSPECTION CHECKLIST

YES	NO	N/A	
[ ]	[ ]	[ ]	Do the control measures match the ESCP?
[ ]	[ ]	[ ]	Have control measured been installed, implemented, and maintained properly?
[ ]	[ ]	[ ]	Does permanent vegetation provide adequate stabilization?
[ ]	[ ]	[ ]	Do all operational storm sewer inlets have adequate inlet protection?
[ ]	[ ]	[ ]	Are soil and mud kept off public roadways at intersections with site access roads?
[ ]	[ ]	[ ]	Are there any non-stormwater discharges from the site?
[ ]	[ ]	[ ]	Are there any illicit connections leaving the site?
[ ]	[ ]	[ ]	Is there any discharge of pollutants from the site?

EROSION AND SEDIMENT CONTROL MEASURES	
CONTROL MEASURE	COMMENTS
BIO-BERM	
CONSTRUCTION ENTRANCE	
CONCRETE WASHOUT	
STREET SWEEPING	
SOIL STABILIZATION	

ISSUES WITH EROSION CONTROL MEASURES			
CONTROL MEASURE	LOCATION	COMMENTS	RESOLUTION DATE

COMMENTS:

EPSC Appendix C-6:

Glossary

GLOSSARY OF TERMS

AASHTO Classification The official classification of soil materials and soil aggregate mixtures for highway construction used by the American Association of State Highway and Transportation Officials.

Adsorption The adhesion of a substance to the surface of a solid or liquid. Heavy metals such as zinc and lead often adsorb onto particles.

Alluvial Soils Soils developed from transported and relatively recently deposited material (alluvium) characterized by a weak modification (or none) of the original material by soil-forming processes.

Alluvium A general term for all detrital material deposited or in transit by streams, including gravel, sand, silt, clay, and all variations and 0"--, mixtures of these. Unless otherwise noted, alluvium is unconsolidated.

Anadromous Fishes which ascend rivers from the sea for breeding.

Annual Storm The highest peak storm discharge that is expected in any given year.

Apron A pad of non-erosive material designed to prevent scour holes developing at the outlet ends of culverts, outlet pipes, grade stabilization structures, and other water control devices.

Aquifer An underground porous, water-bearing geological formation. The term is generally restricted to materials capable of yielding an appreciable supply of water.

Barrel A conduit placed through a dam, levee, or a dike to control the release of water.

Base Flow Stream discharge derived from groundwater sources as .differentiated from surface runoff. Sometimes considered to include flows from regulated lakes or reservoirs.

Bearing Capacity The maximum load that a material can support before failing.

Bedrock The more or less solid rock in place either on or beneath the surface of the earth. It may be soft, medium or hard and have a smooth or irregular surface.

Berm A constructed barrier of compacted earth.

Best Management Practices Physical, structural and/or managerial practices employed to (BMP's) avoid or mitigate damage or potential damage from the contamination or pollution of surface waters or wetlands. Structural BMP's are actual physical installations rather than procedural/managerial BMP's, such as good housekeeping and employee training.

Capillary Action The tendency of drier soil particles to attract moisture from wetter portions of soil.

Catch Basin A grated inlet, curb opening or combination inlet with or without a sump which admits storm water to a sewer or subdrain.

CD	Cross machine direction; direction perpendicular to the machine or manufacture direction.
Channel	A natural stream or excavated ditch that conveys water.
Channel Stabilization	Protecting the sides and bed of a channel from erosion by controlling flow velocities and flow directions using jetties, drops or other structures and/or by lining the channel with a suitable liner such as vegetation, riprap, concrete or other similar material.
Channelization	Alteration of a stream channel by widening, deepening, straightening, or paving certain areas to improve flow characteristics.
Check Dam	A small dam constructed in a gully or other small watercourse to decrease flow velocity , minimize channel scour and promote sediment deposition.
Chute	A high-velocity, open channel for conveying water down a steep slope without erosion, usually paved.
Clay	(1) Soil fraction consisting of particles less than 0.002 mm in diameter. (2) A soil texture class which is dominated by clay or at least has a larger proportion of clay than either silt or sand.
Cohesion	The capacity of a soil to resist shearing stress, exclusive of functional resistance.
Cohesive Soil	A soil that, when unconfined, has considerable strength when air- dried and significant strength when saturated.
Coir	Fiber made from coconut husks.
Compost	Organic residue or a mixture of organic residues and soil, that has undergone biological decomposition until it has become relatively stable humus.
Conventional Pollutants	Contaminants (other than nutrients) such as sediment, oil, and vehicle fluids.
Contour	An imaginary line on the surface of the earth connecting points of the same elevation.
Cut	Portion of ground surface or area from which earth has been removed or will be removed by excavating; the depth below the original ground surface to the excavated surface.
Cut-and-Fill	Process of earth grading by excavating part of a higher area and using the excavated material for fill to raise the surface of an adjacent lower area.
Cutoff Trench	A long, narrow excavation (keyway) constructed along the center line of a dam, dike, levee or embankment and filled with relatively impervious material intended to reduce seepage of water through porous strata.
Cutting	A leaf, stem or branch cut form a plant to establish a new plant.
Design Highwater	The elevation of the water surface at peak flow conditions of the design flood.

Design Life	The period of time for which a facility is expected to perform its intended function.
Design Storm	Selected storm of a given frequency used for designing a design storm system. Hypothetical storm derived from intensity- duration-frequency curves. A prescribed hydrograph and total precipitation amount (for a specific duration recurrence frequency) used to estimate runoff in order to analyze existing drainage, design new drainage facilities or assess impacts of a proposed project on surface water flow.
Desilting Area	An area of grass, shrubs, or other vegetation used for including deposition of silt and other debris from flowing water; located above a stock tank, pond, field, or other area needing protection from sediment accumulation.
Detention	Storage and subsequent release of excess storm water runoff.
Detention Facility	An above or below ground facility, such as a pond or tank, which temporarily stores storm water runoff and releases it at a controlled rate. There is little or no infiltration of the stored storm water.
Detention Time	The theoretical time required to displace the contents of a tank or unit at a given rate of discharge (volume divided by rate of discharge).
Dewatering	The removal of water temporarily impounded in a holding basin.
Dike	An embankment to confine or control water, often built along the banks of a river to prevent overflow of lowlands; a levee.
Discharge	Usually the rate of water flow; a volume of fluid passing a point per unit time commonly expressed as cubic feet per second, cubic meters per second, gallons per minute, or millions of gallons per day.
Dispersion, Soil	The breaking down of fine soil aggregates into individual particles, resulting in single-grain structure. Ease of dispersion influences the erodibility of soils. Generally speaking, the more easily dispersed the soil, the more erodible it is.
Diversion	A channel with a supporting ridge on the lower side constructed at the top, across, or at the bottom of a slope for the purpose of controlling surface runoff.
Diversion Dike	A barrier built to divert surface runoff.
Drain	A buried slotted or perforated pipe or other conduit (subsurface drain) or a ditch (open drain) for carrying off surplus groundwater or surface water.
Drainage	The removal of excess surface water or groundwater from land by means of ditches or subsurface drains.
Drainageway	A natural or artificial depression that carries surface water to a larger watercourse or outlet such as a river, lake, or bay.
Drop Inlet	Overall structure in which the water drops through a vertical riser .r connected a discharge conduit or storm sewer.

Drop Spillway Overall structure in which the water drops over a vertical wall onto an apron at a lower elevation.

Dry Pond A facility which provides storm water quantity control by detaining runoff in a detention basin, then releasing the runoff at allowable rates.

Elongation The increase in length produced in the gage length produced by a tensile load.

Embankment A man-made deposit of soil, rock, or other material often used to form an impoundment.

Emergency Spillway Usually a vegetated earth channel used to safely convey flood discharges around an impoundment structure.

Energy Dissipater A device used to reduce the energy of flowing water to prevent erosion.

Environment The sum total of all the external conditions that may act upon a living organism or community to influence its development or existence.

Erodibility Susceptibility to erosion.

Erosion The wearing away of the land surface by water, wind, ice, gravity, or other geological agents. The following terms are used to describe different types of water erosion:

1. **Accelerated erosion** - Erosion much more rapid than normal or geologic erosion, primarily as a result of the activities of man.

2. **Channel erosion** - The erosion process whereby the volume and velocity of flow wears away the bed and/or banks of a well-defined channel.

3. **Gully erosion** - The erosion process whereby runoff water accumulates in narrow channels and, over relatively short periods, removes the soil to considerable depths, ranging from 1 to 2 feet to as much as 75 to 100 feet.

4. **Rill erosion** - An erosion process in which numerous small channels only several inches deep are formed; occurs mainly on recently disturbed and exposed soils. See Rill.

5. **Splash erosion** - The spattering of small soil particles caused by the impact of raindrops on wet soils. The loosened and spattered particles mayor may not be subsequently removed by surface runoff.

6. **Sheet erosion** - The gradual removal of a fairly uniform layer of soil from the land surface by runoff water.

Erosion Prevention and Sediment Control (EPSC) Any temporary or permanent measures taken to reduce erosion, control siltation and sedimentation, and ensure that sediment-laden water does not leave a site.

Erosion Prevention and Sediment Control Plan (EPSC plan) Plans, specification and BMP details intended to prevent and control erosion and sediment related to the project construction activities.

Estuary Area where fresh water meets salt water, (e.g. bays, mouths of rivers, salt marshes and lagoons). Estuaries serve as spawning and feeding grounds for large numbers of marine organisms and provide shelter and food for birds and wildlife.

Evapotranspiration The combined loss of water from an area by evaporation from the soil surface and by transpiration of plants.

Excess Rainfall The amount of rainfall that runs directly off an area.

Filter Blanket A layer of sand and/or gravel designed to prevent the movement of fine-grained soils.

Filter Fabric A woven or non-woven, water penI1eable material generally made of synthetic products such a polypropylene and used in erosion and sediment control applications to trap sediment or prevent the movement of fine soil particles. Often used instead of a filter blanket.

Flood Peak The highest stage or greatest discharge attained by a flood event. Thus, peak stage or peak discharge.

Floodplain The lowland that borders a stream and is subject to flooding when the stream overflows its banks.

Flood Stage The stage at which overflow of the natural banks of a stream begins.

Floodway A channel, either natural, excavated, or bounded by dikes and levees, used to carry flood flows.

Flume A constructed channel lined with erosion-resistant materials used to convey water on steep grades without erosion.

Fluvial Sediment Those deposits produced by stream or river action.

Foundation Drain A pipe or series of pipes which collects groundwater from the foundation or footing of structures to improve stability.

Freeboard Vertical clearance between the nonI1al operating level and the top side of an open conduit or channel. Vertical distance between the design water surface elevation and the elevation of the barrier retaining the water.

Frequency of Storm (design storm frequency) The anticipated period in years that will elapse before another storm of equal intensity and/or total volume will recur: a 10-year storm can be expected to occur on the average once every 10 years.

Gabion A wire mesh cage, usually rectangular, filled with rock and used to protect channel banks and other sloping areas from erosion.

Gauge Device for measuring precipitation, water level., discharge, velocity, pressure, temperature, etc., e.g., a rain gauge. A measure of the thickness of metal, e.g., diameter of wire or wall thickness of steel pipe.

Geotextile Any permeable textile used with foundation, rock, earth or any other geotechnical engineering-related material as an integral part of a human-made project, structure or system.

Grade (1) The slope of a road, a channel, or natural. ground. (2) The finished surface of canal, bed, roadbed, top of embankment, or bottom of excavation; any surface prepared to a design elevation for the support of construction such as paving or the laying of a conduit. (3) To finish the surface of a canal bed, roadbed, top of embankment, or bottom of excavation, or other land area to a smooth, even condition.

Grade Stabilization Structure A structure for the purpose of stabilizing the grade of a gu1.1y or other watercourse, thereby preventing further head-cutting or lowering of the channel bottom.

Gradient Change of elevation, velocity , pressure, or other characteristics per unit length; slope.

Grading The cutting and/or filling of the land surface to a desired slope or elevation.

Grass A member of the botanical family Gramineae, characterized by blade-like leaves that originate as a sheath wrapped around the stem.

Grassed Waterway A natural or constructed waterway, usua1.1y broad and shallow, covered with erosion-resistant grasses and used to safely conduct surface water from an area.

Ground Cover (Horticulture) Low-growing, spreading plants useful for low- maintenance landscape areas.

Habitat The environment in which the life needs of a plant or animal are supplied.

Harmful Pollutant A substance which has adverse effects on an organism. Adverse effects include immediate death, chronic poisoning, impaired reproduction and other conditions.

Head The height of water above any plain of reference. The energy, either kinetic or potential, possessed by each unit weight of a liquid, expressed as the vertical height through which a unit weight would have to fall to release the average energy possessed. Used in various compound terms such as pressure head of velocity head.

Head loss Energy loss due to friction, eddies, changes in velocity, elevation or direction of flow.

Headwater The source of a stream. The water upstream from a structure or point a stream.

Heavy Metals Metals having a high specific gravity , present in municipal and industrial wastes, that pose long-tem environmental hazards. Such metals include cadmium, chromium, cobalt, copper, lead, mercury, nickel and zinc.

Hydrologic cycle The circuit of water movement from the atmosphere to the earth and back to the atmosphere through various stages or processes such as precipitation, interception, runoff, infiltration, percolation, storage, evaporation, and transpiration.

Hydrology The science of the behavior of water in the atmosphere; on the surface of the earth, and underground.

Hyetograph A graph of runoff rate, inflow rate or discharge rate past a specific point in time. A graph of flow versus time.

Impact basin A device used to dissipate the energy of flowing water to reduce erosion. Generally constructed of concrete partially submerged with baffles to dissipate velocities.

Impervious A surface which water can not easily penetrate. Can include graveled surface as well as paved surfaces.

Material Safety Data Sheets Data sheets which come with materials. The sheets contain (MSDS) information such as pH, flashpoint, reactivity, first aid recommendations and indicate material classification and handling requirements.

MD Machine direction; in textiles, the direction in a machine-made fabric parallel to the direction the fabric followed in the manufacturing machine.

Mean Depth Average depth; cross-sectional area of stream or channel divided by its surface or top width.

Mean Velocity The average velocity of a stream flowing in a channel or conduit at a given cross-section or in a given reach. It is equal to the discharge divided by the cross-section area of the reach.

Microclimate The climate specifically associated with a very small area such as a crevice in a rock outcropping.

Mitigation Means, in the following order of importance:

1. Avoiding the impact altogether by not taking a certain action or part of an action.

2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts.

3. Rectifying the impact by repairing, rehabilitating or restoring the affected environment.

4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

5. Compensation for the impact by replacing, enhancing, or providing substitute resources or environments.

Mulch A natural or artificial layer of plant residue or other materials covering the land surface which conserves moisture, holds soil in place. aids in establishing plant cover, and minimizes temperature fluctuations.

National Pollutant Discharge Elimination System (NPDES) The part of the Federal Clean Water Act which requires permits (NPDES permits) for point and nonpoint source discharges.

Natural Drainage The flow patterns of storm water runoff over the land in its pre- development state.

Nitrogen Fixation The conversion of atmospheric nitrogen into stable compounds usable by plants. Carried out by bacteria that colonize the roots of most legumes.

Nonpoint Source Pollution Pollution that enters a waterbody from diffuse origins on the watershed and does not result from discernible, confined, or discrete conveyances.

Normal Depth Depth of flow in an open conduit during uniform flow for the given conditions.

Nutrients Essential chemicals for plant and animal growth. Excessive amounts can lead to water quality degradation and algae blooms. Some nutrients are toxic at high concentrations.

Open Drain Natural watercourse or constructed open channel that conveys drainage water.

Orifice An opening with closed perimeter, usually of regular form, through which water may flow, generally to control outlet flow.

Outfall The point, location, or structure where wastewater or drainage discharge from a sewer to a receiving body of water.

Outlet Point of water disposal from a stream, river, lake, tidewater, or artificial drain.

Outlet channel A waterway constructed or altered primarily to carry water from man-made structures, such as smaller channels, tiles, lines, and diversions.

Peak Discharge The maximum, instantaneous flow rate during a storm, usually in ~ reference to a specific design storm event.

Permeability A generic term for the ability of a material to conduct a fluid.

Permeable Soils Soil materials with filtration rate of 10 minutes per inch or better . Such soils allow infiltration and reduce or eliminate surface and storm water runoff. Classified as SCS (Soil Conservation Services) Type A.

Permeability Rate The rate at which water will move through a saturated soil. Permeability rates are classified as follows:

- Very slow - Less than 0.06 inches per hour.
- Slow - 0.06 to 0.20 inches per hour.
- Moderately slow - 0.20 to 0.63 inches per hour.

- Moderate - 0.63 to 2.0 inches per hour.
- Rapid - 6.3 to 20.0 inches per hour.
- Very rapid - More than 20.0 inches per hour.

Permittivity For a geotextile, the volumetric flow rate if water per unit cross- y section area, per unit head, under laminar flow conditions, in the normal direction through the fabric.

Plasticity Index The numerical difference between the liquid limit and the plastic limit of soil; the range of moisture content within which the soil remains plastic.

Plastic Limit The moisture content at which a soil changes from a semi-solid to a plastic state.

Point Source Any discernible, confined an discrete conveyance, including but not limited to any pipe ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation. or vessel or other floating craft. from which pollutants are or may be discharged.

Point Source Pollutants Pollution which enters a water body resulting from discernible confined or discrete conveyances.

Pollution Control Plan (PCP) Consists of Pollution Control Plan form, narrative, site map and details describing measures to prevent pollution related to contractor activities.

Pervious Allowing movement of water.

Porosity The volume of pore space in soil or rock.

pH A numerical measures of hydrogen ion activity .The neutral point is pH 7.0. All pH values below 7.0 are acid and all above 7.0 are alkaline.

Rainfall Intensity The rate at which rain is falling at any given instant, usually expressed in inches per hour .

Rational Method A means of computing storm drainage flow rates, Q, by use of the formula Q=CIA, where C is a coefficient describing the physical drainage area, I is the rainfall intensity and A is the area.

Receiving Stream The body of water into which runoff or effluent is discharged.

Recharge Basin A basin provided to increase infiltration for the purpose of replenishing groundwater supply.

Retention The process of collecting and holding surface and storm water runoff with no surface overflow.

Retention/Detention Facility A type of drainage facility designed either to hold water for a considerable length of time and then release it by evaporation, plant transpiration, and/or infiltration into the ground, or to hold surface and storm water runoff for a short period of time and then release it to the surface and storm water management system.

Retention Structure A natural or artificial basin that functions similar to a detention structure except that it maintains a permanent water supply.

Riparian Pertaining to banks of streams, wetlands, lakes or tide waters.

Riparian Rights A principle of common law which requires that any user of waters adjoining or flowing through his lands must so use and protect them that he will enable his neighbor to utilize the same waters undiminished in quantity and undefiled in quality.

Riser The inlet portions of a drop inlet spillway that extends vertically from the pipe conduit barrel to the water surface.

Runoff That portion or precipitation that flows from a drainage area on the land surface, in open channels or in storm water conveyance systems.

Salmonid A member of the fish family salmonidae. Includes Chinook, coho, chum, sockeye and pink salmon, cutthroat, steelhead, rainbow, Dolly varden, brook, kokanee and whitefish.

Sand (1) Soil particles between 0.05 and 2.0 mm in diameter. (2) A soil textural class inclusive of all soils which are at least 70% sand and 15% or less clay.

Saturation In soils, the point at which a soil or an aquifer will no longer absorb any amount of water without losing an equal amount.

Scour The clearing and digging action of flowing water, especially the downward erosion caused by stream water in sweeping away mud and silt from the stream bed and outside bank of a curved channel.

Sediment Fragmented material originated from weathering and erosion of rocks and unconsolidated deposits. The material is transported by, suspended in, or deposited by water.

Sedimentation Deposition or formation of sediment.

Sediment Delivery Ratio The fraction of the soil eroded from upland sources that actually reaches a stream channel or storage reservoir.

Sediment Discharge The quality of sediment, measured in dry weight or by volume, transported through a stream cross-section in a given time. Sediment discharge consists of both suspended load and bed load

Sediment Pool The reservoir space allotted to the accumulation of sediment during the life of the structure.

Seedbed The soil prepared by natural or artificial means to promote the germination of seed and the growth of seedlings.

Seedling A young plant grown from seed.

Settling Basin An enlargement in the channel of a stream to permit the settling of debris carried in suspension.

Sheet Erosion	Relatively uniform removal of soil from an area without the development of conspicuous water channels.
Sheet Flow	Relatively uniform flow over a plane surface without concentration of water into conspicuous channels.
Silt	(1) Soil fraction consisting of particles between 0.002 and 0.05 mm in diameter. (2) A soil textural class indicating more than 80% silt.
Siltation	Process by which a river. lake or other water body becomes clogged with sediment. Siltation can clog gravel beds and prevent successful salmon spawning.
Slope	Degree of deviation of a surface from the horizontal; measured as a numerical ratio or percent. Expressed as a ratio, the first number is the horizontal distance (run) and the second is the vertical distance (rise), e.g., 2:1. Slope can also be expressed as the rise over the run. For instance, a 2:1 slope is a 50 percent slope.
Soil	The unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.
Soil Horizon	A horizontal layer of soil that, through processes of soil formation, has developed characteristics distinct from the layers above and below.
Soil Profile	A vertical section of the soil from the surface through all horizons.
Soil Stabilization	Use of rock-lining, vegetation or other methods to prevent soil movement when loads are applied to the soil.
Soil Structure	The relation of particles or groups of particles which impart to the whole soil a characteristic manner of breaking; some types are crumb structure, block structure, platy structure, and columnar structure.
Soil Texture	The physical structure or character of soil determined by the relative proportions of the soil separates (sand, silt and clay) of which it is composed.
Spillway	A passage such as a paved apron or channel for surplus water over or around or through a dam or similar structure. An open or closed channel, or both, used to convey excess water from a reservoir. It may contain gates, whether manually or automatically controlled, to regulate the discharge of excess water.
Storm Frequency	The statistical time interval between major storms of predetermined intensity and runoff volumes for which storm sewers and other structures are designed and constructed to handle hydraulically without surcharge or backflood.
Storm Sewer	A sewer that carries storm water, surface drainage, street wash and other wash waters, but excludes sewage and industrial wastes. Also called a storm drain.
Storm Water	That portion of precipitation that does not percolate into the ground or evaporate, but flows via overland flow, interflow, channels or pipes into a defIned surface water channel, or a constructed infiltration facility.

Storm Water Facility A constructed component of a storm water drainage system, designed or constructed to perform a particular function, or multiple functions. Storm water facilities include pipes, swales, ditches, culverts, street gutters, detention basins, retention basins, constructed wetlands and other.

Streambanks The usual boundaries, not the flood boundaries, of a stream channel. Right and left banks are named facing downstream.

Stream Gauging The quantitative determination of stream flow using gauges, current meters, weirs, or other measure instruments at selected locations. See Gauging station.

Subcritical Flow Flow at relatively low velocity where the wave from a disturbance can move upstream. Froude No. less than 1.

Subsoil The B horizons of soils with distinct profiles. In soils with weak profile development, the subsoil can be defined as the soil below which roots do not normally grow.

Subsurface Drain A pervious backfilled trench usually containing stone and perforated pipe for intercepting groundwater or seepage.

Subwatershed A watershed subdivision of unspecified size that forms a convenient natural unit.

Surface Runoff Precipitation that falls onto the surfaces of roofs, streets, the ground, etc., and is not absorbed or retained by that surface, but collects and runs off.

Suspended Solids Organic or inorganic particles suspended in and carried by water: sand, mud, clay as well as solids.

Swale An elongated depression in the land surface that is at least seasonally wet, is usually heavily vegetated, and is normally without flowing water. Swales conduct storm water into primary drainage channels and may provide some groundwater recharge.

Tile Drain Pipe made of perforated plastic, burned clay, concrete, or similar material, laid to a designed grade and depth, to collect and carry excess water from the soil.

Tile Drainage Land drainage by means of a series of tile lines laid at a specified depth, grade and spacing.

Time of Concentration The time period necessary for surface water runoff to reach the outlet of a sub-basin from the hydraulically most remote point in the tributary drainage area.

Toe of Slope The base or bottom of a slope at the point where the ground surface abruptly changes to a significantly flatter grade.

Topography General term to include characteristics of the ground surface such as plains, hills, mountains, degree of relief, steepness of slopes and other physiographic features.

Topsoil The dark-colored surface layer of A horizon of a soil. When present it ranges in depth from a fraction of an inch to 2 or 3 feet; equivalent to the plow layer of cultivated soils. Commonly used to refer to the surface soil layer(s), enriched in organic matter and haying textural and structural characteristics favorable for plant growth.

Total Solids Solids in water, sewage or other liquids including dissolved, filterable and nonfilterable solids. The residue left when moisture evaporates and the remainder is dried at a specified temperature.

Total Suspended Solids (TSS) The entire amount of organic and inorganic particles dispersed in water. TSS are the larger particles in the water which are more easily removed by sedimentation than smaller particles which cause turbidity.

Toxicity The characteristic of being poisonous or harmful to plant animal life; the relative degree or severity of this characteristic.

Trash Rack A structural device used to prevent debris from entering a pipe spillway or other hydraulic structure.

Transmissivity The volumetric flow rate per unit thickness under laminar flow conditions, in the in-plane direction of the fabric.

Turbidity Is caused by silt and clay particles, particles smaller than 0.02 mm, suspended in water. Measurement of turbidity can be done by turbidimeter which measures light-beam scatter caused by small suspended particles and converts it to NTU (national turbidity units).

Turf Surface soil supporting a dense growth of grass and associated root mat.

Unified Soil Classification A classification system based on the identification of soils System according to their particle size, gradation, plasticity index, and liquid limit.

Vactor Waste The waste material in the bottom of a catch basin.

Vegetative Stabilization Protection of erodible or sediment-producing areas with:

- Permanent seeding, producing long-term vegetative cover,
- Short-term seeding, producing temporary vegetative cover, or
- Sodding, producing areas covered with a turf of perennial sod-forming grass.

Watercourse A definite channel with bed and banks within which concentrated water flows, either continuously or intennittently.

Water Quality A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.

Water Resources The supply of groundwater and surface water in a given area.

Watershed Area All land and water within the confines of a drainage divide.

Water Table	The free surface of the groundwater. That surface subject to atmospheric pressure under the ground, generally rising and falling with the season, or from other conditions such as water withdrawal.
Weir	Device for measure or regulating the flow of water.
Weir Notch	The opening in a weir for the passage of water.
Wet Pond	A facility treating storm water by utilizing a permanent pool of water to remove conventional pollutants from runoff. Treatment mechanisms include sedimentation, biological uptake and plant filtration.
Wet Season	October 1 to April 30.

EPSC Appendix C-7:

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