



Massachusetts Department of Transportation
Highway Division Construction Office

EROSION AND SEDIMENT CONTROL FIELD GUIDE

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Purpose:

This manual was designed to be a hands-on, easily referenced field guide for engineers and crews working for the roadway and bridge construction, reconstruction, or maintenance, for the Massachusetts Department of Transportation (MassDOT).

Disclaimer: This guide is intended to be used for typical construction site situations and common best management practices utilized. It should not be used in place of site-specific project designs and plans. Approval from the resident engineer is required for the construction of a number of practices included in this field guide.

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Erosion and Sediment Control Practice Matrix

The following chart is designed to help select erosion and sediment control practices that may be appropriate for the site. It is often advantageous to use several practices, including retaining existing vegetation, as a combined treatment approach for addressing erosion and sedimentation issues at the site.

Vegetative cover is the best and often the most cost-effective practice for controlling site erosion!

Practice	Prevention	Runoff Control	Erosion Control	Sediment Control	Good Housekeeping	Page
Site Layout, Project Staging and Phasing	X					7
Vegetation Preservation/Buffers	X					7
Ditch Checks (Temporary)		X				9
Stone Check Dams		X				11
Level Spreaders		X				13
Diversions (Temp. & Perm.)		X				15
Temporary Slope Drains		X				17
Mulch			X			19
Surface Roughening			X			22
Slope Breaks			X			23
Erosion Control Blankets, Nets, Turf Reinforcement Mats			X			26
Seeding and Sod			X			30
Silt Fence				X		33
Straw Bales				X		35
Compost Socks & Berms				X		36
Wattles and Fiber Rolls				X		39
Temporary Sediment Traps				X		42
Temporary Sediment Basins				X		44
Inlet Protection				X		46
Outlet Protection & Stabilization				X		49
Floating Silt Barriers				X		51
Stabilized Ingress & Egress					X	53
Tire Washes					X	53
Construction Road Stabilization					X	55
Swamp Mats/Timber Mats					X	57
Stockpile Management					X	59
Dewatering					X	61
Concrete Washout Areas					X	63
Dust Control					X	64
Construction Waste Material Management					X	66
Street Sweeping					X	67

Introduction

Soil erosion and its by-product, sediment, are a leading cause of water quality problems in lakes, ponds, streams, rivers, wetlands and coastal areas of Massachusetts. Soil erosion and sedimentation are a major concern at construction sites when disturbed areas are left unprotected and exposed to rainfall and runoff. Therefore, it is important to understand the

Factors that Influence or Accelerate Erosion

- Removal of vegetation
- Removal of topsoil and organic matter
- Changes to grading and drainage patterns
- Exposing subsoil to precipitation
- Failure to cover bare and erodible soils
- Allowing rills and gullies to form and grow larger

To address these factors you should observe

Basic principles of Erosion Control

Avoid Disturbance:

- Plan the approach and timing of site work
- Preserve existing vegetation
- Avoid Sensitive Areas

Minimize Disturbance:

- Limit site disturbance
- Install perimeter barriers

Treat the Disturbed Area:

- Encourage stormwater infiltration as close as possible to where it falls as precipitation
- Mulch, seed, or otherwise stabilize bare soil immediately
- Intercept and filter sediment-laden runoff
- Install check dams, protect inlets and outlets, use sediment traps and basins
- Use good housekeeping methods on the site to avoid off-site impacts

Maintain Erosion Controls:

- Check erosion controls daily and as required by construction General Permit
- Check project site-side and repair/replace erosion controls at the beginning of every construction season

And you always have to keep in mind

Sensitive Areas

Sensitive areas can include:

- Wetlands
- Waterways
- Riparian zones
- Floodplains
- Rare species habitats
- Water supplies
- Historic sites
- Conservation land
- Nature preserves
- Public parkland
- Significant coastal features
- Adjacent neighborhoods and businesses

Construction Administration & Regulatory Compliance

Depending on the location, size and design of the construction site, the project may be required to comply with various federal and state environmental permits. Stormwater discharges from construction activities (such as clearing, grading, excavating, and stockpiling) that disturb one or more acres, or smaller sites that are part of a larger common plan of development or sale, are regulated under USEPA NPDES stormwater program. Prior to disturbing earth and discharging stormwater, construction owners/operators must obtain coverage under an EPA NPDES Construction General Permit (CGP).

Sites located in or near wetlands resource areas (streams, wetlands, ponds, floodplains, etc.) are also likely to be regulated by other federal, state, or local permit conditions.

Storm Water Pollution Prevention Plan

- A SWPPP is a document developed in compliance with the USEPA NPDES CGP that identifies the methods for managing, controlling and preventing polluted stormwater runoff or discharge from leaving a construction site. Throughout the course of the project, the SWPPP should be updated, amended and modified as changes occur. Ensure proper implementation of the SWPPP, ESC practices, inspections and compliance monitoring requirements throughout the duration of the project to maintain regulatory compliance, prevent erosion from occurring, and control the discharge of sediment from the job site.

Other Permits, Plans and Agreements

- Check the project plan notes, specifications and the SWPPP for special conditions
- Understand how these conditions affect project phasing, sequencing, and reporting and notification conditions.
- Discuss special conditions at the pre-construction meeting and whenever new Contractor(s) or Operator(s) join the project. Be sure to clearly point out any areas designated for special protection or mitigation.

Where applicable, implement the following minimum items to ensure regulatory compliance and avoid potential construction delays or penalties from non-compliance:

- Prior to beginning work, ensure construction personnel are familiar with any sensitive areas that may be present on, or near, the site. Become familiar with permits (if applicable) and ensure any required access barriers, visual indicators (e.g., flagging, wooden stakes, etc.) and signage are installed prior to starting any work at the site (including installation of ESC BMPs). Consider installing ROW fencing early in construction.
- Select staging, storage and access areas carefully so as to avoid negatively impacting resource areas. Unpermitted impacts to sensitive areas may result in administrative penalties and fines.
- Inform construction personnel of construction activities, project phasing and sequencing, and timing of activities allowed within sensitive areas if such work has been permitted by the appropriate regulatory agencies and jurisdictional authorities.
- Ensure that construction personnel understand any restrictions that apply to construction equipment movement or construction timing and provide details of such restrictions.
- Regularly ensure that site personnel are familiar with site-specific requirements and that questions are addressed. If construction personnel changes during the course of the project ensure that they are familiar with site-specific requirements and that they sign the project SWPPP if one has been prepared for the project.
- If at any time during construction the project scope is modified, or sensitive areas are affected, notify the appropriate MDOT contact, or regulatory agencies/persons immediately in order to ensure regulatory compliance and avoid/minimize any potential penalties.

PREVENTION

P.1 Construction Site Layout, Phasing and Staging

Construction site layout, planning, phasing, staging and sequencing are often determined during the design phase of a project. Wherever possible, phase construction to limit the extent and duration of exposed soils onsite. Limiting the extent and duration of disturbed areas during construction is the most cost-effective method for controlling erosion and sedimentation on site

P.2 Preservation of Existing Vegetation and Buffers

The preservation of existing vegetation (groundcovers, vines, shrubs, trees) on a site wherever possible will increase soil stability and decrease the amount and velocity of runoff. Clearing and grubbing on a site should be performed in the proper phasing and to the minimum degree necessary.

Where and How

- Preserve natural vegetation wherever possible, especially in areas where activities are not scheduled to occur, or will occur at a later time.
- Preserve natural vegetation particularly on steep slopes, near drainage ways, or drainage swales.
- Select and protect trees along roadways where aesthetics demand and wherever possible.
- When approaching a stream crossing, limit the amount of clearing of existing stream bank and riparian vegetation when safety allows.
- Wherever possible, preserve existing vegetation near wetlands and waterways to serve as vegetated buffers. Vegetated buffers help intercept and filter sediment from runoff and are a critical last line of defense before runoff enters a receiving water. If vegetation has been removed or is absent, it can be beneficial to plant native trees, shrubs and grasses to help control sedimentation during construction.

Benefits

- Reduces soil erosion rates and improves aesthetics.
- Reduces landscaping costs.
- Provides habitat for wildlife and provides noise buffers.

RUNOFF CONTROL PRACTICES AND DEVICES

R.1 Temporary Ditch Checks

Spaced properly, Temporary Ditch Checks (TDC) can be very cost-effective and useful methods for reducing the velocity of flowing water in swales and shallow drainage channels. Reducing flow velocity helps to reduce channel scour and erosion, encourages sediment deposition and promotes infiltration where suitable conditions are present.



TDCs constructed with straw wattles [Image source: BSC Group](#)

Where

- Any ditch or shallow drainage channel that may experience erosion, scour, siltation, or any stable drainage ditch that receives sediment laden water from up-gradient areas.
- Check dams should not be installed in creeks or streams. Sediment must be intercepted before it reaches streams, lakes, wetlands and coastal areas.

Benefits

- Relatively inexpensive to install.
- Extremely effective for reducing stormwater flow velocity, erosive force and sediment carrying capacity.
- Reduces flow velocity and promotes settling and infiltration.

Limitations

- Relatively high maintenance required (sediment removal).
- Inappropriate for high grade ditches.
- Inappropriate for high-velocity flows (See R.2 Temporary Stone Check Dams)
- Inappropriate for permanent use.

Installation Tips

- TDCs should be spaced so the top (crest) of the downstream check is at the same elevation as the bottom (toe) of the upstream check.

$$\text{Spacing (in feet)} = \frac{\text{Height of check dam (in feet)}}{\text{Slope in channel (ft/ft)}}$$

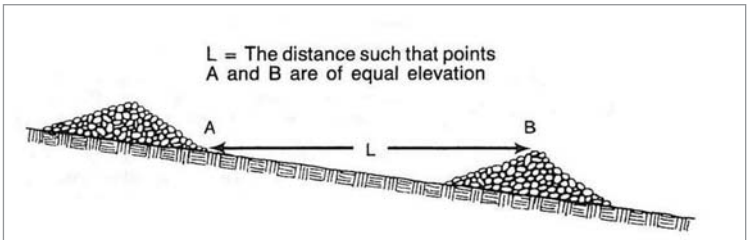


Image source: North Carolina Sedimentation Control Commission

- TDCs must be long enough to ensure the center of the structure is at least 6 inches lower than the outside edges of the TDC. This will allow water to flow over the middle of the TDC and not around the edges.
- Where potential for high flow conditions exists, more than 6 inches will be required to prevent flow around the ends.

Inspection and Maintenance

- Floating or displaced TDCs may indicate that stakes and/or staples are installed incorrectly or require additional support.
- If scour is occurring around the ends of the TDC, the ditch check may not be extending far enough up the channel side slope.
- If TDCs are spliced or abutted together, ensure that connections are adequately protecting against concentrated flow-through.
- If the device becomes undermined, correct and stake or staple with an approved product.
- Remove sediment from upstream side of ditch check when it has reached half of the height of the structure.
- Replace or repair ditch check if torn, split, compressed, unraveling or is otherwise compromised.
- If RECP or other fabric is installed in conjunction with the TDC, replace if torn and may allow water to undermine the ditch check.
- Remove trash and large organic detritus (branches, logs, etc.) when accumulated on ditch check.

- Flow around ditch checks indicates incorrect installation. Reestablish flow over the center of the TDC when necessary. This may require lengthening the ditch check or selecting an alternative ditch check if the current device is not functioning properly.
- Remove ditch checks when all up-gradient areas are stabilized and seed/stabilize resulting voids in the channel. At the discretion of the RE, TDCs that are 100% biodegradable may be left in place to degrade.

R.2 Stone Check Dams

Stone check dams act as containment structures that help slow the velocity of runoff in drainage ditches. They can be used during the construction phase of a project and/or left in place following construction where rip rap will be placed as the permanent channel stabilizing liner. Properly installed stone check dams can be very effective at reducing channel erosion and downstream sedimentation.



Stone Check Dams [Image source: Mass DOT](#)

Where

- Where rip rap will be placed as the final channel liner.
- Steep ditches and channels where velocities exceed 8 fps.
- Temporary/permanent grass swales, open channels, or ditches that drain 10 acres or less.

Benefits

- Effective in ditches and swales with high stormwater discharge velocities.
- Extremely effective for reducing stormwater flow velocity, erosive strength and sediment carrying capacity.
- Slows flow velocity and promotes infiltration.

Limitations

- Relatively high maintenance required (sediment and debris removal)
- Not effective/intended for trapping fine sediment.
- Inappropriate for ditches and swales with low flow velocities.
- Not recommended where grades exceed 20%, except when used in combination with a turf reinforcement mat (TRM).

Installation Tips

- Temporary stone check dams should be spaced as described in [Temporary Ditch Checks](#).
- Width of the stone check dam is the length required to reach from the top of each side slope of the channel. Must be long enough to ensure center of rock check is approximately 6 inches lower than outside edges to allow water to flow over the middle and not around the edges.
- Stone check dams should be constructed of appropriately-sized stone (based on peak velocities).

Inspection and Maintenance

- Stone displaced from face of check dam = stone size too small and/or the face too steep.
- Erosion downstream from dam:
 - Install stone lined apron.
- Erosion of abutments during high flow:
 - Rock abutment height too low.
- Sediment loss through dam:
 - Inadequate layer of stone on inside face or stone too coarse to restrict flow through dam. If the issue is ongoing, consider adding a non-woven geotextile liner to inside of dam



Stone Check Dams [Image source: Mass DOT](#)

R.3 Level Spreaders

Level spreaders are excavated depressions or areas constructed at 0% grade across a slope. Level spreaders are used to transition concentrated flow into lower velocity and evenly distributed (less erosive) sheet flow. Often, level spreaders are used in combination with temporary diversions at strategic locations on a site to help control, intercept and/or direct runoff in order to limit erosion potential in erosion-prone or sensitive areas.

Where

- Drainage area is 5 acres or less.
- Soil is undisturbed (not fill).
- A level lip can be installed without filling.
- The area directly below the spreader is stabilized by existing vegetation.
- Water will not become concentrated below the spreader and can be released in sheet flow down a stabilized slope without causing erosion.
- There is at least 100 feet of vegetated area between the spreader and surface waters.
- The slope of the area below the spreader lip is uniform and a 10% grade or less.
- There will be no construction traffic over the spreader.

Benefits

- Relatively low-cost method for releasing small volumes of runoff safely.

Limitations

- Any low points in the level spreader may cause concentrated flows causing or exacerbating erosion.



Level spreader adjacent to stabilized outlet

Image Source: BSC Group

Installation Tips

- The grade of the channel for the last 20 feet entering the level spreader should be no steeper than 1%.

Grade	0% (Flat)	
Length	Minimum 5 ft	Maximum 50 ft
Width	At least 6 ft	
Depth	6 inches <i>(Measured from the lip and should be uniform)</i>	

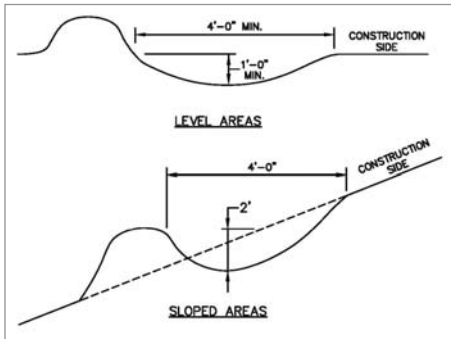
- If level spreader is earthen, stabilize the entire surface with appropriate turf vegetation (sod or seed).
- If seeding, protect the level lip with an appropriate ECB or TRM to provide temporary erosion control.
- The down gradient area should have stable, established, erosion-resistant vegetative cover.

Inspection and Maintenance

- Inspect after every rain event and remove accumulated sediment.
- Repair erosion damage and re-seed as necessary.
- Mow vegetation occasionally to control weeds and the encroachment of woody vegetation.
- If channels and/or erosion form in the level spreader, the level spreader is not uniformly flat and low spots should be repaired.
- If erosion is occurring down gradient of the level spreader:
 - The down gradient vegetation is not stable and the area should be re-seeded, or
 - Level spreader is not long enough or not wide enough.

R.4 Temporary Diversions

Temporary diversions are ridges or channels, or a combination of both, constructed across the top, bottom, or bisecting a steep slope and used to control, direct and convey stormwater runoff to a specific location. Sited and installed properly, temporary diversions are a relatively simple method for protecting areas from erosion and uncontrolled turbid stormwater runoff.



Temporary Diversion Image source: BSC Group

Where

- Above or below cut or fill slopes.
- Across unprotected slopes as slope breaks.
- Along site perimeter to keep sediment on site.
- Above disturbed areas before stabilization to prevent erosion and maintaining acceptable working conditions.
- Up gradient from environmentally sensitive areas to direct turbid stormwater runoff to temporary sediment traps or basins.

Benefits

- Extremely cost-effective method for controlling erosion and sedimentation.
- Temporary diversions can be designed to serve as permanent diversions and incorporated into the post-construction stormwater management approach.

Limitations

- Sited or constructed improperly, may become prone to erosion.
- Siting may be complicated in traffic areas.

Installation Tips

- Temporary diversions must be planned to be stable throughout their intended life, and meet the criteria listed below. Otherwise, they should be designed as permanent diversions.
- Build up swale with compacted excavated material or compacted fill.

- **Drainage areas:** 3 acres or less.
- **Capacity:** Peak runoff from a 10-year storm event
- **Minimum cross section:**

Top Width	Height	Side Slopes
8 ft	1.5 ft	4:1
4 ft	1.5 ft	2:1

- **Grade:** Can be variable depending on topography, but must have a positive grade to the outlet. Maximum channel grade should not exceed 1%.
- **Spacing:** Maximum spacing of diversions on side slopes or graded ROWs should not exceed the following:

Land Slope (%)	Spacing (ft)
0 or less	300
2	200
3-5	150
5 or greater	100

- Diverted runoff should always outlet to a stabilized area: properly designed waterway, grade stabilization structure, or sediment trap/basin.
- Diversions being used 30 days or longer should be seeded and mulched as soon as they are constructed in order to preserve shape and reduce maintenance.

Inspection and Maintenance

- Inspect weekly and after every rain event and repair damage caused by construction traffic or erosion.
- Remove accumulated sediment and debris and stabilize outlets as necessary.
- If necessary, repair ridge to a positive grade and cross section, and add gravel at crossing areas.

R.5 Temporary Slope Drain

A strong, flexible pipe, made out heavy duty, non-perforated corrugated plastic or metal, extends from the temporary diversion at the top of a cut or fill slope to a stabilized outlet or a sediment trap at the base of the slope. Diversions at the top of the slope are used to direct water to the drain to avoid development of gullies or channel erosion, or saturation of slide prone soils on disturbed surfaces. Temporary slope drains are most needed in the time between the construction of a cut or fill slope and installation of permanent water disposal methods. These types of drains can also be used on bridges to direct stormwater from the deck surface, vertically down the bridge pier, toward a stabilized splash pad.



Temporary slope drains Image source: [Missouri DOT](#)

Where

- Cut or fill slopes that have not been permanently stabilized.
- Sites with limited room for sediment traps below.
- Sites with a maximum of five to ten acres of drainage.
For larger areas, use more than one pipe or a rock lined channel.

Benefits

- Very effective at controlling runoff on slopes and safely directing it toward specific locations.

Limitations

- Care must be taken to correctly locate and size slope drains.
- If vegetation is removed from beneath the drain and proper interim measures are not employed to help limit erosion potential, gullying may occur beneath the drain.
- Large drainage areas may require multiple slope drains.

Installation Tips

- After clearing an area for the pipe, re-vegetate the area under and around the pipe to avoid erosion.
- Install a diversion along the top of the slope to direct water to the inlet. (See R.4 Temporary Diversions for additional information).
- The pipe entrance should be a standard flared end outlet with a minimum 6 inch metal toe plate. Pipe size to be determined

Maximum Area per Pipe (Acres)	Minimum Pipe Diameter (Inches)
0.5	12
0.75	15
1.0	18
> 1.0	Individually Designed

by the table below.

- The flared inlet section should be connected to the slope drain using watertight connecting bands.
- Compact soil around and under the pipe. The compacted fill connection to the diversion berm should be at least 1 foot higher than the drain, 6 inches higher than the diversion, and 4 feet in width.
- Install interceptor dikes as needed to better direct flow to the drain.
- Construct a stabilized riprap outlet/velocity dissipater or sediment trap at the base of the drain in Outlet Protection and Stabilization.

Inspection and Maintenance

- Washout along pipe due to seepage resulting from inadequate compaction, or insufficient fill.
- Overtopping of diversion due to blockage at pipe:
 - Drainage area may be too small for pipe size.
 - Inspect inlet and clear away trash or debris.
- Inspect after rain events and remove accumulated sediment or debris at the inlet.
- Monitor outlet for erosion. Repair erosion problems immediately. Erosion at the outlet can result from the pipe not extending to a stable grade, or insufficient outlet protection.

EROSION CONTROL PRACTICES AND DEVICES

E.1 Mulch

Mulching consists of the application of a protective blanket of straw or other plant residue, gravel, compost or organic waste, or synthetic material to the soil surface to provide short term soil protection. Mulch also helps protect newly placed soil and seed by absorbing rainfall energy.

Mulch enhances plant establishment by conserving moisture and moderating soil temperatures, and anchors seed and topsoil in place. Mulch should be used in combination with temporary seeding, as well as permanent seeding when conditions may be drier than optimal. Mulching can be used alone, or in combination with seeding and other BMPs on sloping ground, as an added measure to prevent erosion.

Wood Fiber and Paper Mulch

Wood fiber and paper mulches are biodegradable and exhibit good moisture retention and weed control. Because the decay of freshly produced wood chips from recently living woody plants consumes nitrate, careful consideration should be given to offsetting such nutrient consumption by wood mulch with other nutrient sources (e.g., fertilizers, seed mixes with nitrogen fixing plants, etc.) in order to help establish vegetation. Wood and paper mulches should be used in combination with a soil and mulch binder (See E.3 Soil and Mulch Binders), or another erosion control product that will help provide additional erosion protection (e.g., ECB, TRM, etc.). Reference MassDOT Standard Special Provision M6.04.03 for Woodchip Mulch and M6.04.04 for Wood Fiber Mulch for material specifications.



Paper-based mulch Image source: BSC Group

Bark Chips and Shredded Bark

Bark chips and shredded bark are byproducts of timber processing and often used for landscape plantings. Unlike wood chips, the use of bark does not require additional nitrogen fertilization. Reference MassDOT Standard Special Provision M6.04.05 for Aged Pine Bark Mulch material specifications.

Straw and Hay Mulch

Straw and hay mulch are lightweight, biodegradable and pH neutral. They are effective for moisture retention, but hay mulch can be contaminated by “weed” seeds. Reference MassDOT Standard Special Provision M6.04.01 for Hay Mulch and M6.04.02 for Straw Mulch material specifications. Mulch shall be placed according to MassDOT Standard Specification 767.1.



Straw mulch application [Image source: MassDOT](#)

Compost

Composts are engineered soil amendments derived from natural solid organic materials that can be applied to slopes as an alternative to ECBs. Applied properly, compost helps protect soil from erosion and provides an organic growth medium that can help to establish vegetation. Compost should conform to AASHTO Standard MP 10-03 - Compost for Erosion/Sediment Control (Compost Blankets).

Where

- On temporary or final seeded areas away from high-traffic areas, or where seed or soil might be blown away. Mulch placement on steep slopes (e.g., exceeding 1V:3H) should be limited to hydraulic applications with soil binder, or as contained within ECBs and TRMs.
- At the base of trees and shrubs.
- Never placed in drainageways, unless it is secured in place with additional BMPs designed for providing soil erosion protection (e.g., RECP) from scour during flowage.

Benefits

- Relatively easy to install; immediate results.
- When used in combination with seed, strategic mulch selection can help encourage and facilitate good vegetative cover and suppress weed growth.

Limitations

- Poor quality or improperly selected mulch products may introduce weed seeds or invasive plants to a site.
- Improper soil/mulch binder application may result in loose or lost mulch when used on steep slopes.

Installation Tips

- Sub base shall be prepared according to MassDOT Standard Specification 767.0.
- Hay and straw mulch should be loosely spread to a uniform depth over unseeded areas at a rate of 4 ½ tons/acre except and seeded areas at a rate of 2 tons/acre, or as directed by the RE.
- Wood Chip Mulch and Pine Bark Mulch shall be loosely spread to a uniform depth at a rate of 390 CY per acre (approximately 3 inches in depth), or as otherwise directed by the RE.
- Wood fiber and paper mulch should be applied hydraulically in a uniform manner over designated seeded areas at a rate of 1,400 pounds/acre, or as directed by the RE.
- Mulch application should conform to the methods specified in MassDOT Standard Specification 767.

Inspection and Maintenance

- Ensure there is a continuous, uniform, even coverage.
- Ensure mulch layer is not so thick that it suppresses desired seed germination and plant growth.
- Ensure rilling or gullying does not occur beneath “banded” mulch.
- Replace or repair mulch if washed or blown away.
- If mulch is not controlling erosion, it may be advantageous to install ECB or place binder.

E.2 Surface Roughening

Roughening a bare soil surface with horizontal grooves running across the slope, stair stepping, or slope tracking with track-mounted construction equipment is a technique that can reduce runoff velocity, encourage rainfall infiltration, reduce erosion, and facilitate sediment trapping.



Soil roughened with tracked machinery [Image source: BSC Group](#)

Where

- All embankments or slopes containing exposed bare soils, particularly slopes exceeding 1V:3H
- Roughening slopes with track-mounted equipment should be limited to sandy soils in order to avoid excessive compaction of the soil surface.
- Surface roughening should be used in conjunction with other BMPs including seed or mulch.

Benefits

- Can be a very effective and simple approach when used at the right location.
- Can be incorporated into the site grading approach and does not require additional BMPs, products or equipment other than typical construction machinery.

Limitations

- Limited effectiveness during moderate to heavy storm events.

Installation Tips

- Run track-mounted machinery up and down the slope in order to leave horizontal depressions in the soil running parallel to the slope.
- Do not back-blade during the final grading operations.
- It is a good practice to track slopes at the end of each work day and should always be used in conjunction with other BMPs until final stabilization is established.
- All roughened soil surfaces should immediately be seed and mulched in order to provide optimum conditions for seed germination and plant growth.

Inspection and Maintenance

- Roughened soil surfaces should be seeded and/or mulched as soon as possible.
- If rills appear, soils should be re-graded and re-seeded and/or mulched immediately.

E.3 Temporary Slope Breaks

Wattles, Fiber Rolls and Compost Socks can be installed along slope contours to help control erosion by breaking up the slope lengths and reducing the velocity of stormwater runoff. (Additional information on wattles, fiber rolls and compost socks is provided in the Sediment Control Section of this Field Guide .)

Where

- At regular intervals along the contour of gradual and steep slopes.

Benefits

- Easy to install with limited if any trenching required.
- Wattles and fiber rolls are relatively lightweight and can be moved around easily on site.



Temporary Slope Breaks [Image source: MassDOT](#)

- Most products are free of weed seeds and invasive grasses.
- If not degraded, wattle/sock filler can be reused as mulch on site where appropriate to help provide temporary soil stabilization while vegetation is becoming established.
- Where appropriate, many biodegradable or photodegradable wattle socks/tubes/meshes can be left to degrade in place.

Limitations

- Alone, they may not protect the site adequately from erosion where other contributing factors are present (e.g., rain drop impact, soil texture, etc.).

Installation Tips

- Install slope break on a smooth surface along the contour at a uniform elevation. Where possible, seat the device in a small trench approximately 1/4 - 1/3 of the wattle's diameter.
- Slope break devices can be placed on top of RECP to provide additional temporary erosion protection, especially on very steep slopes and/or slopes with long slope lengths.
- Device must be staked in place according to the manufacturer's specifications to ensure proper function and longevity.

Inspection and Maintenance

- If flow is evident around the edges of the installed slope break, extend the slope break, wrap up the ends, or consider a different material.
- If there is erosion or undercutting at the base or sides of the slope break, or large volumes of water are being impounded behind the device, the devices may be spaced too far apart, or the device may need to be supplemented with an ECB.
- If the slope break requires frequent repair or replacement, reevaluate the material selected and consider choosing a different product or technique for the location/intended function.

E.4 Erosion Control Products

Erosion control products (ECP), including erosion control blankets (ECB), nets, and turf reinforcement mats (TRM), are manufactured or fabricated into rolls and designed to protect soil from erosion and assist in the growth, establishment and protection of vegetation. They are typically used on steep slopes at or exceeding grades 1V:3H and drainage ways where erosion potential is high and temporary measures are required for stabilizing soils while vegetative cover is becoming established.

ECP are typically constructed from interlocking fibers of straw, coconut fiber (coir), excelsior, or a similar material comprising a matrix sandwiched between biodegradable or photodegradable netting and should be selected based on slope/channel grade, length, required sheer strength and/or desired functional longevity.

The following is general information pertaining to typical ECP. However, it will be necessary to review the manufacturer's specifications before selecting a product. An ECP's functional longevity will be greatly affected by site-specific factors including precipitation, soil moisture, direct sunlight, soil microbial processes, and other BMPs that may be used in support of the overall erosion control approach.

Straw

Straw ECBs are composed of the dry stalks of plants (usually cereal plants) after the grains and chaff have been removed, and typically have a functional longevity of 12 months or less. Hay (which should not be used) still contains the grains.

Excelsior

Excelsior ECBs are composed of fine wood shavings (usually derived from aspen or poplar), and typically have a functional longevity of 12 to 24 months.

Coir

Coir ECBs, netting, and mats are made from coconut fibers. These fibers can hold up to eight times their weight in water making them especially good for helping keep soils moist while plants are becoming established. Care should be taken to select the appropriate coconut fiber for your project, as bristle and white coir fibers have different physical properties. Functional longevity will vary depending on the coir fiber and site conditions (36 months typical).

Composite

Composite ECBs are made from straw and coir fibers that may be mixed in various ratios to improve the functional longevity of the materials.

Degradable Netting

Degradable netting is a natural fiber or synthetic mesh used in combination with mulch to help prevent slopes from wind and water-induced erosion.

Turf Reinforcement Mat

TRMs are made from interwoven layers of degradable and/or non-degradable, natural or synthetic materials layered in a 3-dimensional matrix. TRMs can be used to permanently reinforce vegetation in drainage ways during high flows, or where erosion potential is high. TRMs serve as an intermediate BMP between hard armor (e.g., rip rap) and ECBs



Erosion Control Blanket [Image source: BSC Group](#)

Erosion Control Blanket

Where

- Where permanent seed has been placed, winter shutdown, temporary stockpiles, erodible areas where temporary stabilization may be required (e.g., steep slopes, drainage ways, etc.).
- ECBs should be carefully selected based on site-specific criteria including: slope angle, slope length, required functional longevity, required shear strength, presence of environmental resource and habitat areas, re-vegetation goals, etc.



Erosion Control Blanket Image source: BSC Group

Benefits

- Provides immediate soil surface protection.
- Numerous product types to meet variety of site constraints and functional longevity requirements.
- Less susceptible to displacement by natural forces (wind, rain, etc.) and traffic.

Limitations

- Higher material cost as compared to mulch.
- More labor intensive to install as compared to mulch.
- Obscures visibility of erosion beneath blanket if occurring.
- Heavier and longer lasting netting can get tangled in equipment blades if the area is to be mowed.

Installation Tips

- Verify that the ECB delivered to the site are in good condition and have not begun to decompose.
- Install the ECB according to the manufacturer's specifications and as directed by the RE. Typically, blankets should be unrolled upstream to downstream and parallel to the direction of flow (i.e., down slope).
- Where multiple blankets will abut each other, verify that the ECBs overlap with adjacent ECBs according to manufacturer's specifications.
- Ensure that the ECB and is anchored in place securely with stakes or staples. Some manufacturer's paint staple patterns on their ECBs. Staple patterns will differ based slope angle and may have distinct colors.
- Ensure the ends and edges of the blankets are keyed in properly and the entire blanket has good contact with the ground surface.

Inspection and Maintenance

- Ensure good, even contact between the entire ECB and ground surface.
 - Adjacent ECBs overlap per manufacturer's or designer's specifications.
 - Top and edges of the blanket are keyed in and anchored properly to prevent runoff from concentrating beneath the ECB.
 - Repair any areas where rills, or gullies have formed beneath the ECB.
 - ECB is properly anchored with staples or stakes and at frequency consistent with the manufacturer's or designer's specifications.
 - Staples or stakes are driven flush with the soil surface and are preventing the ECB from lifting away from the soil.
 - ECBs have not been damaged by animal activity or traffic.
-

Turf Reinforcement Mat

Turf Reinforcement Mats (TRMs) are similar to ECBs, but contain non-degradable netting that can be used to permanently reinforce vegetation in drainage ways during high flows, or where erosion potential is high. TRMs serve as an intermediate BMP between hard armor (e.g., rip rap) and ECBs.

Where

- On steep slopes below a piped discharge.
- Vegetated channels where erosion potential is high
- Overflow berms between drainage BMPs (e.g., between sediment forebay and bioretention basin).
- Where possible, avoid environmentally sensitive locations such as shorelines or wooded areas where birds, snakes, small mammals, etc., may get tangled or stuck in the non-degradable netting.

Benefits

- Provides immediate, significant soil surface protection prior to vegetative establishment.
- More substantial and higher shear strength compared to ECBs.
- Good alternative to hard armor and concrete in areas requiring long-term stabilization (e.g., drainage ditches, swales, etc).
- Provides added support to vegetation and root reinforcement compared to ECBs and allows vegetation to withstand higher flow velocities.

Limitations

- Not appropriate for locations where final vegetation will be mowed.
- Can be detrimental to wildlife that may become caught in netting.

Installation Tips

- Verify that the TRM delivered to the site is in good condition and if they contain a composite of biodegradable materials, the material has not begun to decompose.
- Most manufacturer's color the blanket web according to the product's specified functional longevity (i.e., common practice is to use white for short-term, green for mid-term and black for long-term functional longevity).
- Some manufacturer's paint staple patterns on their TRMs. Staple patterns will differ between slopes and may have distinct colors.
- TRMs shall be installed according to the manufacturer's specifications. At a minimum, TRMs should be securely keyed in along the top and toe to prevent undermining and edge lifting and staked appropriately.
- Where more than one blanket length or width is required, the upstream TRMs shall overlap over the downstream TRM and have stapled edges per the specifications.

Inspection and Maintenance

- Ensure good, even contact between the entire TRM and ground.
- Adjacent TRMs overlap per manufacturer's or designer's specifications.
- Top and edges of the TRM are keyed in and anchored properly to prevent runoff from concentrating beneath the blanket.
- Repair any areas where rills, or gullies have formed beneath the TRM.
- TRM is anchored with staples or stakes properly and at frequency consistent with the manufacturer's or designer's specifications.
- Staples or stakes are driven flush with the soil surface and are preventing the TRM from lifting away from the soil.
- TRMs have not been damaged by animal activity or traffic.

E.5 Temporary and Permanent Seeding

Well-established vegetation is widely considered the most effective form of erosion control. The presence of temporary or permanent cover will provide stabilization and erosion protection to disturbed areas. Temporary seed mixes contain annual vegetation that grows quickly and helps stabilize an area until permanent vegetation can be established. Proper soil bed preparation, seeding method and soil moisture are critical for successful seed application. Newly placed seed often requires other temporary erosion control to help provide protection and support germination establishment. Mulch or RECPs are effective supporting BMPs that can help facilitate good seed germination and plant establishment.

Temporary Erosion Control Seeding

Where

- Any graded or cleared area where construction has ceased for 21 days or more and if the area will be exposed for less than 12 months.
- Soil stockpiles that will not be removed or reworked within 21 days or more.
- Areas in which permanent seeding is necessary, but is outside of the growing season.

Benefits

- Extremely cost-effective erosion control approach.
- Fast stabilization under favorable conditions.
- Easy to remove when activities resume.
- Helpful in reducing maintenance of sediment control BMPs (i.e., sediment removal).
- Weekly application will ensure seed is available when conditions are favorable for germination.

Limitations

- Weekly seeding alone will not prevent erosion.
- Relying on temporary seeding is not an appropriate alternative to other forms of erosion and sediment control.

Installation Tips

- Install seed mix only during specified time of year.
- Before planting, scarify/roughen the soil surface and install appropriate surface drainage measures to prevent erosion and scouring.
- As needed, provide water, fertilizer, lime, and mulch to the seedbed.
- If it is unlikely that growth will occur due to cold weather, apply mulch or ECBs for temporary stabilization.

Inspection and Maintenance

- Inspect for bare spots, rilling, or gulying and correct as necessary.
- Temporarily stabilized areas will require permanent stabilization when the area has been completed as designed or when the growing season begins

Permanent Seeding

Where

- Any graded or cleared area which has been completed as designed, or will not be brought to final grade for 12 months or more.
- Areas in which permanent seeding is especially important include: filter strips, buffer areas, vegetated swales, steep slopes, and stream banks.

Installation Tips

- Seed with an approved conservation cover mix during the specified growing season.
- Where possible, plant native species of grass and legumes.
- Before planting, scarify/roughen the soil surface and install appropriate surface drainage measures to prevent erosion and scouring.
- As necessary, provide water, fertilizer, lime, and mulch to the seedbed. Where applicable follow all permit requirements (e.g., wetland seed mix in wetlands, etc.).

Inspection and Maintenance

- Inspect seeded areas for failure and make appropriate repairs and re-seed and re-plant as necessary.
- If stand has less than 40% cover, re-evaluate selection of seeding materials and quantities of fertilizer. Lack of water may also be an issue.
- Conduct a follow up survey after one year and re-seed failed areas.

Sod

Sod installed for erosion control is commonly used to provide immediate erosion protection where final grades have been established.

Where

- Any graded or cleared area which has been completed as designed or will not be brought to final grade for 12 months or more.
- Certain areas where fast vegetative establishment is especially important including: filter strips, buffer areas, vegetated swales, steep slopes, level spreaders.
- Adjacent to drop inlets as described in S.5 Catch Basin Inlet Protection.

Benefits

- Provides immediate protection to exposed soils.
- Can help to filter runoff prior to discharge.
- Can be installed as an alternative to seed when seasonal constraints may not adequately support germination and plant growth.

Limitations

- More labor intensive to install compared to seed.
- Higher installation costs compared to seeding.
- Greater initial follow-up maintenance compared to seed (e.g., watering).

Installation Tips

- See MassDOT Standard Specification Section 770 for installation specifications.
- Reference MassDOT Standard Special Provision Section M6.05.0 for sod material requirements.

Inspection and Maintenance

- Inspect sod areas for failure or surface irregularities and make appropriate repairs as necessary.
- See MassDOT Standard Specification Section 770 for maintenance specifications.

SEDIMENT CONTROL PRACTICES AND DEVICES

S.1 Perimeter Controls/Erosion Controls

Perimeter Controls (PC) are utilized intercept, filter and/or reduce the velocity of stormwater run-off. They should be installed around the perimeters of disturbed areas, especially those adjacent to wetlands, waterways, roadways, stockpile or spoil areas, or at the base of slopes.

In all circumstances, PCs should be installed prior to disturbing up gradient areas.

Sediment (Silt) Fence

Sediment fence (also referred to as silt fence) can be used along or in combination with other BMPs (e.g., straw bales, wattles, etc.) depending on its intended function. Reference MassDOT Standard Special Provision Section 670 for additional product and installation requirements.



Typical sediment fence installation [Image source: US EPA](#)

Where

- Install in areas down gradient from disturbed areas subject to sheet flow and/or rill erosion with a maximum slope length less than 150 feet and drainage area less than 1 acre.
- Do not install across streams, ditches, or waterways.
- Don not install where accumulation of water may cause flooding.
- Install at least 10 feet from the toe of steep slopes.

Benefits

- Relatively inexpensive.
- Materials are readily available.

Limitations

- Requires disturbing soils during installation.
- Removal and disposal required once construction is complete.
- Prone to failure if subject to high flow volumes and velocities
- Poor transmissivity properties and prone to clogging.
- Requires frequent maintenance (sediment removal).

Installation Tips

- Dig a trench approximately 8 inches deep and 4 inches wide, or a V-trench on the upslope side of the fence line.
- Drive posts securely at least 16 inches into the ground, on the down slope side of the trench. (Posts should be 2X2 oak stakes or 1.33 pounds/linear foot steel).
- Space posts at an 8 feet maximum if fence is supported by wire, 6 feet if extra strength fabric is used without support wire. (Use 14 gauge support wire with 6 inch mesh).
- Fasten fabric and then support wire securely to the upslope side of the fence post with wire ties or staples. Extend wire 6 inches into the trench.
- Place the bottom 1 foot of fabric in the trench and Backfill with compacted earth or gravel.
- The fence should be level along most of its length.
- Flare 10-20 feet of fabric at each end slightly uphill.

Inspection and Maintenance

- Remove accumulated sediment when it reaches one half the height of the sediment fence.
- Sagging, frayed, torn, or otherwise damaged fabric should be repaired or replaced.
- Repair end runs and undercutting.
- Inspect reinforcement and staking materials for structural integrity, and replace when necessary

Straw Bales



Typical straw bale barrier installation Image source: [MassDOT](#)

Straw bales (not hay bales) can be used alone or in combination with sediment fence, depending on its intended function.

Where

- Install at toe of slope, down gradient from disturbed areas with maximum slope length of 150 feet and maximum drainage area of 1 acre.
- Install at wetland or waterway boundaries as well as at roadways, adjacent to disturbed areas.
- Can be used in combination or interchanged with silt fence.
- Install in minor swales with a maximum contributing drainage area of 1 acre or less.

Benefits

- Relatively inexpensive.
- Materials are readily available.

Limitations

- Bales commonly contain invasive and non-native plant seeds.
- Prone to quick rot and degradation.
- Bales can be relatively heavy and cumbersome, especially when wet.
- Installation relatively labor intensive compared to other PCs.
- Removal and disposal required once construction complete.

Installation Tips

- Bales should be wire bound or string tied. The bales should be placed so that the bindings are on the sides of the bales rather than against the ground.
- Install bales in a single row, lengthwise on the contour. Abut bales tightly against each other.
- Entrench bales to a minimum depth of 4 inches.
- Backfill around the base of the bale.
- Anchor bales using two 1-inch-diameter oak stakes driven through the bale and into the ground (drive 1st stake towards the previously laid bale).
- If used with silt fence the bales should be placed on the upslope side of the silt fence.

Inspection and Maintenance

- Ensure there are not gaps between bales or evidence of undermining.
- Inspect before a forecasted storm event and daily during a prolonged rain event.
- Remove accumulated sediment when it reaches one half the height of the bale.
- Replace rotted or sediment covered bales as necessary.

Compost Filter Berms & Socks

A sediment barrier composed of a long term, wood fiber mulch that can be installed as a berm, or mulch contained in a natural or synthetic fiber sock. Usually installed at the toe of slope and downgradient from disturbed construction areas. The berm/sock is meant to intercept and filter small amounts of sediment from disturbed areas. The mulch should contain primarily fibrous, elongated, organic material such as shredded or composted bark, stump grindings, and fragmented wood in a well graded mixture of particle sizes.

Wherever possible, compost should conform to AASHTO Standard MP 9-06 - Compost for Erosion/Sediment Control (Filter Berms and Filter Socks). Wood chips, bark chips and reprocessed wood products will not be acceptable. (MassDOT standards do allow the use of chips as long as they are ground to the proper size.)



Compost filter sock [Image source: MassDOT](#)

Where

- Use to prevent sediment from entering an adjacent wetland or waterbody or from compromising a storm drain system.
- The contributing drainage does not exceed $\frac{1}{4}$ acre foot per 100 feet of barrier and the maximum contributing slope is 2:1.
- Do not use in areas of concentrated flows unless additional support is provided with silt fence.
- Never construct compost filter berms in stream channels or swales.

Benefits

- Easy to install with limited if any trenching required for installation.
- Most compost socks do not require staking or additional securing.
- Fiber rolls are relatively light in weight and can be easily moved around on site.
- Most products are free of weed seeds and invasive grasses.
- Many products are completely biodegradable or photodegradable and require minimal removal if any.
- Compost can be reused on site as a soil amendment following site stabilization.
- Many products are versatile and can be used for multiple purposes (e.g., PC, slope breaks, check dams, etc.)

Limitations

- Site/location must be accessible to a blower truck.
- There are numerous manufacturers that offer products of various quality and effectiveness.

Installation Tips

- Woody vegetation and tall grasses may need to be removed before installing the berm to prevent voids that would allow sediment under the berm/sock. The berm/sock must be a minimum of 12 inches high and a maximum of 24 inches high. It must also be a minimum of 48 inches long. If the slope has a continuous run of greater than 50 feet, more than one filter berm/sock must be used, or the berm/sock must be built wider to accommodate the flow.
- The approved mulch mixture can be mechanically sprayed into place or installed with hand tools.
- When construction activities are completed, the berm/sock and trapped sediments can be spread into the surrounding landscape, seeded and mulched.
- Berms/socks can also be planted with woody vegetation, and seeded with legumes for additional stability.

Inspection and Maintenance

- Unless otherwise specified, ensure that compost filler is 100% compost and not a compost/wood chip blend.
- Inspect filter berms/socks regularly and after rain events. Repair as needed with additional compost.
- Sediment deposits should be removed when they reach half the height of the berm/sock. Berms/socks should be reshaped and repaired when they have eroded, or have become sediment clogged or ineffective.
- If flow is evident around the edges of the installed berm/sock, extend the barriers or evaluate replacing them with temporary check dams.
- If there is erosion or undercutting at the base or sides of the berm/sock, or large volumes of water are being impounded behind the berm/sock, the berm/sock may be reinforced with an additional sediment control measure such as silt fence or stone check dam.

Wattles, Fiber Rolls and Sediment Logs (Biorolls)

Fiber rolls and sediment logs, sometimes called biorolls, typically consist of biodegradable fibers contained in biodegradable, photodegradable, or non-degradable netting with 0.5 inch x 0.5 inch openings. Fibers typically consist of straw, coconut fiber (coir), or excelsior.

Biorolls rolls are typically prefabricated and delivered to a site as a minimum 10 foot x 6 inch diameter log. Manufacturers and distributors can provide a large variety of bioroll sizes that may be advantageous depending on intended use, required functional longevity and location on a site.

Straw wattles are made from grain straw that is free from seed bearing stalks and noxious grasses and plants.

Excelsior wattles are made from fine wood shavings (usually derived from aspen or poplar) approximately 6 inches in length.

Coir wattles (often referred to as logs or fascines) are made from bristle or white coconut husk fibers.

Because most biorolls are 100% bio- or photodegradable, they do not typically need to be removed from the site at the end of the project. However, it is important to confirm the product's specified functional longevity in order to ensure that it will function throughout the duration of construction, but will not last far longer than is necessary (i.e., several months past project completion).



Straw wattles Image source: BSC Group

As a rule of thumb, the functional longevity of each treatment is as follows:

- Straw:** 12 months or less
- Excelsior:** 12 – 24 months
- Coir:** Variable depending on the coir fiber comprising the matrix and netting (i.e., bristle versus white coir fiber) – typically 36 months.



Fiber rolls installed as a ditch check [Image source: MassDOT](#)

Where

- As an alternative to straw bales in most locations.
- Install at toe of slope, downgradient from disturbed areas with maximum slope length of 150 foot and maximum drainage area of 1 acre.
- Install as slope breaks (interruptions) on steep slopes to break up continuous slope lengths.
- Install at wetland or waterway boundaries as well as at roadways, adjacent to disturbed areas.
- Install in minor swales with a maximum contributing drainage area of 1 acre or less.
- Coir wattles can be used to help provide temporary shoreline or bank stabilization.

Benefits

- Easy to install with limited if any trenching required for installation.
- Many products are versatile and can be used for multiple purposes (e.g., PC, slope breaks, TDCs, etc.)
- Straw wattles and fiber rolls are relatively lightweight when dry and can be easily moved around on site.
- Most products are free of weed seeds and invasive grasses.
- Many products are completely biodegradable or photodegradable and require minimal removal if any.
- If not degraded, mulch can be reused on site following site stabilization, or left to degrade in place.

Limitations

- Alone, may not be as visually obvious on site as silt fence or other PC devices.

Installation Tips

- Woody vegetation and tall grasses may need to be removed prior to installing the bioroll to prevent voids that would allow sediment under the roll. The biorolls should be a minimum of 8 inches high (where extremely low grades occur up-gradient) and a maximum of 12 inches high. If the slope has a continuous run of greater than the length of the bioroll, more than one bioroll must be used. Where upgradient slopes are low angle, biorolls may be abutted end-to-end. However, where steeper grades occur upgradient (e.g., 4:1 or steeper), it may be advantageous to overlap the ends of each roll a minimum of 6 inches and stake in order to avoid creating voids between roll ends. For all projects, installation should conform to the manufacturer's recommendations, or as directed by the RE.
- Biorolls should be staked/secured in place according to the manufacturer's recommendations, or as directed by the RE. However, typically stakes are not driven through the center of biorolls. In most cases, stakes are placed in front of/behind the bioroll or through the mesh only. Staking through the bioroll can negatively impact the device's permittivity.
- When construction activities are completed, the trapped sediments can be spread into the surrounding landscape, seeded and mulched, or should be completely removed from the site.
- Where permitted, 100% degradable biorolls can be left in place and allowed to degrade naturally.

Inspection and Maintenance

- Inspect biorolls regularly and after rain events.
- Sediment deposits should be removed when they reach half the height of the bioroll. Replace if rolls become ripped, rotted, sediment clogged or otherwise become ineffective at trapping sediment.
- If flow is evident around the edges of the installed bioroll, extend the barriers or evaluate replacing them with temporary check dams.
- If there is erosion or undercutting at the base or sides of the bioroll, or large volumes of water are being impounded behind the bioroll, the bioroll may be reinforced with an additional sediment control measure such as silt fence or a temporary rock check dam.
- If biorolls require frequent repair or replacement, reevaluate the material you selected and consider choosing a different product or technique for the location/intended function.

S.2 Temporary Sediment Traps and Basins

Temporary Sediment Traps and Sediment Basins are structures used to intercept stormwater runoff and retain it long enough allow sediment to settle. The sediment trap is a temporary measure installed in drainage ways and used more to detain runoff, while the sediment basin is a more permanent measure that can store runoff and sediment in areas where other erosion control measures are not adequate to prevent off-site sedimentation

Temporary Sediment Traps

Where

- Drainage area is 5 acres or less.
- Formed by excavating a pond, or by placing an earthen embankment across a low area or drainage swale.

Benefits

- Provides additional sediment storage along a perimeter or at the bottom of a steep slope.
- Can be incorporated into final site drainage design (e.g., sites where final stormwater management system includes basins, depressions, etc.).
- Can be installed in tight construction sites and areas with spatial constraints.
- Easily incorporated in construction phasing and sequencing approach – can be constructed and removed throughout the project.

Limitations

- Limited capacity on sites with a high groundwater table.
- Standing water for duration of greater than four (4) days may create mosquito breeding habitat.
- Overflow from sediment trap may require secondary or additional treatment(s) if adequate settling time not achieved for clarifying runoff.



Temporary sediment trap installed along a drainage way

Image source: [MassDOT](#)

Installation Tips

- Clear, grub and strip all vegetation and root material from area of embankment and place embankment fill. Compact fill and construct side slopes 2:1 or flatter.
- Typically, sediment traps are two times (2x) longer than wide and 2 feet deep.
- Rock can be used at the outlet to limit erosion and provide additional filtration.
- Linear sediment traps should be kept narrow and shallow (2 feet wide by 1 foot deep).
- If used adjacent to a slope toe, care should be taken to avoid over-steepening or destabilizing the slope.

Inspection and Maintenance

- Inspect after every rain event and remove accumulated sediment, remove erosion and piping holes, clean or replace the spillway gravel and inspect vegetation.
- Install a stake with a marking at $\frac{1}{2}$ the design depth. Remove sediment when it reaches this mark.
- Over topping of dam may result due to inadequate spillway size.
- Inadequate storage capacity may be due to the need to remove sediment more frequently.
- Erosion of the embankment may be due to inadequate vegetative cover or over-steepened side slopes.

Temporary Sediment Basins

Where

- Install only where space and topography are appropriate to allow for a basin capacity large enough to contain a specified storm runoff volume.
- Install in areas with drainage areas of ≤ 100 acres.
- Basins should not be installed where failure may cause injury to persons, damage to property, or prevent access to roads, or utilities.

Advantages

- Can be incorporated into overall site drainage design.
- Effective for treating large quantities of turbid runoff.



Temporary sediment basin [Image source: BSC Group](#)

Limitations

- Standing water for a duration of greater than four (4) days may create mosquito breeding habitat.
- Sediment basins require a large area for installation.
- Overflow from sediment trap may require secondary or additional treatment(s) if adequate settling time not achieved for clarifying runoff.

Installation Tips

- Locate the basin in an easily accessible upland area, not wetland area.
- Locate in an area that intercepts the largest possible amount of runoff from the disturbed area.
- Divert sediment-laden water to the upper end of the sediment pool to improve trapping effectiveness.
- Basin should have a surface area sufficient to handle the anticipated peak discharge from the area being treated. $A_s = 0.01Q_p$ where A_s = Basin surface area in acres and Q_p = incoming peak discharge (cubic feet per second).
- Sediment basins can also be outfitted with baffles made from coir, jute or other porous materials that help to further reduce the velocity of incoming stormwater runoff and encourage sediment deposition, as well as skimmers which help increase drainage/dewatering duration.

Inspection and Maintenance

- Inspect basin after each rain event.
- Remove and properly dispose of sediment when it accumulates to one-half design volume (marked by a reference stake).
- Repair structural devices related to the riser assembly and any dewatering equipment (skimmer, etc.)
- Monitor embankment, spillway, and outlet for erosion. Repair erosion problems immediately.
- Clean and or replace gravel when needed.
- Where skimmers are used, inspect for clogging or blockage of intake, leaks around joints, grounding.

S.3 Catch Basin Inlet Protection

Temporary devices placed around and within existing catch basin inlets to protect the stormwater management system from high sediment loads and high velocities, while disturbance due to construction is occurring in the drainage area.

Sod or Stone Mound Inlets



Stone mound inlet protection [Image source: BSC Group](#)

Where

- Areas where stormwater run-off is relatively heavy and overflow capability is necessary. Sod can be used where the surrounding area will be vegetated, while stone can be used in areas prone to the heaviest flows.
- Sod should only be used in well vegetated areas and when the general area around the inlet is planned for vegetation.
- Sod is well suited for lawns.
- Stone mounds are well suited for the heaviest flows in all instances.

Benefits

- Easier to maintain than BMPs installed within a drop inlet structure (e.g., Filter Baskets or Silt Bags), because structures do not need to be opened in order to remove sediment.

Limitations

- Some forms of this type of inlet protection may create pooling situations, which may encroach upon traffic areas or structures.

Installation Tips

- For Sod: A mound of permanently vegetated sod should be placed around the perimeter of the inlet to a minimum height of 6 inches. See E.13 Sod for additional information
- For Stone: Stone can be used alone or in combination with stacked concrete blocks. Gravel alone will slow drainage time and increase settlement.
- Place wire mesh with 0.5 inch openings over the inlet with 1 foot extending on each side. Overlay with filter fabric.
- Surround inlet with mound of gravel, 1 inch diameter or smaller, to a minimum height of 6 inches, placed over the mesh.
- If blocks are used, stack them around the inlet, between 12 and 24 inches high, place mesh over the openings and pile the gravel against the outside face of the blocks.

Inspection and Maintenance

- Inspect weekly and after each major rain event.
- Remove accumulated sediment when it reaches one half of the height of the filter mound. Stone especially must be regularly maintained in order to maintain permittivity.
- Repair erosion and scour around the device as necessary. Some repairs may require modifications to the device or implementation of other ESC practices on site to help reduce sedimentation or runoff flow velocity.



Silt bag drop inlet protection [Image BSC Group](#)

Filter Baskets or Silt Bags

Where

- To be installed within catch basins in combination with straw bales, fabric, stone or sod drop inlets.
- Can potentially be used alone where drainage area is small and has shallow flows.
- May cause ponding or may rip under heavier flows without the additional external filtering method.

Benefits

- Relatively inexpensive.
- Relatively simple installation.

Limitations

- Prone to clogging, overflow, or tearing.
- Trapped sediment reduce flow rate of device resulting in flooding or icing conditions.
- Can be challenging to maintain or remove without release of sediment into storm drain.

Installation Tips

- Several trademarked/name brand filter/silt bags exist and should be installed per the manufacturer's instructions.
- Almost all consist of a porous fabric bag which is fitted under the catch basin grate.
- Sediments are filtered out of the stormwater and accumulate in the bag.

Inspection and Maintenance

- Inspect inlet and fabric weekly and after each major rain event.
- Remove sediment when the bag is halfway full.
- Replace bags when wear becomes evident to avoid ripping.

S.4 Outlet Protection and Stabilization

Measures designed to control erosion and scour at the outlet of a water conveyance structure, by reducing the velocity and dissipating the energy of stormwater flow. Also known as velocity dissipation devices, the outlet protection structures should be designed to handle the peak runoff from the 10-year storm. Outlet protection and velocity dissipation can prevent plunge pools and gullies from forming that may significantly weaken and undermine embankments and slopes. Outlet protection should be constructed early during the project-related activities, but can be installed whenever necessary. Outlet protection devices can include stone/riprap, TRMs, or other devices specifically designed to prevent scour.



Riprap outlet protection at an outfall pipe [Image source: BSC Group](#)

Where

- Install at the outlet of all pipes, culverts, swales, diversions, drains or other water conveyances where velocity of flow may cause erosion in the receiving channel or receiving area.
- Use at outlets where the design capacity for stormwater flow velocity could result in plunge pools.

Benefits

- Provides immediate stabilization and protection of outlet area.
- Extremely effective for energy dissipation.

Limitations

- Requires frequent inspection to ensure adequate function and maintenance (debris and detritus removal, etc.).

Installation Tips

- Excavate sub grade below the design elevation to allow for thickness of filter fabric and riprap. The riprap will need to be at least as thick as 1.5 times the maximum stone diameter.
- Construct the apron on zero grade. It should be straight and aligned with the receiving channel, with sufficient length to dissipate energy.
- Compact the fill used in the sub grade to the density of surrounding material, and smooth out the surface to avoid tearing the filter fabric.
- Install a continuous section of extra strength filter fabric on the smooth, sub grade surface.
- Protect the filter fabric from tearing while the riprap is installed with machinery. The top of the riprap apron must be level with, or slightly lower than the receiving channel.
- If the fabric tears during riprap placement, repair it immediately by completely replacing the torn fabric.
- Immediately after installation, stabilize all exposed disturbed areas with vegetated cover.

Inspection and Maintenance

- Inspect after every rain event for stone displacement and erosion at the sides and ends of the apron.
- Add stone if sediment builds up within the crevices of the outlet structure.
- Make necessary repairs with appropriately sized stones but do not place stones higher than the finished grade.
- If erosion occurs around apron and scour holes appear at outlet, foundation may not be excavated wide or deep enough.
- If erosion is occurring downstream:
 - Riprap apron may not be on a level grade
 - Riprap stones may be too small or not graded well.
 - Riprap may not extend far enough down slope.
- If movement of stone is occurring:
 - Riprap stones may be too small or not graded well.
 - Appropriate filter fabric may not be installed under riprap.
- If erosion of the foundation is occurring, the appropriate filter fabric may not be installed under riprap.

S.5 Floating Siltation Barriers

Temporary flexible barriers used within a waterbody to separate or deflect natural flow around a work area. Barriers are placed around the source of the sediment to contain the sediment-laden water, allowing suspended soil particle to settle out of suspension and stay in the immediate area. Floating siltation barriers are often called silt or turbidity curtains, and can be purchased from manufacturers or constructed on site.



Floating Turbidity Curtain Image source: MassDOT

Where

- In streams – use only in negligible or low flow conditions, typically less than 2.5 ft./sec. and depths between 2.6 ft and 6 ft deep.
- In ponds – can be used to depths up to 30 feet with weighted ballast and low water velocities.
- In coastal areas – can be used to depths up to 30 feet with weighted ballast and low water velocities, and with waves potentially up to 10 feet.
- Do not use to stop, divert, or filter a significant volume of water.

Installation Tips

- Purchasing (or renting) a pre-manufactured silt curtain such as will save time constructing the barrier. Follow the manufacturer's specifications and installation instructions.
- Enclose the smallest area as possible. Locate the barrier far enough away from construction equipment to avoid damage to the barrier itself.

- Launch the furled barrier from a ramp, pier or shore. Set the shore anchor points and tie off one end of the barrier to the stream anchor point and the downstream end to a boat. Bring to the downstream point to be anchored.
- Anchor the barrier in the desired formation and ensure the skirt is not twisted around the flotation device.
- Cut the furling ties and let the ballast sink to its maximum depth.
- Slant the barrier at an angle, not perpendicular to the flow. If the barrier will be exposed to reversing currents, anchor it on both sides.

Inspection and Maintenance

- Inspect daily for any rips or tears or turbidity in the stream flow. Repair immediately with overlapping pieces of geotextile fabric.
- Remove accumulated sediment from the base of the barrier. If necessary, dewater turbid water to an onshore filter bag, or other apparatus before removing the barrier.
- Remove the barrier carefully when the work is completed and after suspended sediments have been allowed sufficient time to settle out.

GOOD HOUSEKEEPING AND GENERAL OPERATIONS

H.1 Stabilized Ingress/Egress & Tire Wash

Stabilized construction ingress/egress points are often outfitted with a stone-stabilized pad located at construction vehicle entrance/exit to a site which provides. Stabilized access points help to reduce the tracking of mud and sediment off-site onto public roads, reduces hazards associated with sediment accumulation on public roadways, and reduces potential for sediment-laden stormwater runoff from flowing off the site and on to public roadways. Where necessary, tire washes can be used in combination with stabilized access points to help further remove sediment from vehicle tires.

Where

- Install at the entrance and exit of construction vehicle access roads to the site, at intersections with public roadways
- Do not install at curves in public roadways
- Do not install on steep slopes. Install on as level of a grade as possible.

Benefits

- Reduces offsite tracking of mud, sediments and other pollutants onto paved roadways.
- Can help prevent sedimentation toward offsite stormdrains and sewers.
- Reduces potential for generation of airborne dust.

Limitations

- Can be relatively expensive to construct and maintain.
- Tire washes require access to a water supply.
- Runoff from tire washes must be managed properly and directed toward a sediment basin or trap, or treated onsite in order to remove pollutants and reduce potential for creating muddy, messy areas.

Installation Tips

- Install 3 to 4-inch-diameter stone, reclaimed stone, or recycled concrete over geotextile fabric.
- Length of pad should be a minimum of 50 feet.
- Width of pad should extend the entire width of the construction access road.
- Flare the end of the pad at the entrance/exit to the public roadway.
- If washing will also be used at exit, install provisions to intercept the wash water and trap sediment before it is carried off-site.



Stabilized Construction Entrance Image source: [MassDOT](#)

Inspection and Maintenance

- Inspect once a week and after every rain event.
- Inspect public roadway for sediment deposition.
- Inspect pad for muddy conditions. If pad is muddy:
 - Stone is too small. Install larger stone.
 - Pad too thin. Install additional stone.
 - Install additional filter fabric under pad.
- If sediment is washing on to road:
 - Runoff control is inadequate. Improve up-gradient runoff control as necessary.
 - Pad is too short for construction traffic. Extend pad beyond the minimum of 50 feet.
 - Pad is not sufficiently flared at the road entrance. Flare the pad at the public roadway.
 - Use a tire wash in combination with the stone pad. Wash the tires of all exiting vehicles with pressurized water.

H.2 Construction/Haul Road Stabilization

Stabilizing on-site transportation routes, temporary construction access roads, and construction parking areas reduces erosion and prevents blowing dust problems. It also improves the efficiency of work and activities on and around the site, and decreases the amount of sedimentation transported to nearby streams or wetlands. Since construction roads are continuously disturbed by traffic, they are highly vulnerable to erosion and cannot be stabilized with vegetation. Stabilization materials should be cheap to install and easy to remove if the final condition of the area will be affected.

Where

- Temporary on-site construction access roads and transportation routes.
- Temporary construction vehicle parking areas.
- Do not construct haul roads on steep slopes > 15%.
- Do not construct haul roads within wet areas.
- Do not construct haul on highly erodible soil.



Construction haul road [Image source: MassDOT](#)

Benefits

- Reduces erosion from vehicular traffic and helps limit airborne dust.
- Can improve on-site work efficiency and access during inclement weather
- Limits potential for immobilized machinery and delivery vehicles.

Limitations

- May require maintenance to repair ruts or replace aggregate.
- May be costly to install and demolish if not a component to the final site design or surface treatment.

Installation Tips

- Immediately following grading and installation of utilities within the road right-of-way, install a 6 inch layer of 2 to 4-inch-diameter crushed rock or gravel base.
- Install the road along the contour of the natural terrain to the extent possible.
- The road should be designed to handle the maximum weight of the machinery that will be utilizing it.
- Stabilize any possible adjacent areas with vegetative cover.
- The slope of the temporary road should not exceed 15%.
- Grade roadway carefully to divert excess runoff from roadway to stable areas. Drainage swales can be provided along the sides of the road.
- Protect any existing drain inlets. (See S.3 Catch Basin Inlet Protection)
- Dust control should be used when necessary (i.e. soil wetting, dust covers, etc. (See H.7 Dust Control).
- Pave permanent roads and parking areas as soon as possible after grading. The initial application of stone may also prevent recurrent erosion and sedimentation problems, and can be used in the base fill of the road.

Inspection and Maintenance

- Inspect once a week and after every rain event.
- If muddy conditions exist, add crushed rock or improve surface drainage.
- Re-stabilize eroding areas immediately.
- Install/implement dust control measures as necessary.

Special Considerations

- If temporary access will be necessary near a stream bank or wetland, clear vegetation to ground level, no lower. This will encourage rapid re-growth of natural vegetation.
- Grubbing in the road right-of-way is not necessary in areas that will not be permanently disturbed.
- If vehicular access is necessary in or adjacent to wetlands, streams, or other saturated soils, the typical gravel based construction road should not be used. For access across streams, wetlands, or other saturate soils, entirely different mitigation measures apply.

H.3 Swamp Mats/Timber Mats

The use of swamp mats allows for heavy equipment access within wetland and other seasonally wet areas by creating temporary access roads through these areas. Using swamp mats minimizes the need to remove vegetation beneath the access way and helps to reduce the degree of soil disturbance and rutting in soft wetland soils. The swamp mats used most often are 1 ft by 1 ft by 16 ft wooden timbers bolted together typically into 4-ft by 16-ft sections, wooden lattice mats, or plastic composite mats. In some cases, swamp mats or other mats are used for staging or access in upland areas based on site conditions (e.g., agricultural field access) or for small stream or ditch crossings.

Where

- Temporary on-site construction access roads and transportation routes within wetlands and other wet areas.
- Temporary construction staging areas on soft soils.
- Do not construct haul roads on steep slopes

Benefits

- Reduces rutting and erosion from vehicular traffic and helps limit airborne dust.
- Reduces impact to wetland areas.
- Impacted areas recover quickly following construction with a minimal amount of restoration work.
- Minimizes the need for erosion controls along access routes through wetlands.
- Easier to install and remove than temporary crushed rock access roads.
- Materials are re-usable and there are several specialty installers to choose from.
- Access roads can be built from “on structure”.

Limitations

- Requires cleaning between uses to avoid transferring invasive species for site to site.
- May be more costly to install and demobilize than a base intended as a component to the final site design or surface treatment.
- Requires specialty equipment for installation and removal.
- Rental costs can be significant.



Swamp Mat Use Through Wetlands [Image Source: BSC Group](#)

Installation Tips

- To traverse minor slopes and uneven ground the mats can be stacked with each succeeding layer perpendicular to the last. This method can also be used to build temporary bridges over small streams and ditches.
- Install the swamp mats along the contour of the natural terrain to the extent possible.
- The road should be designed to handle the maximum width, turning radius, and weight of the machinery that will be utilizing it.
- The transition ramps to the mats should be in an upland area and can be made of crushed stone.
- Erosion controls should be placed along the ramp transitions but are not necessary along the swamp mat road.
- The slope of the swamp mat road should be close to 0%. Mat roads can be slick when wet.
- If mats are to be placed in an area with tall vegetation the vegetation should be cleared to a foot above ground level, no lower. This will encourage rapid re-growth of natural vegetation.
- Mowing contractors may have to work off the leading edge of a swamp mat in order to lay the next swamp mat.

Inspection and Maintenance

- Inspect once a week and after every rain event for signs of settling or separation.
- Inspect the transition ramps and paved surfaces at the ends of the swamp mat roads for sediment carryover/tracking

Special Considerations

- Timber swamp matting may be in high demand during the construction season.
- Permitting authorities may require that mats be removed following a construction season. This may require multiple mobilizations/demobilizations.

H.4 Stockpile Management

Measures implemented to reduce sediment or pollutant loads in stormwater flow that has come in contact with stockpiles of soil or other materials involved with paving or grading activities.

Where

- Any site where soil or paving materials will be stockpiled.
- Place stockpiles out of the way of concentrated flows of stormwater and drainage channels. Do not stockpile near catch basin/inlets or wetlands and waterways wherever possible.
- Where soils are contaminated (e.g. urbanized or industrial areas where spills, discharges or underground tanks have led to soil contamination), follow specific instructions provided by the RE based on the type of contaminant identified.

Benefits

- Minimizes potential pollutant runoff from stockpiles.
- Supports compliance potentially applicable project permit requirements (OOC, WQC, etc.)

Limitations

- May limit stockpile access.
- May reduce available work and staging areas.

Best Management Practices

- Install PCs (biorolls, haybales, silt fence) around the stockpile to protect the pile from erosion, as well as to prevent sedimentation.
- Stockpiles can be wetted to control dust during dry periods. (See H.7 Dust Control).
- Soil stockpiles should be temporarily seeded if they will remain inactive for more than 21 days. (See E.12 Temporary and Permanent Seeding). Roots from vegetative cover will help provide soil cohesion and reduce potential for erosion from rainfall.
- Stockpiles with higher pollutant potential can be placed on plastic liners. The pile should also be covered in plastic sheeting to protect from rain and wind.
- Plastic covering can also be used to prevent erosion and as a dust control on stockpiles that will remain inactive.
- Avoid stockpiling of contaminated materials. If stockpiling is necessary, enclose with PCs and cover in plastic sheeting as specified.

- Do not stockpile contaminated soils near drains or waterways.
- Install temporary security fence around contaminated zones.
- Prevent ground, surface and storm water from flowing through the contaminated zone. If water is contaminated, collect and contain it and bring it to the proper disposal or treatment site.
- Dispose of all contaminated excavate at the proper facilities.

Installation of Plastic Covering (where applicable)

- Do not use plastic covering on stockpiles upgradient of unstable or steep slopes due to a high velocity of runoff caused by the plastic surface.
- Plastic sheeting should be at least 0.06 mm thick.
- Run plastic up and down slope rather than across, with a minimum of 8 inch overlap at the seams.
- Seams should be taped, especially in wind-blown areas.
- Place plastic in 12 inches wide by 6 inches deep slope trenches at the top and bottom of the stockpile. Backfill to hold in place.



Plastic Sheeting on Stockpiles Image source: BSC Group

Inspection and Maintenance

- Inspect plastic covering for tears or open seams. Repair immediately to prevent erosion.
- Inspect PCs regularly. Clear away excess sediment as described in S.1 Perimeter Controls.

H.5 Dewatering

Dewatering is often necessary in or adjacent to wetlands or streams to expose the work area and provide drier workspace. Discharges should be conveyed to filter bags in well-vegetated areas outside of the wetlands. The filter bags can be placed within containment corrals when discharging in especially sensitive areas, such as near streambanks or wetlands.

Filter Bags and Straw Bale Containment

Where

- Use filter bags for discharge when it is necessary to dewater the work area or excavation in order to provide a drier workspace.
- Dewatering sites should be located in well-vegetated areas within the ROW or within approved work areas.
- Where possible, discharges should be located outside of wetlands and over 100 feet from a streambank or waterbody.
- If a well-vegetated area is not available, or if the discharge will be within 100 feet of a wetland or waterbody, discharge to a filter bag and a containment structure.



Filter bag & straw bale dewatering area Image source: BSC Group

Benefits

- Effective at detaining sediment from dewatering areas.
- Dewatering to a controlled area or structure helps to limit potential erosion from dewatering effluent.

Limitations

- Filter bags can be prone to clogging when detewatering contains very turbid water.

Installation Tips

- Pump should be placed in a containment structure, such as a plastic, child-sized pool to avoid any fuel leaks to the wetlands or waterways.
- Properly place the discharge hose into a pre-manufactured, geotextile filter bag per the manufacturer's instructions.
- If possible, place the filter bag in a well-vegetated area outside of a wetland area and over 100 feet from a waterbody.
- The intake hose should be elevated off the ground, and a sump should be created with clean rock in order to avoid pumping additional sediment.
- If the water must be discharged within 100 feet of a wetland or waterbody, a containment corral should be built around the filter bag.
- Install the containment corral in an "L" or "U" shape on the downgradient sides of the bag. This will further filter the discharge water.

Inspection and Maintenance

- Pump refueling should be done within a plastic containment structure, or over 100 feet from the wetland or waterbody.
- The pump should be manned at all times.
- The filter bag should be checked regularly during pumping activities to ensure that it is not reaching its holding capacity.
- If the bag appears to be nearing capacity, dewatering should cease until more water has filtered out and the bag can be replaced.
- Used filter bags and trapped sediment, must be disposed of in the proper manner.

REMEMBER*

Under no circumstances should trench water, or other forms of turbid water, be directly discharged onto exposed soil or into any wetland or waterbody.

H.6 Concrete Washout Area

A concrete washout area is a temporary, structural BMP designed to prevent runoff of concrete removed from vehicles/equipment by washing from entering storm drains and waterbodies. Washout areas may be lined or unlined excavated pits, aboveground structures, earthen bermed areas, or prefabricated portable containers.

Where

- Where concrete vehicles/equipment are washed on site.
- Where concrete or concrete waste must be disposed of on site.
- Where environmentally sensitive areas are absent from the vicinity of the site.

Benefits

- Reduced cost and logistics associated with daily management of concrete waste by managing on site.

Limitations

- Require frequent maintenance where concrete pouring, management, etc. is actively occurring onsite.



Example of a concrete washout area [Image source: BSC Group](#)

Inspection and Maintenance

- Ensure signage is present indicating the location of the washout area.
- Ensure that concrete delivery personnel understand the location of, and need for, such washout measures.
- Remove excess material when 75% of the washout capacity is reached.

H.7 Dust Control

Used to reduce surface and air movement of dust from exposed soil surfaces during land disturbance, demolitions and construction activities. These practices will decrease the amount of dust in the air, decreasing the potential for accidents, respiratory problems and airborne sedimentation. To reduce the amount of areas requiring dust control, construction activities should be scheduled appropriately to have as little of the site surface as possible exposed at one time.

Where

- Disturbed soil surfaces and exposed soil surfaces, especially during hot or dry weather periods and in areas with excessively well-drained soils.



Water sprinkling used for dust Control Image source: BSC Group

Benefits

- Decreasing the concentration of airborne dust reduces the potential for on and offsite accidents, respiratory problems and is a good-neighbor practice.

Limitations

- Excessive use of water to control airborne dust, particularly where the soil has been compacted, can cause runoff problems and muddy sites.

Methods

Table 1. Dust Control Methods and BMPs

Type	Description/Uses
Vegetative Cover	<ul style="list-style-type: none">• Most effective and practical method.• Use in disturbed areas not subject to traffic.• Follow seeding requirements as directed by EAD or permit requirements.
Stone	<ul style="list-style-type: none">• Cover soil surface with crushed stone/coarse gravel.
Water/Sprinkling	<ul style="list-style-type: none">• Sprinkle exposed soils until wet (Water trucks may be used depending on size of the site).• Do not excessively wet the soil as this causes run-off and also wastes water.
Barriers	<ul style="list-style-type: none">• Board fences, wind fences and sediment fences control air currents and blowing soil.• Wind barriers protect soil downgradient for a distance of ten times the barrier height.• Perennial grasses and stands of existing trees also serve as wind barriers, stressing the importance of planning work phasing properly and minimizing the amount of exposed soil.
Plastic Covering	<ul style="list-style-type: none">• Cover soil piles with sheets of plastic/tarp to minimize dust.

Inspection and Maintenance

- Repetitive treatments should be used as needed, or required by permits, and until the surface is permanently stabilized.

H.8 Construction Waste Material Management

Sound construction and waste material management practices are an important practice for preventing discharge of construction debris and potential pollutants from the site and into storm drains. The NPDES CGP requires construction site operators to control and manage waste in a manner that avoids adverse impacts to water quality.

Approach

- Designate a waste collection area(s) for the construction site. Clearly identify these locations in the SWPPP and ESC Plan.
- Dumpsters must be covered whenever they are not in active use and especially during rain events or when predicted rainfall is imminent. Covering dumpsters helps prevent waste from being displaced by wind and contaminated runoff from flowing out of dumpster.
- Liquid waste and chemicals (e.g., petroleum products, paints, solvents, pesticides, curing compounds, etc.) should not be placed in dumpsters designated for litter and construction debris. They should be disposed of in accordance with the SWPPP and any other pertinent project permits.
- Dumpsters should not be washed out, except when located in areas of proper containment and management.
- Sanitary facilities/portable toilets should be located on level ground surface away from sensitive areas.

Inspection and Maintenance

- Inspect areas in and around dumpsters for trash and debris outside of designated dumpsters.
- Inspect the dumpster and surrounding area for liquid waste draining from the dumpster.
- Ensure that neither liquid waste nor chemicals have been placed in dumpsters designated for litter and construction waste.
- If dumpsters are full, they should be emptied immediately.
- Inspect site inlets, outfalls and drainage ways for collected litter, debris, containers, etc.
- Empty portable toilets as required.
- Update the SWPPP if the construction waste management plan changes.

H.9 Street Sweeping

Sweeping equipment varies considerably and careful consideration should be given to selecting the most appropriate type of equipment for the site.

Sweeper Brooms:

Inexpensive, but generate dust

Pick-up Brooms:

Relatively inexpensive and generate less dust

Pick-up broom with water and vacuum collection:

Provide effective sweeping and good dust control

Pick-up broom with water, vacuum collection, air recirculation and filtration:

Best form of dust control and sweeping effectiveness. Though the most expensive option, it may be the most appropriate option for sensitive environments – e.g., near schools, hospitals, neighborhoods, etc.

PROJECT CLOSE-OUT

Final Site Stabilization

Final Punchlist

Environmental Compliance

- All disturbed areas permanently stabilized
 - (100% vegetative cover)
- All ESC devices removed from site:
 - Silt fence, stakes, posts. Note: Straw bales and other degradable BMPs may remain in place to degrade if approved by RE.
- Landscaping:
 - All plantings installed. Healthy.
 - Seed has germinated and plants established.
- All debris and solid waste removed.
- All stockpiles (borrow and contaminated) removed.
- Storm Drainage System cleaned and fully functional.
- Sediments removed in structures and at discharge points.
- All asphalt and concrete waste piles removed.
- Bridge Projects
 - All debris removed from channel, foundations, piers, substructure elements of former bridge removed/cut below mud line. Channel sweep performed (Coast Guard permits).
- All deliverables in Environmental Permits submitted:
 - Certifications, survey information, As-Built Plans, Reports, etc.
 - Contact District Environmental Engineer for complete list.
 - NOT submitted to USEPA in accordance with the NPDES CGP requirements.

Acronyms & Abbreviations

AASHTO	- American Association of State Highway and Transportation Officials
BMP	-Best Management Practice
CGP	-Construction General Permit
CWA	-Clean Water Act
CY	-Cubic Yards
DoA	-Determination of Applicability
ECB	-Erosion Control Blanket
ESC	-Erosion and Sediment Control
fps	-Feet per second
HECP	-Hydraulically Erosion Control Products
MassDEP	-Massachusetts Department of Environmental Protection
MassDOT	-Massachusetts Department of Transportation
MESA	-Massachusetts Endangered Species Act
NOI	-Notice of Intent
NOT	-Notice of Termination
NPDES	-National Pollutant Discharge Elimination System
NTU	-Nephelometric Turbidity Units
OOC	-Order of Conditions
PAM	-Polyacrylamide
PC	-Perimeter Control
RE	-Resident Engineer
RECP	-Rolled Erosion Control Products
ROW	-Right-of-Way
SWPPP	-Stormwater Pollution Prevention Plan
TDC	-Temporary Ditch Check
TOY	-Time-of-Year
TRM	-Turf Reinforcement Mat
USACE	-United States Army Corp of Engineers
USEPA	-United States Environmental Protection Agency
WQC	-Water Quality Certificate

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- **Construction Site Best Management Practices Manual:** California Department of Transportation
- **Construction Stormwater Best Management Practices:** Nebraska Department of Roads.
- **Erosion and Sediment Control Planning and Design Manual:** North Carolina Sedimentation Control Commission, North Carolina Department of Environmental and Natural Resources, North Carolina Agricultural Extension Service
- **Erosion and Sediment Control Field Guide for Construction Inspection:** Illinois Department of Transportation
- **Erosion and Sediment Control Pocket Guide:** University of Minnesota
- **Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas:** Massachusetts Department of Environmental Protection
- **Roadside Revegetation: An Integrated Guide to Establishing Native Plants:** Coordinated Technology Implementation Program.
- **Vermont Erosion Prevention and Sediment Control Field Guide:** Vermont Department of Environmental Conservation

Special thanks to those who wrote, edited and created this ESC Field Guide:

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Content and Design Consultant: BSC Group, Inc.

Image sources: As noted in captions.

Ten Things You Can Do to Reduce Erosion On Your Site and Comply With Your Permits

- 1.** Preserve existing site vegetation wherever possible, especially buffers adjacent to water resource areas.
- 2.** Limit soil disturbance areas by thoughtfully phasing and sequencing construction activities.
- 3.** Limit the duration of exposed soils on your site. Stabilize soils promptly.
- 4.** Intercept and infiltrate stormwater runoff as close to source the possible in order to help prevent it from running across and eroding exposed soils.
- 5.** Minimize hard surfaces on your site and avoid unnecessary soil compaction.
- 6.** Break up slope lengths in order to slow down runoff and reduce its erosive energy.
- 7.** Establish and maintain dedicated stabilized construction ingress and egress locations.
- 8.** Ensure storm drain inlets are adequate protected from sedimentation and controls are functioning appropriately.
- 9.** Read and understand your permits and ask questions about any project-specific requirements.
- 10.** Inspect and maintain your erosion and sediment control devices regularly.

Think like a raindrop.