Staging Areas

Description

This BMP includes measures for collecting runoff from a staging area, materials storage site, or industrial activity area or for diverting water flow away from such areas so that pollutants do not mix with clean stormwater runoff. Various flow diversion structures, called stormwater conveyances, can be used to contain runoff on site, to channel it around the industrial area, or to carry pollutant-laden water directly to a treatment device or facility. Several options are available:

**Stormwater Conveyances**: This term includes many kinds of channels, gutters, drains, and sewers. Stormwater conveyances can be either temporary or permanent. They are constructed or lined with many different materials, including concrete, clay tiles, asphalt, plastics, metals, riprap, compacted soils, and vegetation. The type of material used depends on the use of the conveyance.

**Dikes or Berms**: Diversion dikes or berms are ridges built to block runoff from passing beyond a certain point. Temporary dikes are usually made with compacted soil or compost. More permanent ones are constructed out of concrete, asphalt, or other durable materials.

Diversion dikes are used to prevent the flow of stormwater runoff onto construction or staging/storage areas. Limiting the flow across these areas reduces the volume of stormwater that may carry pollutants from the area and, therefore, require treatment. This method is suitable for sites where significant volumes of stormwater runoff tend to flow onto active materials handling or equipment staging sites and other construction areas.

**Graded Areas and Pavement**: Land surfaces can be graded, or graded and paved, so that stormwater runoff is directed away from construction activity areas. The slope of the grade allows the runoff to flow, but keeps it from washing over areas that may be contaminated with pollutants. Like conveyances and dikes, grading can prevent runoff from entering construction areas and becoming contaminated with pollutants from these areas. Grading can be a permanent or temporary control measure.

Applications

**Stormwater Conveyances**: Stormwater conveyances can be used for two different purposes. The first is to keep uncontaminated stormwater from getting into areas of a construction site where it may become contaminated. This can be accomplished by collecting the stormwater in a conveyance and directing the flow away from those areas. Secondly, conveyances can be used to collect stormwater downhill from construction areas and keep it separate from runoff that has not been in contact with those areas. When potentially contaminated stormwater is collected in a conveyance like this, it can be directed to a treatment device or another facility on the site if desired.
Other beneficial aspects of stormwater conveyances include:

- Prevention of temporary flooding at industrial sites.
- Low maintenance.
- Erosion-resistant conveyance of stormwater runoff.
- Long-term control of stormwater flows.

**Dikes or Berms:** Typically, dikes are built on slopes just uphill from an active construction area together with some sort of a conveyance, such as a swale. The conveyance is necessary to keep the water away from the dike so that the water will not pool and seep through the dike. See BMP 41-Earth Dike.

Some advantages of diversion dikes are that they:

- Effectively limit stormwater flows over industrial site areas.
- Can be installed at any time.
- Are economical, temporary structures when built from soil on site.
- Can be converted from temporary to permanent at any time.

**Graded Areas and Pavement:** Grading is appropriate for any construction site where outdoor activities may pollute stormwater runoff—parking lots or outdoor storage areas, for example. Grading is often used in conjunction with coverings, buffer zones, and other practices to reduce the runoff velocity, increase infiltration of uncontaminated runoff, or direct pollutant-laden runoff to stormwater treatment facilities. Grading and paving are relatively inexpensive and easy to implement.

**Limitations**

<table>
<thead>
<tr>
<th>Drainage area - unlimited</th>
<th>Maximum slope – 15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum bedrock depth - N/A</td>
<td>Minimum water table – N/A</td>
</tr>
<tr>
<td>NRCS soil type - ABCD</td>
<td>Freeze/thaw – good</td>
</tr>
<tr>
<td>Drainage/flood control – yes</td>
<td></td>
</tr>
</tbody>
</table>

**Stormwater Conveyances:**

Once the stormwater is concentrated in conveyances, it should be routed through stabilized structures all the way to its discharge to a receiving water or other stormwater BMP.

- May increase flow rates.
- May be impractical if there are space limitations.
- May be expensive to install, especially for small facilities or after a site has already been constructed.

**Dikes and Berms**

- Are not suitable for large drainage areas unless there is a gentle slope.
- May require maintenance after heavy rains.

**Graded Areas and Pavement**

- May be uneconomical to re-grade and resurface large areas.
- May not be effective during heavy precipitation.
Targeted Pollutants

Design Parameters

Sediment

**Stormwater Conveyances**: In planning for stormwater conveyances, consider the amount and speed of the typical stormwater runoff. Also, consider the stormwater drainage patterns, so that channels may be located to collect the most flow and can be built to handle the amount of water they will receive. When deciding on the type of material for the conveyance, consider the resistance of the material, its durability, and its compatibility with any pollutants it may carry.

Conveyance systems are most easily installed when a facility is first being constructed. Where possible, use existing grades to decrease costs. Grades should be positive to allow for the continued movement of the runoff through the conveyance system; however, grades should not create an increase in velocity that causes an increase in erosion. Consider the materials used for lining the conveyance and the types of outlet controls provided.

**Dikes and Berms**: In planning for the installation of dikes, consider the slope of the drainage area, the height of the dike, the amount of runoff it will need to divert, and the type of conveyance that will be used with the dike. Steeper slopes result in higher volumes of runoff and higher velocities, which the dike should be capable of handling. Remember that dikes are limited in their ability to manage large volumes of runoff. See BMPs 41-Earth Dike for additional parameters.

**Graded Areas and Pavement**: When designing graded and paved areas, be sure to consider both control and containment of runoff flows. The grading should control the uncontaminated flow by diverting it around areas that may have pollutants. The grading should also contain the contaminated flows or divert them to treatment facilities.

Construction Guidelines

**Stormwater Conveyances**: Specific construction methods apply to the type of conveyance being used.

**Dikes and Berms**: Ideally, dikes are installed before construction activity begins. However, dikes can be easily constructed at any time. Temporary dikes (usually made of dirt) generally only last for 18 months or less, but they can be made into permanent structures by stabilizing them with vegetation. Slope protection such as vegetation is crucial for preventing the erosion of the dike.

**Graded Areas and Pavement**: Staging/storage areas should be designated prior to the start of construction.

Maintenance

- It is best to inspect stormwater conveyances within 24 hours of a rainstorm and remove debris promptly. Make daily inspections during periods of prolonged rainfall, since heavy storms may clog or damage the conveyances. It is important to repair damage to these structures as soon as possible.
- Dikes should be inspected regularly for damage. This is especially important after storm events since a heavy rain may wash parts of a temporary dike away. Any necessary repairs should be made immediately to make sure the structure continues to function effectively.
- Inspect unpaved, graded areas to check for gullies and other signs of erosion. Inspect paving regularly for cracks that may allow contaminants to seep into the ground. Also, check to make sure that the drains receiving the discharge from the paved area remain free of clogged sediment or other debris so that the water does not back up into areas where pollutants may be.
Stabilization of Construction Entrance/Exit | BMP 5

**Description**  
A temporary sediment removal device--normally a pad of crushed rock or stone--can be installed at the approach from a construction site to a public roadway to stabilize the road. This BMP is used to limit sediment tracking from vehicles and equipment leaving the construction site onto public rights-of-way and streets.

**Applications**  
A stabilized construction entrance is appropriate in the following locations:
- Wherever vehicles are entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk or parking area.
- At any unpaved entrance/exit location where there is risk of transporting mud or sediment onto paved roads.

**Limitations**
- Drainage area - unlimited
- Minimum bedrock depth – 3 ft
- NRCS soil type - ABCD
- Drainage/flood control – no

**Targeted Pollutants**
- Sediment
- Phosphorus
- Trace Metals
- Hydrocarbons

**Design Parameters**

**Width:** The width should be at least 10 ft but not less than the full width of points where ingress or egress occurs. At sites where traffic volume is high, the entrance should be wide enough for two vehicles to pass safely. Flare the entrance where it meets the existing road to provide a sufficient turning radius.

**Length:** The minimum length should be 50 ft except on a single-residence lot where a 30 ft minimum would apply.

**Depth:** Total depth of rock should be at least 6 in.

**Aggregate:** Fractured stone 2 to 8 in. diameter (for the base layer) and crushed stone 2 in. diameter or reclaimed or recycled concrete equivalent (for the top layer).

**Geotextile (filter fabric):** Most installations will include geotextile (filter fabric) with the products placed over the entire area to be covered with aggregate. Work on single residential lots will generally not need geotextile unless there is potential for excessive erosion, a high water table, or other risk factor. The geotextile should be a woven or
nonwoven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The geotextile should be inert to commonly encountered chemicals, hydrocarbons, mildew, and rot resistant.

**Drainage:** Runoff from a stabilized construction entrance should drain to a sediment trap or a sediment basin. Piping of surface water under the entrance should be provided as needed. If piping is impossible, install a mountable berm with 5:1 slopes.

**Dust Control:** Dust control should be provided at all times (see BMP 7-Dust Control).

**Construction Guidelines**
- Clear all vegetation, roots, and all other obstructions in preparation for grading.
- Prior to placing geotextile (filter fabric), make sure that the entrance is properly graded and compacted.
- To reduce maintenance and loss of aggregate, place geotextile over the existing ground before placing the stone for the entrance.
- Place a 1 ft layer of fractured stone over the entire width and length of the entrance.
- Place a 4 in. layer of 2 in. crushed stone over the base layer.

**Maintenance**
- The entrance should be maintained in a condition that will prevent tracking or flow of mud onto public rights-of-way. This may require periodic top dressing with additional 2 in. stone (as conditions demand) and repair or cleaning of any structures used to trap sediment.
- All materials spilled, dropped, washed, or tracked from vehicles onto roadways or into storm drains should be removed immediately. When necessary, vehicle wheels should be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it should be done on an area stabilized with aggregate that drains into an approved sediment trap.
- Trapped sediment should be removed from the site or stabilized on site and prevented from entering storm drains, ditches, or waterways. Disturbed soil areas resulting from removal should be permanently stabilized.
- The stabilized construction entrance may be removed after final site stabilization is achieved or after the temporary BMPs are no longer needed.
CONSTRUCTION SPECIFICATIONS

1. STONE SIZE—USE 2" STONE OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH—AS REQUIRED, BUT NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS—NOT LESS THAN 6 INCHES.
4. WIDTH—10 FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
5. FILTER CLOTH—WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE. FILTER WILL NOT BE REQUIRED ON A SINGLE FAMILY RESIDENCE LOT.
6. SURFACE WATER—ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPPED ACROSS THE ENTRANCE. IF PIPEING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE—THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WASHING—WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHTS-OF-WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.
Erosion Prevention on Temporary Roads       BMP 6

Description

Any of several measures can be used to control erosion and sedimentation originating with haul roads, detours, access roads, and other unpaved or temporary roadbeds associated with a construction project. Possible measures include:

Road Placement: Place temporary roads as far as possible away from streams, surface waters or wetlands.

Open-Top Box Culvert: A wooden culvert installed across the road grade to convey surface runoff and roadside ditch flows to the downslope side. Open-top box culverts are useful for collecting surface runoff and ditch flows and channeling this water across the road without eroding the drainage system or road surface.

Waterbar (or Cross Ditch): A cut and berm built at a downward angle across the roadway, extending from the cutbank to the opposite fill shoulder. Waterbars reduce erosion by diverting stormwater runoff from the road surface and directing it to a safe discharge area.

Road Sloping: Constructing the road with an outward slope of 1 to 2% from the cut slope to the fill slope. Sloped roads are designed to divert surface water off the entire road surface so that water does not concentrate in any specific location.

Rolling Dip: Constructing the road with shallow, outward-sloping dips or undulations to collect surface runoff and con...
roads where erosion of the roadbed and fill slope is unlikely due to low runoff volume or intensity.

**Rolling Dip:** Used as a runoff diversion measure to prevent erosion of the road surface. Rolling dips are effective on long inclines to keep stormwater from flowing directly down the road, where it may cause gullying and other damage to the road surface and grade.

**Level Spreader:** Useful where concentrated runoff from bare ground or other unstabilized areas can be diverted onto stabilized areas under sheet flow conditions. Level spreaders are often placed at the outlets of diversion dikes or runoff interception trenches to control runoff, dissipate water velocity, and disperse the water over a broad surface area. Level spreaders are relatively inexpensive to install. They may be used on slopes of 3:1 or flatter.

**Open-Top Box Culvert:** Generally, box culverts are not required on grades of 6% or less and are ineffective under continuous or recurrent use where cleaning is sporadic.

**Waterbar:** Suitable only for light-use, low-maintenance, unpaved roads.

**Road Sloping:** Suitable only for low-traffic haul roads where runoff volume and intensity are low.

**Rolling Dip:** Not suitable on road grades steeper than 5%.

**Level Spreader:** Level spreaders are not recommended for use in most situations. They are not suitable on slopes steeper than 3:1 or where the soils are easily erodible. They should be constructed only on natural soils, not on fill material. Level spreaders cannot handle large quantities of sediment-laden stormwater. If altered by erosion or other disturbance, they may "short circuit" and actually concentrate flows into small streams instead of spreading the flows into sheet flow.

**Targeted Pollutants**
- Sediment
- Phosphorus
- Trace Metal
- Hydrocarbons

**Design Parameters**
- **Open-Top Box Culvert:** Box culverts can be built from logs lumber discarded guardrail or corrugated steel. They are installed at a skewed angle downgrade across the roadway, with the discharge end extending 6 to 12 in beyond the surface of the roadbed.
  - Spacing between culverts should be in accordance with recommended cross...
drainage spacing in Table 6-1. Where recommended spacing is less than 33 ft, the road should be paved with gravel or crushed rock.

**Waterbar:** Waterbars are generally constructed using a blade-equipped tractor or by hand. The size of the waterbar depends on the amount of precipitation in the area, the soil erodibility, and anticipated traffic.
- The waterbar should extend from the cutbank side of the road completely across to the fillslope side.
- Cut dimensions: Up to 16 in deep across road, 8 to 16 in deep at outlet, 3 to 4 ft wide.
- Berm dimensions and orientation: 1 to 2 ft high 5 in minimum height, skewed at angle of 30° to 40° across road.
- Spacing between bars: Use Table 6-1 for recommended cross drain spacing on low to moderately steep topography.
- Discharge: Runoff should not be directed onto fill material without proper energy dissipation and drainage away from the fill.

**Geotextile (filter fabric):** Most installations will include geotextile (filter fabric) with the properties listed in Table 6-2, placed over the entire area to be covered with aggregate. Work on single residential lots will generally not need geotextile unless there is potential for excessive erosion, a high water table or other risk factor. The geotextile should be a woven or nonwoven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The geotextile should be rot resistant and inert to commonly encountered chemicals, hydrocarbons, mildew.

**Road Sloping:** The slope should be approximately 1 to 2% from the cut slope outward to the fill slope. Berms on the outside of the road should be limited or removed to allow water to flow off the road surface. Provide sediment collection or erosion-control measures at the toe of the fill slope to prevent excessive erosion and sediment transport.

**Rolling Dip:** (applies to roads greater than 150 ft long only) The dip should be approximately 1 ft below the surface plane of the road. The upgrade approach to the bottom of the dip should be approximately 66 ft long. The downgrade approach to the bottom of the dip should be approximately 23 ft long. Align the dip across the road at nearly a 90° angle, and slope it outward approximately 5%.

**Open-Top Box Culvert:** Construct a box-like frame (three-sided, open-topped) of logs, lumber, discarded guardrail, or corrugated steel. Install it flush with the road surface, skewed at an angle downgrade across the roadway. Set the inflow end at the same grade as the side ditches on the road and extend it into the cut bank. The discharge end should extend 6 to 12 in. beyond the surface of the roadbed and should be directed onto vegetated ground or riprap or into another erosion-control structure such as a sediment trap or catch basin.

**Waterbar:** Cut each waterbar into solid soil to a minimum depth of 6 in. next to the cutbank and 8 in. at the road shoulder, with an adverse
grade on the downroad or downgrade side of the waterbar. Build a continuous, firm berm of soil, at least 6 in. above normal grade, parallel to the waterbar cut on its downhill side. Include a bank tie-in point, cut 6 to 12 in. into the roadbed. For added stability, the bar may be compacted with a nonerosive fill material. The completed waterbar should extend across the full roadway width, aligned at an angle of 30° to 40° relative to the roadway. A dissipation or filter device (such as riprap or silt fence) may be needed below the waterbar to control erosion and trap sediment.

**Road Sloping:** Road sloping is built into the road during construction. Install erosion- and sediment-control measures downslope before completing the finish grade of the sloped road. Then construct the outward slope of 1 to 2%, as specified in the contract plans.

**Rolling Dip:** Rolling dips are built into the road, during construction, following the natural contours of the land. Install erosion and sediment measures at the low point of the dip (drainage outfall to fill slope) before final grading to direct stormwater discharge from the dip. Construct the dip according to the specifications shown in the contract plans. If not specified, make the dip 1 ft deep, with a 23 ft-long approach on the downgrade side and a 66 ft-long approach on the upgrade side.

**Maintenance**

Inspect all devices regularly according to provisions of the contract or project site plan. Make repairs promptly to avoid progressive damage. Remove accumulated sediments as necessary to ensure proper functioning.

**Open-Top Box Culvert:** Clean and repair the culverts on a regular basis. Remove sediments and other debris that may block drainage flow or decrease structural efficiency.

**Waterbar:** Properly constructed bars should require little or no maintenance. However, all waterbars need to be open at the lower end so water can easily flow away from the roadway. Hand shovel work may be necessary following high runoff periods or severe storms to ensure unrestricted flow.

**Road Sloping:** Minor regrading may be required to maintain slope angle.

**Rolling Dip:** Outflows should be kept free of debris to prevent ponding.
### Table 6-1. Recommended Cross Drain Spacing (Source: ITD, 1994)

<table>
<thead>
<tr>
<th>Road Grade (percent)</th>
<th>Spacing Between Open-Top Culverts, feet (meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 to 5</td>
<td>300 to 500 (90 to 150)</td>
</tr>
<tr>
<td>6 to 10</td>
<td>200 to 300 (60 to 90)</td>
</tr>
<tr>
<td>11 to 15</td>
<td>100 to 200 (30 to 60)</td>
</tr>
<tr>
<td>16 to 20</td>
<td>&lt;100 (&lt;30)</td>
</tr>
</tbody>
</table>

### Table 6-2. Geotextile Properties by Road Type

<table>
<thead>
<tr>
<th>Geotextile Properties</th>
<th>Light Duty(^1) Roads Grade Subgrade</th>
<th>Heavy Duty(^2) Haul Roads Rough Graded</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grab Tensile Strength (lbs)</td>
<td>200</td>
<td>220</td>
<td>ASTM D1682</td>
</tr>
<tr>
<td>Elongation at Failure (%)</td>
<td>50</td>
<td>60</td>
<td>ASTM D1682</td>
</tr>
<tr>
<td>Mullen Brust Strength (lbs)</td>
<td>190</td>
<td>430</td>
<td>ASTM D3786</td>
</tr>
<tr>
<td>Puncture Strength (lbs)</td>
<td>40</td>
<td>125</td>
<td>ASTM D751 modified</td>
</tr>
<tr>
<td>Equivalent Opening Size</td>
<td>40-80</td>
<td>40-80</td>
<td>US Std Sieve CW-02215</td>
</tr>
<tr>
<td>Aggregate Depth (in.)</td>
<td>6</td>
<td>10</td>
<td>--</td>
</tr>
</tbody>
</table>

\(^1\)Light Duty Road: Are sites that have been graded to subgrade and where most travel would be single axle vehicles and an occasional multi-axle truck. Trevira Spunbond 1115, Mirafi 100X, Typar 3401, or equivalent.

\(^2\)Heavy Duty Road: Are sites with only rough grading, and where most ravel would be multi-axle vehicles. Trevira Spunbond 1135, Miraft 600X, or equivalent.

\(^3\)Geotextiles not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.
NOTES

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<td>5</td>
<td>10</td>
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<td>12</td>
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<tr>
<td>10</td>
<td>18</td>
<td>10</td>
<td>15</td>
<td>50</td>
</tr>
</tbody>
</table>


table 00

VARIABLES OR CROSS-SECTION CROSS SECTION AT CENTER LINE

crossware (or cross-section)

END VIEW

OPEN-TO-PAN OUTFLOW

PEACE VIEW

Top View

Proj View

Plan View

Plot Slop

Plot Slop

Plot Slop

Plot Slop

PROJECT

ENGINEERING

SECTION

CONSTRUCTION
Stockpile Management

Description
Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, paving materials such as Portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called “cold mix” asphalt), and pressure-treated wood.

Applications
Implement in all projects that stockpile soil and other materials.

Limitations
- Drainage area – N/A
- Minimum bedrock depth - N/A
- NRCS soil type – N/A
- Drainage/flood control – no

Targeted Pollutants
Sediment

Construction Guidelines

General
- Locate stockpiles a minimum of 50 ft away from concentrated flows of stormwater, drainage courses, and inlets.
- Protect all stockpiles from stormwater run-on using a temporary perimeter sediment barrier such as berms, dikes, fiber rolls, silt fences, sandbags, or gravel bags.
- Implement wind erosion control practices as appropriate on all stockpiled material.
- Place bagged materials on pallets and under cover.

Protection of Non-Active Stockpiles
- Soil stockpiles: During the rainy season, soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times. During the non-rainy season, soil stockpiles should be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.
- Stockpiles of PCC rubble, AC, asphalt concrete rubble, aggregate base, or aggregate sub base: During the rainy season, the stockpiles should be covered or protected with a temporary sediment perimeter barrier at all times. During the non-rainy season, the stockpiles should be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.
- Stockpiles of “cold mix”: During the rainy season, cold mix stockpiles should be placed on and covered with plastic or comparable material at all times. During the non-rainy season, cold mix stockpiles should be placed on and covered with plastic or comparable materials prior to the onset of precipitation.
- Stockpiles/storage of pressure-treated wood: During the rainy season, pressure-treated wood should be covered with plastic or comparable
material at all times. During the non-rainy season, pressure-treated wood should be covered with plastic or comparable material at all times.

Protection of Active Stockpiles

- All stockpiles should be protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of “cold mix” should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Maintenance

- Inspect and verify that BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are underway, inspect weekly during the rainy season and at 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.
Hydromulching

Description

Hydraulic mulching (hydromulching) is a process where wood fiber mulch, processed grass, hay, or straw mulch are applied with a tacking agent in a slurry with water to provide temporary stabilization of bare slopes or other bare areas. This mulching method provides uniform, economical slope protection. It may be combined with hydroseeding as a revegetation method (see BMP 21-Seeding).

Applications

Hydromulching is an effective way to increase water retention (thereby reducing erosion) for 6 months or up to 1 year. Beyond 1 year, the effectiveness drops off. Hydraulic mulching can be applied to areas that are within about 200 ft of a road or that can otherwise be reached by truck. Small roadside slopes and large, relatively flat areas are well adapted to this method. When adequate moisture exists, the slurry can be combined with seed and fertilizer to initiate stabilization and revegetation in a single application (see BMP 3-Preservation of Existing Vegetation). The mulch usually lasts about 1 year. The growing vegetation is needed to provide continued stabilization.

Limitations

- Loses effectiveness after 1 year.
- Only suited for physically stable slopes (at natural angle of repose, or less).
- Avoid hydromulching on long uninterrupted slopes. Break up concentrated flows with other BMPs, such as BMP 26-Gradient Terracing or BMP 32-Check Dams.

Targeted Pollutants

- Sediment
- Phosphorus

Design Parameters

- **Effectiveness**: Hydromulching initially reduces sediment generation by 70 to 80% as compared to sediment production off bare slopes. Within 2 years, the breakdown of wood fiber will have reduced its effectiveness to 40 to 60%. Beyond that time, only 10 to 30% effectiveness can be expected, and the mulch should be replaced. Nutrient generation is typically reduced 50 to 70% for 6 months, 20 to 50 percent up to 2 years, and 0 to 10% beyond 2 years.

- **Equipment**: The hydraulic mulching machine should be equipped with a gear-driven pump and a paddle agitator. Agitation by recirculation from the pump is not acceptable. Agitation should be sufficient to produce homogeneous slurry of tacking agent and mulch (and seed fertilizer, if used).

Application rates: Apply the water at a minimum rate of 3000 gallons per...
acre. Tack ing agent should be applied at 28.5 ft³ of wet ingredients per acre. When seeding is combined with hydraulic mulching, be sure to include an appropriate specified formulation at the specified rate. Legume seeds should be pellet inoculated with the appropriate bacteria. Inoculation rates should be four times that required for dry seeding.

**Construction Guidelines**

- The time allowed between placement of seed in the hydraulic mulcher and the emptying of the hydraulic mulcher tank should not exceed 30 minutes.
- Wood fiber may be dyed to aid in uniform placement. Dyes should not stain concrete or painted surfaces nor injure plant or animal life when applied at the manufacturer’s recommended rate.
- Application of the slurry should proceed until a uniform cover is achieved. The applicator should not be directed at one location for too long a period of time or the applied water will cause erosion.

**Maintenance**

Hydromulched slopes should be inspected periodically for damage due to wind, water, or human disturbance. Repair all damaged areas immediately using hydromulching at the original specifications or straw mulch.
Check Dams

BMP 32

Description

Check dams are small dams constructed in open channels, swales, or drainageways. Check dams may be temporary or permanent barriers made of logs and brush, straw bales, stone, or other materials. A triangular silt dike is a geotextile-encased check dam that consists of a urethane foam core encased in geotextile material. Check dams are used to reduce or prevent excessive bank and bottom erosion by reducing the gradient or runoff velocity.

Applications

Check dams are often used in natural or constructed channels or swales where adequate vegetation cannot be established promptly. They are used below small drainage structures (smaller than 36 in. pipe culverts) but may be used below large structures if a diversion ditch cannot be used. Log and brush check dams should be placed where they will not cause flooding and where they can be left in place.

An array of three-dimensional manufactured barriers is also available: triangular and burrito-shaped, prefilled and fillable on-site, reusable and disposable, and temporary and more-or-less permanent. Triangular silt dikes are temporary, reusable barriers consisting of a triangular urethane foam core covered by permeable, woven geotextile fabric. From 16 to 20 in. wide at the base and usually 8 to 10 in. high, the silt dike is typically used at the toe of a slope to contain sediment from runoff or perpendicular to the flow of water in a drainage ditch.

Limitations

<table>
<thead>
<tr>
<th>Drainage area – 10 ac.</th>
<th>Maximum slope – 50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum bedrock depth – 2 ft</td>
<td>Minimum water table - N/A</td>
</tr>
<tr>
<td>NRCS soil type - ABCD</td>
<td>Freeze/thaw – good</td>
</tr>
<tr>
<td>Drainage/flood control – yes</td>
<td></td>
</tr>
</tbody>
</table>

Check dams should never be placed in live streams unless approved by appropriate local, state and/or federal authorities.

Targeted Pollutants

Sediment

Design Parameters

- The drainage area above the check dam should be between 1 and 4 acres.
- The dams should be spaced so that the toe of the upstream dam is never any higher than the top of the downstream dam. Excavating a sump immediately upstream from the check dam improves its effectiveness.
- Maximum height should be 2 ft. The center of the dam should be 16 to 10 in. lower than either edge, to form a weir for the outfall.
- The check dam should be as much as 20 in. wider than the banks of the
channel to prevent undercutting as overflow water re-enters the channel.

- Provide outlet stabilization below the lowest check dam (where the risk of erosion is greatest) and consider the use of channel linings or protection such as plastic sheeting or riprap where there may be significant erosion or prolonged submergence.

- Materials:
  - Stone 2 to 16 in. in diameter
  - Logs 6 to 8 in. in diameter
  - Sandbags filled with pea gravel
  - Filter fabric meeting the standard specifications (see BMP 36-Silt Fence)

- The logs should be driven into the ground a minimum of 28 in..

**Construction Guidelines**

**Rock check dams:** Place the stones on filter fabric either by hand or using appropriate machinery; do not simply dump them in place. Keep the side slopes 1:2 or flatter. Lining the upstream side of the dam with a layer of 0.8 to 1.1 in. gravel and 12 in. deep is a suggested option for additional channel protection.

**Log check dams:** Logs should be firmly embedded in the ground. Intermingled brush and logs or filter cloth may be attached to the upstream side of the dam to retard the flow and trap additional sediment. If a filter cloth is used, it should be securely stapled to the top of the dam and adequately anchored in the streambed.

**Sandbag check dams:** Be sure that all bags are securely sealed. Place the bags by hand or use appropriate machinery to place them in an interlocking pattern.

**Gravel-filled burlap bags:** Gravel-filled burlap bags may be used for temporary check dams in areas of concentrated flow. Fold the burlap bag flaps under the bags in a direction away from the water flow. Construct gravel bag check dams such that the crest of the downstream check dam is approximately level with the toe of the upstream check dam. Install check dams so the side end points are higher than the centerline crest. Erosion caused by high flows around the edges should be corrected immediately.

**Triangular silt dike:** The flexibility of the materials in triangular silt dikes allows them to conform to all channel configurations.

- They can be fastened to soil with staples or rock and pavement with adhesives.
- They have been used to build temporary sediment ponds, diversion ditches, concrete wash out facilities, curbing, water bars, level spreaders, and berms.

Riprap may be necessary on the downstream side of the dam to protect the streambed from scour.

**Maintenance**

- Inspect the check dams regularly and after every runoff-producing storm. Make any repairs necessary to ensure the measure is in good working order.
order.

- Remove accumulated leaves and sediments from behind the dam when they reach a depth of one-half the original height of the dam. Dispose of all materials properly so they do not contribute to pollution problems at the disposal site.
- Restore stone as necessary for the dams to maintain their correct height.
- On sandbag dams, inspect the sandbag fabric for signs of deterioration.
LOG CHECK DAM

ROCK CHECK DAM

L = THE DISTANCE SUCH THAT POINTS A AND B ARE OF EQUAL ELEVATION

SPACING BETWEEN CHECK DAMS
PLACE DOWNSTREAM STRUCTURE SUCH THAT POINT "B" IS APPROXIMATELY LEVEL WITH THE LOWEST GROUND ELEVATION OF THE UPSTREAM STRUCTURE.
Silt Fence

Description
A silt fence is a temporary sediment barrier consisting of a filter fabric stretched and attached to supporting posts. Wire fence backing is necessary with several types of filter fabric commonly used. Silt fences assist in sediment control by retaining some of the eroded soil particles and slowing the runoff velocity to allow particle settling.

Applications
- Silt fences can be used near the perimeter of a disturbed area to intercept sediment while allowing water to percolate through. The fences should remain in place until the disturbed area is permanently stabilized.
- Silt fences can also be used along the toe of fills, on the downhill side of large through-cut areas, along streams, and at natural drainage areas to reduce the quantity of sediment and to dissipate flow velocities to downstream areas.
- Also use at grade breaks on cut/fill slopes and above interceptor dikes.
- The silt fence should be constructed after the cutting and slashing of trees and before excavating haul roads, fill benches, or any soil disturbing construction activity in the drainage areas.

Limitations
- Drainage area – 1 ac./100 ft
- Minimum bedrock depth – 2 ft
- NRCS soil type - ABCD
- Maximum slope – 33%
- Minimum water table – 2 ft
- Freeze/thaw – good
- Drainage/flood control – no

Silt fences should not be used where there is a concentration of water in a channel or drainageway or where soil conditions prevent the minimum fabric toe-in depth or minimum depth for installation of support posts. If concentrated flow occurs after installation, take corrective action by placing rock berms or other corrective measures in the areas of concentrated flow.

Targeted Pollutants
Sediment

Design Parameters
- Maximum allowable slope lengths contributing runoff to a silt fence are listed in Table 36-1 below.
- Maximum drainage area for overland flow to a silt fence should not exceed 0.5 ac. per 100 ft of fence.
- Design computations are not required. All silt fences should be placed as close to the contour as possible, and the area below the fence should be undisturbed or stabilized.
- A detail of the silt fence should be shown on the plan, and contain the following minimum requirements:
  ✓ The type, size, and spacing of fence posts
  ✓ The size of woven wire support fences
  ✓ The type of filter cloth used
  ✓ The method of anchoring the filter cloth
The method of fastening the filter cloth to the fencing support

- Where ends of filter fabric come together, they should be overlapped, folded and stapled to prevent sediment bypass.

Materials:

- Silt Fence Fabric: The fabric should meet the specifications in Table 36-2 below, unless otherwise approved by the appropriate erosion and sediment control plan approval authority. Such approval does not constitute statewide acceptance. Statewide acceptability depends on in-field and/or laboratory observations and evaluations.
- Fence Posts (for fabricated units): The length should be a minimum of 36 in. long. Wood posts will be of sound quality hardwood with a minimum cross sectional area of 3.0 square in.. Steel posts will be standard “T” and “U” section weighing not less than 1 pound per linear ft.
- Wire Fence (for fabricated units): Wire fencing should be a minimum 14.25 gage with a maximum 6 in. mesh opening, or as approved.
- Prefabricated Units: Envirofence or approved equal may be used in lieu of the above method providing the unit is installed per manufacturer’s instructions.

Construction Guidelines

- Posts should be spaced 10 ft apart when a wire mesh support fence is used and no more than 6.5 ft apart when using extra-strength filter fabric (without a wire fence). The posts should extend at least 16 in. into the ground.
- If standard strength filter fabric is to be used, fasten the optional wire mesh support fence to the upslope side of the posts using heavy duty wire staples, tie wires, or hog rings. Extend the wire mesh support to the bottom of the trench. The filter fabric should then be stapled or wired to the fence.
- Extra strength filter fabric does not require a wire mesh support fence. Staple or wire the filter fabric directly to the posts.
- Do not attach filter fabric to trees.
- Where joints in the fabric are required, splice it together only at a support post, with a minimum 6 in. overlap, and securely seal the joint.
- Embedded filter fabric should extend in a flap that is anchored by backfill, to prevent fabric from pulling out of ground.

Maintenance

Silt fences should be inspected periodically for damage (such as tearing by wind, animals, or equipment) and for the amount of sediment that has accumulated. Remove the sediment when it reaches one-half the height of the silt fence. In situations where access is available, machinery can be used.

Otherwise, the silt should be removed manually. The following are key elements to remember:

- The sediment deposits should be removed when heavy rain or high water is anticipated.
- The sediment deposits should be placed in an area where there is little danger of erosion.
The silt fence should not be removed until adequate vegetative growth ensures no further erosion of the slopes. Generally, the fabric is cut at ground level, the wire and posts are removed, then the sediment is spread, seeded, and protected (mulched) immediately.

Table 36–1. Maximum Allowable Slope Lengths

<table>
<thead>
<tr>
<th>Slope Steepness</th>
<th>Maximum Slope Length (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:1</td>
<td>50</td>
</tr>
<tr>
<td>3:1</td>
<td>75</td>
</tr>
<tr>
<td>4:1</td>
<td>125</td>
</tr>
<tr>
<td>5:1</td>
<td>175</td>
</tr>
<tr>
<td>Flatter than 5:1</td>
<td>200</td>
</tr>
</tbody>
</table>

Table 36-2. Filter Fabric Specifications

<table>
<thead>
<tr>
<th>Fabric Properties</th>
<th>Value</th>
<th>Minimum Acceptable Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grab Tensile Strength (lbs)</td>
<td>90</td>
<td>ASTM D1682</td>
</tr>
<tr>
<td>Elongation at Failure (%)</td>
<td>50</td>
<td>ASTM D1682</td>
</tr>
<tr>
<td>Mullen Burst Strength (PSI)</td>
<td>190</td>
<td>ASTM D3786</td>
</tr>
<tr>
<td>Puncture Strength (lbs)</td>
<td>40</td>
<td>ASTM D751 (modified)</td>
</tr>
<tr>
<td>Equivalent Opening Size</td>
<td>40-80</td>
<td>US Std Sieve CW-02215</td>
</tr>
<tr>
<td>Ultraviolet Radiation Stability %</td>
<td>90</td>
<td>ASTM-G-26</td>
</tr>
</tbody>
</table>
CONSTRUCTION NOTES FOR FABRICATED SILT FENCE

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES.

2. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24 INCHES AT TOP AND MID-SECTION.

3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY 6 INCHES AND FOLDED.

4. MAINTENANCE SHALL BE PREFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

POSTS: STEEL, EITHER "T" OR "U" TYPE OR Z" HARDWOOD.

FENCE: WOVEN WIRE, 14 GAGE, 6" MAX. MESH OPENING.

FILTER CLOTH: FILTER X, MIRAFI 100X, STABILINKA T140N OR APPROVED EQUAL.

PREFABRICATED UNIT: GEOFAB, ENVIROFENCE OR APPROVED EQUAL.
1. Set Posts and Excavate a 4” x 4” Trench upslope along the line of the posts.

2. Staple Wire Fencing to the Posts.

3. Attach the Filter Fabric to the Wire Fence and Extend it into the Trench.

4. Backfill and Compact the Excavated Soil

Extension of Fabric and Wire into the Trench

Filter Fabric
Vegetative Buffer Strip

Description
A vegetative buffer strip is a gently sloping area of vegetative cover that runoff water flows through before entering a stream, storm sewer, or other conveyance. The buffer strip may be an undisturbed strip of natural vegetation or it can be a graded and planted area.

Vegetative buffer strips act as living sediment filters that intercept and detain stormwater runoff. They reduce the flow and velocity of surface runoff, promote infiltration, and reduce pollutant discharge by capturing and holding sediments and other pollutants carried in the runoff water. Vegetative buffer strips function much like vegetated or grassed swales. Buffer strips, however, are fairly level and treat sheet flow across them, whereas grassed swales are indentations that treat concentrated flows running along them (see BMP 40-Temporary Swale).

Applications
- Used for temporary or permanent control, usually in conjunction with other sediment collection and slope protection practices. Consider use with level spreaders or diversion measures such as earth dikes (BMP 41) and slope drains (BMP 24). Also, silt fences (BMP 36) installed upgradient can prevent overloading of the buffer strip.
- May be placed at many locations between the source of sediment (road surface, side slopes) and a natural or constructed waterway. They are inexpensive and easily constructed, and can be put into place at any time if climatic conditions allow for planting.
- May be used at almost any site that can support vegetation, but is best suited for areas where the soils are well drained or moderately well drained and where the bedrock and the water table are well below the surface.
- Provides low to moderate treatment of pollutants in stormwater while providing a natural look to a site.
- Can provide habitat for wildlife.
- Can screen noise and views if trees or high shrubs are planted on the filter strips.

Limitations
- Drainage area - unlimited
- Minimum bedrock depth – 5 ft
- NRCS soil type – ABCD
- Drainage/flood control – no
- Maximum slope – 20%
- Minimum water table – 3 ft
- Freeze/thaw – fair
Not effective for filtering high velocity flows from large paved areas, steep slopes, or hilly areas. Consider other measures if slopes exceed 15%.

Requires significant land space.

May have a short useful life due to clogging by sediments and oil and grease.

Do not use planted or seeded ground as a buffer strip for sediment trapping until the vegetation is well established.

**Targeted Pollutants**

**Sediment**

A buffer strip should be at least 20 ft wide to function well. Along live streams or above wetlands, the minimum width should be 100 ft. The length of the strip should be approximately 50 to 82 ft. Where slopes become steeper, increase the length of the strip.

Tall, dense stands of grass form good sediment traps, as do willows and alder. The willows and alder can be native or planted. A combination of grasses with willows or alder is also effective. Any planted species should be deep rooted and able to adjust to low oxygen levels. Vegetative cover should be at least 75% to assure adequate removal of sediments. Forested strips are always preferred to vegetated strips, and existing vegetation is preferred to planted vegetation. In planning for vegetated strips, consider climatic conditions, since vegetation may not take hold in especially dry and/or cold regions.

In many cases, a vegetative buffer strip will not effectively control runoff and retain sediments unless employed in conjunction with other control measures. Where heavy runoff or large volumes of sediment are expected, provide diversion measures or other filtering measures above or below the buffer strip.

**Construction Guidelines**

Try to direct sediment-laden water onto naturally vegetated or stabilized planted ground.

Fertilizing seeded or planted ground may enhance growth (and improve its effectiveness as a buffer strip).

Do not place any equipment, construction debris, or extra soil in the buffer strip (or the strip will be damaged).

**Maintenance**

Inspect the buffer strip at regular intervals to ensure proper functioning. Check for damage by equipment and vehicles. In newly planted areas, check the progress of germination and plant growth, and arrange for fertilizing, if needed, to enhance growth and establishment. (Planted ground should not be used for a sediment trap until the vegetation is well established.) Make sure that water flowing through the buffer strip is not causing additional erosion nearby and not forming ponds due to erosion within the buffer strip.

Buffer strips in natural vegetation do not generally require maintenance; however, on some sites it may be necessary to remove sediments and replant on a regular basis. Promptly repair any damage from equipment, vehicles, or erosion.
Sedimentation Trap (Basin)  

Description  
A sedimentation trap is a temporary or permanent dam or basin used to collect, trap, and store sediment produced by construction activities, or as a flow detention facility for reducing peak runoff rates. Sediment basins can be designed to maintain a permanent pool or to drain completely dry. Either way, the basin detains sediment-laden runoff long enough to allow most of the sediment to settle out.

A sediment basin can be constructed by excavation or by placing an earthen embankment across a low area or drainage swale. The pond has a riser and pipe outlet with a gravel outlet or spillway to slow the release of runoff and provide some sediment filtration.

Applications  
Sediment traps are appropriate where physical site conditions or land ownership restrictions preclude the effective use of barrier-type erosion control measures. It may be used below construction operations which expose critical areas to soil erosion.

A temporary sediment basin used in combination with other control measures, such as seeding or mulching, is especially effective for removing sediments. Note that the use of sedimentation basins on construction sites greater than or equal to 1 ac., with an NPDES stormwater permit has special requirements. Refer to Part IV.D.2.a. (2)(a) of the NPDES stormwater general permit for on-site activities.

Limitations  
- Drainage area – 5 ac.
- Minimum bedrock depth – 3 ft
- NRCS soil type - BCD
- Drainage/flood control – no
- Maximum slope – 10%
- Minimum water table – 2 ft
- Freeze/thaw – good

- May not be feasible downstream of narrow right-of-way due to lack of space.
- May not be practical in highly erodible soil types (0.01in. and smaller, very fine sand, silt and clay) due to extremely large basin size requirements.
- May not remove enough of the fine silts. Additional control measures such as filter cloth around riser should be used to minimize release of fine silts. If filter cloth is used, regular inspection and replacement is required to deal with clogging.
- Should not be located in any active stream channel.

Targeted Pollutants  
- Sediment

Design Parameters  
- Design of the basin should be based upon the total drainage area lying upstream and (if permanent) on the future use of such lands. A professional engineer should approve the design.
The volume of the sediment basin should be at least 1800 ft$^3$/ac. of total drainage area (about 0.5 in. over the watershed). Disturbed areas greater than 10 acres within the same drainage basin should be provided a basin with a capacity of 3600 ft$^3$ of total drainage area (1 in. over the watershed) to meet the NPDES regulations.

The basin should be designed with baffles or other deflectors to spread the flow throughout the basin. It should also include an emergency spillway and riser pipe(s). These structures should be designed on a site-specific basis using standard engineering practices. Calculating the settling zone volume and adding the necessary sediment storage volume should size the basin pond.

The settling zone volume is determined by the pond surface area calculated using the following equation:

$$SA = 1.2Q_x / V_{sed}$$

Where:

- $SA$ = the pond surface area in square meters
- $Q_x$ = the design inflow (in cubic meters per second) based on the runoff from the design storm event for the drainage area.
- $V_{sed}$ = the settling velocity for the design soil particle in meters per second. Table 3.8 lists theoretical settling velocities for different particle sizes (#200 sieve).

For particle sizes of 0.01 in. and smaller, the $V_{sed}$s are so low that the SA becomes extremely large, often making the overall basin size requirement too large to be practical. In this case, extra protection measures should be taken to negate the need for the basin.

The settling volume requirement is then calculated by multiplying the surface area by the settling depth. The settling depth should be a minimum of 1 ft and a maximum of 4 ft and is governed by a relationship with the basin length (distance from the inlet to the outlet). The ratio of length to settling depth should be greater than 200. For example, if the length was 394 ft, the settling depth should be less than 2 ft to achieve the ratio of greater than 200.

Typically, a sediment storage depth of 3 ft is appropriate unless large volumes of soil are expected from highly erodible site conditions. In this case, use the universal soil loss equation or other applicable estimating methods to design the storage depth on a site-specific basis.

Determine the final pond dimensions and volume as follows:

- Determine the pond geometry for the sediment settling volume calculated above by adding a sediment storage depth of 3 ft and 3:1 side slopes from the bottom of the basin. The bottom should be level.
- Extend the side slopes (at 3:1) as necessary to obtain the settling zone volume at the settling zone depth determined above.
- Adjust the geometry of the basin to effectively combine the settling zone volume and sediment storage volume while preserving the depth and side slope criteria listed above.

Sediment basins covered by this standard should be limited to the following...
category:
- The water surface at the crest elevation of the pipe spillway should not exceed 10 ft measured upward from the original streambed to the crest elevation of the pipe spillway; and the drainage area should not exceed 150 acres.
- Because finer silts may not settle out completely, additional erosion control measures should be used to minimize release of the fine silt. Runoff should enter the basin as far from the outlet as possible to provide maximum retention time.

Construction Guidelines
- The temporary sediment basin should be installed before clearing and grading is undertaken. It should not be built within an active stream channel. Putting a dam in such a site could destroy aquatic habitat, and failure of the dam could result in flooding. A temporary sediment basin should be constructed only if there is sufficient space and appropriate topography. The basin should be made large enough to handle the maximum expected amount of site drainage. Fencing around the basin may be necessary for safety reasons or to discourage vandalism.
- The following general construction criteria are critical to successful installation and operation of sediment basins.
  ✓ Locate the dam to provide maximum volume capacity for silt behind the structure.
  ✓ Prepare the dam site by clearing vegetation and removing topsoil before beginning dam construction. Areas under the embankment and any structural works should be cleared and grubbed, and the topsoil stripped to remove all trees, vegetation, roots and other objectionable material. To facilitate cleanout and restoration, the pool area (measured at the top of the pipe spillway) should be cleaned of all brush, trees or other debris.
  ✓ Level the bed for the pipe spillway to provide uniform support through its entire length under the dam.
  ✓ Construct an emergency spillway (as per design) on undisturbed soil—not on fill. The design width and entrance/exit channel slopes are critical to the spillway’s ability to successfully protect the dam with a minimum of erosion hazard in the spillway channel. The spillway should be lined with 4 in. of concrete, reinforced with 6 x 6 in. 10/10 wire mesh extending to a minimum of 36 in. down each face of the embankment. The spillway should be at least 20 in. deep with 1:1.5 slide slopes.
  ✓ All pipe joints should be securely fastened and watertight. The riser should be rigidly and securely fastened to the barrel and the bottom of the riser should be sealed (watertight). The barrel should be placed on a firm foundation according to the lines and grades shown on the plans.
  ✓ Place at least 1 ft of hand-compacted backfill (maximum 6 in. lifts) over the pipe spillway before crossing it with construction equipment. The movement of the hauling and spreading equipment over the fill should be controlled so that the entire surface of each lift will be traversed by not less than one tread tract of the
equipment.

✓ The pipe spillway should discharge at ground elevation below the dam, and not more than 12 in. above any streambed.

✓ Fill material should be taken from approved designated borrow areas, and should be of the type and quality conforming to that specified for the adjoining fill material. It should be free of roots, woody vegetation, oversize stones, rocks exceeding 6 in. diameter, or other objectionable materials. Do not use frozen material.

✓ Areas on which fill is to be placed should be scarified prior to placement of fill. Fill materials should be placed in 6 in. maximum lifts, compacted by construction equipment. The embankment should be raised and compacted to an elevation that provides for anticipated settlement to design elevation (allow at least 10% for settlement). Lifts should be continuous over the entire length of the fill and approximately horizontal.

✓ Stabilize the embankment and emergency spillway with revegetation or other stabilization measures.

**Maintenance**

- Sediment basins should be readily accessible for maintenance and sediment removal. The sediment maintenance volume should be determined and marked before the basin is used. They should be inspected after each rainfall and be cleaned out when about half the volume has been filled with sediment. Poorly draining basins require maintenance to clean clogged riser or filter cloth. Removed sediment should be disposed of and stabilized in an approved location such that spoils do not re-enter waters of the state. Sediment may not be dumped into any water of the U.S. without appropriate permitting.

- The sediment basin should remain in operation and be properly maintained until vegetation or other measures permanently stabilize the drainage area. A well-built temporary sediment basin that is large enough to handle the post-construction runoff volume may later be converted to use as a permanent stormwater management structure.

- If the pond is located near a residential area, it is recommended for safety reasons that a sign be posted and that the area be secured by a fence.

<table>
<thead>
<tr>
<th>Size (in.)</th>
<th>$V_{sed}$ (ft/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.02</td>
<td>0.19</td>
</tr>
<tr>
<td>0.008</td>
<td>0.067</td>
</tr>
<tr>
<td>0.004</td>
<td>0.023</td>
</tr>
<tr>
<td>0.002</td>
<td>0.0062</td>
</tr>
<tr>
<td>0.0008</td>
<td>0.00091</td>
</tr>
<tr>
<td>0.0004</td>
<td>0.000241</td>
</tr>
<tr>
<td>0.0002</td>
<td>0.00006</td>
</tr>
</tbody>
</table>
PERFORATIONS OR SLITS MUST NOT BE MADE ANY LOWER THAN 6" ABOVE TOP OF THE HORIZONTAL OUTFALL BARREL

OPTIMAL SEDIMENT TRAP DEWATERING DEVICE - 1
WITH 6" PERFORATED RISER

DIAMETER PERFORATED ED WITH FILTER CLOTH
CAP END OF PIPE
20' MIN
12' MIN, 2' STONE
STONE 0' SEDIMENT
BMP 50: CONTROLLED DROP CHECKDAM

NOTES:

1. The culvert shall be sloped as required to maintain the drop.

2. Extend the drop of the culvert 6'-0" beyond the face of the stability wall.

3. Clean the drop when sediment is within 9" of the culvert inlet.

4. Soils to minimize sediment transport.

5. See Note 1 - Rock Outlet.
**Portable Spill Containment Berm**

**Affordable, Convenient and Portable Spill Containment.**

This flexible-sidewall Portable Spill Containment Berm line is the easiest to use. It is the most affordable hazardous material storage product on the market today. The berm provides incidental spill control during temporary storage of drums, machine parts, tanks and generators and can also be used as a wash-down pad or pumping station. An alternative to hard plastic pallets if you do not need permanent storage of drums.

Features include 4” foam sidewalls that easily spring back into place after any type of pressure is applied. Reusable. Easily folds up so you can place it on a shelf. Frees up floor space when not in use.

Made of a 6 ounce nylon fabric with a PVC covering that is very flexible. The overall finished coat weight is equal to 22 ounces. This portable spill containment berm has strong rip and tear properties and good chemical resistance. Cold crack to -40 degrees.

### Quick Overview

- Easy set up and fold up
- Reusable
- Material is very easy to clean
- 4” foam walls
- Chemical and rust resistant
- Can also be used as a pumping station or wash-down pad
- Strong and will not split or crack
- Made of nylon and PVC
- When folded can fit on shelf
- Great for temporary store of drums, tanks, machine parts and containers
- Usually ships within 5 days

**Technical Info**

6 ounce nylon fabric with PVC covering. Finished weight equal to 22 ounces

Cold crack to -40 degrees

Dimensions, sump capacity, load capacity and weights for each product noted below in Description.

Drums in picture not included

**Helps You Comply**

See Federal Regulatory Compliance Summaries here.
Emergency Fuel Spill Containment Pop Up Pools

Portable Fuel Spill Containment Pop Up Pools

You will always be ready for an emergency fuel spill with our portable spill containment unit that pops up with the greatest of ease! This is very handy, small unit that conveniently fits in any small compartment or behind the seat of your truck. Ideal for spill containment. Commonly used in the fuel industry.

Strong and durable yet lightweight, this product features a fabric construction made of high-density polyethylene tapes and a low-density coating. These portable units are chemical resistant to acids, gasoline's, diesels and other hazardous chemicals. The emergency fuel spill containment pop up pools are resistant to temperatures up to 65°F. See through material helps you see how full the pool is.

Our Emergency Fuel Spill Containment Pop Up Pools are ideal for mobile equipment and truckers. Because they are so compact they take up very little space and can fit behind the seat of most trucks. If a large fuel tank springs a leak, placing the spill containment pop up pool under the leaking tank can save thousands of dollars in clean-up costs if the soil is contaminated or if the fuel gets into storm drain or stream.

It is easy to order online below or call toll free (800)869-9633.

Available in four sizes
- Will not split or crack
- Polyethylene for excellent durability
- Usually ships within 48 hours
- Economical
- Portable spill containment pop-ups can be purchased online or toll free at (800) 869-9633

Quick Overview
- Available in four sizes
- Compact and easy to open
- Easy to position under fuel tanks and vehicles
- Made of heavy duty 100% polyethylene
- Chemical, UV and rust resistant

Technical Info
100% high density polyethylene
Dimensions, sump capacity, load capacity and weights for each product noted below in Description.

Helps You Comply
See Federal Regulatory Compliance Summaries here.