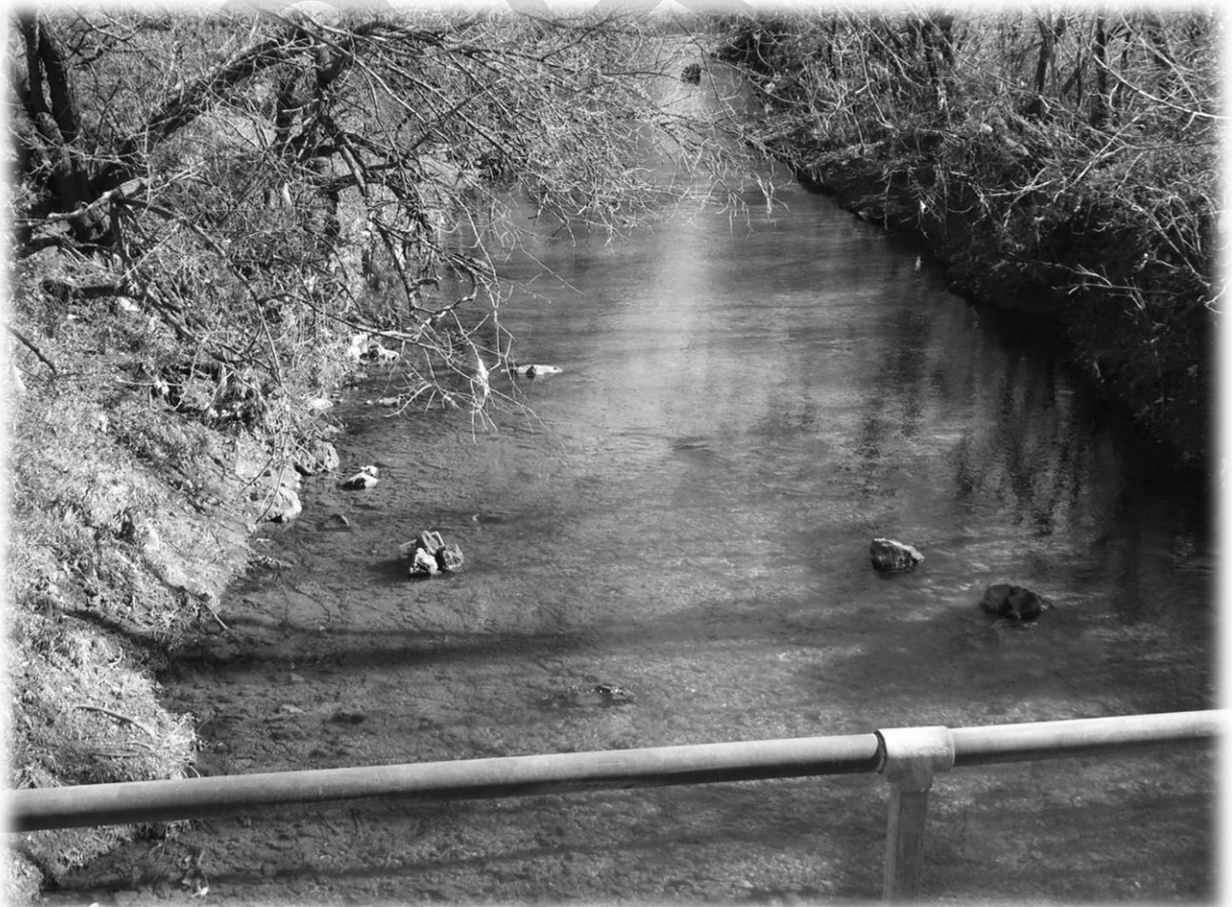


**2015**

City of  
Birmingham

# **[MAINTENANCE, OPERATION, AND CONSTRUCTION BEST MANAGEMENT PRACTICES PLAN]**



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## INTRODUCTION

The Waterway Maintenance Best Management Practices (BMP) Manual provides guidance for preventing or minimizing the related problems of erosion, sediment and stormwater while conducting creek maintenance. The primary objective of this manual is compliance with the Clean Water Act, which aims to “restore and maintain the chemical, physical, and biological integrity of the Nation’s water.” (CWA § 101(a).) The secondary objective of this manual is to alleviate the City from having to obtain a permit every time stream maintenance is needed. Instead, the City hopes to gain permission from the Army Corps of Engineers to conduct maintenance activities as long as long as this BMP Manual is followed.

Additionally, the BMP manual will be used as a tool to adhere to the standards set by *Alabama Department of Environmental Management Water Division- Water Quality Program* (Volume 1) regarding water quality parameters such as dissolved oxygen (DO) and turbidity. These water quality parameters are of importance because they are directly related to disturbances that could be caused by creek maintenance activities; when turbidity increases, dissolved oxygen decreases, thus degrading the water quality of the creek.

This manual is derived from a combination of Best Management Practices from the *Alabama Handbook for Erosion Control, Sediment Control and Stormwater Management on Construction Sites and the Urban Areas* (Volumes 1 and 2) and the *Washington State Department of Transportation Best Management Practices Field Guide*. This adaptation best provides a manual that pertains specifically to the City of Birmingham’s waterways. To assist with the ease of reading, BMPs have been separated into the following outcome categories:

- **Keep Water from Work Area**
- **Reduce Potential for Soil Becoming Waterborne or Airborne**
- **Filter/ Perimeter Protection**
- **Settling**
- **Reduce Water Velocity/ Erosive Forces**
- **Containment**
- **Habitat Protection/ Maintenance**
- **Reduce Potential for Contaminants Falling into Water**
- **Stream Maintenance**





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## PROCESSES AND PRINCIPLES OF EROSION AND SEDIMENTATION

Erosion is the process by which the land surface is worn away by the action of water, wind, ice or gravity. Soil disturbance, whether by natural forces or by creek maintenance activities, can accelerate the rate of erosion. Careful planning combined with proper selection and installation of erosion control measures can reduce the impact creek maintenance related erosion.

### SOIL EROSION PROCESS

Different types of erosion are detailed below:

- **Splash erosion** is the result of raindrops hitting bare or sparsely vegetated soil and breaking up the soil particles.
- **Sheet erosion** occurs when these soil particles are transported in a thin layer, or sheet, by flowing water.
  - Rills and gullies are formed by concentrated, high velocity sheet flow. More soil detaches, increasing the erosion damage.
- **Stream and channel erosion** occurs by even higher rates of velocity and steepness of poorly vegetated slopes.
- **Wind erosion** occurs during dry weather conditions and high winds. The size of particles being moved is related to wind velocity. Wind erosion may cause air pollution, soil loss and/or water quality degradation.



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Water quality and fish habitat are the major concerns associated with soil movement. BMPs combined with training and oversight will enable the Department of Public Works (DPW) personnel to lessen the effects of soil erosion from the work site.

### SEDIMENTATION

Sedimentation is described as the tendency for soil particles settling out of suspension as the velocity of water decreases. The larger and heavier particles (gravel and sand) settle out more rapidly than silt and clay particles, which are easily transported and settle out very slowly. It is difficult, and perhaps



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impossible in some instances to totally eliminate the transport of the clay and silt particles even with the most effective erosion control programs.

Turbidity occurs in conjunction with sedimentation. Turbidity, cloudiness in the water, occurs when eroded soil is suspended in the water before it settles out. Turbid water can stress or kill fish by clogging their gills and making it hard for them to see food sources. Since some of Birmingham's creeks are designated as "warm water fisheries", thus it is important for us to maintain a pristine habitat.

## **PRINCIPLES OF EROSION AND SEDIMENTATION CONTROL**

Effective erosion and sedimentation control requires first that the soil surface be protected from the erosive forces of wind, rain, and runoff, and second that eroded soil is controlled onsite. The following principles shall be integrated into a system of control measures and management techniques to control erosion and reduce offsite sediment migration. For ready reference, readers are encouraged to obtain a copy of the, "Field Guide for Erosion and Sediment Control on Construction Site in Alabama" from the Alabama Soil and Water Conservation Committee and Partners (First Edition, August 2004). Furthermore, City construction crews working with heavy equipment on or in close proximity to City streams are advised to attend the Erosion and Sediment Control for Home Builders Workshop at least once every two years. This workshop is sponsored in part by the City of Birmingham Stormwater Management Program and taught by City Engineering Inspectors, in conjunction with the Home Builders Association. The classes represent an opportunity for attendees to maintain knowledge on current erosion and sediment control practices and provides a forum to share ideas and solutions to field problems, which might be encountered.

### **I. Minimize the Extent and Duration of Exposure**

Scheduling can be a very effective means of reducing the hazards of erosion. Schedule construction activities to minimize the exposed area and the duration of exposure. However, it is understood that maintenance activities cannot always be scheduled. In either case, it is important to stabilize disturbed areas as quickly as possible in both scheduled and unscheduled maintenance.

### **II. Protect Areas to be Disturbed from Stormwater Runoff**

Use berms, diversions, pumps, dams, barriers, sediment traps and constructed waterways to intercept runoff and divert it away from cut-and-fill slopes or other disturbed areas as may be needed. Install these measures before beginning maintenance and/or land disturbing activities.

### **III. Stabilize Disturbed Areas**

Removing the vegetative cover and altering the soil structure by clearing the surface may increase an area's susceptibility to erosion. Apply stabilizing measures after the land is disturbed and implement

temporary or permanent vegetation, mulches, or other BMPs to correspond with maintenance activities.

#### **IV. Minimize Runoff Velocities**

Clearing existing vegetation may reduce the surface roughness and infiltration rate, thereby increasing runoff velocities and volumes. Use measures that break the slopes to reduce the problems associated with concentrated flow volumes and runoff velocities.

#### **V. Retain Sediment on the Site**

Even with careful planning, some erosion is unavoidable. The resulting sediment can be reduced by BMP placement that reduces on site erosion. Plan the location where sediment deposition will occur and maintain access for maintenance cleanout. Plan, install and use sediment traps and basin BMPs before other land-disturbing activities (except in emergencies).

#### **VI. Inspect and Maintain BMPs**

Inspection and maintenance of BMPs is vital to the performance of erosion and sedimentation BMPs. It is essential to inspect all BMPs to determine that they are working properly and to ensure that problems are corrected as they are detected. At a minimum, this should be done weekly and after any significant rainfall event.

**OUTCOME CATEGORY:**

## **KEEP WATER FROM WORK AREA**

---

**Definition:** The BMPs in this category are used to keep water from reaching the work area or disturbed soils generally by means of a bypass, diversion or interception process.

**Desired Outcome:** The desired outcome of these BMPs is to bypass or divert sheet flow, stormwater or stream flow around or through the work area. The intercepted water will be discharged to an acceptable storm drainage system or outfall.

**Applications:** These BMPs work well:

- In streams or ditches where the normal flow can be piped around the work area by temporarily damming and conveying the flow by pumping or gravity. (HPA) Environmental permits may be required for these measures.
- Covering stock piles or disturbed soils with impermeable fabric to intercept rainfall. Sheet flows shall be collected and diverted at the bottom of the covering.
- Diverting sheet flow around work area or disturbed soils by constructing upslope berms or channels.

**Limitations:** These BMPs are often used in combination with other BMPs (i.e., dewatering work area, grass-lined swales). Refer to individual BMP limitations.

**Permit Conditions:** Reintroduce water flow into the work area to reduce sediment transport. Comply with permit requirements. Inspect and maintain BMPs according to these Guidelines.

**BMP Options (include but not limited to):**

- Dewatering
- Diversion Berm
- Diversion Channel
- Plastic Covering
- Sandbag
- Vactoring

**OUTCOME CATEGORY:**

**REDUCE POTENTIAL FOR SOIL BECOMING WATERBORNE OR AIRBORNE**

---

**Definition:** The BMPs in this category work to keep soil particles in disturbed areas from becoming water borne or air borne.

**Desired Outcome:** The desired outcome of these BMPs is to reduce erosion by reducing soil particles from becoming water borne or air borne.

**Application:** These BMPs work well to stabilize:

- Slopes
- Soils
- Roadways
- Channels

**Limitations:** Often used in combination with other BMPs allowing the disturbed area to stabilize. Refer to individual BMP limitations.

**Permit Conditions:** Comply with any permit requirements. Inspect and maintain BMPs according to these guidelines.

**BMP Options (include but not limited to):**

- Back of Slope Planting
- Construction Exit Pad
- Dust Control
- Filter Fabric
- Grass Lined Channel
- Hand Seeding
- Hydroseeding
- Mulching
- Plastic Covering
- Soil Stabilization (Erosion Control Blankets/Matting)
- Sweeping
- Vegetative Buffer





**OUTCOME CATEGORY:**

**FILTER/PERIMETER PROTECTION**

---

**Definition:** The BMPs in this category reduce erosion and sedimentation of soil particles/contaminants as the water passes through a filtering device. This outcome will also apply to perimeter protection around the job site.

**Desired Outcome:** The desired outcome of these BMPs is to reduce soil particles/contaminants before the water discharges from the job site.

**Application:** These BMPs work well:

- When the rate of flow is relatively low and the filter can be inspected and maintained to ensure the BMP continues to function.
- Perimeter protection around job site.

**Limitations:** Not effective in areas of high flows. Refer to individual BMP limitations.

**Permit Conditions:** Comply with permit requirements. Inspect and maintain BMPs according to these guidelines.

**BMP Options (include but not limited to):**

- Coir Log
- Continuous Berm
- Curb Inlet Sediment Trap
- Excelsior Filled Log
- Filter Fabric
- Grass Lined Channel
- Gravel Filled Sump
- Half Round Filter
- Inlet Protection
- Kimble Filter Pipe
- Silt Fence
- Silt Mat
- Straw Bale Barrier (1)
- Straw Bale Barrier (2)
- Straw Bale Barrier (3)
- Straw Log
- Washed Rock

## OUTCOME CATEGORY:

### SETTLING

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**Definition:** The BMPs in this category allow particles/contaminants to settle as the water velocity decreases.

**Desired Outcome:** The desired outcome of these BMPs is to allow sediment to settle out of the water. This will reduce soil particles/contaminants from leaving the job site.

**Application:** These BMPs work well:

- When the rate of flow is relatively low.
- When there is sufficient space or volume to properly size a settling BMP.

**Limitations:** Not effective in areas of high flows. Refer to individual BMP limitations.

**Permit Conditions:** Comply with permit requirements. Inspect and maintain BMPs according to these guidelines.

**BMP Options (include but not limited to):**

- Coir Log
- Continuous Berm
- Curb Inlet Sediment Trap
- Excelsior Filled Log
- Filter Fabric
- Rock Check Dam
- Sandbag
- Silt Fence
- Silt Mat
- Straw Bale Barrier (1)
- Straw Bale Barrier (2)
- Straw Bale Barrier (3)
- Straw Log
- Temporary Sediment Trap
- Triangular Silt Dike
- Turbidity Curtain

**OUTCOME CATEGORY:**

**REDUCE WATER VELOCITY/EROSIVE FORCES**

---

**Definition:** The BMPs in this category reduce or diminish the water velocity, thereby dissipating its erosive force.

**Desired Outcome:** The desired outcome of these BMPs is to create energy dissipation and reduce erosion.

**Application:** These BMPs work well:

- On stream and ditch banks.
- In swales/grass lined channels.
- In waterbodies.
- On slopes.
- On large disturbed areas.

**Limitations:** These BMPs may be used if required by permit conditions. Refer to individual BMP limitations.

**Permit Conditions:** Comply with permit requirements. Inspect and maintain BMPs according to these guidelines.

**BMP Options (include but not limited to):**

- |                          |                          |
|--------------------------|--------------------------|
| • Back of Slope Planting | • Sandbag                |
| • Coir Fabric            | • Silt Fence             |
| • Coir Log               | • Silt Mat               |
| • Continuous Berm        | • Straw Bale Barrier (1) |
| • Excelsior Filled Log   | • Straw Bale Barrier (2) |
| • Hand Seeding           | • Straw Bale Barrier (3) |
| • Hydroseeding           | • Straw Log              |
| • Mulching               | • Triangular Silt Dike   |
| • Rip Rap                | • Turbidity Curtain      |
| • Rock Check Dam         | • Vegetative Buffer      |

**OUTCOME CATEGORY:**

**CONTAINMENT**

---

**Definition:** The BMPs in this category retain water and soil particles/ contaminants on the work site.

**Desired Outcome:** The desired outcome of these BMPs is to reduce water discharge from the job site.

**Application:** These BMPs work well:

- In enclosed drainage systems.
- In swales.
- In open drainage systems.
- In waterbodies (during bridge maintenance or other maintenance activities).

**Limitations:** These BMPs may be used if required by permit conditions. Refer to individual BMP limitations.

**Permit Conditions:** Comply with permit requirements. Inspect and maintain BMPs according to these guidelines.

**BMP Options (include but not limited to):**

- Vactoring
- Removal and proper disposal of soil particles/contaminants/obstructions by mechanized or hand means

**OUTCOME CATEGORY:**

**HABITAT PROTECTION/MAINTENANCE**

---

**Definition:** The BMPs in this category maintain or protect habitat.

**Desired Outcome:** The desired outcome of these BMPs is to maintain or protect habitat by providing:

- Bank/slope stabilization.
- Habitat shading.
- Reducing erosion by providing ground cover, binding soil particles with roots, and lowering water velocity.
- Habitat for primary production.
- Habitat for prey base organisms such as macro-invertebrates.

**Application:** These BMPs work well in:

- Riparian areas.
- Sensitive areas.
- Watercourses and streams.

**Limitations:** These BMPs should be done in accordance with project design. Refer to individual BMP limitations.

**Permit Conditions:** Comply with permit requirements. Inspect and maintain BMPs according to these guidelines.

**BMP Options (include but not limited to):**

- Coir Fabric
- Coir Log
- Excelsior Filled Log
- Hand Seeding
- Hydroseeding
- Erosion Control Blanket



**OUTCOME CATEGORY:**

**REDUCE POTENTIAL FOR CONTAMINANTS FALLING INTO WATER**

---

**Definition:** The BMPs in this category reduce the potential for the contaminants from the work area from entering the water. This outcome can be achieved by capturing falling particles from bridge or other over-water work.

**Desired Outcome:** The desired outcome of these BMPs is to reduce contaminants from entering the water.

**Application:** These BMPs work well:

- On bridge or pipeline maintenance projects.

**Limitations:** Refer to individual BMP limitations.

**Permit Conditions:** When used in watercourses or streams, these BMPs must be used in accordance with permit requirements. Inspect and maintain BMPs according to these guidelines.

**BMP Options (include but not limited to):**

- Diaper Netting
- Plywood Work Platform
- Spray Zone

**OUTCOME CATEGORY:**

**STREAM MAINTENANCE**

---

**Definition:** The BMPs in this category eliminate sedimentation bars from City streams, which will reduce the potential for upstream flooding and redirection of stream flow that can contribute to substantial erosion.

**Desired Outcome:** The desired outcome of these BMPs is to reduce sedimentation load, improve stream bottom habitat, reduce stream bank erosion, improve water quality, and restore natural channel bottom slopes.

**Application:** These BMPs work well in:

- When the rate of flow is relatively low.
- When there is adequate space to operate a long arm reach excavator.
- When there is sufficient space to accept and transfer excavated material by truck to landfill.
- When there is substantial sedimentation material accumulating in stream flowways.
- 

**Limitations:** These BMPs should be done in accordance with any required federal or environmental resource permit or state construction permit or court order. These BMPs are not effective in high flows. Refer to individual BMP limitations. Limitation shall include:

- All heavy equipment shall have a readily deposal spill containment kit(s) for spill containment of oil, grease and/or hydraulic fluids
- No material excavation or depositing to ditch bank or other areas beyond the sedimentation spoil area. No changes to the existing hydrologic stream cross section. Only sedimentation spoil material removal

**Permit Conditions:** Comply with permit requirements o administrative orders. Inspect and maintain BMPs according to these guidelines.

**BMP Options (include but not limited to):**

- Hand Seeding
- Hydroseeding
- Rip Rap
- Straw Bale Barrier (2)
- Turbidity Barrier (Type II)

## BMP OUTCOME CATEGORY MATRIX

<b>BMP Outcome Category Matrix</b>  X = Recommended BMP Application but not limited to		Keep Water From Work Area	Reduce Potential for Soil Erosion	Filter / Perimeter Protection	Settling	Reduce Water Velocity/ Erosive Forces	Containment	Habitat Protection /Maintenance	Reduce Potential for Contaminants Falling Into Water	Stream Maintenance
BMP	PAGE									
BACK OF SLOPE PLANTING	19		X			X				
COIR FABRIC	21					X		X		
COIR LOG	23			X	X	X		X		
CONSTRUCTION EXIT PAD	26		X							
CONTINUOUS BERM	30			X	X	X				
CURB INLET SEDIMENT TRAP	33			X	X					
DEWATERING	39	X								
DIAPER NETTING	41								X	
DIVERSION BERM	43	X								
DIVERSION CHANNEL	46	X								
DUST CONTROL	50		X							
EXCELSIOR FILLED LOG	52			X	X	X		X		
FILTER FABRIC	54		X	X	X					
GRASS LINED SWALE	56		X			X				
GRAVEL FILLED SUMP	59			X						
HALF ROUND FILTER	60			X						
HAND SEEDING	62		X			X		X		X
HYDROSEEDING	64		X			X		X		X
INLET PROTECTION	66			X						
KIMBLE FILTER PIPE	73			X						
MULCHING	75		X			X				
PLASTIC COVERING	78	X	X							
PLYWOOD WORK PLATFORM	80								X	



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BMP Outcome Category Matrix		Keep Water From Work Area	Reduce Potential for Soil Erosion	Filter / Perimeter Protection	Settling	Reduce Water Velocity/ Erosive Forces	Containment	Habitat Protection /Maintenance	Reduce Potential for Contaminants Falling Into Water	Stream Maintenance
BMP	PAGE									
X = Recommended BMP Application but not limited to										
RIP RAP	82					X				X
ROCK CHECK DAM	87				X	X				
SANDBAG	90	X			X	X				
SILT FENCE	92			X	X	X				
SILT MAT	102			X	X	X				
SOIL STABILIZATION	104		X							
SPRAY ZONE	109								X	
STRAW BALE BARRIER (1)	111			X	X	X				
STRAW BALE BARRIER (2)	114			X	X	X				X
STRAW BALE BARRIER (3)	119			X	X	X				
STRAW LOG	121			X	X	X				
SWEEPING	124		X							
TEMPORARY SEDIMENT TRAP	126				X					
TRIANGULAR SILT DIKE	129				X	X				
TURBIDITY CURTAIN	133				X	X				X
VACTORING	142	X					X			
VEGETATIVE BUFFER	144		X			X				
WASHED ROCK	147			X						

## **BMP**

### **Back of Slope Planting**

---

#### **DESCRIPTION**

**B**ack of slope planting requires leaving the roadway slope clear for public safety. This BMP includes planting grass, forbs, small trees and brush. This BMP provides long term soil stabilization and/or reduces water velocity/ erosive forces.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Ditch slopes vegetated with grass and forbs to reduce exposed soil.
- Planting trees and brush outside of the ditch on the back of the slope allowing plants to grow over the ditch or channel.
- Providing shade as long as it does not become a public safety hazard (No trees larger than 4-inches allowed in clear zone or recovery area).

#### **APPLICATIONS**

This BMP may be used in ditches (including ditches which are watercourses or streams) parallel to roadways or at road crossings. Revegetation plans will be done in accordance with permit requirements and Alabama Department of Transportation highway safety design or standards. It may be used in combination with other BMPs.

This BMP provides long term soil stabilization once plantings have been established. Soil stabilization can only be achieved in combination with other BMPs. For example; Grasses and forbs on shoulder and in ditch slopes with brush, shrubs or trees behind the ditch.

#### **LIMITATIONS**

This BMP should not be used:

- If it creates a potential public safety hazard.
- In clear zone areas.
- If it could cause water flow problems that may result in flooding of the roadway.



- Within utility rights of way without utility permission.

### **CONSTRUCTION GUIDELINES**

- Select appropriate native vegetation for the location.
- Review planting guidelines; plant at the appropriate time of year.
- Planting must be done in accordance with design and/or permit conditions.

### **BMP MAINTENANCE**

- Inspect during plant establishment period. Replant, due to plant mortality, as necessary.

### **BMP REMOVAL**

- BMP removal is not necessary.

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## **BMP**

### **Coir Fabric**

---

#### **DESCRIPTION**

Coir Fabric is a geo-textile product made from coconut fibers loosely woven into a fabric usually packaged in roll form. This fabric can be used to provide a reduction in water velocity/erosive forces and/or habitat protection/ maintenance. Other materials such as jute mesh can be used instead.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Decreasing bank erosion in high flow/high velocity channels.
- Long term slope stabilization.
- Stream and riverbank stabilization.
- Revegetation projects.

#### **APPLICATIONS**

This BMP may be used to provide stabilization/protection to the soil surface of steep slopes, stream and/or river banks. It can be used in combination with vegetation to reinforce soil in high flow/high velocity waters and on slopes as steep as 1 horizontal to 1 vertical. It may be used as bank stabilization before vegetation/re-vegetation has occurred.

#### **LIMITATIONS**

This BMP should not be used:

- In the streambed of a channel.
- When short term biodegradability is required.

#### **CONSTRUCTION GUIDELINES**

- When used in water courses or streams, this BMP must be used in accordance with permit requirements.
- The fabric may be laid out horizontally or vertically on a slope.



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- Use stakes or staples to anchor fabric to ground. Use anchoring devices on the edges and in the field of the fabric.
- Lay loosely on the surface so that the fabric makes contact with the ground. Avoid stretching the fabric.
- If the seam is perpendicular with water flow, overlap fabric at least 18 inches in the direction of water flow.
- If the seam is parallel with the water flow, overlap edges at least 8 inches, staking both edges securely.
- The fabric should be trenched at least 12 inches deep at top and bottom ends of the installation to prevent undercutting of the fabric.
- Hand Seeding and/or Hydroseeding should occur prior to coir fabric placement.

## BMP MAINTENANCE

- During construction, inspect BMPs daily during the work week.
- Schedule additional inspections during storm events.
- Make any required repairs.

## BMP REMOVAL

- BMP removal is not necessary.



*Coir Fabric*

## **BMP**

### **Coir Log**

---

#### **DESCRIPTION**

A coir log is a manufactured coconut fiber log used as a structural and rooting mechanism for bioengineered systems. These logs can be used to provide filter/perimeter protection, settling, reduction in water velocity/erosive forces and habitat protection/maintenance. They may be cut or folded, to the appropriate length, to fit the desired location.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Intercepting sheet flow.
- Intercepting and detaining small amounts of water from disturbed areas during construction operations in order to promote settling of soil particles.
- Filtering soil particles and debris.
- Trapping topsoil and retaining moisture from rainfall, which aids in growth of seedlings planted along the upslope side of the rolls.

#### **APPLICATIONS**

This BMP may be used for temporary check dams in ditches of any dimension, temporary soil stockpile protection, drop inlet protection, temporary interceptor dike and swale, check dam in ditches and/or bank stabilization. Coir logs may also be used for habitat protection at the toe of a bank and can be incorporated with vegetative planting. This BMP may be used for perimeter sediment control. This BMP is particularly useful in areas where the effects of soil disturbance need to be minimized. It may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- Where flow volume or velocity inhibit BMP function.

## CONSTRUCTION GUIDELINES

- Coir log installation must be done in accordance with applicable design and/or permit conditions.
- Install to prevent water from going around or under BMP.
- BMP must be staked (wood only) to insure soil particle containment.
- When using as a check dam, prior to installation, cut or fold to proper length.

## BMP MAINTENANCE

- During construction, inspect BMPs daily during the workweek.
- Schedule additional inspections during storm events. Make any required repairs.
- Sediment should be removed when deposits reach one-half the height of the BMP.

## BMP REMOVAL

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup in front of BMP.
- Removal of BMP may not always be necessary.
- Depending upon BMP placement, re-vegetation of site may be necessary.



*Coir logs used as habitat protection at the toe of a bank*





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*Coir log used to allow settling and to decrease water velocity/erosive forces*

## **BMP**

### **Construction Exit Pad**

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#### **DESCRIPTION**

A construction access road is a stabilized rock (or an alternative material) pad located at points of vehicular egress at a construction site. This provides a buffer area where mud and caked soil can be removed from the tires of construction vehicles to avoid transporting it onto public roads. The construction access road may include a fabric underliner.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Allowing stability for vehicle access to construction sites.
- Limiting mud and debris deposited on roadways from adjacent construction sites.

#### **APPLICATIONS**

This BMP may be used at construction sites with unstable soils and/or steep slopes to gain traction, especially during wet weather. It may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- As the sole BMP.

#### **CONSTRUCTION GUIDELINES**

- Unsuitable material should be excavated prior to placement of fabric and rock.
- Place an optional "fabric underliner" the full width and length of the access road, as required by design.
- Compact road as appropriate.
- Drainage is designed to state and local design standards.

#### **BMP MAINTENANCE**

- During construction, inspect BMPs daily during the workweek.



# BIRMINGHAM FORWARD

— MAYOR WILLIAM A. BELL, SR. —

- Schedule additional inspections during storm events. Make any required repairs.
- Materials spilled, dropped or tracked from vehicles onto roadways should be removed.
- Water trucks will not be used to remove dropped, spilled, or tracked materials, unless the water can be treated by other BMPs.

## BMP REMOVAL

- Remove BMP if appropriate (recycle and/or re-use if applicable).
- Re-vegetate and/or restore area disturbed by BMP.

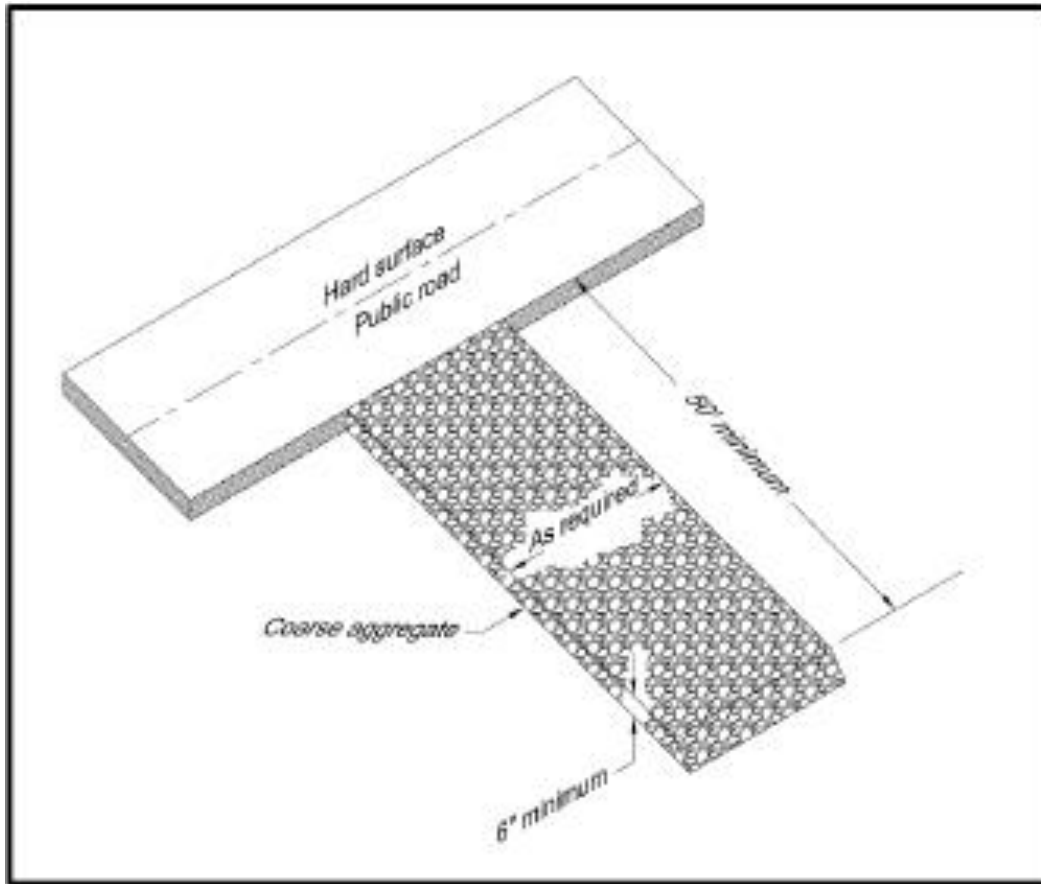


*Construction Exit Pad*



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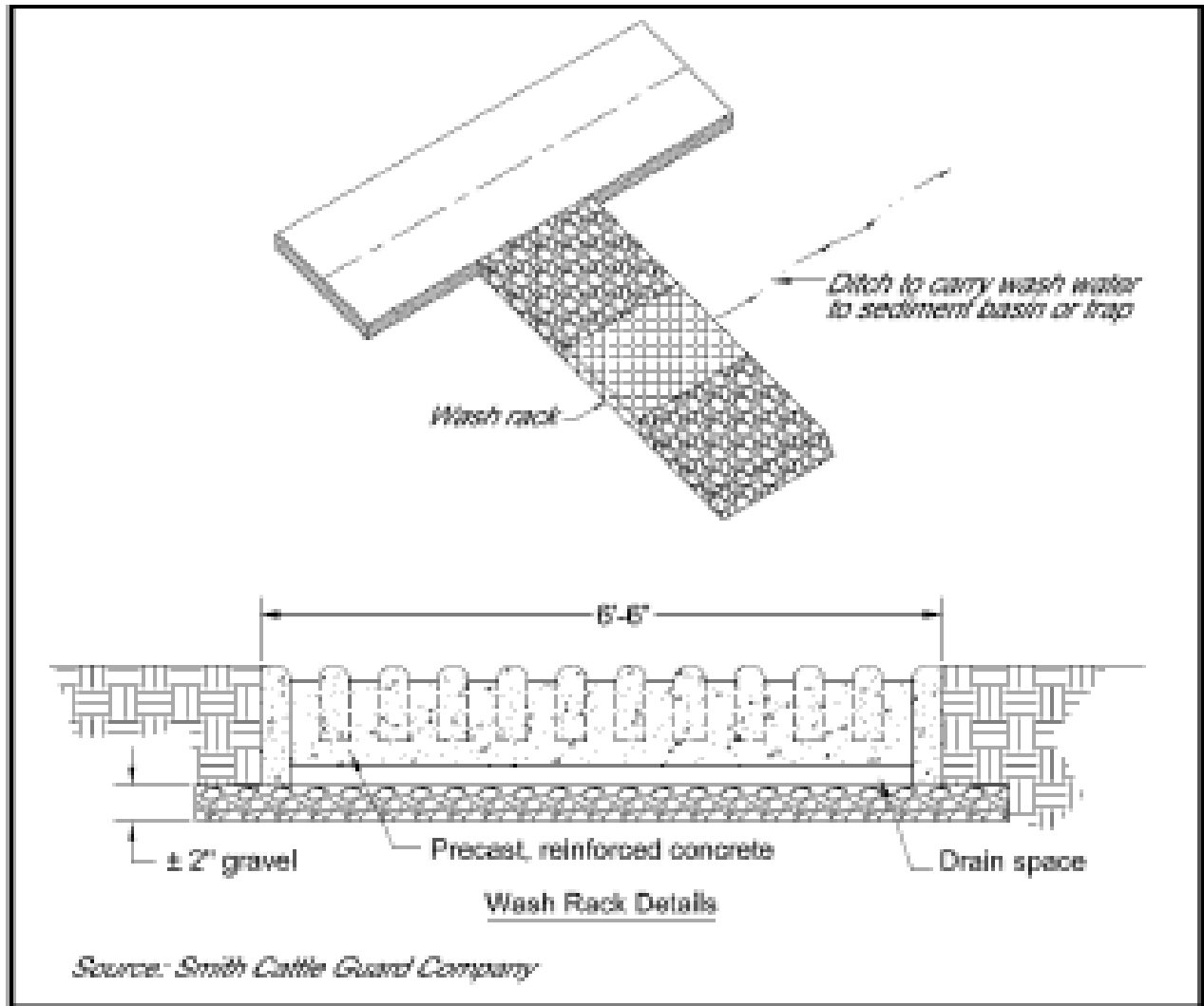
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# BIRMINGHAM FORWARD

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## **BMP**

### **Continuous Berm**

---

#### **DESCRIPTION**

A continuous berm is a temporary diversion dike or sediment barrier constructed with infill material, either soil, sand or gravel, encased within geosynthetic fabric. This BMP requires a Continuous Berm Machine (CBM) for filling and placing. A continuous berm can be used to provide filter/perimeter protection, settling, and reduction in water velocity/erosive forces. Although this BMP is not recommended for use in streams, under some applications it could be used in association with wetlands and therefore may require an Environmental Resource Permit. Check with federal and state regulatory agencies prior to any site maintenance using a CBM.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Diverting sheet flow.
- Intercepting sheet flow.
- Intercepting and detaining small amounts of water from disturbed areas during construction operations in order to allow settling of soil particles.
- Decreasing down slope sheet flow velocity.
- Retaining soil particles/debris on site.

#### **APPLICATIONS**

This BMP may be used for perimeter sediment control. It may be used in combination with other BMPs.

This BMP may be used below disturbed areas subject to sheet and rill erosion where drainage area is no greater than .25 acre per 100 lineal feet of barrier and the slope behind the barrier should be no steeper than 2 horizontal feet to 1 vertical foot. On relatively flat slopes the maximum disturbed slope distance should not exceed 100 feet. The allowable disturbed slope distance decreases as the slope gets steeper.

#### **LIMITATIONS**

This BMP should not be used:

- Directly in water courses.
- In front of storm outlets.

## **CONSTRUCTION GUIDELINES**

- Use a Continuous Berm Machine (follow operating manual).
- Apply to relatively smooth surfaces to form a tight seal with ground.
- A source of infill material is required (sand, gravel, or local soils).
- Increase the elevation at the ends of the BMP installation to prevent "end runs."

## **BMP MAINTENANCE**

- During construction, inspect BMPs daily during the workweek. Schedule additional inspections during storm events. Make any required repairs.
- Repair any damaged BMPs due to end runs or undercutting.
- Sediment should be removed when deposits reach one-half the height of the BMP.

## **BMP REMOVAL**

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup in front of BMP.
- Remove BMP (recycle and/or re-use is applicable).
- -Removal consists of slitting and removing the fabric.
- -Remove the infill material from the site or grade infill material into the existing shoulder or soil.
- Depending upon BMP placement, re-vegetation of site may be necessary.





# BIRMINGHAM FORWARD

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*Continuous berm machine*



*Continuous berm*



*Continuous berm intercepting water from construction area*

## **BMP**

### **Curb Inlet Sediment Trap**

---

#### **DESCRIPTION**

A curb inlet sediment trap is a temporary barrier constructed from concrete blocks, gravel, filter fabric or gravel bag filter. Geotextile grade covers and geotextile collectors (inserts) are available pre-manufactured. Curb inlet sediment traps can be used to provide filtering and settling of soil particles.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Reducing the soil particles discharged into storm drains by settling and/ or filtering the runoff.
- Allowing for overflow from high runoff events.
- Allowing the ponded water to filter rapidly through gravel.

#### **APPLICATIONS**

These BMPs are used at curb inlets on gently sloping streets where water can pond and allow particles to filter or settle.

#### **LIMITATIONS**

This practice is for drainage areas of less than 1 acre.

This BMP should not be used:

- Where the ponding area will encroach into the travel lanes or pedestrian walkways.
- Steep grades.

#### **CONSTRUCTION GUIDELINES**

- A spillway structure shall be constructed with the sandbags to allow overflow.
- Place sandbags in a curved row from the top of curb at least 3 feet into the street; curve the ends upward.
- Overlap several layers of bags and pack tightly.

- Leave a one-sandbag gap at the upstream end in the top row to act as a spillway.
- Slope runoff should flow over blocks and gravel and not be bypassed over the curb.
- Install pre-manufactured grade covers and geo-textile collectors in accordance with manufacturer specifications.
- Install grade covers, geo-textile collectors, or filter fabric on top of or in front of the inlet. Construct a small dam immediately downstream of the inlet to stop flow.
- The height of the block structure should be 1 to 2 feet.
- Gravel placed around the concrete block structure should have 2:1 side slopes or flatter.
- Place a minimum of 1 block on the bottom row (more as needed) on its side to allow for dewatering the pool.
- The foundation for the blocks should be excavated at least 2" below the crest of the storm drain. The bottom row of blocks should be placed against the edge of the storm drain for lateral support and to avoid washouts when overflow occurs. If needed, lateral support may be given to subsequent rows by placing 2" x 4" wood studs through block openings.
- Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, with the ends of adjacent blocks abutting. The height of the barrier can be varied, depending on design needs, by stacking combinations of 4", 8" and 12" wide blocks. The barrier of blocks should be at least 12" high and no greater than 24" high.
- The top elevation of the structure must be at least 6" lower than the ground elevation downslope from the inlet. It is important that all storm flows pass over the structure and into the storm drain and not past the structure. Temporary dikes below the structure may be necessary to prevent bypass flow. Material may be excavated from inside the sediment pool for this purpose.
- Wire mesh should be placed over the outside vertical face (webbing) of the concrete blocks to prevent stone from being washed through the holes in the blocks. Hardware cloth or comparable wire mesh with 1/2" openings should be used.
- Stone should be piled against the wire to the top of the block barrier
- Alabama Highway Department No. 57 Coarse Aggregate or similar gradations should be used.
- If the stone filter becomes clogged with sediment so that it no longer adequately performs its function, the stone must be pulled away from the blocks, cleaned and replaced.

## **BMP MAINTENANCE**

- Sediment shall be removed.
- If the gravel becomes clogged with sediment, it must be carefully removed from the inlet and either cleaned or replaced.



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- During construction, inspect BMPs daily during the workweek. Schedule additional inspections during storm events. Make any required repairs.

### BMP REMOVAL

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup in front of BMP.
- Remove BMP (recycle and/or re-use if applicable).
- Use vacuum sweeper or hand broom to clean road surface.
- Use "Vactor-Truck" to clean drainage system



*Block and gravel inlet protection*



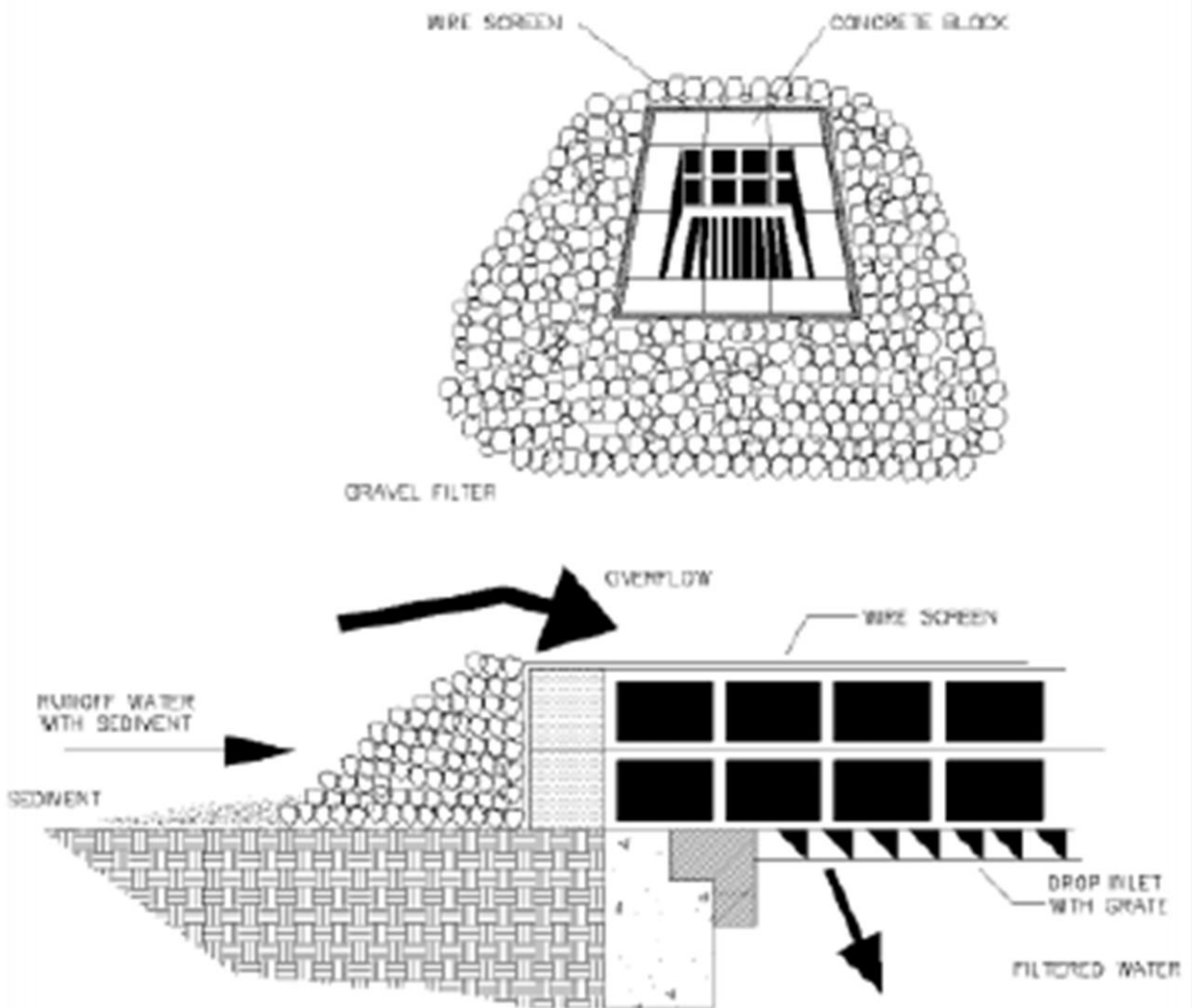




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## BLOCK AND GRAVEL DROP INLET SEDIMENT FILTER



### SPECIFIC APPLICATION

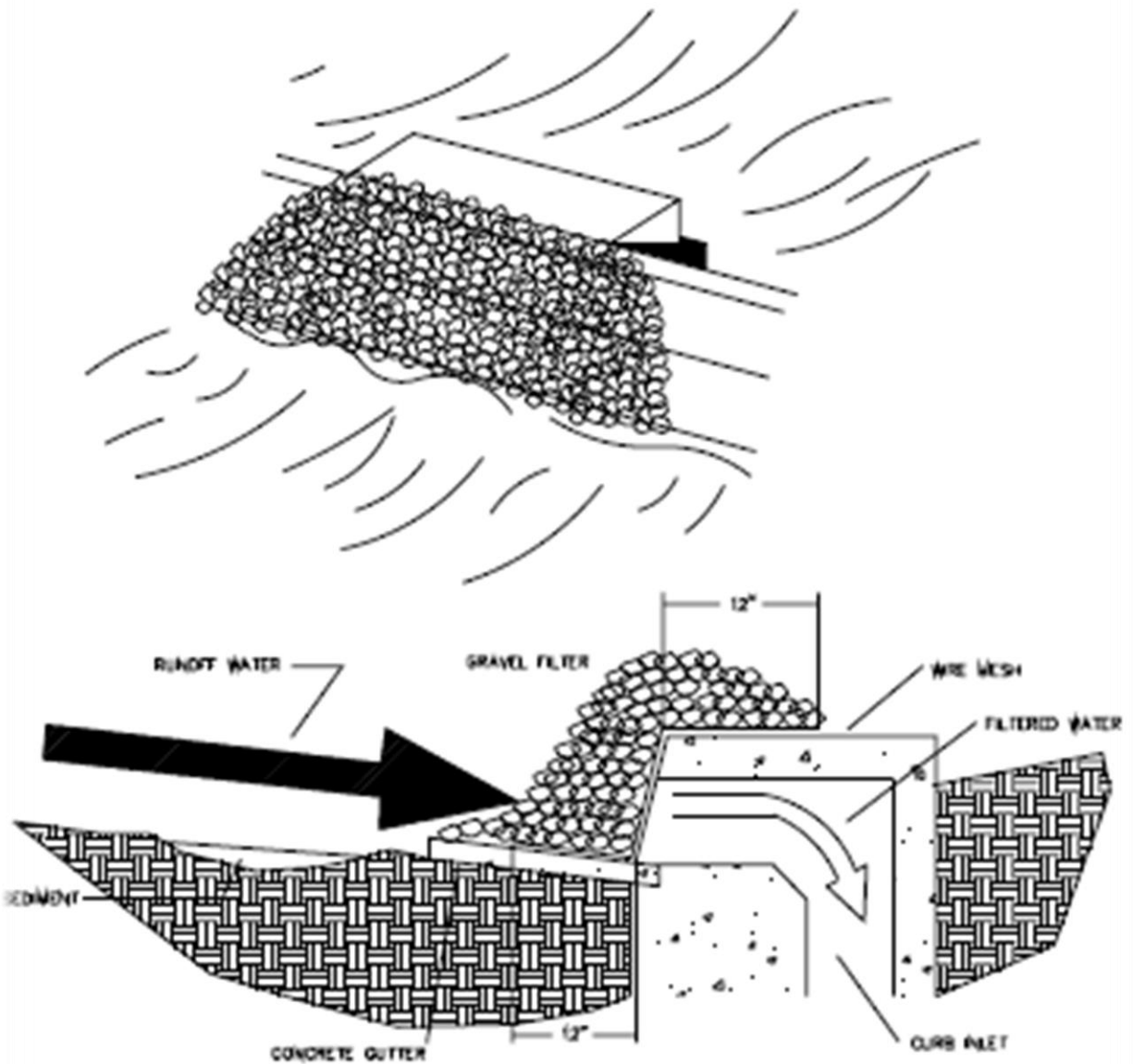
THIS IS APPLICABLE WHERE HEAVY FLOWS ARE EXPECTED AND WHERE AN OVERFLOW CAPACITY IS NECESSARY TO PREVENT EXCESSIVE PONDING AROUND THE STRUCTURE





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*Curb inlet sediment trap detail*



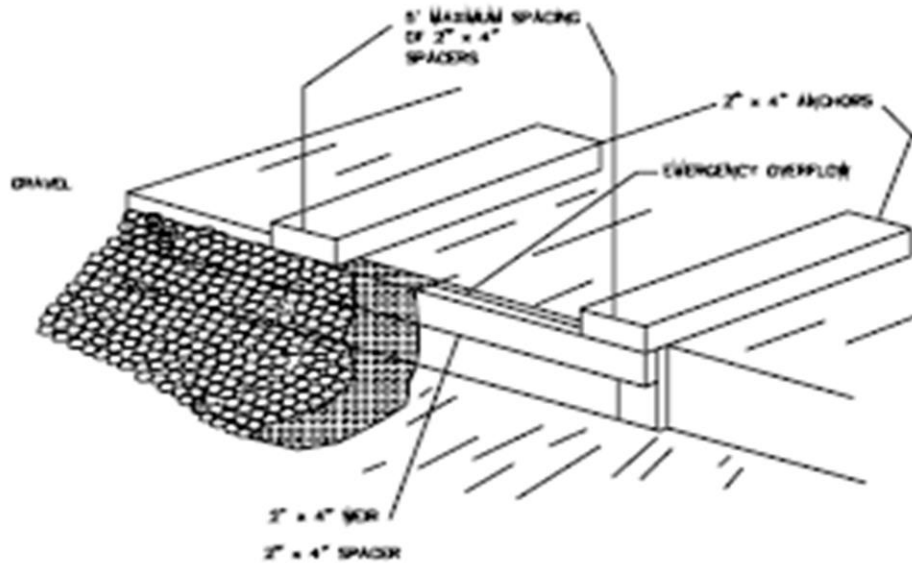


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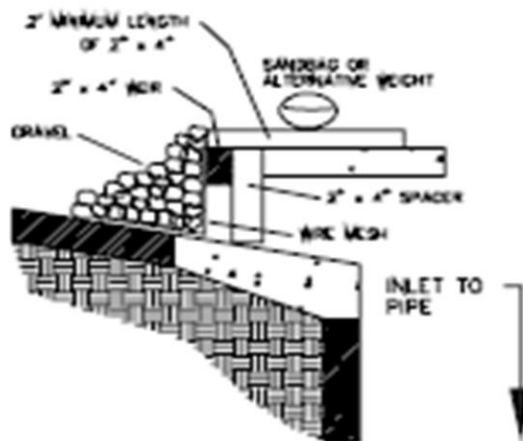
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## Curb inlet sediment trap detail

### PERSPECTIVE VIEW



### SIDE ELEVATION



### SPECIFIC APPLICATION

THIS IS APPLICABLE TO CURB INLETS WHERE A STURDY, COMPACT INSTALLATION IS DESIRED. EMERGENCY OVERFLOW CAPABILITIES ARE MINIMAL. EXPECT SIGNIFICANT PONDING WITH THIS MEASURE.





## **BMP**

### **Dewatering**

---

#### **DESCRIPTION**

**D**eewatering can be used to keep water from a work area by using any or all of the following: pump, barrier, vactor, or bypass culvert.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Allowing work to be performed in dewatered conditions.
- Reducing the transport of soil particles by flowing water.
- Reducing the liquefaction of soils.

#### **APPLICATIONS**

This BMP may be used in, but not limited to, ditches, watercourses or streams, channels, swales and excavations. It will generally be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- Where flows are greater than pump capacity.

#### **CONSTRUCTION GUIDELINES**

- Determine if the project will require continuous dewatering.
- Schedule pumping, monitoring, equipment and maintenance activities accordingly.
- Dewatering must be used in accordance with applicable design and/or permit conditions.
- Install dewatering devices.
- Install site specific barrier, prior to dewatering, to prevent exterior water from entering construction area.
- Ensure water discharged from the site reduces erosion.
- Dewatered water will be discharged to a containment device or a sanitary sewage system.



## **BMP MAINTENANCE**

- Schedule pumping, monitoring, equipment and maintenance activities in accordance with dewatering needs.
- During construction, inspect BMPs daily during the workweek. Schedule additional inspections during storm events. Make any required repairs as needed.
- Inspect bypass, pump, and barrier periodically. Make necessary repairs.
- Check for erosion at discharge. Repair or move as necessary.
- Have adequate fuel supply and backup pumps in the event of mechanical failure.

## **BMP REMOVAL**

- Remove BMP (recycle and/or re-use if applicable).
- Reintroduce water gradually.
- Re-vegetate area disturbed by BMP removal (if applicable).

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## **BMP**

### **Diaper Netting**

---

#### **DESCRIPTION**

**D**iaper/netting is a fine mesh netting or canvas suspended under a bridge, pipeline or pier to catch debris during construction or maintenance activities.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Catching and containing falling debris (such as: concrete, wood chips, sawdust, slag and metal) from entering water during construction, maintenance and repair activities.

#### **APPLICATIONS**

This BMP is used in bridge, pipeline or pier construction and repairs. It may also be used in maintenance activities such as cleaning and painting. It may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- During periods of high winds that reduce the effectiveness of the BMP.

#### **CONSTRUCTION GUIDELINES**

- Multiple nets with different mesh sizes may be required, depending upon the work tasks performed. Mesh size gets progressively smaller from top to bottom.
- Attach diaper/netting securely prior to starting work.
- Remove diaper/netting carefully after work, not allowing debris to fall.
- Maintain separation between diaper/netting and water surface.

#### **BMP MAINTENANCE**

- During construction, inspect BMPs daily during the workweek. Schedule additional inspections during storm events. Make any required repairs.

- Crew must provide progressive clean up of debris during the day.

## **BMP REMOVAL**

- Evaluate site to determine BMP is no longer needed.
- Remove debris on BMP.
- Remove BMP (recycle and/or re-use if applicable).
- Inspect after job is complete to make sure diaper/netting is in good repair for next project.



*Diaper netting under bridge*

## **BMP**

### **Diversion Berm**

---

#### **DESCRIPTION**

A diversion berm is a temporary ridge of compacted soil constructed at the top or base of a disturbed slope. This BMP is not suitable for placement within a stream cross-section.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Diverting storm runoff from upslope drainage areas away from unprotected disturbed areas and toward a stabilized outlet.
- Diverting sediment-laden runoff from a disturbed area to a sediment-containment facility such as a sediment trap or a sediment basin.

#### **APPLICATIONS**

This BMP may be used wherever stormwater runoff must be temporarily diverted away from a disturbed slope and toward a sediment containment facility. These structures generally have a life expectancy of 18 months or less. This BMP may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- If water flow is likely to erode the berm.
- If there is inadequate space for construction.

#### **CONSTRUCTION GUIDELINES**

- Berms should be installed as a first step in the land-disturbing activity.
- The berm should be adequately compacted to reduce failure.
- Minimum freeboard can be 0.3 feet.
- Temporary seeding and mulch can be applied to the berm following construction of the berm.
- Clear plastic may be used as an additional erosion control method. See "Plastic Covering" BMP construction guidelines.

## **BMP MAINTENANCE**

- During construction, inspect BMPs daily during the workweek.
- Schedule additional inspections during storm events. Make any required repairs.
- During long term implementation inspect once every two weeks, whether a storm has occurred or not.

## **BMP REMOVAL**

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup.
- Remove BMP (recycle and/or re-use if applicable).
- Re-vegetate area disturbed by BMP removal (if applicable).

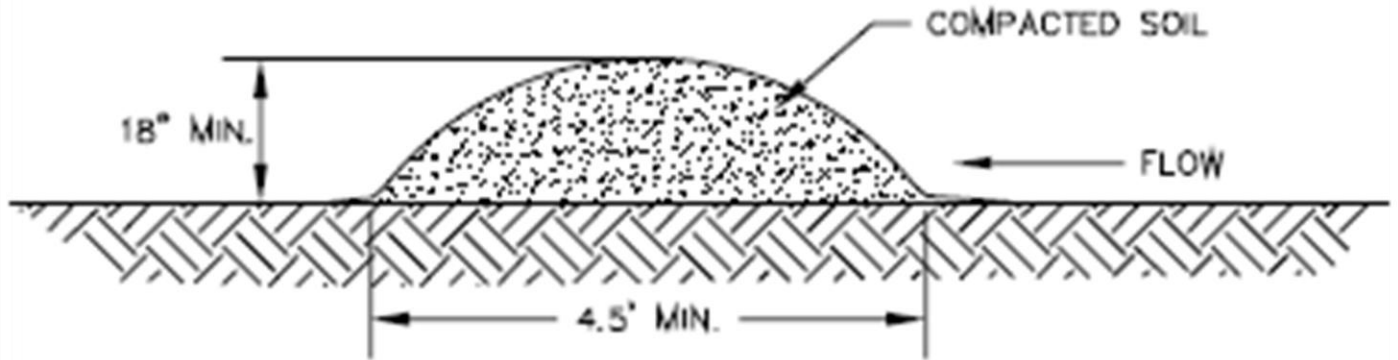


*Diversion near top of slope*



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TYPICAL DIVERSION BERM

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## **BMP**

### **Diversion Channel**

---

#### **DESCRIPTION**

A diversion channel is constructed across a slope with a supporting earthen ridge on the lower side. The practice is used to protect an area down slope by intercepting and carrying excess water to a stable outlet. The diversion channel anticipated here is not to be used to divert any City stream or stream tributary except as appropriately designed and engineered for that purpose and having all necessary federal, state, and local Environmental Resource Permits.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Reducing slope length.
- Intercepting and diverting stormwater runoff to stabilized outlets at non-erosive velocities.
- Intercepting sheet flow.
- Decreasing down slope sheet flow velocity.

#### **APPLICATIONS**

This BMP may be used where runoff from areas of higher elevation may damage property, cause erosion, or interfere with the establishment of vegetation on down slope areas. It may also be used where surface and/or shallow subsurface flow is damaging a slope and where the slope length needs to be reduced to minimize soil loss. This BMP may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- If the down slope is greater than 2 horizontal by 1 vertical.
- If water flow is likely to erode the channel.

- If there is inadequate space for construction.

## **CONSTRUCTION GUIDELINES**

- The diversion channel shall be excavated or shaped to line, grade and cross-section as required:
  - Side slopes of the channel shall be no steeper than 2 horizontal by 1 vertical.
  - Minimum freeboard shall be 0.3 feet.
- Construct the diversion ridge by compacting earthfill in 6" to 8" lifts, overbuilding 10% for settlement.
- Temporary seeding and mulch can be applied to the channel following construction of the channel.
- Clear plastic may be used as an additional erosion control method. See "Plastic Covering" BMP construction guidelines.

## **BMP MAINTENANCE**

- During construction, inspect BMPs daily during the workweek. Schedule additional inspections during storm events. Make any required repairs.
- Seeded areas which fail to establish a vegetative cover shall be reseeded as necessary.
- During long term implementation inspect periodically, whether a storm has occurred or not.

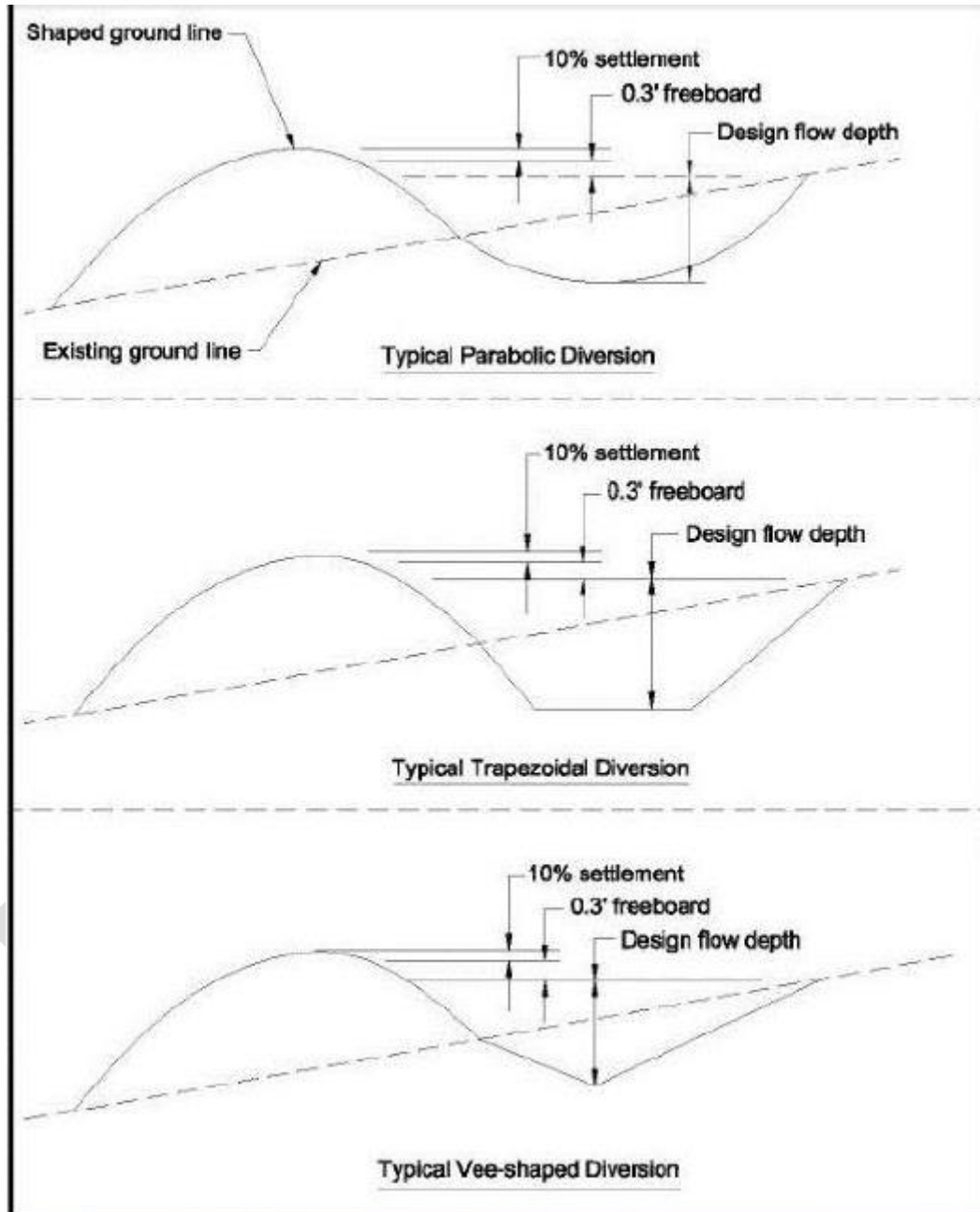
## **BMP REMOVAL**

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup.
- Remove BMP (recycle and/or re-use if applicable).
- Re-vegetate area disturbed by BMP removal (if applicable).



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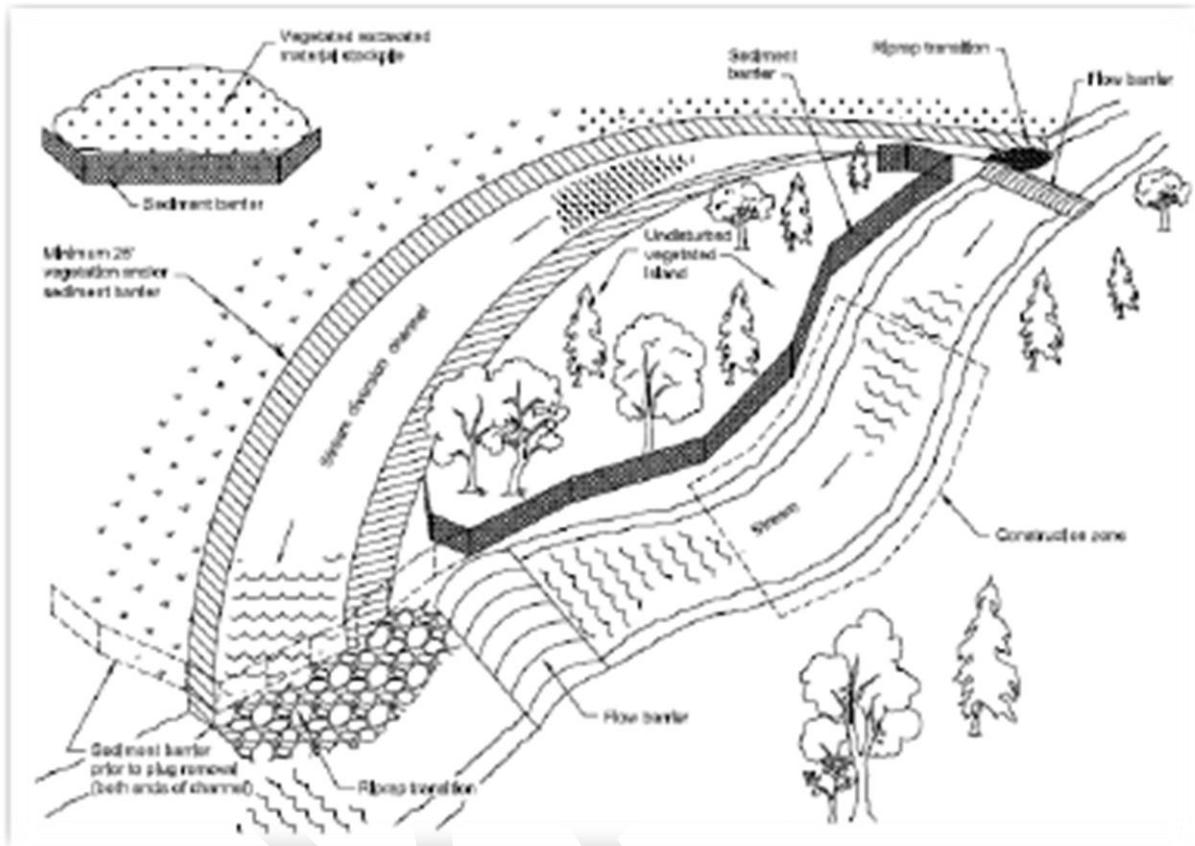
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# BIRMINGHAM FORWARD

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*Minor flow-line diversion*



## **BMP**

### **Dust Control**

---

#### **DESCRIPTION**

**D**ust control is the use of water, products, and/or measures for reducing wind erosion.

Particles moved by wind may cause air pollution, soil loss and/or water quality degradation. Application of water soluble anionic polyacrylamide (PAM) to control erosion caused by wind or water is acceptable. Cationic forms of PAM are not allowed for use under this guideline due to the high levels of toxicity to aquatic organisms. In all cases using chemical dust controls, read and apply the product in accordance with OSHA Material Safety Data Sheets and after approval from City Stormwater Managers.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Reducing soil particle travel by wind due to construction or maintenance operation activities.
- Reducing air and water pollution.

#### **APPLICATIONS**

This BMP may be used on construction sites, roads, shoulders, operating headquarters or pit/quarry sites. It may be used in combination with other BMPs. Protecting the soil surface is accomplished through measures such as applying straw/mulch, water, matting, hydroseeding, plastic covering, or chemical spray-on adhesives.

#### **LIMITATIONS**

This BMP should not be used:

- With straw in locations where compaction is required (for example, roadway shoulders or road bases).
- If a chemical suppressant could enter watercourses or streams.

#### **CONSTRUCTION GUIDELINES**

- Water, Lignum derivative, or Magnesium Chloride can be applied by mechanical means.
- A temporary straw covering may be applied by hand to a small area of exposed soil where compaction is not required.

- Erosion control blanket
- Create a berm downslope to control possible runoff from watering.
- Install fences perpendicular to prevailing wind at intervals of 15 times the fence height.
- Mulching
- Permanent seeding using native Alabama vegetation
- Sodding

**Application Rates for Spray-on Adhesives Used in Dust Control**

Adhesive	Water Dilution (water: adhesive)	Type of Nozzle	Application Rate (gallons/acre)
Anionic Asphalt Emulsion	7:1	Coarse	1200
Latex Emulsion	12:5:1	Fine	235
Resin in Water	4:1	Fine	300
Acrylic Emulsion (Non-traffic)	7:1	Coarse	450
Non-Acrylic Emulsion (traffic)	3:5:1	Coarse	350

#### **BMP MAINTENANCE**

- During the construction period, inspect BMPs daily during the workweek. Make any required repairs.
- Reapply BMP as needed.

#### **BMP REMOVAL**

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of wind erosion has passed).
- Straw removal may be necessary if the area is to be re-vegetated.
- Re-vegetate area disturbed by BMP removal.

## **BMP**

### **Excelsior Filled Log**

---

#### **DESCRIPTION**

An excelsior filled log is a manufactured log filled with curled wood excelsior. When cut or folded to appropriate length, these logs can be used to provide filter/perimeter protection, settling, reduction in water velocity/erosive forces and habitat protection/maintenance.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Reducing slope length to capture and retain sediment on the slope.
- Temporarily stabilizing slopes by reducing soil creep, sheet and rill erosion until permanent vegetation can be established.
- Trapping topsoil and retaining moisture from rainfall, which aids in growth of seedlings planted along the upslope side of the rolls.
- Intercepting and detaining small amounts of water from disturbed areas during construction operations in order to promote settling of soil particles.
- Filtering soil particles and debris.
- Reducing water velocity and erosive forces.

#### **APPLICATIONS**

This BMP may be used in ditches or across culvert ends of any dimension. Excelsior filled logs may also be used for habitat protection at the toe of a bank and can be incorporated with vegetative planting. It may be used instead of straw logs, coir logs, or straw bale filtering systems. Excelsior filled logs may also be used for perimeter sediment control.

This BMP may be used in gullies and stream channels as check dams in conjunction with gabions, rip rap, articulated block, or cellular confinement systems. It may be used to anchor and enhance the effectiveness of willow wattles (fascines), turf reinforcement mats, coir mats, continuous berms and other erosion control material. Excelsior filled logs may be used to replace silt fences or straw bales on steep slopes. It may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:



- Where flow volume or velocity inhibit BMP function.
- For long term applications.

## **CONSTRUCTION GUIDELINES**

- Excelsior filled log must be placed in accordance with applicable design and/or permit conditions.
- Logs are placed and staked along the contour of newly constructed or disturbed slopes, in 2-3 inch deep trench.
- Spacing depends on soil type and slope steepness.
- Tightly about any adjacent logs.
- Install to prevent water from going around or under BMP.
- See "Live Staking", "Handseeding" and/or "Hydroseeding" BMP for planting.

## **BMP MAINTENANCE**

- During construction, inspect BMPs daily during the workweek. Schedule additional inspections during storm events. Make any required repairs.
- Sediment should be removed when deposits reach one-half the height of the BMP.

## **BMP REMOVAL**

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup in front of BMP.
- Depending upon BMP placement, re-vegetation of site may be necessary.
- BMP removal may not be necessary.

## **BMP**

### **Filter Fabric**

---

#### **DESCRIPTION**

**F**ilter fabric is a permeable material made with synthetic fibers. It may be a woven or non-woven fabric and is usually packaged in roll form. This fabric can be used to reduce potential for soil becoming water borne, filter/ perimeter protection and/or settling.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Filtering soil particles from water.
- Stabilizing and reinforcing soils.

#### **APPLICATIONS**

This BMP may be used in drainage filtration, to reinforce paved and unpaved roads, stabilize access or haul roads and to separate soils.

#### **LIMITATIONS**

This BMP should not be used:

- In the streambed of a channel.
- When short term biodegradability is required.

#### **CONSTRUCTION GUIDELINES**

- When used near watercourses or streams, this BMP must be used in accordance with permit requirements.
- Some applications may be designed or reviewed by an engineer.
- Woven filter fabric should only be used for soil separation, road reinforcement and soil separation.
- Non-woven filter fabric should only be used for drainage filtration although it may be used under unpaved roads in certain circumstances.
- Use according to manufacturers details.

#### **BMP MAINTENANCE**

- During construction, inspect BMPs daily during the workweek.

- Schedule additional inspections during storm events. Make any required repairs.

### **BMP REMOVAL**

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- If used as a filter, remove sediment buildup from in front of the BMP.
- Re-vegetate area disturbed by BMP removal (if applicable).
- BMP removal may not be necessary when it is part of the final structure.

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## **BMP**

### **Grass Lined Swale**

---

#### **DESCRIPTION**

A grass lined swale is the vegetative lining of a swale to protect it from erosion and to provide filter/perimeter protection.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited:

- Reducing erosion by providing ground cover, binding soil particles with roots, and lowering water velocity.
- Providing filter/perimeter protection.
- Providing habitat for primary production.
- Providing habitat for prey base organisms such as macro-invertebrates.

#### **APPLICATIONS**

This BMP may be used where a vegetative lining can provide sufficient stability for the channel grade by decreasing velocity; where site conditions require establishment of vegetation (climate, soil and topography are present). This BMP may be used in combination with other bank stabilizing methods.

#### **LIMITATIONS**

This BMP should not be used:

- In locations where there is frequent turbulence with flows likely to rip out grass lining, creating erosion and downstream plugging of system.

#### **CONSTRUCTION GUIDELINES**

- This BMP must be used in accordance with applicable permit requirements.
- Layout the grass swale from the outlet according to the planned location and the design grade limits.
- Ensure that lateral surface drainage into the grass swale is not blocked.
- Ensure design dimensions are obtained. Most grass swales have a parabolic cross-section but may be designed to be triangular or trapezoidal.

## **BMP MAINTENANCE**

- During initial vegetation establishment, inspection should occur and any necessary repairs made.
- After vegetation establishment, the channel should be inspected periodically to determine if the channel is withstanding flow velocities without damage.
- Check the channel for debris, scour, or erosion and make repairs.
- Remove all significant sediment accumulations to maintain the designed carrying capacity. Debris such as litter, car parts, appliances and items that pose a risk to public safety should be removed. Any large woody material that falls into the channel and does not pose a threat to public safety or structure damage should be left in place or relocated to an area that is not a public safety hazard or ROW structure problem.
- Check channel outlet and all road crossings for bank stability, evidence of piping or scour holes and make repairs.
- Mow and fertilize as needed.

## **BMP REMOVAL**

- BMP removal is not necessary.

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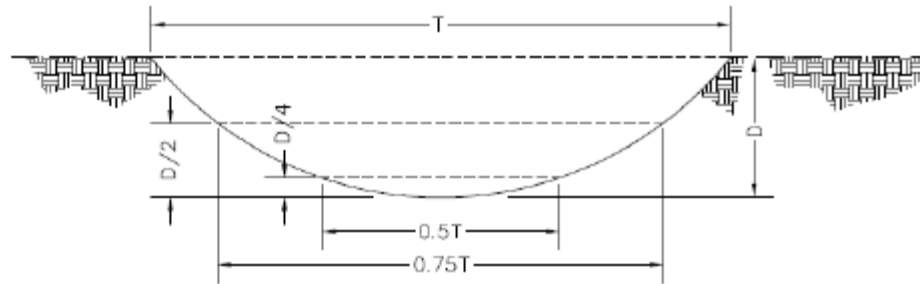


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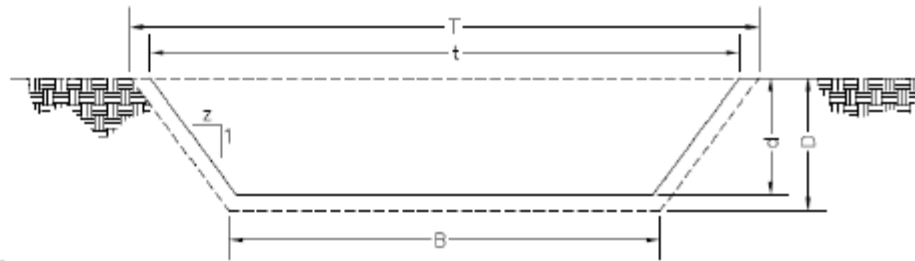
$T$  = design top width  
 $D$  = design depth

Both values include allowance for the vegetative lining



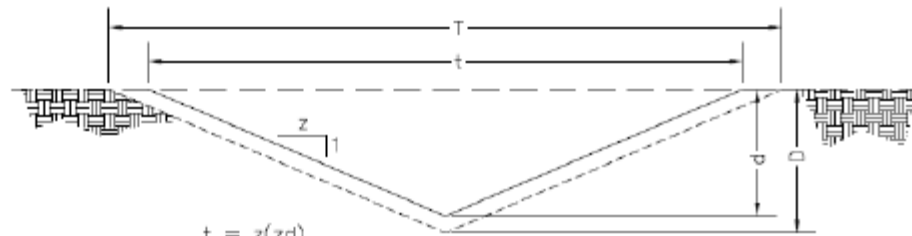
Parabolic Cross-Section

$B$  = design bottom width  
 $d$  = design depth  
 $D$  = design depth plus allowance for vegetative lining  
 $t$  = design top width  
 $T$  = design top width plus allowance for vegetative lining  
 $z$  = side slope ratio



Trapezoidal Cross-Section

$d$  = design depth  
 $D$  = design depth plus allowance for vegetative lining  
 $t$  = design top width  
 $T$  = design top width plus allowance for vegetative lining  
 $z$  = side slope ratio



Triangular Cross-Section

## **BMP**

### **Gravel Filled Sump**

---

#### **DESCRIPTION**

A gravel filled sump is a constructed sump filled with gravel and a standing perforated pipe or bucket that allows pumping filtered water out of a non-erosive location.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Dewatering construction sites.
- Filtering sediment from water.

#### **APPLICATIONS**

This BMP is used in conjunction with flow bypass.

#### **LIMITATIONS**

This BMP should not be used:

- When peak flows exceed the pump capacity.

#### **CONSTRUCTION GUIDELINES**

- Excavate hole at least 3 feet deep.
- Line the base and sides of the hole with filter fabric.
- Place perforated pipe inside the hole.
- Shore up pipe by adding washed rock to space between hole and pipe exterior.
- Have adequate fuel supply and backup pumps in the event of mechanical failure.

#### **BMP MAINTENANCE**

- Inspect bypass, pump, and sump periodically. Repair any leaks immediately.
- Check for scour at bypass outfall. Repair or move as necessary.
- Provide downstream sediment filtration.

#### **BMP REMOVAL**

- Remove BMP when in water work is complete.
- Remove BMP (recycle and/or re-use if applicable).
- Re-vegetate area disturbed by BMP removal (if applicable).



## **BMP**

### **Half Round Filter**

---

#### **DESCRIPTION**

The half round filter BMP is one-half section of perforated pipe cut lengthwise (with optional filter fabric lining) and filled with washed rock.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Filtering sediment from water.
- Reducing water velocity.

#### **APPLICATIONS**

This BMP may be used at construction sites to filter sediment-laden water pumped from construction area. This BMP may be used with other sediment control BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- In fast flowing water.
- To filter water with a high percentage of fines.
- As the sole BMP.

#### **CONSTRUCTION GUIDELINES**

- Make sure pump head (if used) is secured within washed rock.
- Make sure length of pipe and amount of rock is sufficient for site.
- Have additional washed rock available on site.
- Have adequate fuel supply and backup pumps in the event of mechanical failure.

#### **BMP MAINTENANCE**

- Evaluate half round filter and pump (if used) periodically to ensure BMP is functioning properly.
- Check for scour at outfall.
- Check outlet to make sure water is running clear. If not, add washed rock.

## **BMP REMOVAL**

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup.
- Remove BMP (recycle and/or re-use if applicable).
- Re-vegetate area disturbed by BMP removal (if applicable).

DRAFT

## **BMP**

### **Hand Seeding**

---

#### **DESCRIPTION**

**H**and seeding is broadcasting grass seed on disturbed areas by hand or a hand seeding device.

This BMP is used to reduce potential for soil becoming water or air borne, to reduce water velocity/erosive forces after vegetation establishment and to aid in habitat protection/maintenance.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Establishing vegetation in sparse, bare and/or exposed soil areas.
- Decreasing soil erosion.

#### **APPLICATIONS**

This BMP may be used after soil disturbance is completed at construction sites. This BMP may be used in areas that need to be permanently or temporarily vegetated. It may be used in conjunction with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- In months when seed germination will not occur. (In winter months, see "Mulching" and/or "Plastic Covering" BMPs).

#### **CONSTRUCTION GUIDELINES**

- Seed mixes vary. Seed selection should be based on the intended use of the area it is applied to, for example, low growing grass versus ditch bank grass.
- Spread seed uniformly and according to manufacturer's recommendations.
- Cover with other methods as needed to protect surface (for example, light application of mulch, jute matting).

#### **BMP MAINTENANCE**

- Inspect during seed establishment period. Re-seed, due to mortality, as necessary.



## BIRMINGHAM FORWARD

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- Schedule additional inspections during storm events and/or heavy rainfall. Check for scour and sloughing; any required repairs shall be made.

### **BMP REMOVAL**

- BMP removal is not necessary.

DRAFT



## **BMP**

### **Hydroseeding**

---

#### **DESCRIPTION**

**H**ydroseeding is broadcasting grass seed, tackifier, wood fiber mulch and water on disturbed areas by using a hydroseeding machine. This BMP is used to reduce potential for soil becoming water or air borne, to reduce water velocity/erosive forces after vegetation establishment and to aid in habitat protection/maintenance.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Establishing vegetation in sparse, bare and/or exposed soil areas over a large site.
- Decreasing soil erosion.

#### **APPLICATIONS**

This BMP may be used after soil disturbance is completed at construction sites. This BMP may be used in areas that need to be permanently or temporarily vegetated. It may be used in conjunction with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- In months when seed germination will not occur. (In winter months, see "Mulching" and/or "Plastic Covering" BMPs).
- During strong winds or freezing weather.

#### **CONSTRUCTION GUIDELINES**

- Seed mixes vary. Seed selection should be based on the intended use of the area it is applied to. For example low growing grass versus ditch bank grass.
- Spread seed uniformly and according to manufacturer's recommendations.
- Cover hydroseeded area with other methods as needed.
- Hydroseeding should be applied after finish grading and/or surface roughening. Application may depend on slope, soil, exposure and time of year.
- Tackifier and/or moisture retention agent may need to be added, per state standard.

### **BMP MAINTENANCE**

- Inspect during seed establishment period. Re-seed, due to mortality, as necessary.
- Schedule additional inspections during storm events and/or heavy rainfall. Check for scour and sloughing; any required repairs shall be made.

### **BMP REMOVAL**

- BMP removal is not necessary.

DRAFT

## **BMP**

### **Inlet Protection**

---

#### **DESCRIPTION**

**I**nlet protection is a sediment filter located at the inlet to a storm drainage conveyance. It may be an external structure such as a filter fence box or a gravel berm. This forms a small basin around a storm drain inlet to temporarily pond runoff water allowing suspended soil particles to settle out; thereby minimizing sediment entering storm drains during construction. Inlet protection is used with the following practices:

- Block and Gravel Inlet Protection
- Excavated Drop Inlet Protection
- Fabric Drop Inlet Protection

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Reducing soil particles from entering storm drainage systems.

#### **APPLICATIONS**

This BMP may be used in ditches at the inlet to enclosed drainage systems. They may also be used in manholes or catch basins. This BMP may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- Where there are traffic conflicts.
- In areas where it creates excessive ponding.
- To remove excessive fines.

#### **CONSTRUCTION GUIDELINES**

- Ensure that each inlet protection practice has no more than 1 acre of drainage area and the approaches to the inlet are 1% or flatter.
- Install the inlet protection according to the plans.





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- Shape or construct the storage area as necessary to obtain the volume of storage required in the plans.
- Ensure that excess runoff water will go over the inlet protection practice and into the storm drain and does not bypass.
- Refer to sketches on following pages for details and specific construction guidelines.

### BMP MAINTENANCE

- During construction, inspect BMPs daily during the workweek. Schedule additional inspections during storm events. Make any required repairs.
- Sediment should be removed when deposits reach one-half the height of the BMP.

### BMP REMOVAL

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup in front of BMP.
- Remove BMP (recycle and/or re-use if applicable).
- Re-vegetate area disturbed by BMP removal (if applicable).



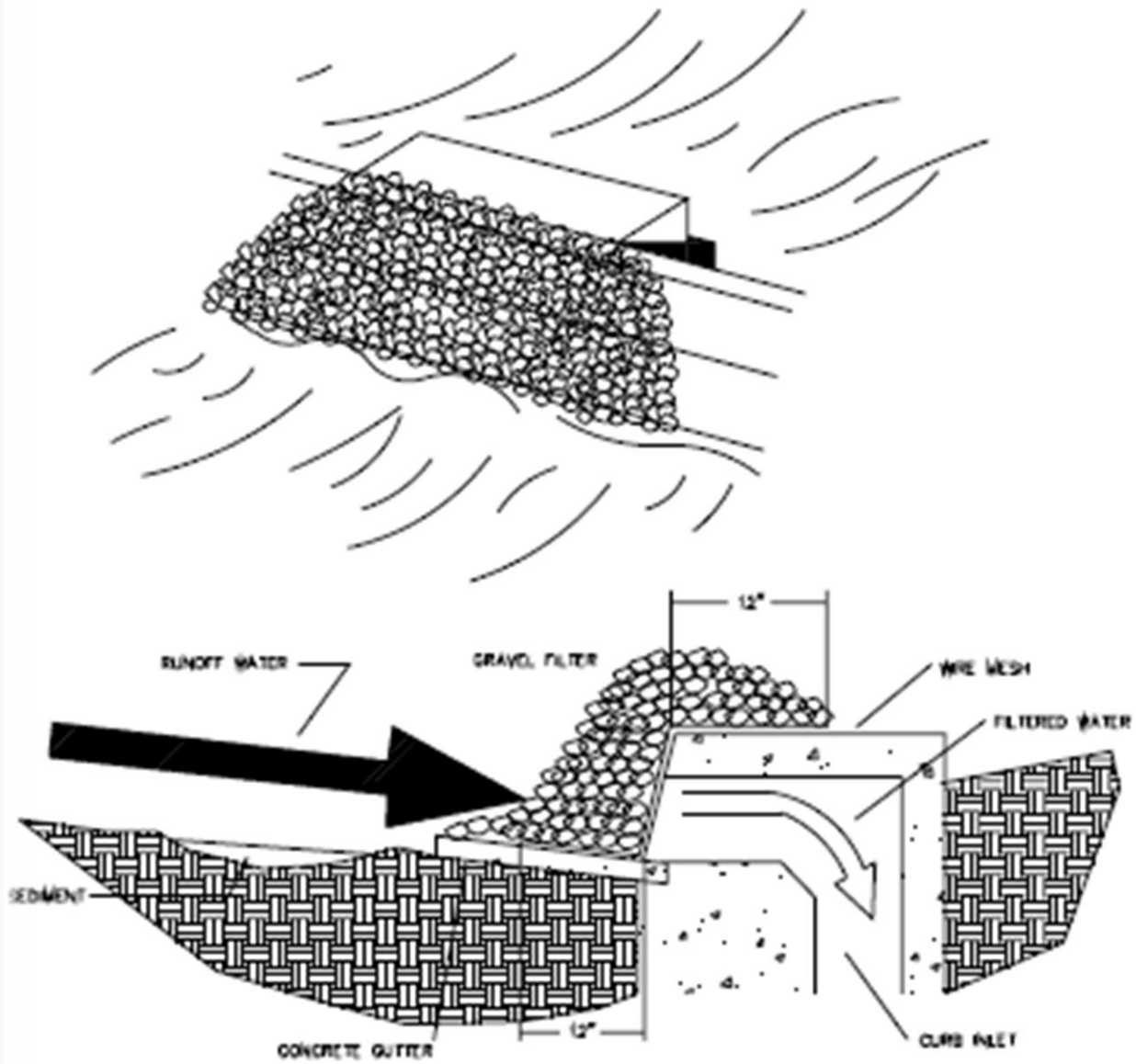
*Inlet protection: filter fence surrounding catch basin to reduce soil particles from entering drainage system*





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*inlet protection details*

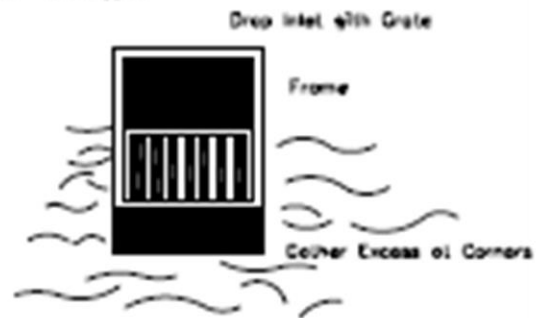
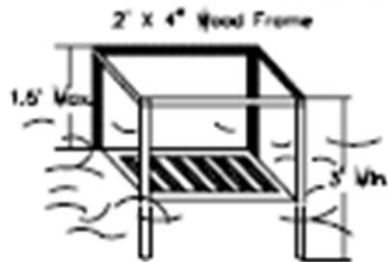


# BIRMINGHAM FORWARD

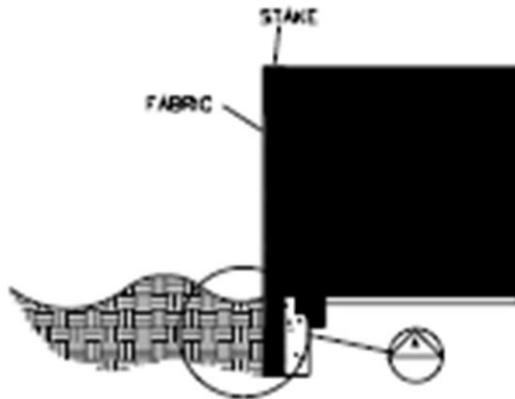
MAYOR WILLIAM A. BELL, SR.

## SILT FENCE DROP INLET PROTECTION

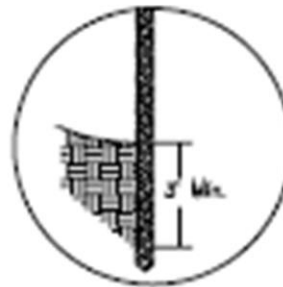
### PERSPECTIVE VIEWS



### ELEVATION OF STAKE AND FABRIC ORIENTATION



### DETAIL A



### SPECIFIC APPLICATION

THIS METHOD OF INLET PROTECTION IS APPLICABLE WHERE THE INLET DRAIN IS A RELATIVELY FLAT AREA (SLOPE CANNOT EXCEED 5%), WHERE INLET SHEET OR OVERLAND FLOWS ARE TYPICAL AND CANNOT EXCEEDING 1 CFS. THIS METHOD SHALL NOT BE USED WHERE THE INLETS ARE RECEIVING CONCENTRATED FLOWS, SUCH AS IN STREETS OR HIGHWAY MEDIANS

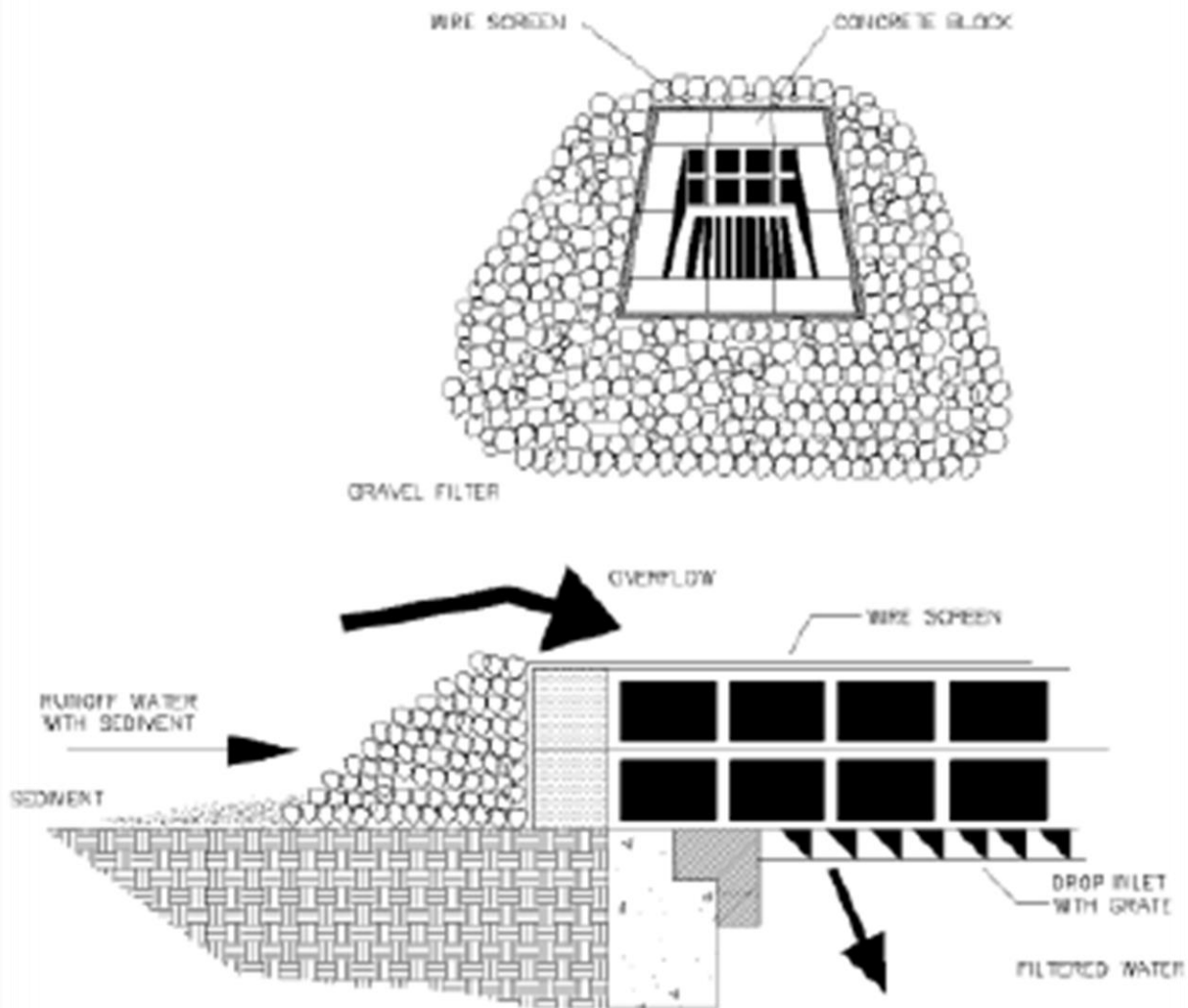




# BIRMINGHAM FORWARD

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## BLOCK AND GRAVEL DROP INLET SEDIMENT FILTER



### SPECIFIC APPLICATION

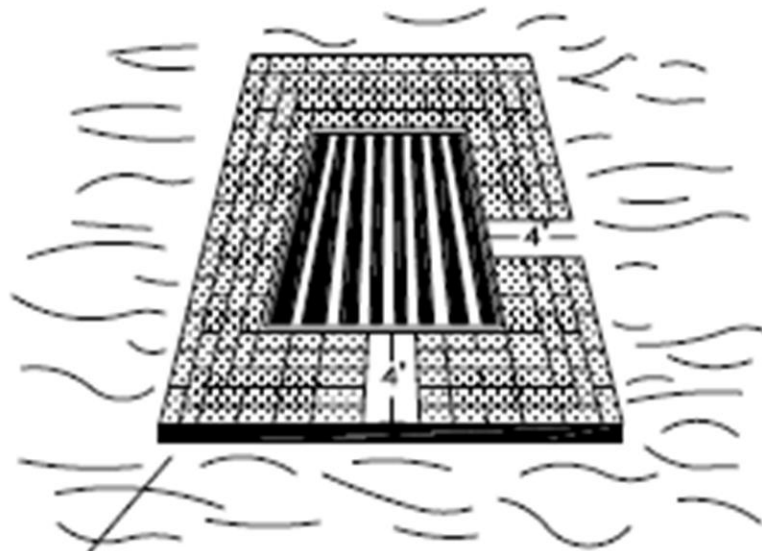
THIS IS APPLICABLE WHERE HEAVY FLOWS ARE EXPECTED AND WHERE AN OVERFLOW CAPACITY IS NECESSARY TO PREVENT EXCESSIVE PONDING AROUND THE STRUCTURE



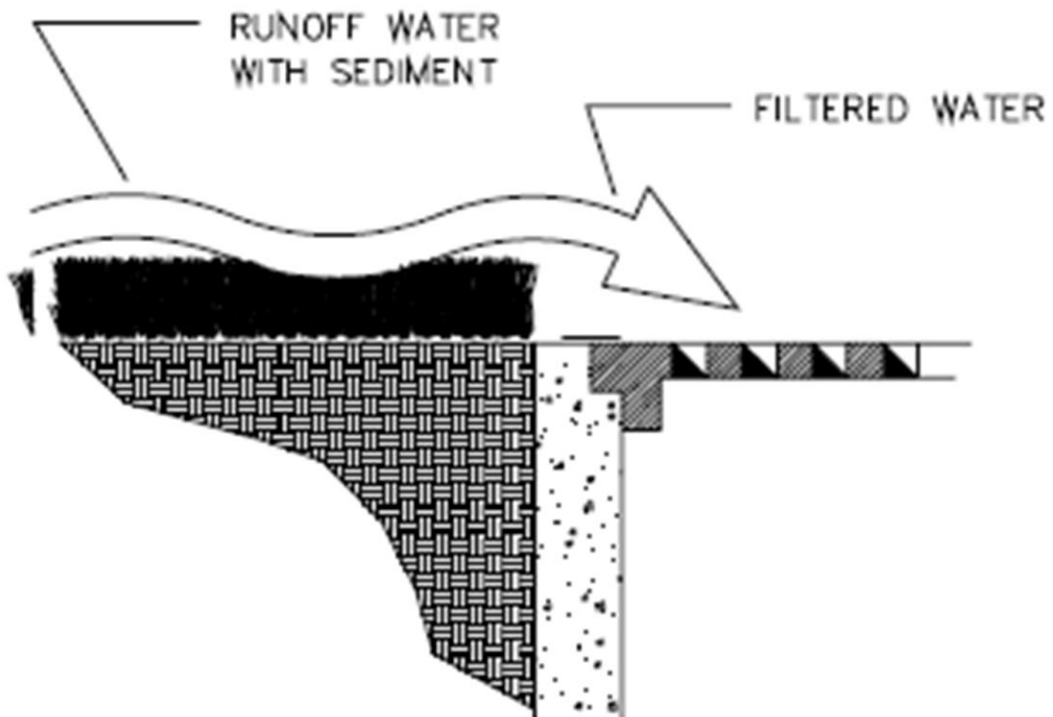


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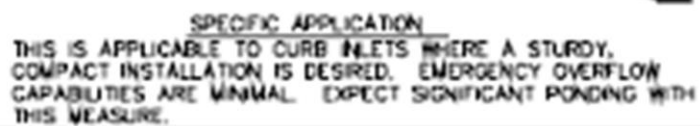


FOUR 1-FOOT WIDE STRIPS OF SOD ON EACH SIDE OF THE DROP INLET



*Inlet protection detail*





## **BMP**

### **Kimble Filter Pipe**

---

#### **DESCRIPTION**

**A** Kimble filter is a perforated pipe (with an optional filter fabric wrap, depending on soil types) added to an existing inlet pipe, surrounded by washed rock.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Filtering sediment from water entering existing pipe at construction area.

#### **APPLICATIONS**

This BMP may be used in open drainage system maintenance and in conjunction with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- When the inlet elevation for the perforated pipe extension exceeds the surrounding bank height.
- To remove excessive fines unless the optional filter fabric is used.

#### **CONSTRUCTION GUIDELINES**

- Secure perforated pipe onto existing pipe and wrap in filter fabric as needed.
- Fill washed rock high enough to ensure filtration.

#### **BMP MAINTENANCE**

- Check outfall periodically. Revise methods if water is not running clear.

#### **BMP REMOVAL**

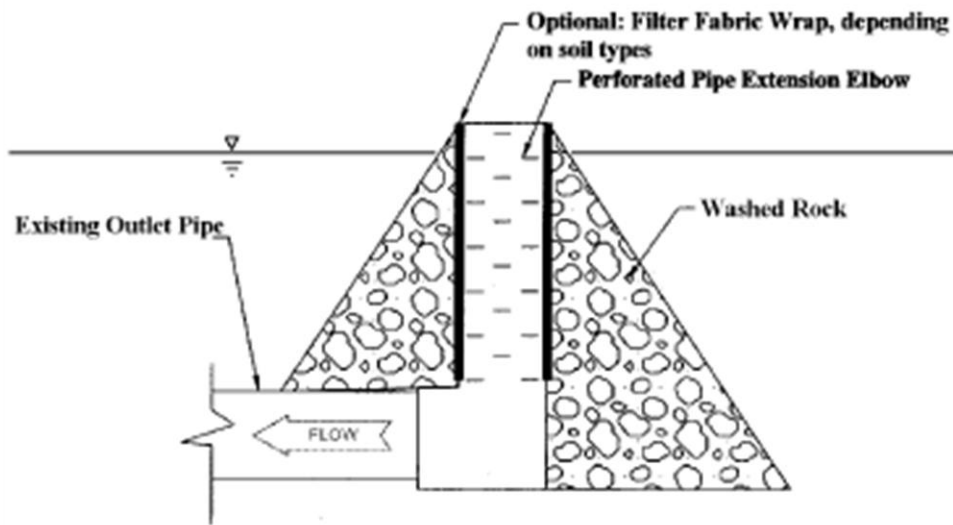
- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup in front of BMP.
- Remove BMP (recycle and/or re-use if applicable).
- Re-vegetate area disturbed by BMP removal (if applicable).





# BIRMINGHAM FORWARD

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*Kimble filter detail*

## **BMP**

### **Mulching**

---

#### **DESCRIPTION**

**M**ulching is the application of straw, wood chips, or other suitable materials on the soil surface applied manually or by machine. This BMP is used to reduce potential for soil becoming water borne or air borne and to reduce water velocity/erosive forces after vegetation establishment.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Reducing erosion by protecting the soil surface from raindrop impact or wind.
- Decreasing surface water or wind velocity impacts.
- Fostering the growth of vegetation by increasing available moisture and providing insulation against extreme heat and cold.

#### **APPLICATIONS**

This BMP can be used in areas to provide protection to the soil surface. Areas that have been seeded can be mulched to provide additional protection. This BMP may be used in combination with plantings of trees, shrubs, certain ground covers or in conjunction with seeding.

#### **LIMITATIONS**

This BMP should not be used:

- On slopes steeper than 2 horizontal to 1 vertical.
- In watercourses and streams.
- In ditches where water flow is continuous.

#### **CONSTRUCTION GUIDELINES**

- When used near watercourses or streams, this BMP must be used in accordance with permit requirements.
- Remove stumps, roots, and other debris from the site before seeding and/or mulching.
- Grade area, if needed, to permit the use of equipment for seeding, mulching, and maintenance.
- Shape area so that it is relatively smooth.
- If seeding, follow seeding specifications and apply mulch immediately after seeding.

- Spread straw uniformly over the area with a power blower, hydroseeder, or by hand at rates recommended for either seeded areas or without seeding.
- When mulching with seeding, 25% to 35% of the ground surface should be visible after mulching is applied.
- Mulch should be applied so that the soil is covered sufficiently enough to allow seeds to germinate, but also protects the soil from erosion.
- When mulching without seeding, 100% of the soil surface should be covered.
- Nets and matting may be used in combination with mulch.
- Various types and sizes of mulch are available.
- If used to stabilize soil from wind forces, the mulch needs to be tilled or incorporated into the soil.
- Apply at the rates shown in the plan or in the table below if there is not a plan.

**Mulch Application Plan**

<b>Material</b>	<b>Rate per Acre and (Per 100 ft. <sup>2</sup>)</b>	<b>Notes</b>
<b>Straw (With Seed)</b>	1 ½ - 2 tons (70 lbs – 90 lbs)	Spread by hand or machine; anchor when subject to blowing.
<b>Straw Alone (No Seed)</b>	2 ½ - 3 tons (115 lbs – 140 lbs)	Spread by hand or machine; anchor when subject to blowing.
<b>Wood Chips</b>	5 – 6 tons (230 lbs – 275 lbs)	Treat with 12 lbs. nitrogen/ton.
<b>Bark</b>	35 cubic yards (0.8 cubic yard)	Can apply with mulch blower.
<b>Pine Straw</b>	1 – 2 tons (45 lbs – 90 lbs)	Spread by hand or machine; will not blow like straw.
<b>Peanut Hulls</b>	10 – 20 tons (450 lbs – 900 lbs)	Will wash off slopes. Treat with 12 lbs. nitrogen/ton.

## **BMP MAINTENANCE**

- During construction, inspect BMPs daily during the workweek. Schedule additional inspections during storm events. Make any required repairs.
- Additional mulch should be applied where erosion or scouring occurs.
- If a tear occurs in the cover netting or matting, repair as necessary.
- Continue inspections of seeded areas until vegetation is well established.
- Keep mower height high if plastic netting is used to prevent netting from wrapping around mower blades or shaft.

## **BMP REMOVAL**

BMP removal is not necessary under normal circumstances.



*Straw being used to reduce erosion*

## **BMP**

### **Plastic Covering**

---

#### **DESCRIPTION**

**P**lastic covering is used to cover exposed areas, which need immediate protection from erosion.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Providing immediate temporary erosion protection to slopes, piles and disturbed areas that cannot be covered by mulching.
- Protecting exposed surfaces from water and/or wind erosion.
- Used in winter months as a temporary erosive control device when grass seed will not germinate.

#### **APPLICATIONS**

This BMP may be used in disturbed areas, which require immediate erosion protection, areas seeded during winter and spring to aid in germination and for protection from heavy rain. Plastic covering may be used on steep slopes, construction sites and on stockpiles and/or excess materials. It may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- For long term erosion control.
- Without controlling surface water runoff from the plastic covered area.

#### **CONSTRUCTION GUIDELINES**

- Plastic must be secured by staking or using weight (i.e. sandbag or tires) to prevent movement. Rebar must not be used as a staking mechanism.
- Plastic covering must be "keyed" in at the top of the slope.
- Additional BMPs, such as a berm and/or sediment control, must be used to control surface water runoff from plastic.

## BMP MAINTENANCE

- During construction, inspect BMPs daily during the workweek.
- Schedule additional inspections during storm events. Make any required repairs.
- Replace damaged sections of plastic.

## BMP REMOVAL

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove BMP (recycle and/or re-use if applicable).
- Re-vegetate area disturbed by BMP removal (if applicable).



*Plastic covering used to protect exposed surface from erosion during construction/repair activities*

## **BMP**

### **Plywood Work Platform**

---

#### **DESCRIPTION**

A plywood work platform is a temporary work area under bridges or piers consisting of framework, plywood, scaffolding and/or tarps. This BMP is used to reduce the potential for debris and contaminants falling into water.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Providing a safe and efficient working environment.
- Containing fallen debris (concrete, wood chips, sawdust, slag and metal) from entering water during construction, maintenance and repair activities.

#### **APPLICATIONS**

This BMP may be used under most small timber bridges, pipelines or piers. It may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- Where spans exceed 16 feet from bent to bent.

#### **CONSTRUCTION GUIDELINES**

- Framework is usually 4 in. x 6 in. joists 16 inches on center which span the stream.
- 3/4 in. x 4 ft. x 8 ft. plywood is placed flat and tight, edge to edge, on joists, and tacked with 6 d nails for easy removal.
- Tarps are placed over the plywood deck and draped vertically approximately 36 in. high at the abutment wall of the deck and over the hand rails at the other edges.
- A truck mounted bridge work platform may be an option, depending on location and scope of work.
- A fire extinguisher shall be on hand at all times for spark and fire suppression.
- Ensure that plywood platform and tarp do not enter the water.



## **BMP MAINTENANCE**

- During construction, inspect BMPs daily during the workweek. Schedule additional inspections during storm events. Make any required repairs.
- Crew must provide frequent clean up of debris during the day.
- Rips or tears in the tarp must be repaired.

## **BMP REMOVAL**

- Evaluate site to determine BMP is no longer needed.
- Remove debris on BMP.
- Remove BMP (recycle and/or re-use if applicable).
- Re-vegetate bridge abutment area disturbed by maintenance activities (if applicable).



*Plywood work platform providing a safe work environment and containing fallen debris from entering water during construction, maintenance, and repair activities*

## **BMP**

### **Rip Rap**

---

#### **DESCRIPTION**

**R**ip rap is a long-term, erosion-resistant ground cover. It is composed of large, loose, angular rock which may be used to stabilize embankments and ditches. An optional filter fabric or granular underlining may be used. Placement of rip rap should be in accordance with a system that has been properly designed and engineered. If placed within a stream cross-section or associated with a wetland system, it is required to also have an Environmental Resource Permit.

#### **PURPOSE**

This BMP includes, but is not limited to:

- Protecting the soil from the erosive forces of concentrated runoff.
- Reducing the velocity of runoff while enhancing the potential for infiltration.

#### **APPLICATIONS**

This BMP may be used for stabilization of steep slopes with seepage problems and/or unstable soils that need armoring to prevent sloughing, downstream turbidity, and roadway or shoulder failure. This BMP should be used as a last resort in locations where planting or other stabilizing methods are impracticable. Rip rap may also be used to fill minor washouts along ditch lines, at culvert exits and entrances and shoulders. It may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used in watercourses or streams:

- Without permit review and approval.
- Rock riprap lining should not be used when channel velocities exceed 10 feet per second unless a detailed engineering analysis is performed using appropriate guidelines.
- For applications outside of watercourses or streams, there are no limitations, other than design constraints.

## CONSTRUCTION GUIDELINES

- In locations where permits are required, rip rap must be placed in accordance with design and/or permit
- Remove unstable and unusable soil.
- Shape the sub-base to conform to site.
- Install fabric (if applicable).
- Place rip rap.
- Rip rap should be designed to resist displacement when the channel is flowing at the bankfull discharge or the 10-year, 24-hour frequency discharge, whichever is the lesser.
- Dumped and machine placed riprap should be installed on slopes flatter than 2 horizontal to 1 vertical.
- Where riprap is placed by hand the slopes may be steeper.
- Stone for riprap should consist of field stone or rough unhewn quarry stone of approximately rectangular shape.
- The specific gravity of the individual stones should be at least 2.5.
- A filter blanket should be placed between the riprap and base material, if needed.

## MAINTENANCE

- Inspect periodically to determine if high flows have caused scour beneath the rip rap or filter fabric.

## BMP REMOVAL

- BMP removal may not be necessary. If BMP is removed, it should be done in accordance with design and applicable permits.



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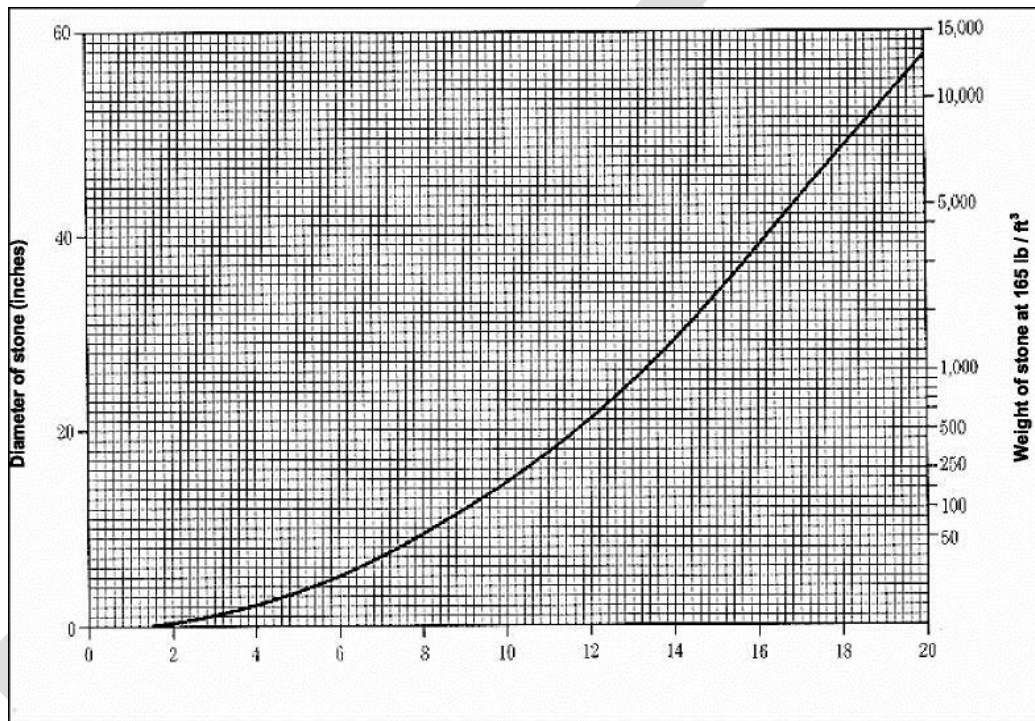


*Rip rap used to provide bank stability*

DRAFT

Use the figure below to determine the stable basic stone weight (d<sub>100</sub>). Using the d<sub>100</sub> size as a d<sub>90</sub>, select a commercially available riprap gradation as classified by the Alabama Department of Transportation, from table below.

- 1) Determine the design velocity.
- 2) Use design velocity and the Isbash Curve determine d<sub>100</sub> rock size.
- 3) Use d<sub>100</sub> from the Isbash Curve as d<sub>90</sub> to select rock gradation from the Graded Rip Rap Table



*Isbash Curve*

### Graded Rip Rap

Class	Weight (lbs.)					
	d <sub>10</sub>	d <sub>15</sub>	d <sub>25</sub>	d <sub>50</sub>	d <sub>75</sub>	d <sub>90</sub>
1	10	-	-	50	-	100
2	10	-	-	80	-	200
3	-	25	-	200	-	500
	-	-	50	500	1000	-
5	-	-	200	1000	-	2000

### Size of Rip Rap Stones

Weight	Mean Spherical Diameter (feet)	Rectangular Shape Length Width, Height (feet)	
50	0.8	1.4	0.5
100	1.1	1.75	0.6
150	1.3	2.0	0.67
300	1.6	2.6	0.9
500	1.9	3.0	1.0
1000	2.2	3.7	1.25
1500	2.6	4.7	1.5
2000	2.75	5.4	1.8
4000	3.6	6.0	2.0
6000	4.0	6.9	2.3
8000	4.5	7.6	2.5
20000	6.1	10.0	3.3

A filter blanket can be of 2 general forms: a gravel layer or a geotextile filter cloth.

Gravel filter blankets are to be designed in accordance with the criteria below.

The following relationships must exist:

$$\frac{d_{15} \text{ filter}}{d_{15} \text{ base}} < 5 < \frac{d_{50} \text{ filter}}{d_{50} \text{ base}} < 40$$

$$\frac{d_{15} \text{ filter}}{d_{15} \text{ base}} < 40$$

$$\frac{d_{50} \text{ filter}}{d_{50} \text{ base}} < 40$$



## **BMP**

### **Rock Check Dam**

---

#### **DESCRIPTION**

A rock check dam is a small temporary or permanent dam constructed across an area of concentrated flow to slow the water and reduce channel erosion. A rock check dam can be used to provide settling of soil particles and reduction in water velocity/erosive forces.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Reducing water velocity/erosive forces.
- Trapping soil particles generated from adjacent areas or the drainage ditch.

#### **APPLICATIONS**

Rock check dams may be used to aid in sediment trapping from a work site. It may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- For drainage areas of greater than 10 acres.
- In “live” streams.

#### **CONSTRUCTION GUIDELINES**

- In locations where rock check dams are required, rock check dam must be placed in accordance with design and/or permit conditions.
- Remove debris and other unsuitable material from the check dam location.
- Construct the dam with a parabolic top with the center portion 6 to 12”, depending on drainage area, lower in elevation than the outer edges so that the flow goes over the structure and not around the structure.
- Construct the dam with side slopes of 2:1 or flatter.
- Maximum dam height should be 2’ for drainage areas of 5 acres or less and 3’ for drainage areas of 5 to 10 acres.





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- For added stability, excavate a shallow keyway (12” – 24” deep and at least 12” wide) into the channel bottom and abutments.
- If specified, install a non-woven geotextile fabric in the keyway.
- Maximum spacing between the dams should be such that the toe of the upgrade dam is at the same elevation as the top of the downgrade dam.
- Filter fabric may be used under the stone to provide a stable foundation and to facilitate the removal of the rock.
- Use in small open channels.
- Refer to sketches on following pages for details.

### BMP MAINTENANCE

- During construction, inspect BMPs daily during the workweek. Schedule additional inspections during storm events. Make any required repairs.
- Repair damaged BMPs due to end runs or undercutting.
- Sediment should be removed when deposits reach one-half the height of the BMP.
- Inspection on a regular basis should ensure that the center of the dam is lower than the edges. Erosion around the edges of the dam should be corrected.

### BMP REMOVAL

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup in front of BMP.
- Remove BMP (recycle and/or re-use if applicable).
- Re-vegetate area disturbed by BMP removal (if applicable).

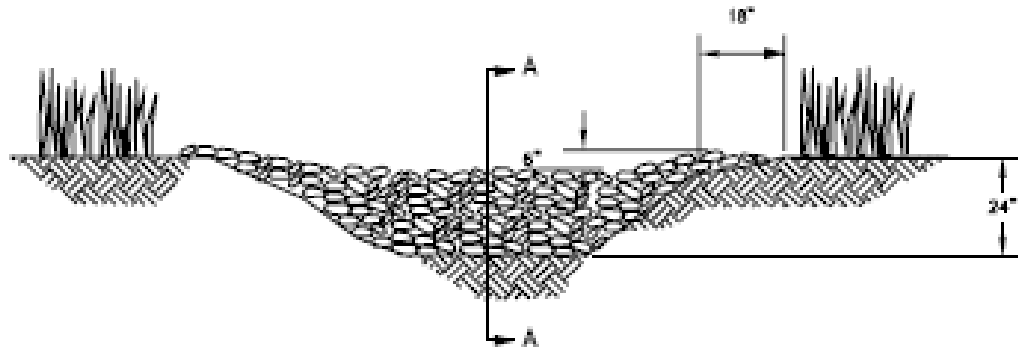




# BIRMINGHAM FORWARD

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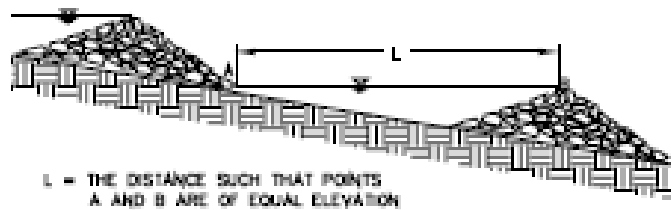
## ROCK CHECK DAM



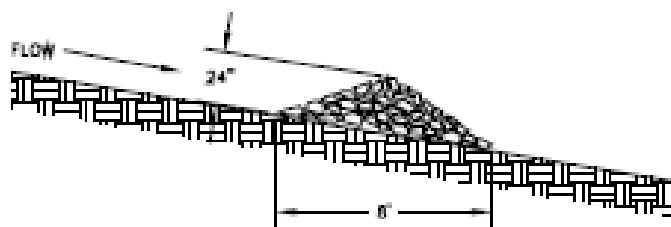
### NOTE

KEY STONES INTO CHANNEL BANKS AND EXTEND IT BEYOND THE ABUTMENTS 18" (MIN.) TO PREVENT FLOW AROUND DAM.

## SPACING BETWEEN CHECK DAMS



### SECTION A-A



## **BMP**

### **Sandbag**

---

#### **DESCRIPTION**

A sandbag is a pre-manufactured cloth or plastic bag (polypropylene) filled with sand or gravel. Sandbags can be used to keep water from the work area, for settling and reduction in water velocity/erosive forces.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- A barrier.
- A protective barrier against flooding.
- Using in combination with other methods, to form a cofferdam.
- Using as a sediment filter (when used with clean pea gravel).
- Using as a ballast.
- Other multi-purpose situations.

#### **APPLICATIONS**

Sandbags may be used during emergencies to build walls and control the flow and level of water. It may be used in combination with other barriers. This BMP may be used during construction to form walls in dewatered areas, for example, cofferdams, and for various other impromptu situations.

#### **LIMITATIONS**

This BMP should not be used:

- Where permit conditions state otherwise.

#### **CONSTRUCTION GUIDELINES**

- When used in watercourses or streams, this BMP must be used in accordance with permit requirements.
- If sandbag filling is to be used as streambed gravel, it must be washed prior to filling bags, appropriately sized according to design and placed in accordance with permit conditions. Wash rock off-site (at a location where washed water can not enter watercourses, streams or wetlands) until water runs clear.
- Secure ends of sandbags to ensure material does not scatter.
- When used as a barrier, stack bags tightly together and in alternating, brick-layer fashion.

### **BMP MAINTENANCE**

- During construction, inspect BMPs daily during the workweek. Schedule additional inspections during storm events. Make any required repairs.
- Replace damaged sandbags.
- Repair damaged sandbag berm due to end runs or undercutting.
- Sediment should be removed when deposits reach one-half the height of the BMP.
- Check bags often for seepage and replace or add as needed.

### **BMP REMOVAL**

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup in front of BMP.
- Remove BMP (recycle and/or re-use if applicable).
- Re-vegetate area disturbed by BMP removal (if applicable).
- Gravel filled bags may be split and the contents left in place, in streams, when so stated in the specific permit conditions (Bags are to be removed from job site).



*Sandbags acting as a barrier*



*Sandbags filled with washed rock  
acting as a filter*

## **BMP**

### **Silt Fence**

---

#### **DESCRIPTION**

A silt fence is a temporary sediment barrier consisting of fabric stretched across and attached to supporting posts and entrenched into the soil. It is generally installed perpendicular to the flow direction to slow or stop water and to allow filter/perimeter protection, settling of soil particles, and/or reduce water velocity/erosive forces. Three types of silt fences are described in this manual:

- Type A Silt Fence
- Type B Silt Fence
- Type C Silt Fence

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Intercepting sheet flow.
- Intercepting and detaining small amounts of water from disturbed areas during construction operations in order to allow for filtering or settling of soil particles.
- Decreasing down slope sheet flow velocity.
- Retain soil particles on site.

#### **APPLICATIONS**

This BMP may be used for perimeter protection. It may be used in combination with other BMPs. This BMP may be used below disturbed areas subject to sheet and rill erosion where drainage area is no greater than .25 acre per 100 lineal feet of barrier and the slope behind the barrier should be no steeper than 2 horizontal feet to 1 vertical foot. On relatively flat slopes, the maximum disturbed slope distance should not exceed 100 feet. The allowable disturbed slope distance decreases as the slope gets steeper.

#### **LIMITATIONS**

This BMP should not be used:

- Where rock or hard surfaces prevent the full and uniform anchoring of the barrier.
- Directly in perennial streams or water courses.
- Around drop inlets.
- In front of storm drain inlets.



- As a diversion dam.

#### Slope Limitations for Silt Fence

Land Slope (Percent)	Maximum Slope Length Above Fence (Feet)
<2	100
2 to 5	75
5 to 10	50
10 to 20*	25
>20	15

\*In areas where the slope is greater than 10%, a flat area length of 10 feet between the toe of the slope to the fence should be provided.

#### CONSTRUCTION GUIDELINES

- The BMP should be placed along contours.
- The bottom of the fabric must be continuously and securely anchored for its entire length to reduce undermining.
- The height of the fence shall be adequate to reduce the potential of silt from leaving the job site.
- There must be at least a 3-foot overlap at vertical seams to avoid leakage. Both ends of the overlap must be securely attached to posts.
- Increase the elevation at the ends of the BMP installation to prevent "end runs."
- Silt fences must be trenched in at the bottom to prevent runoff from undermining the fence and developing rills under the fence.
- Locations with high runoff flows or velocities should use wire fence reinforcement.
- Silt fence fabric should conform to the requirements of geotextile meeting the requirements found in ASSHTO M288.
- Type A Silt Fence
  - Type A fence is at least 32" above ground with wire reinforcements and is used on sites needing the highest degree of protection by a silt fence. The wire reinforcement is necessary because this type of silt fence is used for the highest flow situations and has almost 3 times the flow rate as Type B silt fence.

- Type A silt fence should be used where runoff flows or velocities are particularly high or where slopes exceed a vertical height of 10 feet. Staked tie backs on each end of a Type A silt fence may be necessary to prevent overturning.
- Provide a riprap splash pad or other outlet protection device for any point where flow may overtop the sediment fence.
- Details for overlap of Type A silt fence is available from The Alabama Department of Transportation construction drawings.
- Type B Silt Fence
  - This 36" wide filter fabric should be used on developments where the life of the project is greater than or equal to 6 months.
  - Details for overlap of the silt fence and fastener placement are shown in Figure SB-4.
- Type C Silt Fence
  - Though only 22" wide, this filter fabric allows the same flow rate as Type B silt fence. Type C silt fence should be limited to use on relatively minor projects, such as residential home sites or small commercial developments where permanent stabilization will be achieved in less than 6 months.

*Wood Post Fasteners for Silt Fence*

	Minimum Length	Type of Post	Size of Post
Type A	5'	Steel "T" Post	1.3lb./ft. min.
Type B	4'	Soft Wood Oak	3" diameter or 2X4 1.5" X 1.5"
Type C	3'	Soft Wood Oak Steel	2" diameter or 2X2 1" X 1" .75lb./ft. min.

*Post Size for Silt Fence*

	Gauge	Crown	Legs	Staples/Post
Wire Staples	17 min.	3/4" wide	1/2" long	5 min.
	Gauge	Length	Button Heads	Nail/Post
Nails	14 min.	1"	3/4" long	4 min.

### BMP MAINTENANCE

- During construction, inspect BMPs daily during the workweek. Schedule additional inspections during storm events. Make any required repairs.
- Replace damaged sections of fabric.
- Repair damaged BMPs due to end runs or undercutting.
- Sediment should be removed when deposits reach one-half the height of the BMP.

### BMP REMOVAL

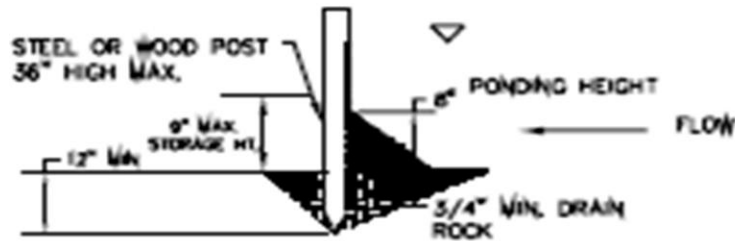
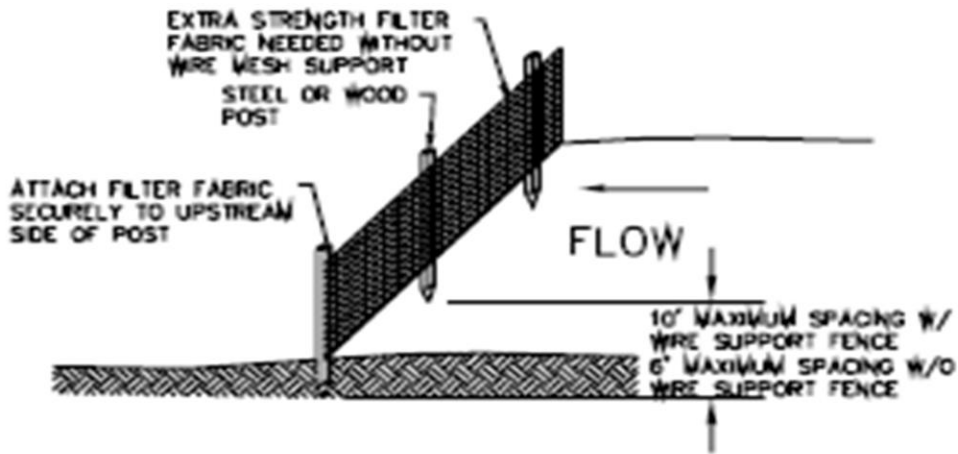
- Evaluate site to determine BMP is no longer needed (the area has stabilized- potential of sediment laden water exiting the area has passed).
- Remove sediment buildup in front of BMP.
- Remove BMP (recycle and/or re-use if applicable).
- Re-vegetate area disturbed by BMP removal.





# BIRMINGHAM FORWARD

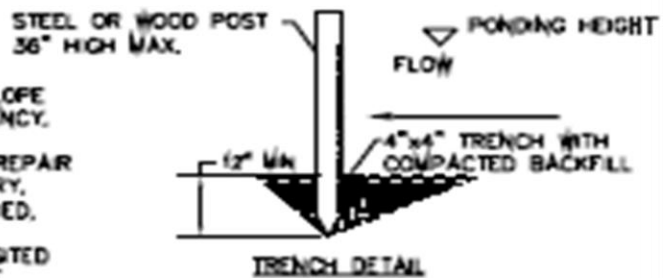
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INSTALLATION WITHOUT TRENCHING

## NOTES

1. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.
2. AFTER STORM EVENT, INSPECT AND REPAIR FENCE. REMOVE SEDIMENT AS NECESSARY. 9" MAX. STORAGE HEIGHT IS RECOMMENDED.
3. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND THAT CAN BE STABILIZED.



TRENCH DETAIL





# BIRMINGHAM FORWARD

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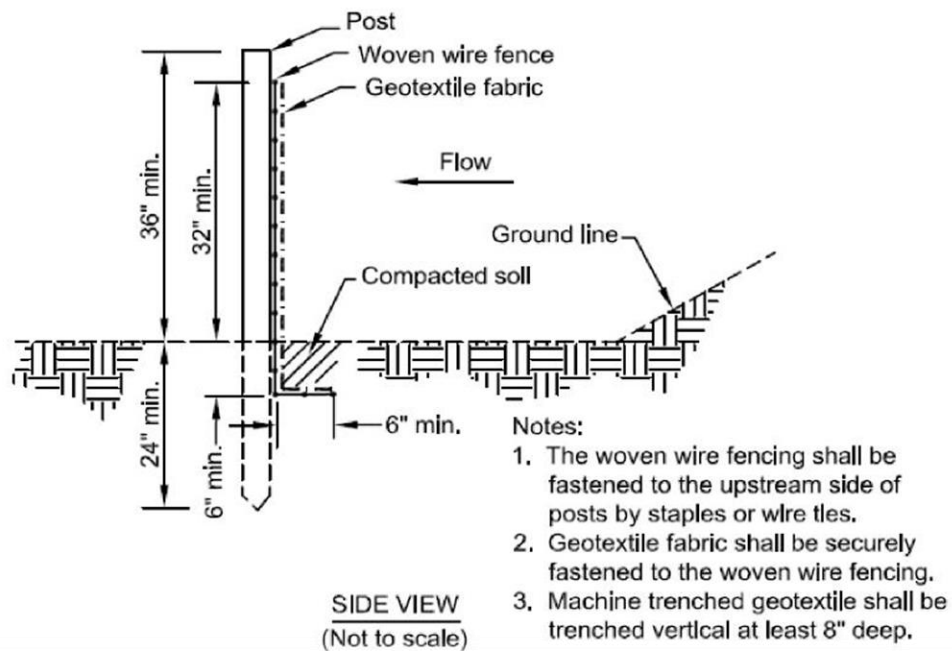
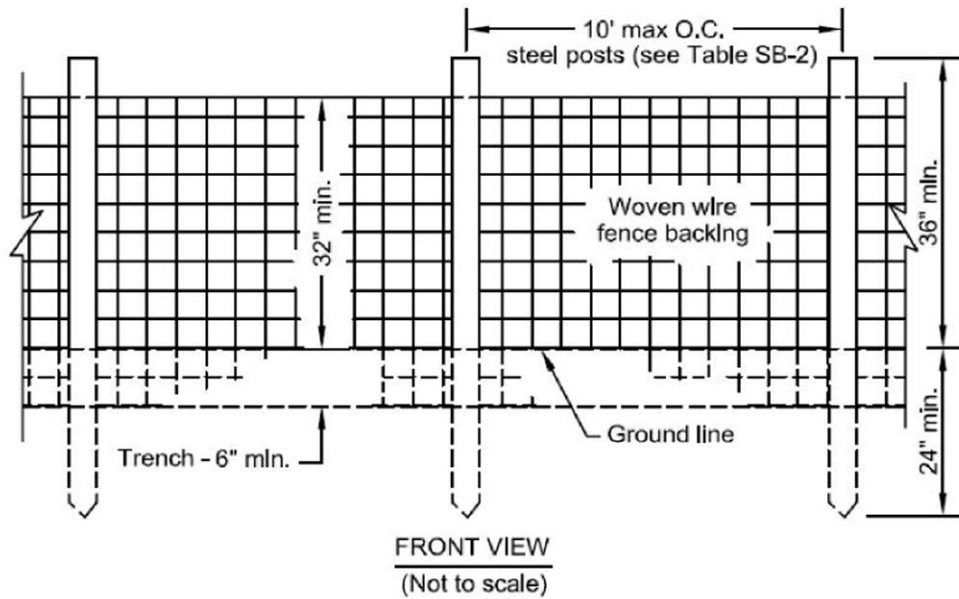
*Silt Fences*





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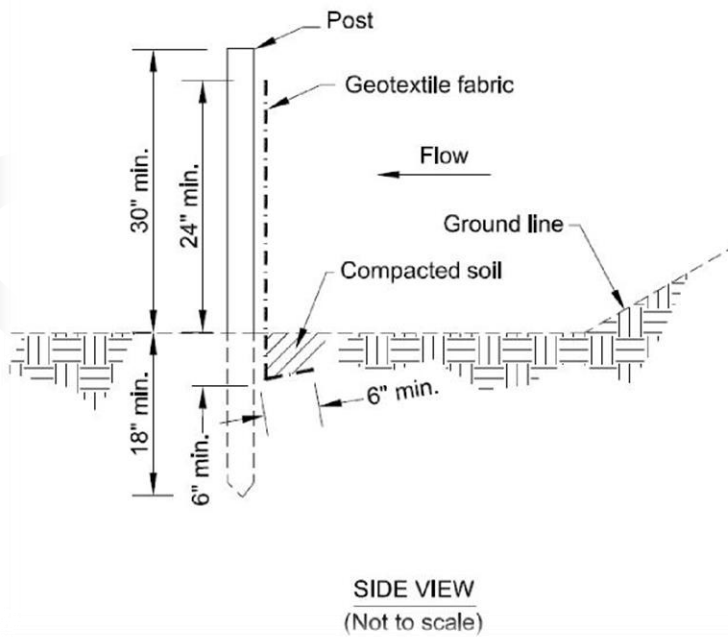
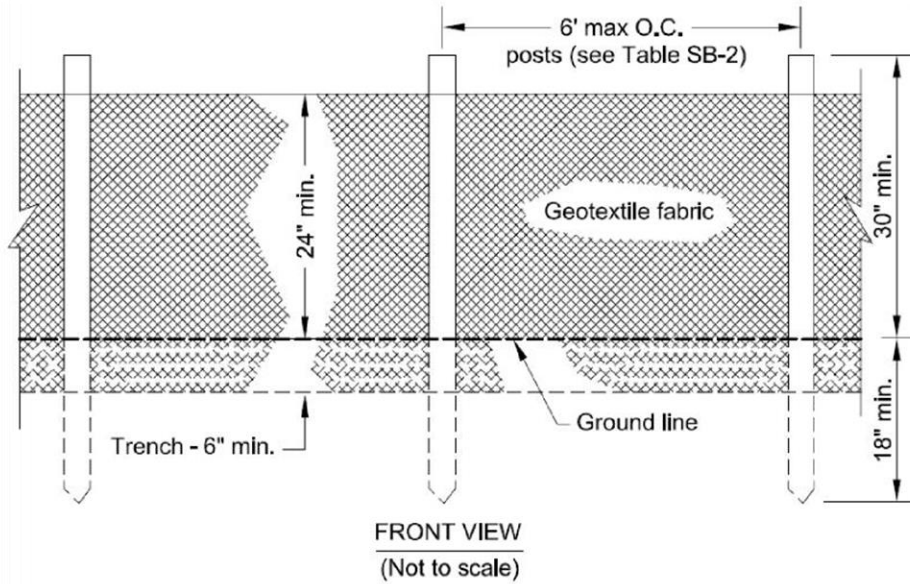
*Silt Fence-Type A*





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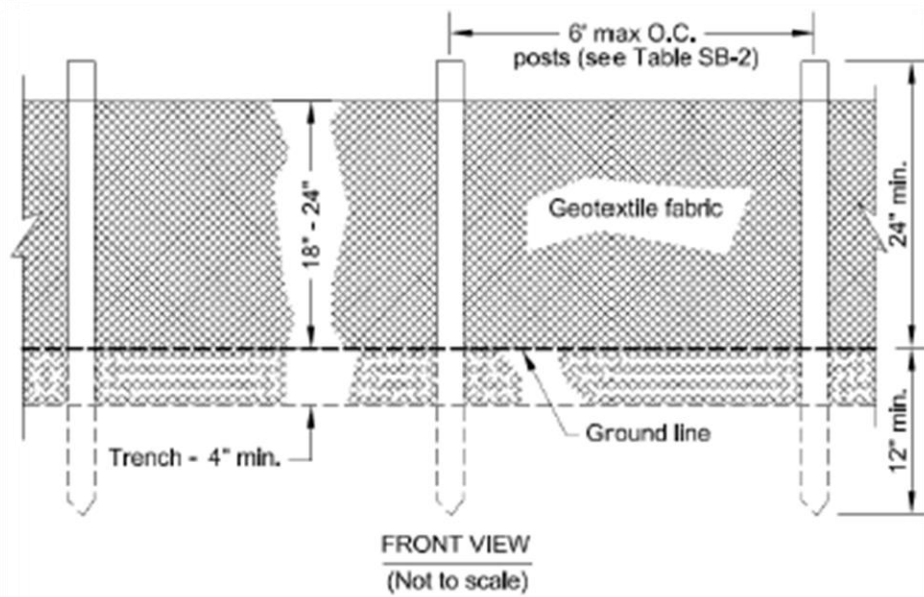
*Silt Fence - Type B*



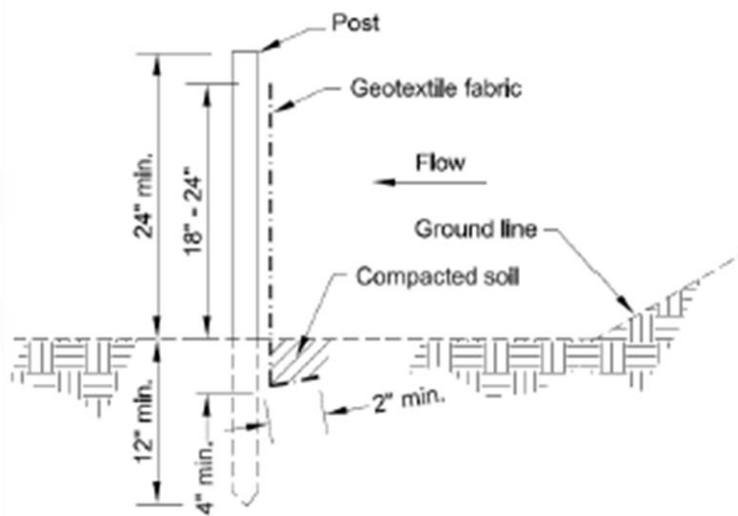


# BIRMINGHAM FORWARD

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FRONT VIEW  
(Not to scale)



SIDE VIEW  
(Not to scale)

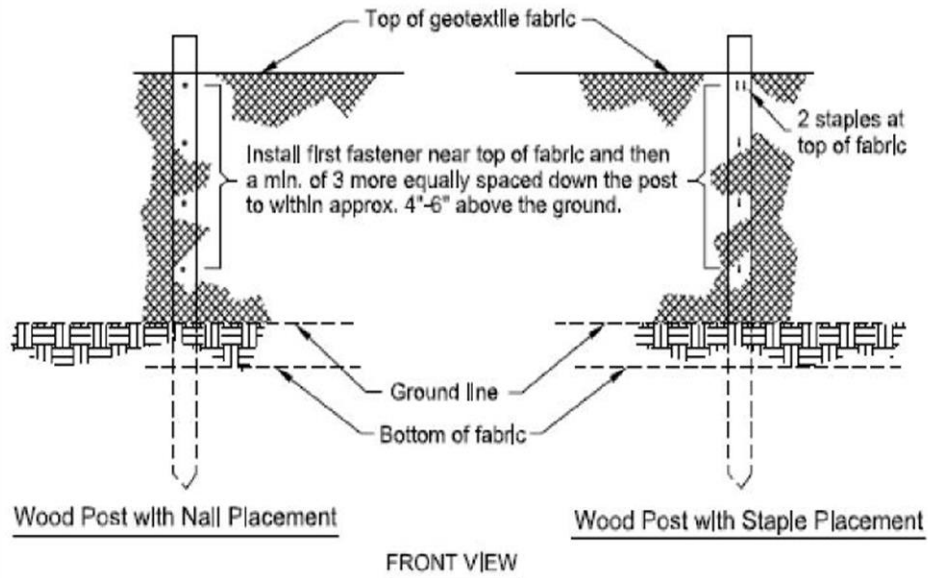
*Silt Fence — Type C*





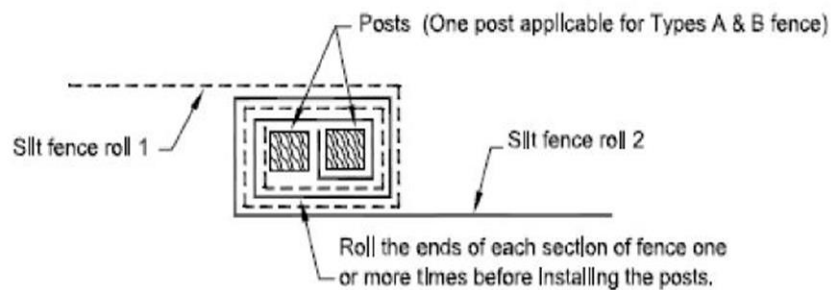
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## FASTENERS FOR SILT FENCES

(Not to scale)



## ROLL JOINT FOR JOINING TWO ADJACENT SILT FENCE SECTIONS

(Not to scale)



## **BMP**

### **Silt Mat**

---

#### **DESCRIPTION**

A silt mat is a flat pre-manufactured pad made in three layers: jute mesh, excelsior, and burlap. The pads are 4 feet by 10 feet and are biodegradable. Sediment passes through the mat layers and is held by the burlap layer. Silt mats can be used to provide filter/perimeter protection, settling and reduction in water velocity/erosive forces.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Intercepting and detaining small amounts of soil particles.
- Preventing erosion at discharge points.

#### **APPLICATIONS**

It may be used at pump discharges, pipe outlets, and/or downstream of work sites to retain soil particles and provide stabilization. It may also be used in ditch lines. It may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- As the only BMP when excessive soil particles are present.
- In high flow rates.

#### **CONSTRUCTION GUIDELINES**

- This BMP may be used singly or in a group on the streambed immediately downstream of a work site.
- Silt mats should be installed with either staples or stakes.
- There is no need for disposal. Place on adjacent slope or leave in place after use and add seed and mulch to stabilize the slope.
- Joints need to be overlapped according to flow.





## **BMP MAINTENANCE**

- During construction, inspect BMPs daily during the workweek. Schedule additional inspections during storm events. Make any required repairs.
- Sediment loads should be monitored frequently to ensure the silt mat's capacity load is not exceeded. Replace silt mats before capacity is reached. (Unless used in conjunction with re-vegetation).
- Check periodically for gaps.

## **BMP REMOVAL**

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove BMP (recycle and/or re-use if applicable).
- Silt mat may be incorporated into permanent stabilization/re-vegetation process.
- Re-vegetate area disturbed by BMP removal (if applicable).



*Silt mat installed in ditch to decrease erosion and allow settlement of suspended solids*

## **BMP**

### **Soil Stabilization (erosion control blankets and matting)**

---

#### **DESCRIPTION**

**S**oil stabilization can be accomplished through the installation of a protective blanket (covering) or a soil stabilization mat on a prepared planting area, a steep slope, channel and/or shoreline. Protective covering can be made of straw, jute, wood, or other plant fibers; plastic, nylon, paper, or cotton.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Reducing erosion.
- Providing a microclimate that protects young vegetation and promotes its establishment.
- "Reinforcing the turf" to resist the forces of erosion during storm events.

#### **APPLICATIONS**

This BMP may be used on short, steep slopes where erosion hazard is high and planting is likely to be slow in establishment. It may also be used on stream banks or tidal shorelines where moving water is likely to wash out new plantings. Soil stabilization blankets and matting may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- In watercourses or streams without proper permits.

#### **CONSTRUCTION GUIDELINES**

- Grade the site to a smooth uniform surface, free of debris.
- Incorporate soil amendments and seed according to plans and specifications.
- Install erosion control blankets according to manufacturer's recommendations, especially concerning check slots and stapling patterns.
- Anchor blanket so that continuous, firm contact is maintained with the soil surface.
- Check materials used for compliance with specifications and suitability for application.
- Check finished grade and dimensions for compliance with specifications.
- Check staple installation for compliance with recommendations.

- Installation is site specific.
- See following drawings and specifications.

### **BMP MAINTENANCE**

- If vegetation is incorporated, inspect during the plant establishment period. Re-plant, due to mortality, as necessary.
- Schedule additional inspections during storm events. Check for erosion or undermining; any required repairs shall be made.

### **BMP REMOVAL**

- BMP removal is not necessary.

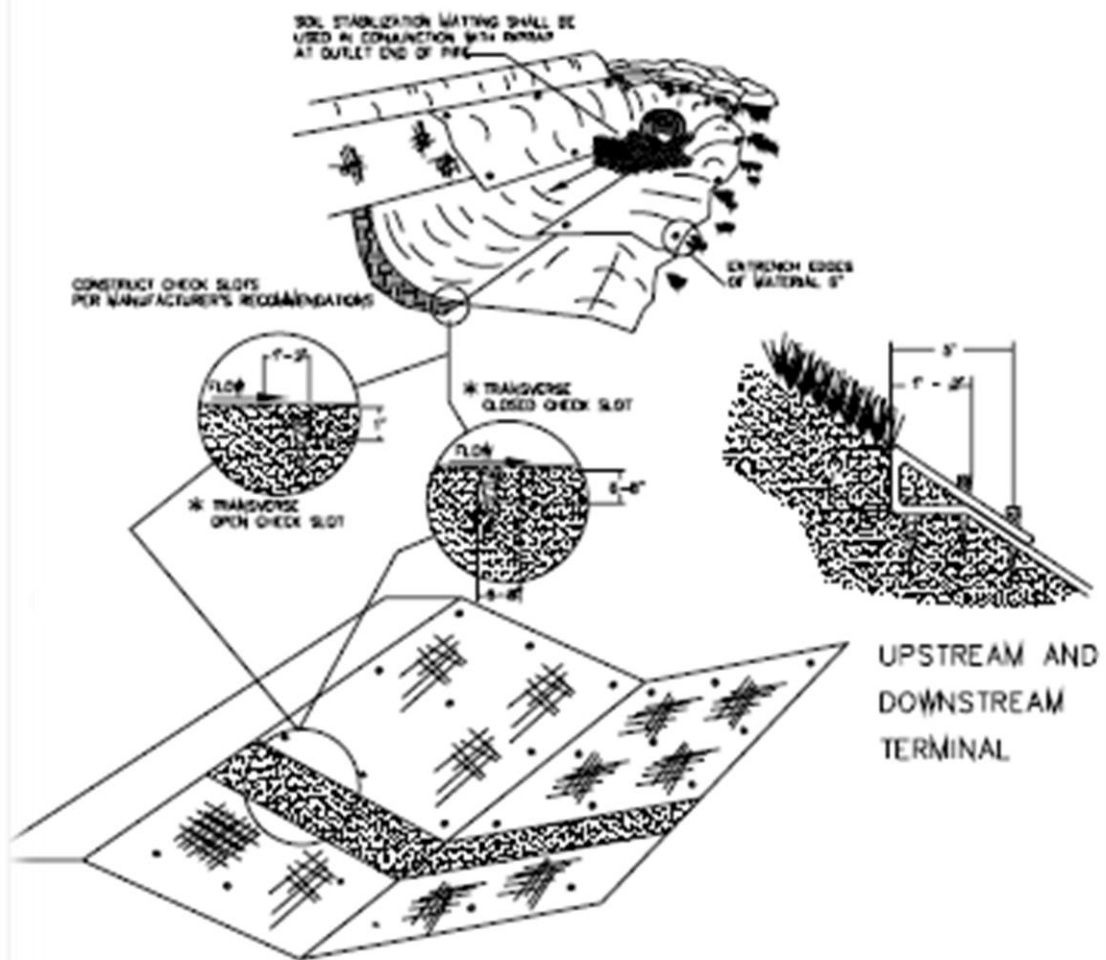
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## TYPICAL TREATMENT SOIL STABILIZATION MATTING INSTALLATION

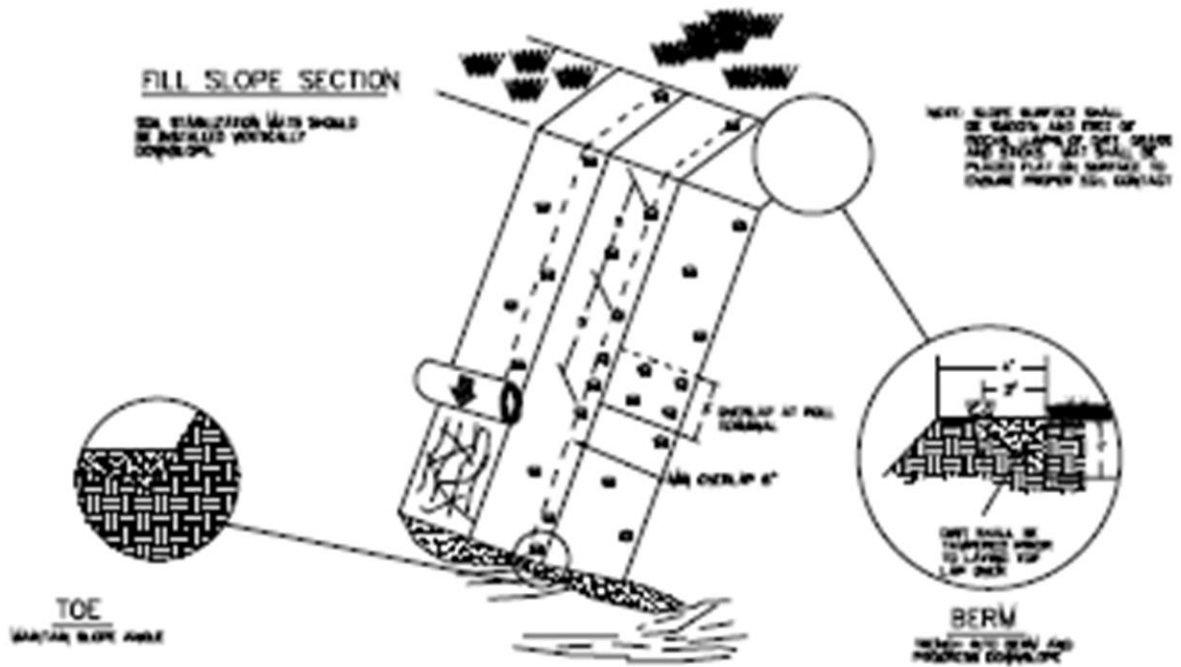




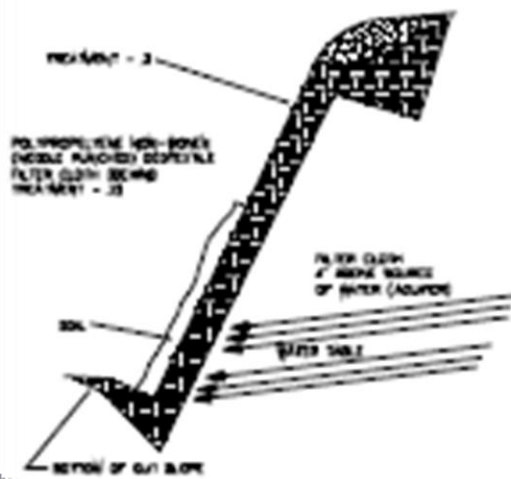
# BIRMINGHAM FORWARD

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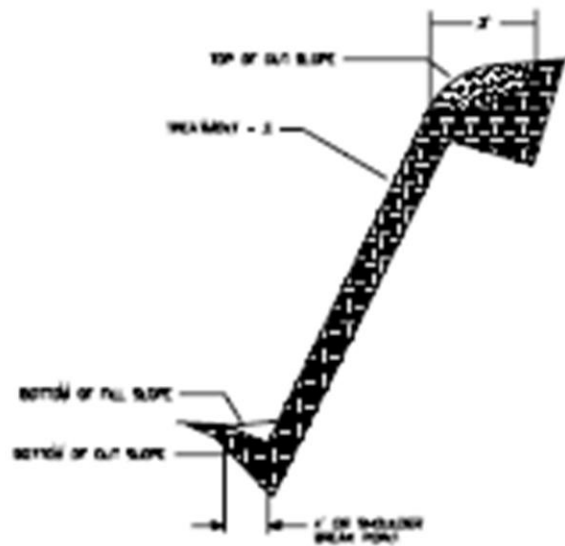
## TYPICAL TREATMENT SOIL STABILIZATION MATTING SLOPE INSTALLATION



### SLOPE LINING (WET SLOPE)



### SLOPE LINING (DRY SLOPE)

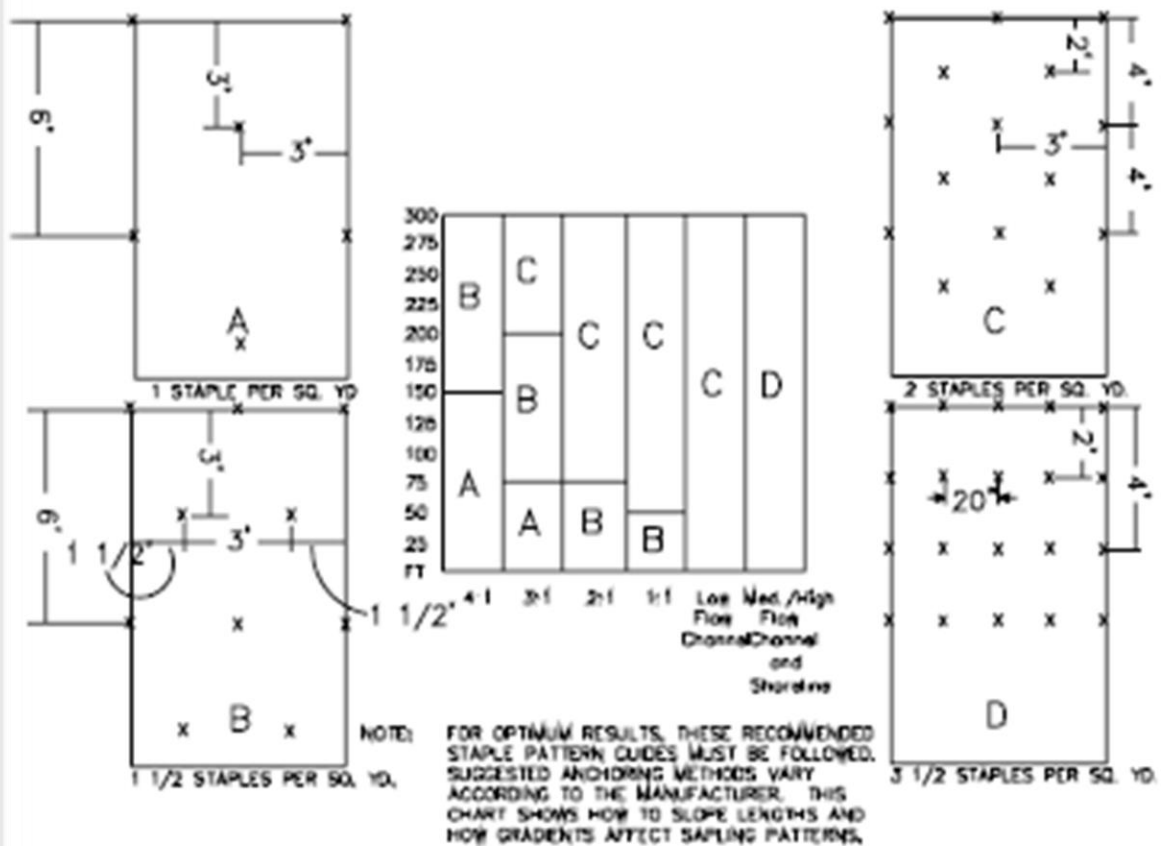




# BIRMINGHAM FORWARD

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## GENERAL STAPLE PATTERN GUIDE AND RECOMMENDATIONS AND (SOIL STABILIZATION MATTING)



## **BMP**

### **Spray Zone**

---

#### **DESCRIPTION**

The spraying or fogging process disperses small particles of biocides which target mosquitos or other insects or non-insect pest in flight or at rest on vegetation.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Reduce environmental contamination to soil, ground water, surface water, pollinators, wildlife and endangered species as a result of biocide control activities.
- Use target specific pesticides at the lowest effective rates to the extent possible.
- Emphasize the proper timing of applications.
- Protect human, animal and environmental health.

#### **APPLICATIONS**

Biocides are applied as an Ultra-Low-Volume (ULV) spray where small amounts are dispersed by truck-mounted equipment to target mosquitoes. ULV spray units dispense very fine aerosol droplets (fog) that stay aloft and kill mosquitoes on contact. Spray or fog designated areas within the City between wind speeds of 3 to 5 mph. Application for other pests (i.e. insects, fungus, mold, mildew, etc) using portable applications shall conform to all biocides label instructions when using around City water resources.

#### **LIMITATIONS**

- Biocides should be applied only according to label specifications.
- Biocides should not be applied in rainy or excessive windy conditions.
- Biocides should only be applied by personnel trained or certified in their usage and handling, or when operating under the supervision of an individual having met the necessary certification requirements.
- No applications are recommended once the temperature drops below 50°F. Each product may have specific instructions restrictions on the label for temperature.







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- No fogging applications are recommended within 100 meters of a body of water and 250 meters from bodies of water that support populations of endangered or threatened species.
- Portable pack direct spray applications shall not be closer than 25ft from water bodies that support endangered or threatened species or no closer than top of bank for all other water proximity application not supportive of endangered or threatened species.
- No application near buffer zones and non-target areas.

### BMP MAINTENANCE

- Before application check previous and present weather conditions.
- Application equipment shall be calibrated and maintained per equipment manufacturer's specifications and timetables.
- Always carry Material Safety Data Sheet (MSDS) for chemicals and an Emergency Response Plan.



## **BMP**

### **Straw Bale Barrier (1)**

---

#### **DESCRIPTION**

A strawbale barrier (1) is a small temporary barrier constructed across a non-fish bearing swale, gully, or drainageway. It is generally installed perpendicular to the flow direction to slow or stop water and to allow filter/ perimeter protection, settling of soil particles, and/or reduce water velocity/ erosive forces.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Intercepting sheet flow.
- Intercepting and detaining small amounts of soil particles from disturbed areas during construction operations in order to allow settling of soil particles.
- Decreasing down slope sheet flow velocity.
- Retaining soil particles on site.

#### **APPLICATIONS**

This BMP may be used in areas where permanent stabilization cannot be accomplished immediately. It may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- Where rock or hard surfaces prevent the full and uniform anchoring of the barrier.
- Where flow volume or water velocity inhibit BMP function.

#### **CONSTRUCTION GUIDELINES**

- Place bales in a single row perpendicular to the flow, with ends tightly abutting one another.
- The bottoms of the end bales should be placed higher in elevation than the top of the middle bale spillway to ensure sediment-laden runoff will flow over the barrier, and not around it.





## BIRMINGHAM FORWARD

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- Bales shall be installed so that bindings are oriented around the sides rather than on the tops and bottoms, to prevent deterioration.
- Bales shall be entrenched a minimum of 4 inches.
- Gaps between bales shall be sealed by wedging straw in the space to limit escaping water.
- Bales shall be securely anchored by at least two stakes driven into the ground a minimum depth of 18 inches.
- See following pages for construction guidelines and additional detail.

### BMP MAINTENANCE

- During construction, inspect BMPs daily during the workweek. Schedule additional inspections during storm events.
- Any required repairs shall be made. (Repair any damaged BMPs due to end runs or undercutting).
- Sediment should be removed when deposits reach one-half the height of the BMP.

### BMP REMOVAL

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup in front of BMP.
- Remove BMP.
- Re-vegetate area disturbed by BMP removal.

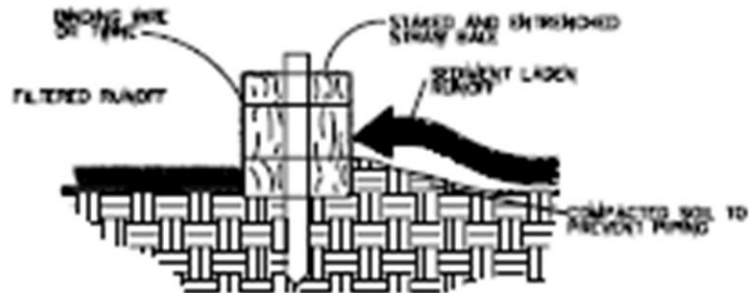




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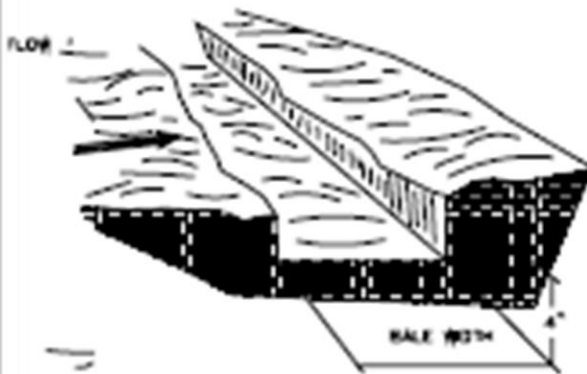
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## PROPERLY INSTALLED STRAW BALE (CROSS SECTION)

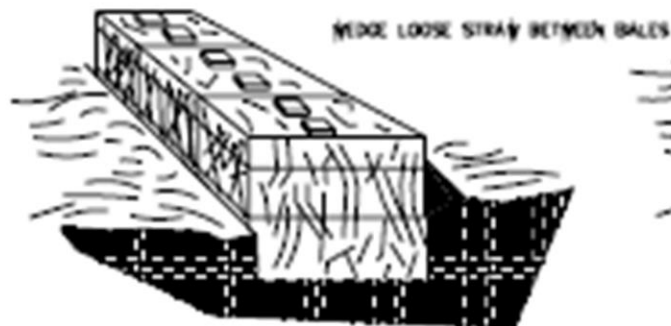
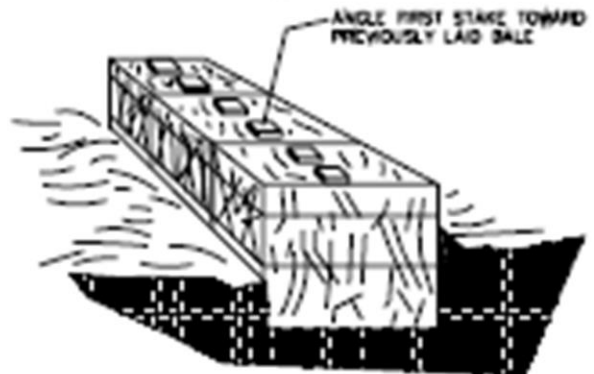


## CONSTRUCTION OF STRAW BALE BARRIER

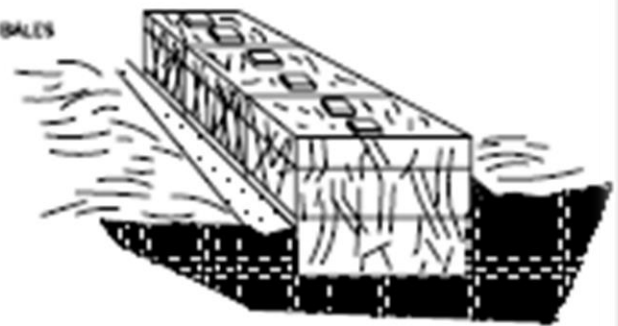
1. EXCAVATE THE TRENCH



2. PLACE AND STAKE STRAW BALES



3. WEDGE LOOSE STRAW BETWEEN BALES



4. BACKFILL AND COMPACT THE EXCAVATED SOIL



## **BMP**

### **Straw Bale Barrier (2)**

---

#### **DESCRIPTION**

A straw bale barrier (2) is a temporary sediment barrier consisting of a row of entrenched and/or anchored straw bales. It is generally installed perpendicular to the flow direction to slow or stop water and to allow filter/ perimeter protection, settling of soil particles, and/or reduce water velocity/ erosive forces.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Intercepting sheet flow.
- Intercepting and detaining small amounts of water from disturbed areas during construction operations in order to allow settling of soil particles.
- Decreasing down slope sheet flow velocity.
- Retaining sediment on site.

#### **APPLICATIONS**

This BMP may be used for perimeter sediment control. It may be used in combination with other barriers. This BMP may be used below disturbed areas subject to sheet and rill erosion where drainage area is no greater than .25 acre per 100 lineal feet of barrier and the slope behind the barrier should be no steeper than 2 horizontal to 1 vertical. On relatively flat slopes the maximum disturbed slope distance should not exceed 100 feet. The allowable disturbed slope distance decreases as the slope gets steeper. This BMP maybe used as a buffer between excavation equipment and stream top of bank to limit erosion from tractor treads

#### **LIMITATIONS**

This BMP should not be used:

- Where rock or hard surfaces prevent the full and uniform anchoring of the barrier.
- Directly in watercourses or streams when fish are present.
- Required by other regulations.
- Where flow volume or water velocity inhibit BMP function.

## CONSTRUCTION GUIDELINES

- Bales shall be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. (If area does not allow a single row, additional rows need to be installed in a staggered fashion).
- Bales shall be installed so that bindings are oriented around the sides rather than on the tops and bottoms, to prevent deterioration.
- Bales shall be entrenched a minimum of 4 inches.
- Bales shall be securely anchored by at least two stakes driven into the ground a minimum depth of 18 inches.
- Gaps between bales shall be sealed by wedging straw in the space to limit escaping water.
- Loose straw scattered over the area immediately uphill from the bale may increase barrier efficiency.
- See following pages for construction guidelines and additional detail.

## BMP MAINTENANCE

- During stream excavation, straw bales should be anchored at the top of bank between the stream ditch and the long arm reach excavator to prevent top of bank erosion due to activity of the excavator.
- During construction, inspect BMPs daily during the workweek. Schedule additional inspections during storm events.
- Any required repairs shall be made. (Repair any damaged BMPs due to end runs or undercutting).
- Sediment should be removed when deposits reach one-half the height of the BMP.

## BMP REMOVAL

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup in front of BMP.
- Remove BMP (recycle and/or re-use if applicable).
- Re-vegetate area disturbed by BMP removal.



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*Straw Bale Barrier (2) reducing water velocity and erosive forces, in conjunction with other BMPs*





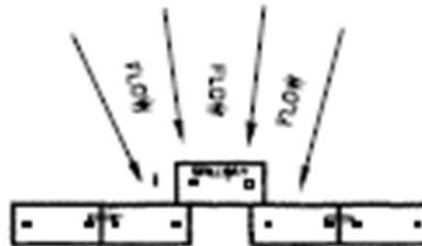


# BIRMINGHAM FORWARD

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## STRAW BALE CHECK DAM

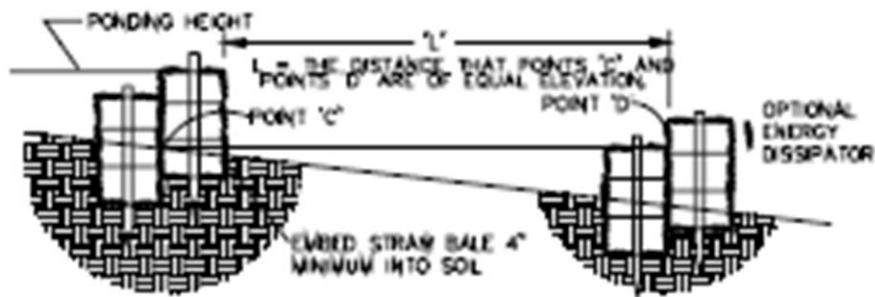
### PLAN



### VIEW LOOKING UPSTREAM



### SECTION A - A SPACING BETWEEN CHECK DAMS



#### NOTES:

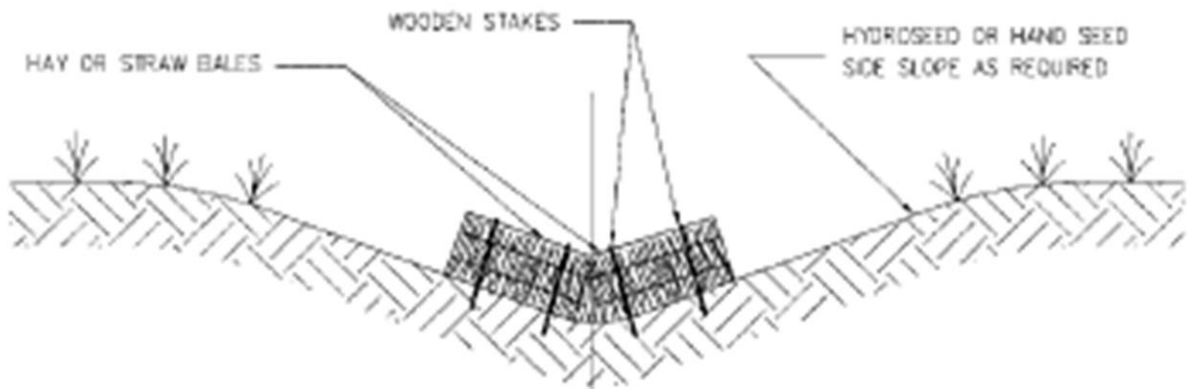
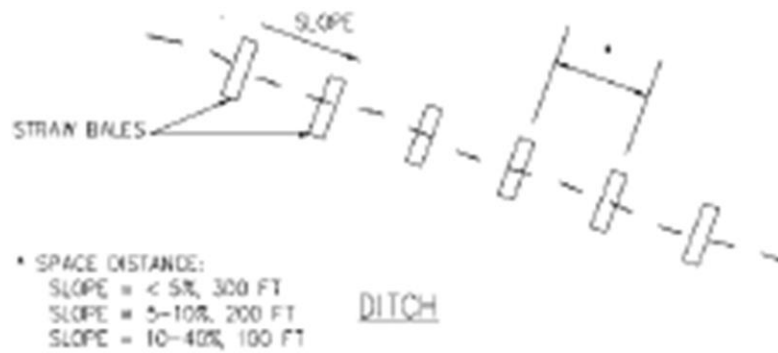
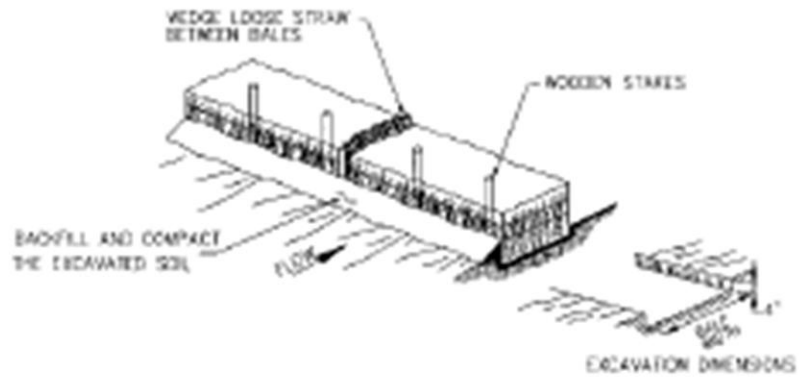
1. EMBED BALES 4" INTO THE SOIL AND 'KEY' BALES INTO THE CHANNEL BANKS.
2. POINT 'A' MUST BE HIGHER THAN POINT 'B' (SPILLWAY HEIGHT).
3. PLACE BALES PERPENDICULAR TO THE FLOW WITH ENDS TIGHTLY ABUTTING
4. SPILLWAY HEIGHT SHALL NOT EXCEED 24".





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## STRAW BALE BARRIER

N.T.S.



## **BMP**

### **Straw Bale Barrier (3)**

---

#### **DESCRIPTION**

A straw barrier (3) is a temporary barrier consisting of straw bales and a rock spillway placed across small drainage areas or gently sloping swales. It is generally installed perpendicular to the flow direction to slow or stop water and to allow filter/perimeter protection, settling of soil particles, and/or reduce water velocity/erosive forces.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Intercepting sheet flow.
- Intercepting and detaining small amounts of water from disturbed areas during construction operations in order to allow settling of soil particles.
- Allowing runoff to flow through or over the barrier.
- Decreasing runoff velocity.
- Retaining sediment on site.

#### **APPLICATIONS**

This BMP may be used in small channel flow situations. The rock size used in the spillway can be enlarged to accommodate larger flows.

#### **LIMITATIONS**

This BMP should not be used:

- Where rock or hard surfaces prevent the full and uniform anchoring of the barrier.
- Directly in watercourses or streams when fish are present.
- Where flow volume or water velocity inhibit BMP function.

#### **CONSTRUCTION GUIDELINES**

- Maximum height of the spillway shall be 2 feet.
- See following pages for construction guidelines and additional detail.



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- Bales shall be installed so that bindings are oriented around the sides rather than on the tops and bottoms, to prevent deterioration.
- Bales shall be entrenched a minimum of 4-inches.
- Bales shall be securely anchored by at least two stakes driven into the ground a minimum depth of 18 inches.

### BMP MAINTENANCE

- Inspect bales periodically and after each significant rainfall.
- Sediment shall be removed when it reaches one-half the height of the bale.

### BMP REMOVAL

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup in front of BMP.
- Remove BMP (recycle and/or re-use if applicable).
- Re-vegetate area disturbed by BMP removal.



## **BMP**

### **Straw Log**

---

#### **DESCRIPTION**

**S**traw logs are manufactured from straw (or flax) wrapped in plastic netting. Logs are placed and staked along the contour of newly constructed or disturbed slopes, in shallow trenches. When cut or folded to appropriate length, these logs can be used to provide filter/perimeter protection, settling, reduction in water velocity/erosive forces.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Reducing slope length to capture and retain sediment on the slope.
- Temporarily stabilizing slopes by reducing soil creep, sheet and rill erosion until permanent vegetation can be established.
- Trapping topsoil and retaining moisture from rainfall, which aids in growth of seedlings planted along the upslope side of the rolls.
- Intercepting and detaining small amounts of water from disturbed areas during construction operations in order to promote settling of soil particles.
- Filtering soil particles and debris.
- Reducing water velocity and erosive forces.

#### **APPLICATIONS**

This BMP may be used in ditches or across culvert ends of any dimension. It may be used instead of excelsior filled logs, coir logs, or straw bale filtering systems. Straw logs may also be used for perimeter sediment control. This BMP is particularly useful in areas where the effects of soil disturbance need to be minimized.

This BMP may be used in gullies and stream channels as check dams; in conjunction with gabions, rip rap, articulated block, or cellular confinement systems. It may be used to anchor and enhance the effectiveness of willow wattles (fascines), turf reinforcement mats, coir mats, continuous berms and other erosion control material. Straw logs may be used to replace silt fences or straw bales on steep slopes. It may be used in combination with other BMPs.

## LIMITATIONS

This BMP should not be used:

- Where flow volume or water velocity inhibit BMP function.
- For permanent applications. (Other than vegetation).

## CONSTRUCTION GUIDELINES

- Logs are placed and staked along the contour of newly constructed or disturbed slopes, in 2-3 inch deep trench.
- Spacing depends on soil type and slope steepness.
- Tightly about any adjacent logs.
- Install to prevent water from going around or under BMP.
- See "Handseeding" and/or "Hydroseeding" BMP for planting.

## BMP MAINTENANCE

- During construction, inspect BMPs daily during the workweek.
- Schedule additional inspections during storm events. Make any required repairs.
- Sediment should be removed when deposits reach one-half the height of the BMP.

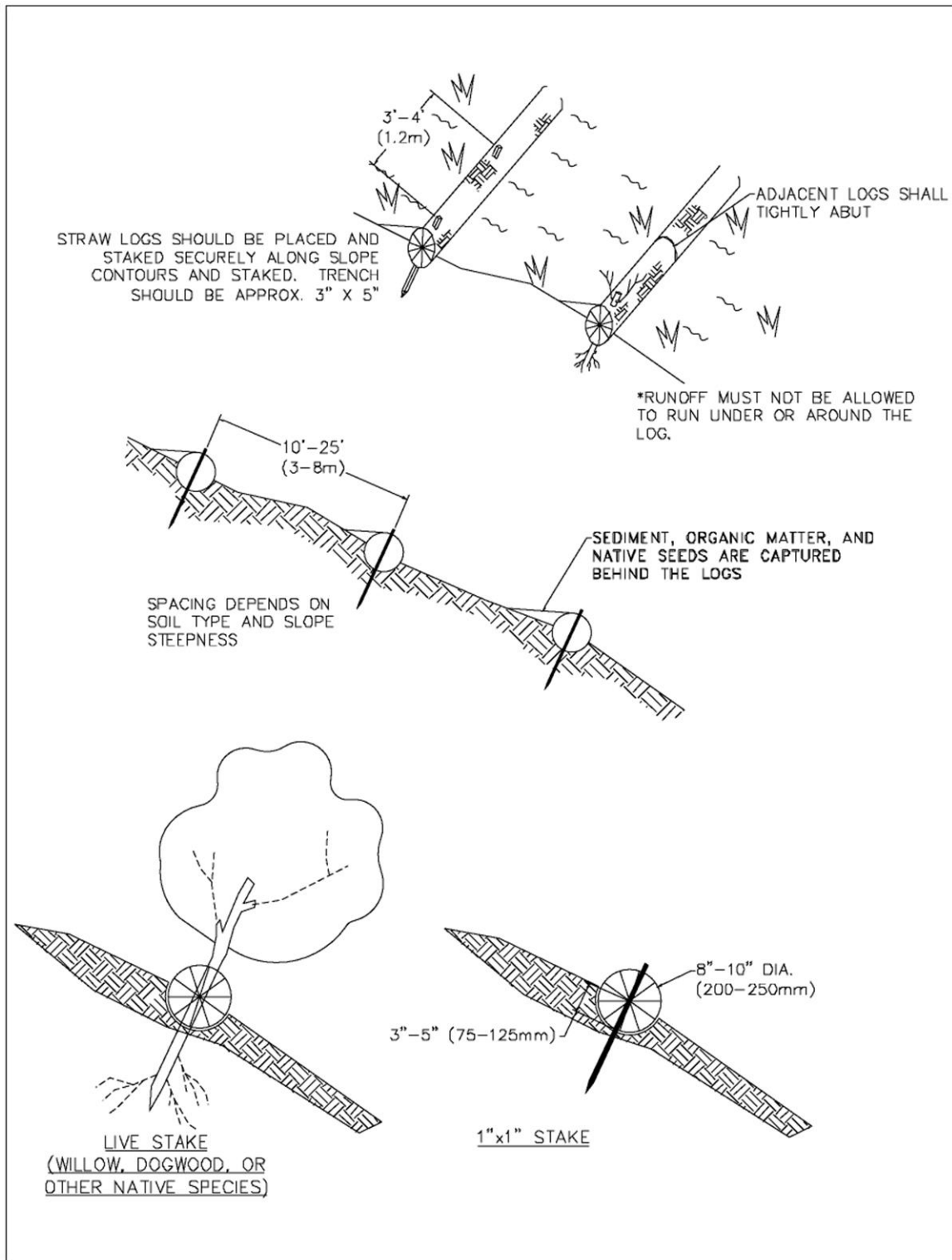
## BMP REMOVAL

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup in front of BMP.
- Depending upon BMP placement, re-vegetation of site may be necessary.
- BMP removal may not be necessary.



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## **BMP Sweeping**

---

### **DESCRIPTION**

**S**weeping is done by hand or mechanical means. A sweeper is a vehicle with brushes and/or a vacuum system and water spray system used on the roadways to remove debris and soil particles.

### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Removing soil particles and debris before entering drainage systems, streams or watercourses.
- Suppressing dust on roadways and at construction sites.
- Removal of snow sand after snow and ice control operations.

### **APPLICATIONS**

This BMP may be used to remove soil particles, debris and/or snow sand from paved surfaces. It may be used in combination with other BMPs.

### **LIMITATIONS**

All street sweeping is a benefit. There are no limitations.

### **CONSTRUCTION GUIDELINES**

- Use pickup brooms in sensitive areas.
- Use water with mechanical brooms.
- Schedule snow sand removal as part of the snow and ice emergency response.
- Dispose of collected material.

### **BMP MAINTENANCE**

- BMP maintenance is not applicable.

### **BMP REMOVAL**

- BMP removal is not applicable.





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*A sweeper picking up debris and soil particles on a paved access road*



## **BMP**

### **Temporary Sediment Trap**

---

#### **DESCRIPTION**

A temporary sediment trap is a small ponding area formed by constructing an earthen embankment with a rock outlet to allow for soil particle settling.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Intercepting and detaining small amounts of water from disturbed areas during construction operations in order to allow settling of soil particles.
- Retaining sediment on site.

#### **APPLICATIONS**

This BMP may be used below disturbed areas where the total contributing drainage area is less than 3 acres. Drainage areas larger than 3 acres may use other BMPs such as siltation ponds or settling tanks, as defined in applicable permit conditions. It may also be used where the sediment trap will be used no longer than 18 months. This BMP may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- In areas where the total contributing drainage area is more than 3 acres.

#### **CONSTRUCTION GUIDELINES**

- The area under the embankment shall be cleared and stripped of any vegetation and root mat.
- Fill material shall be free of roots or other woody vegetation, organic material and other unsuitable material.
- All embankment slopes shall be not steeper than 2 horizontal to 1 vertical.
- The embankment shall be seeded.

#### **BMP MAINTENANCE**

- During construction, inspect BMPs daily during the workweek.
- Schedule additional inspections during storm events. Make any required repairs.
- Sediment shall be removed when it has accumulated to one-half the original dimension.



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## BMP REMOVAL

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup from BMP.
- Remove BMP (recycle and/or re-use if applicable).
- Re-vegetate area disturbed by BMP removal (if applicable).

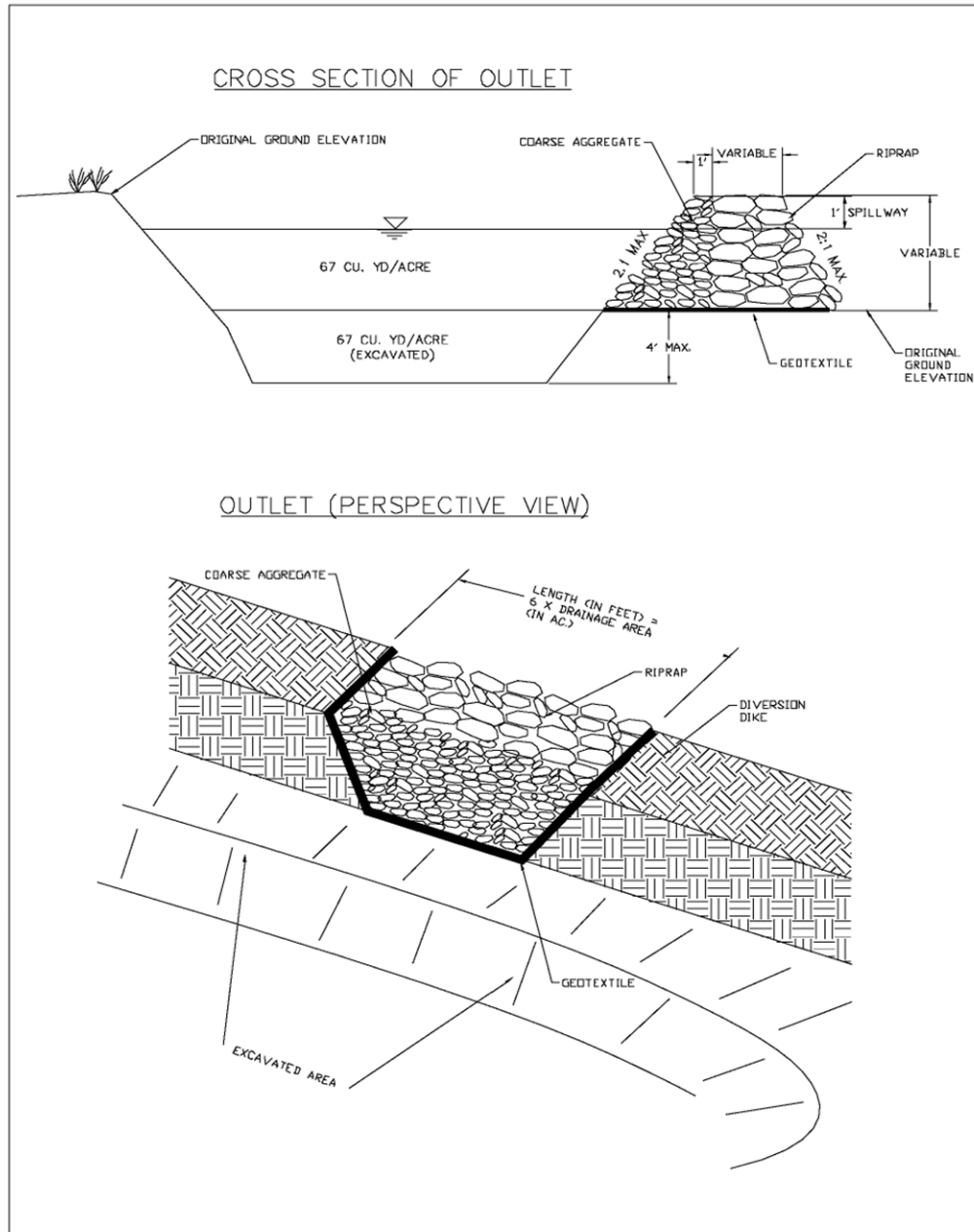
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*Temporary sediment trap*

## **BMP**

### **Triangular Silt Dike**

---

#### **DESCRIPTION**

A triangular silt dike is a sediment control device made of foam sewn into a woven geo-synthetic fabric. It is triangular in shape, 10 in. to 14 in. high in the center, with a 20 in. to 28 in. base. An apron extends beyond both sides of the triangle along its standard section of 7 ft. A sleeve at one end allows attachment of additional sections as needed. This BMP can be used to provide settling and/or reduction in water velocity/erosive forces.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Intercepting sheet flow.
- Intercepting and detaining small amounts of water from disturbed areas during construction operations in order to allow settling of soil particles.
- Decreasing down slope sheet flow velocity.
- Retaining soil particles on site.

#### **APPLICATIONS**

This BMP may be used for temporary check dams in ditches of any dimension. This BMP may be used for perimeter protection. It may be used in combination with other barriers.

This BMP may be used below disturbed areas subject to sheet and rill erosion where drainage area is no greater than .25 acre per 100 lineal feet of barrier and the slope behind the barrier should be no steeper than 2 horizontal to 1 vertical. On relatively flat slopes the maximum disturbed slope distance should not exceed 100 feet. The allowable disturbed slope distance decreases as the slope gets steeper.

#### **LIMITATIONS**

This BMP should not be used:

- Where flow volume or velocity inhibit BMP function.
- As a filter.



## CONSTRUCTION GUIDELINES

- Install with the long flap upstream.
- Install to prevent water from going around or under BMP.
- BMP should be placed along contours.
- BMP must be anchored with adhesive on asphalt or other hard surfaces or staples or stakes on soil or soft surfaces.

## BMP MAINTENANCE

- During construction, inspect BMPs daily during the workweek.
- Schedule additional inspections during storm events. Make any required repairs.
- Sediment should be removed when deposits reach one-half the height of the BMP.

## BMP REMOVAL

- Evaluate site to determine BMP is no longer needed (the area has stabilized—potential of sediment laden water exiting the area has passed).
- Remove sediment buildup in front of BMP.
- Remove BMP (recycle and/or re-use if applicable).
- Use sweeper or hand broom to clean road surface.
- Depending upon BMP placement, re-vegetation of site may be necessary.







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*A triangular silt dike in place with accumulated*



*A triangular silt dike detaining water and allowing soil particles to settle*

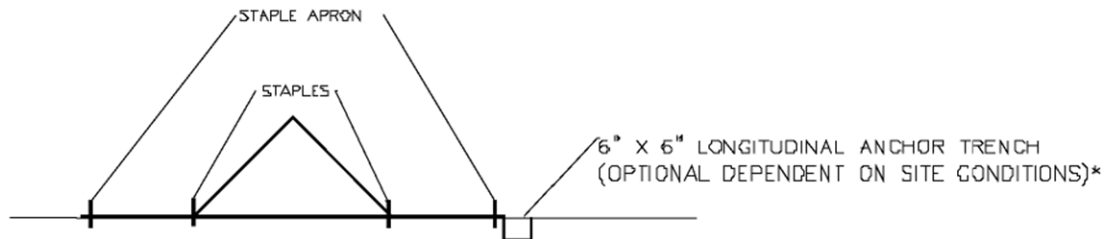
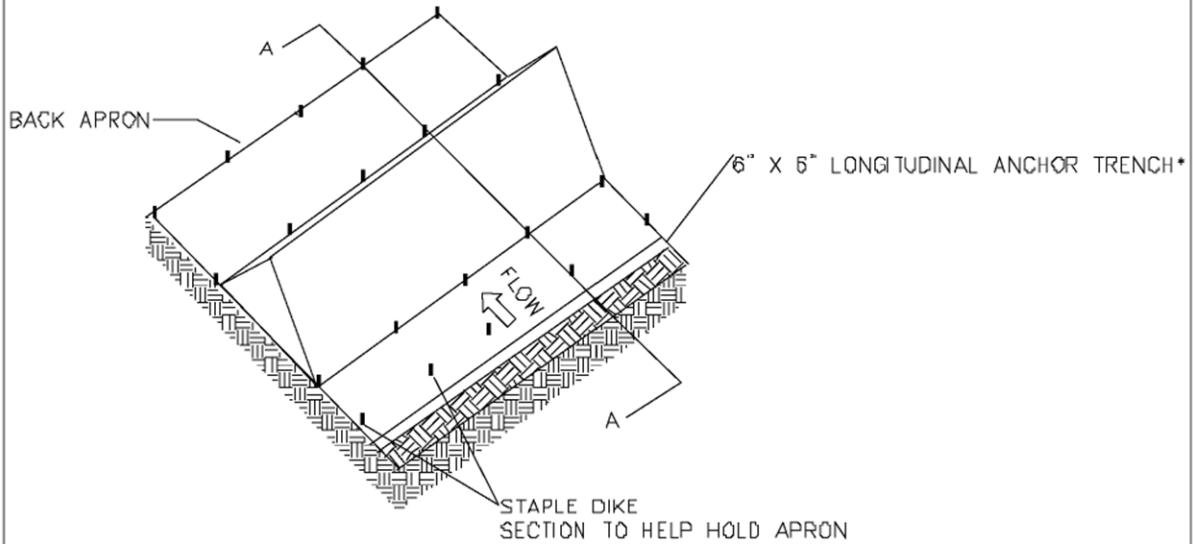




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## TRIANGULAR SILT DIKE DETAIL



DETAIL A-A

\* TRENCH APRON DEPENDING ON SITE  
CONDITIONS AND MANUFACTURER'S  
SUGGESTED USE



## **BMP**

### **Turbidity Curtain**

---

#### **DESCRIPTION**

A turbidity curtain is a pre-manufactured geotextile structure with floats on the top, weights on the bottom, and an anchorage system that minimizes sediment transport from a disturbed area that is adjacent to or within a body of water. This device allows for settling of suspended solids and/or reducing water velocity. The barrier provides sedimentation and turbidity protection for a watercourse from up-slope land disturbance activities where conventional erosion and sediment controls cannot be used or need supplemental sediment control, or from dredging or filling operations within a watercourse. The practice can be used in non-tidal and tidal watercourses where intrusion into the watercourse by construction activities has been permitted and subsequent sediment movement is unavoidable.

Floating turbidity barriers are normally classified into 3 types:

- Type I is used in protected areas where there is no current and the area is sheltered from wind and waves.
- Type II is used in areas where there may be small to moderate current (up to 2 knots or 3.5 ft/sec) and/or wind and wave action can affect the curtain.
- Type III is used in areas where considerable current (up to 3 knots or 5 ft/sec) may be present, where tidal action may be present, and/or where the curtain is potentially subject to wind and wave action.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Minimizing the mixing of turbid water with the adjacent clean water.
- Containing soil particles during construction and/or repair activities.

#### **APPLICATIONS**

This BMP may be used in water including open drainage systems and non-tidal watercourses where construction activities create turbidity. This includes removal of sedimentation from within City streams.



## LIMITATIONS

This BMP should not be used:

- Across the entire flow of the watercourse or stream.
- Where flow volume or water velocity inhibit BMP function.

## CONSTRUCTION GUIDELINES

- All work shall be within turbidity curtain(s) to avoid the release of unintended material downstream.
- Turbidity barrier types must be selected based on the flow conditions within the waterbody, whether it is a flowing channel, lake, pond, or a tidal watercourse. The specifications contained within this practice pertain to minimal and moderate flow conditions where the velocity of flow may reach 5 ft/sec (or a current of approximately 3 knots).
- For situations where there are greater flow velocities or currents, a qualified design professional and product manufacturer should be consulted.
- When sizing the length of the floating curtain, allow an additional 10-20% variance in the straight-line measurements.
- Turbidity curtains must be installed according to applicable permit requirements.
- Follow manufacturer recommendations and guidelines for installation and safety measures.
- Turbidity curtains should extend the entire depth of the watercourse whenever the watercourse in question is not subject to tidal action and/or significant wind and wave forces.
- Turbidity curtains are available in various heights. The units are preassembled in 50-foot lengths and are used by connecting the number of units required.
- In tidal and/or wind and wave action situations, the curtain should never be so long as to touch the bottom. A minimum 1 foot gap should exist between the weighted, lower end of the skirt and the bottom at “mean” low water.
- Add a suitable weight or anchoring system to the bottom of the curtain.
- See drawings on following pages
- The turbidity curtain can be deployed in standing and/or in flowing water (see limitations).
- External anchors may consist of 2” x 4” or 2½” minimum diameter wooden stakes, or 1.33 pounds/linear foot steel posts when Type I installation is used. When Type II or Type III installations are used, bottom anchors should be used.
- Excavation shall only be used with a long arm excavator. No heavy equipment should be permitted in the stream flow way.

## **BMP MAINTENANCE**

- During construction, inspect BMPs daily during the workweek.
- Schedule additional inspections during storm events.
- Make any required repairs.
- Inspect daily.
- If repairs are required, follow directions in repair kit instructions.
- No excavation material shall be placed in adjacent areas to the excavation nor on ditch banks or at the top of bank. All material should be removed from the site by container trucks and deposited at area appropriate landfills for construction materials

## **BMP REMOVAL**

- Soil particles should always be allowed to settle for a minimum of 6-12 hours before removal by equipment or before removal of a turbidity curtain.
- Remove BMP (recycle and/or reuse if applicable).
- Follow manufacturer recommendations for removal.
- When curtain is removed it shall be in such a manner as to minimize turbidity. Remaining soil particles shall be sufficiently settled before removing the curtain.
- Water discharged from turbidity curtain shall meet permit requirements at the point of discharge.



*A turbidity curtain being used to contain turbid waters during construction activities*





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The combined efforts of the turbidity curtain and other BMPs



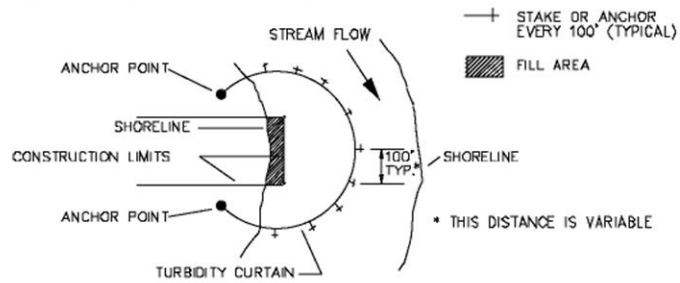


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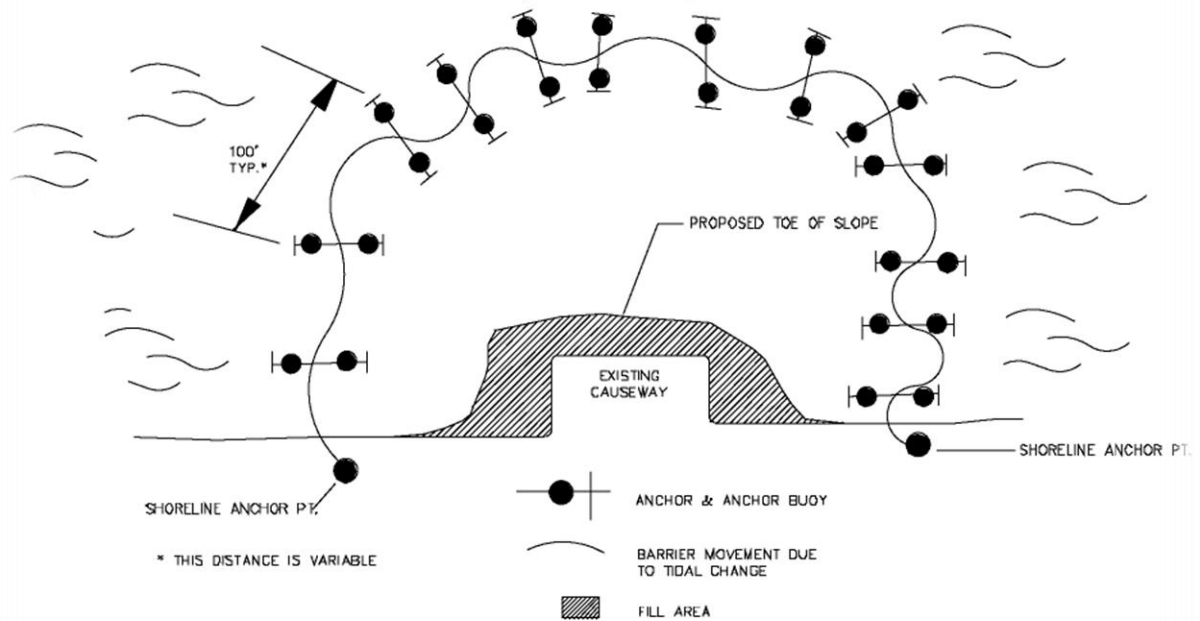
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## TURBIDITY CURTAIN

TYPICAL LAYOUTS;  
STREAMS, PONDS, AND LAKES (PROTECTED AND NON-TIDAL)



TIDAL WATERS AND/OR HEAVY WIND AND WAVE ACTION



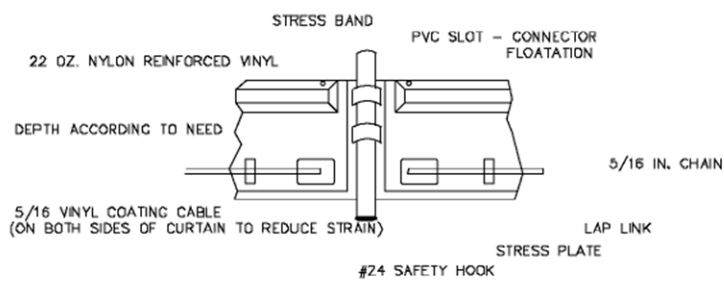




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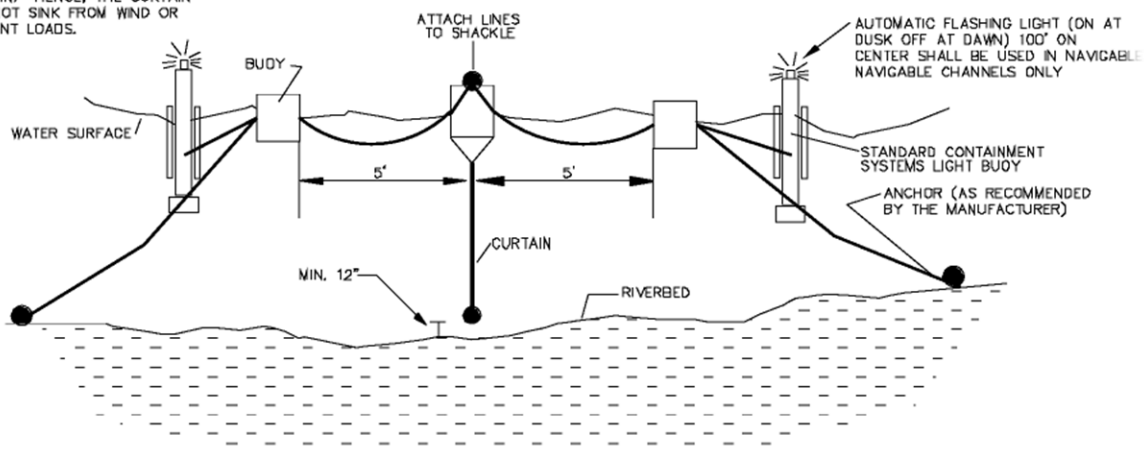
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## TURBIDITY CURTAIN TYPE III



## ORIENTATION WHEN INSTALLED (TIDAL SITUATION - TYPE III)

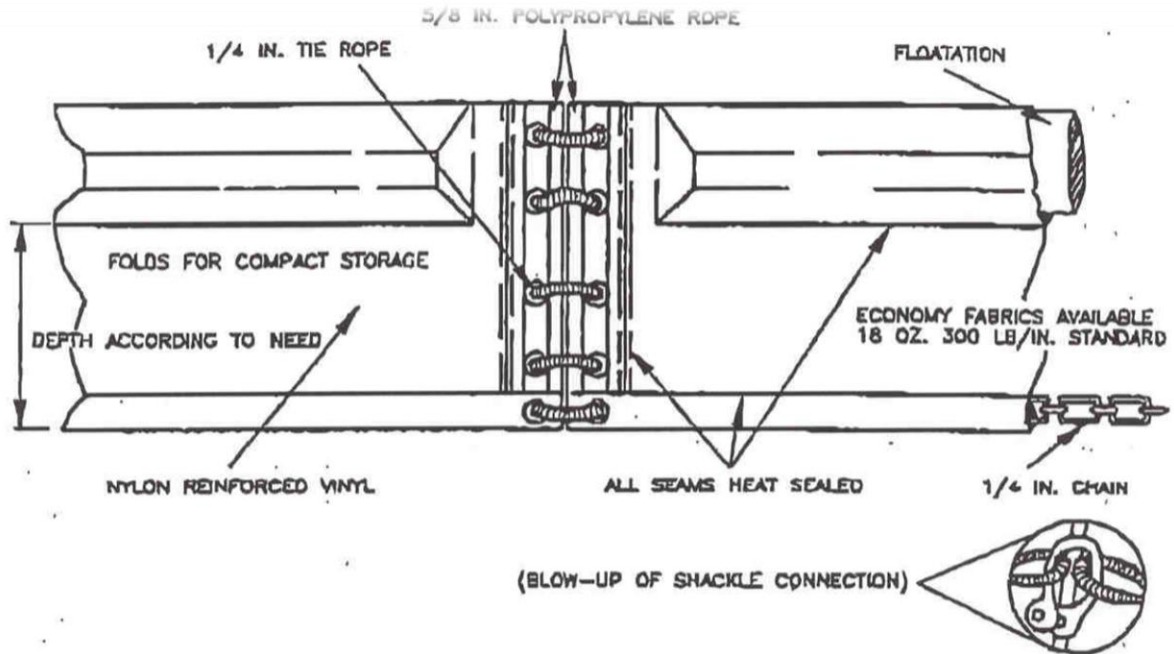
NOTE: ANCHORING WITH BUOYS, AS SHOWN, REMOVES ALL VERTICAL FORCES FROM THE CURTAIN. HENCE, THE CURTAIN WILL NOT SINK FROM WIND OR CURRENT LOADS.



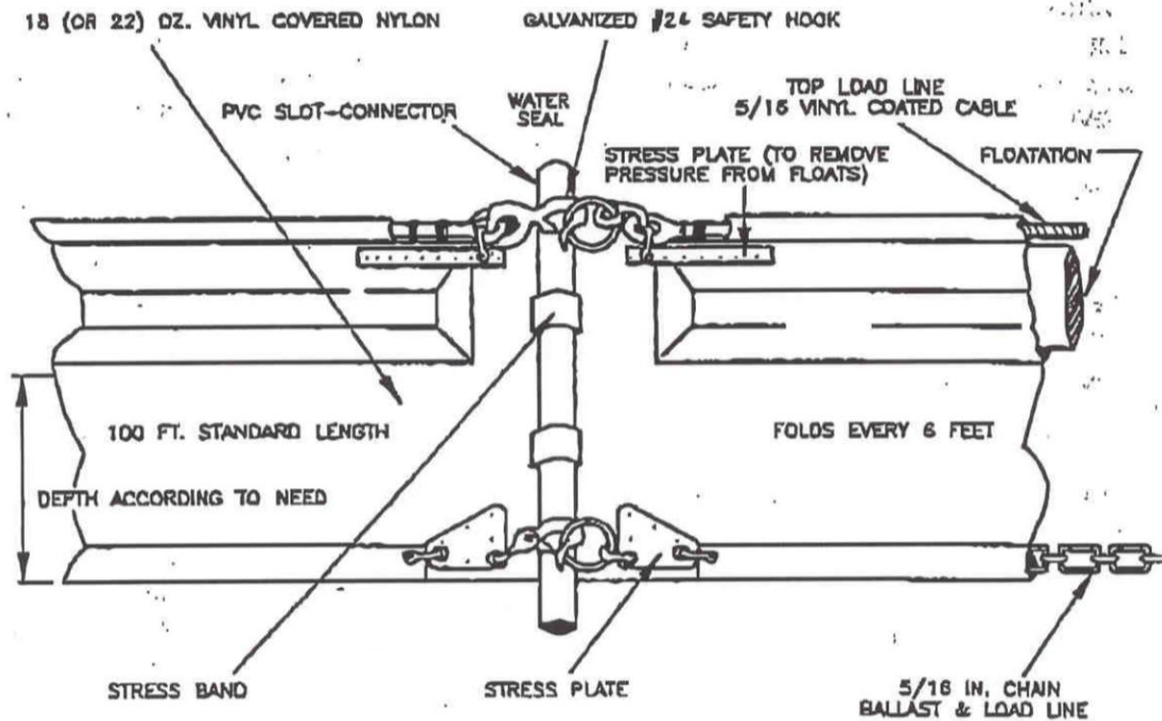


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Type I



Type II

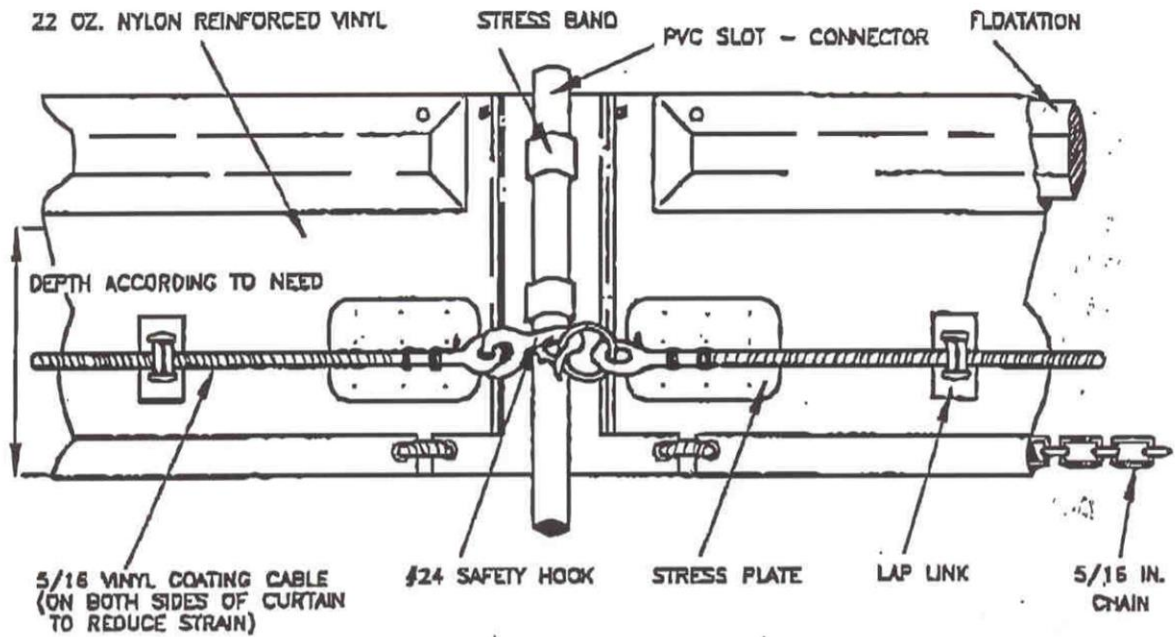




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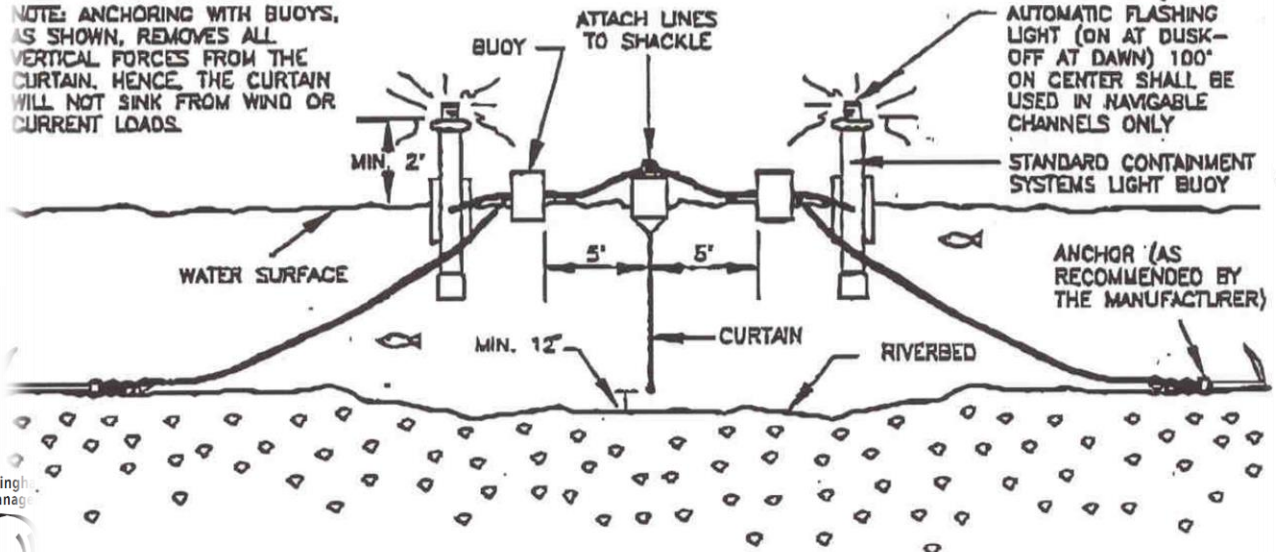
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Type III



Orientation When Installed  
(Tidal Situation - Type III)

NOTE: ANCHORING WITH BUOYS, AS SHOWN, REMOVES ALL VERTICAL FORCES FROM THE CURTAIN. HENCE, THE CURTAIN WILL NOT SINK FROM WIND OR CURRENT LOADS.

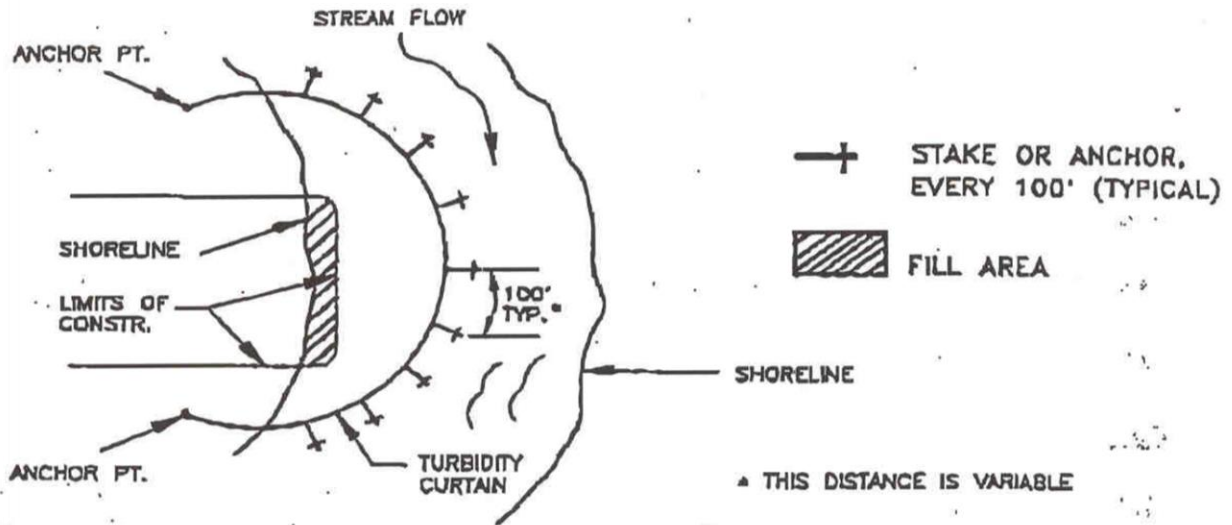




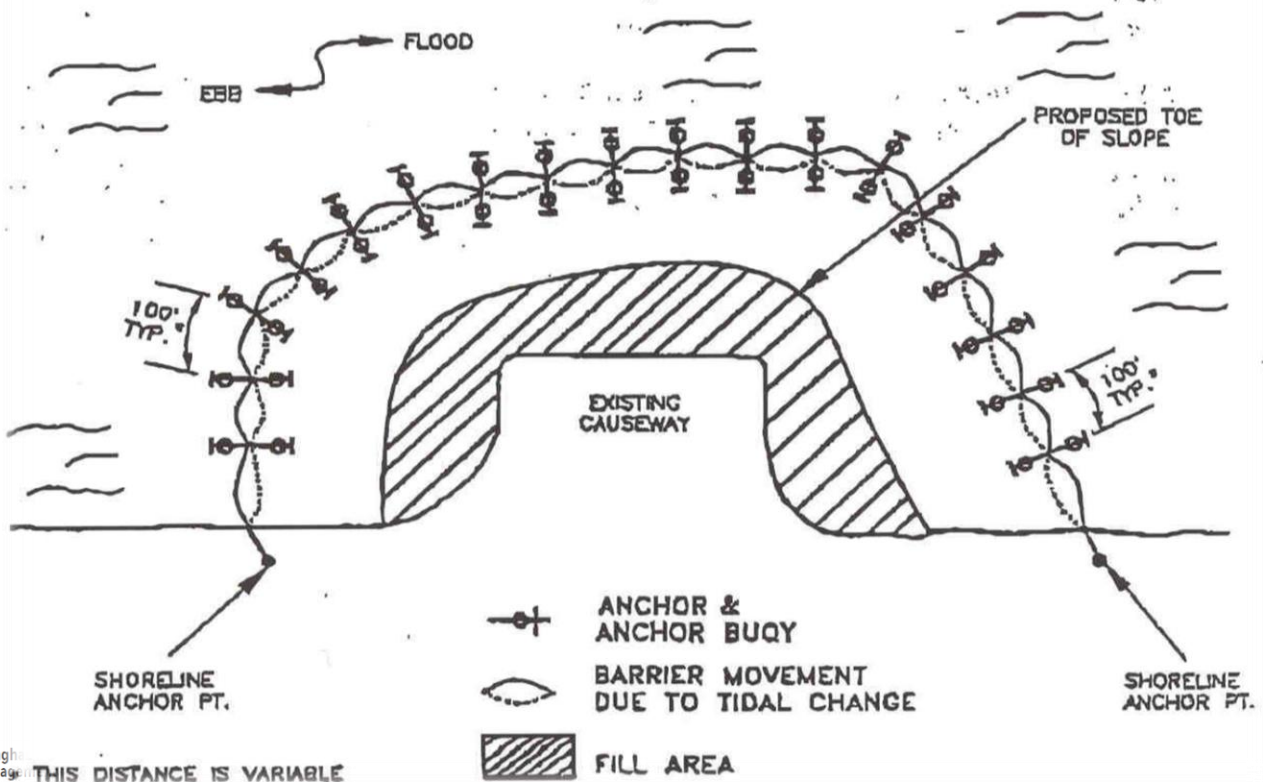
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## Typical Layouts Streams, Ponds, and Lakes (Protected and Non-Tidal)



## Tidal Waters and/or Heavy Wind and Wave Action



## **BMP**

### **Vactoring**

---

#### **DESCRIPTION**

**V**actoring is the use of a truck mounted drainage system cleaning device. The cleaning device operates on the principle of large volume, high-speed air movement to lift water, soil particles/sediment, contaminants and debris. A large tube conveys the collected materials into a tank mounted on the truck. The cleaning device also includes a freshwater supply and high-pressure pump system to flush and clean pipes and structures. Collected material is transported in the truck to approved disposal sites.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Cleaning drainage systems.
- Dewatering the work area.

#### **APPLICATIONS**

This BMP may be used to clean and/or dewater enclosed drainage systems, open drainage systems, excavations and settling ponds. It may be used in conjunction with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- Where the flow exceeds the capacity of the cleaning device.
- To remove large debris.

#### **CONSTRUCTION GUIDELINES**

- When used in a watercourse or stream, vactoring should be done according to applicable permit requirements.
- Reduce potential for sediment and debris from re-entering water.
- If entering a confined space use appropriate air testing and entry procedures.
- Prepare work sequence to address backup equipment or project phasing when tank is full.



## **BMP MAINTENANCE**

- Follow manufacturer's operation and service guidelines.

## **BMP REMOVAL**

- BMP removal is not applicable.



*Vactor truck removing sediment from catch basin*

## **BMP**

### **Vegetative Buffer**

---

#### **DESCRIPTION**

A vegetative buffer is a strip of vegetation (grasses and small forbes) associated with land-disturbing sites or bordering streams, lakes, and wetlands, which provides streambank stability, reduces scour erosion, reduces storm runoff velocities and filters sediment in stormwater. This practice applies on construction sites and other disturbed areas that can support vegetation and can be particularly effective on floodplains, next to wetlands, along streambanks and on steep, unstable slopes.

#### **PURPOSE**

The purpose of the BMP includes, but is not limited to:

- Providing bio-filtration.
- Reducing soil particles, snow sand and debris from entering ditches or the drainage system.
- Providing habitat and shade when planted along stream and/or watercourse banks.
- Providing habitat for prey base organisms such as macro-invertebrates.
- Allowing plants to grow over the ditch or channel.
- Providing shade as long as it does not become a public safety hazard.

#### **APPLICATIONS**

This BMP may be used adjacent to ditches and/or sensitive areas, parallel to roadways, parking lots or at road crossings and must comply with back of slope BMPs along ditch lines. It may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- If it creates a potential public safety hazard according to federal, state, or city safety standards.
- If it prohibits infiltration or prevents sheet flows.



## CONSTRUCTION GUIDELINES

- A buffer zone 50 feet wide with desirable vegetation may provide significant protection of a perennial stream, water body or wetland. Adjustments can be made to account for the purpose(s) of the buffer and landscape characteristics.
- To the greatest extent possible, preserve existing vegetation as a buffer.
- See other BMPs such as, handseeding and hydroseeding for construction guidelines.
- If planned to be 45 to 55 feet wide, the recommended width and plant categories are described in the following listings:
- Zone 1: the first 15 to 20 feet nearest the stream. Cover is close growing trees (commonly 6 to 10 feet apart).
- Zone 2: the next 10 to 15 feet. Cover is trees or trees and shrubs.
- Zone 3: the next 20 feet. Cover is grass or dense groundcover.
- Existing vegetation should be considered for retention, especially hardwoods that are in Zones 1 and 2.
- Buffer Zone 3 may be established with a grass planting or with close-growing groundcover that will provide dense cover to filter sediment. Where topography accommodates sheet flow from the adjacent landscape, Zone 3 should be retained or developed as a Filter Strip.
- Necessary site preparation and planting for establishing new buffers should be done at a time and manner to insure survival and growth of selected species.

## BMP MAINTENANCE

- Mow or trim the vegetative buffer in accordance with applicable standards.
- Re-vegetate as necessary.

## BMP REMOVAL

- BMP removal is not necessary.





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*Vegetative Buffer*

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## **BMP**

### **Washed Rock**

---

#### **DESCRIPTION**

**W**ashed rock is sediment free non-angular gravel.

#### **PURPOSE**

The purpose of this BMP includes, but is not limited to:

- Minimizing siltation in ditches and/or stormwater facilities.
- Reducing velocity and erosive forces.
- Filtering soil particles from water.
- Stabilizing disturbed areas.

#### **APPLICATIONS**

This BMP may be used wherever gravel will be placed in ditches and/or stormwater facilities which are watercourses or streams. It may be used in combination with other BMPs.

#### **LIMITATIONS**

This BMP should not be used:

- In locations where design and/or permit conditions prescribe other streambed material.
- On steep slopes.
- On road shoulders.

#### **CONSTRUCTION GUIDELINES**

- Wash rock off-site (at a location where washed water can not enter watercourses, streams or wetlands) until water runs clear.
- Haul material in clean truck bed.

- Dump cleaned rock onto tarped area on-site.
- Place cover and berms around clean rock that will not be used immediately.

#### **BMP MAINTENANCE**

- Inspect stockpiles of cleaned rock periodically. If rock becomes contaminated rewash rock prior to use.

#### **BMP REMOVAL**

- BMP removal is not applicable.