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PROPOSED

LAFAYETTE COLLEGE

CEERC

Civil & Environmental Engineering Research Center

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Report 5

Erosion and Sediment Control Report

Site
Former Hummel Lumber Supply at 900 Bushkill Drive

City of Easton, Northampton County, Pennsylvania

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Erosion and Sediment Report Table of Contents

SECTION I: GENERAL PROJECT DESCRIPTION

Erosion and sediment control requires persons proposing or conducting earth disturbance activities to develop, implement and maintain BMPs to minimize the potential for accelerated erosion and sedimentation and to manage post construction stormwater.

E&S Requirements:

<u>Notable Requirements Include:</u>

(1) BMPs to minimize the potential for accelerated sedimentation and erosion.

(3) E&S Plan must be submitted by someone trained and experienced in E&S control methods and techniques.
(5) E&S Plan must contain drawings and narratives that describe: existing topographic features, soil location/depths, volume and rate of runoff, sequencing of BMPs installation, etc.
(8) The E&S Plan, inspection reports and monitoring records shall be available for review and inspection by the Department or the conservation district at the project site during all stages of the earth disturbance activity.
(9) Upon complaint or site inspection, the Department or conservation district may require that the E&S Plan be submitted for review and approval to ensure compliance with this chapter.

SECTION II: GENERAL CONSERVATION PROGRAM

SUGGESTED OUTLINE FOR BMP SEQUENCING

1. Field-mark limits of disturbance and environmentally sensitive areas (including steep slopes, riparian buffers, wetlands, springs, and floodways)
2. Rock Construction Entrance(s)
3. Access to Site/BMPs
    a) Access Roads and their BMPs
    b) Temporary/Permanent Stream Crossings
    c) Roadway Drainage Structures
4. Surface Water Diversion
    a) Diversion Channels and Berms
    b) Stabilization of Channels and Berms
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6. Solids Separation BMPs
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        (1) Sediment Barriers
        (2) Conveyance from Outlet Structures to Surface Water
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        (4) Earthwork to Construct Sediment Basin
        (5) Emergency Spillway and Lining
        (6) Stabilization of Basin and of Areas Disturbed to Construct Sediment Basin
    b) Sediment Traps

(1) Conveyance from Outlet Structures to Surface Water
(2) Construct Sediment Trap
(3) Stabilization of Trap and of Areas Disturbed to Construct Sediment Trap

7. Collection of Site Runoff for Treatment
    a) Collector Channels, Waterbars, Broad-based dips, etc.
    b) Stabilization of Channels, Waterbars, Broad-based dips, etc.
8. Site Earthwork
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    c) Fills with incremental stabilization
    d) Construction of Buildings, Roadways and Other Structures
    e) Site Utility Construction
9. Permanent Stabilization
    a) Replacement of Topsoil (4 - 6 inches)
    b) Permanent Seeding
        (1) Soil Amendments
        (2) Seed Application
        (3) Mulch and/or blanketing
    c) Crushed Aggregate Surfaces (Apply as soon as road or parking lot surfaces are graded)
    d) Paved areas
10. Removal/Conversion of Temporary Sediment Pollution Controls
    a) Permanent Vegetation Requirement
    b) Interceptor Channels
    c) Basins and Traps
    d) Sediment Barriers
    e) Temporary Diversion Channels
    f) Stabilization of disturbed areas

SECTION III: EROSION & SEDIMENT POLLUTION CONTROL MEASURES

Temporary BMPs to be used during construction phase include compost filter socks, sediment basin, swales, and erosion control matting.

SECTION IV: BEST MANAGEMENT PRACTICES

IV.1 Site Access

This section addresses site access during actual construction of a proposed project. It should be noted that site access for site preparation work (e.g. surveying, exploration drilling, etc.) should follow the same general principals. When it becomes necessary to remove vegetative cover or cross surface waters to conduct a survey, or complete required exploration drilling and sampling, appropriate BMPs must be provided to protect the surface waters. BMPs not addressed in this chapter may be reviewed by the Department on a case-by-case basis and approved if they are found to be equal to, or better than, the following BMPs.

IV.1.1 Rock Construction Entrance

A rock construction entrance should be installed wherever it is anticipated that construction traffic will exit the project site onto any roadway, public or private. Access to the site should be limited to the stabilized construction entrance(s).

Figure IV.1 Rock Construction Entrance

A geotextile underlayment should be placed over the existing ground prior to placing the stone. Where site conditions warrant, it may be necessary to extend the length or width of the rock to ensure the effectiveness of the entrance. Wherever access to the site is across a roadside ditch, stream channel, natural drainage course, etc., a suitable means of conveying the flow past the entrance (e.g. a properly sized culvert pipe) should be provided. For such installations, a mountable berm is recommended to prevent crushing the pipe.

Rock construction entrances should be maintained to the specified dimensions and the capacity to remove sediment from the tires by adding rock when necessary. For some sites this could occur several times a day. A stockpile of rock material should be maintained on site for this purpose. It should be noted that occasionally the rock construction entrance can become too clogged and might have to be removed and replaced.

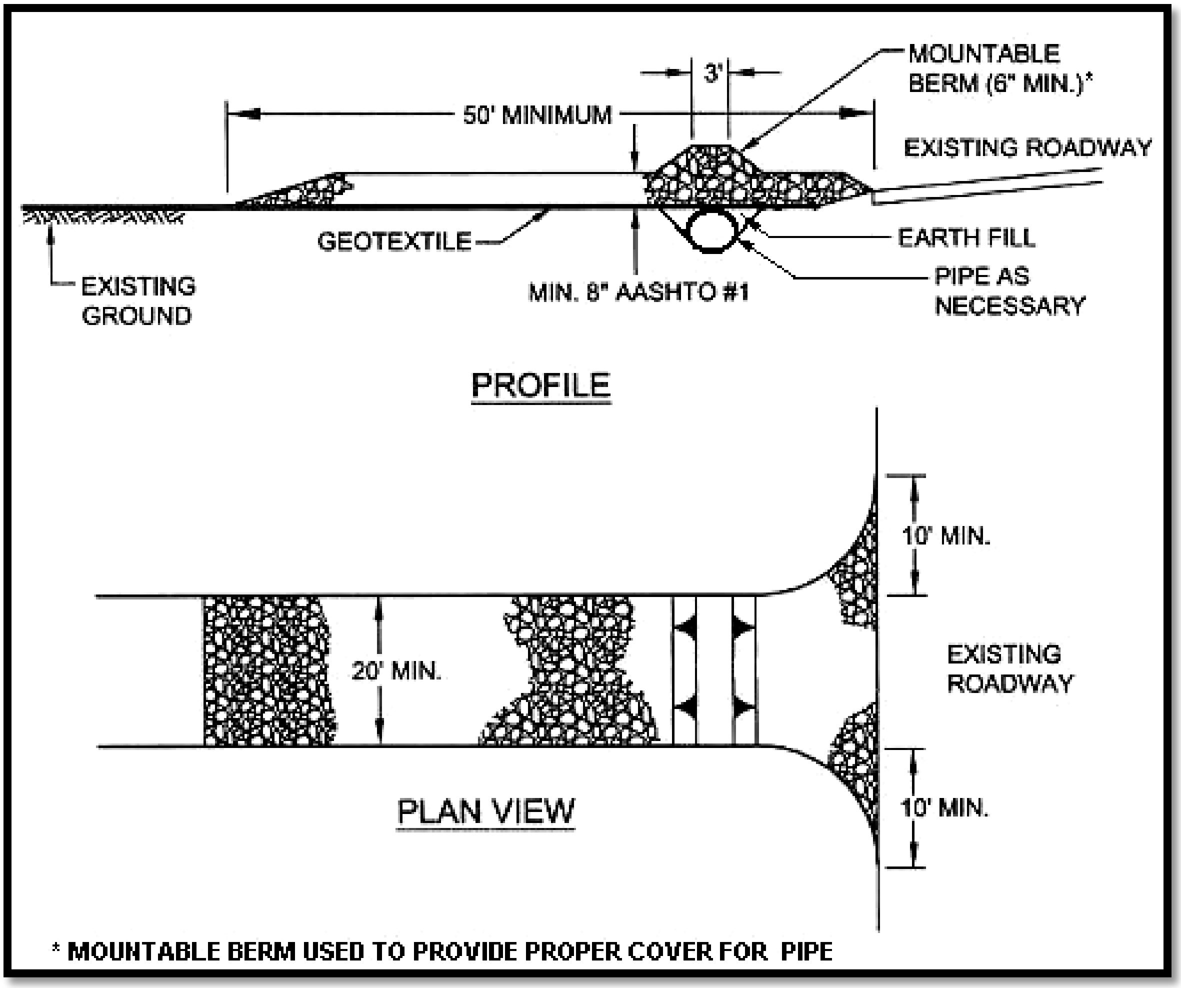


Figure IV.2 Standard Construction Detail of Rock Construction Entrance

IV.1.2 Compost Sock Sediment Trap

In many locations, there is little or no opportunity to direct runoff from an access road into a well-vegetated area. This may occur at entrances or where surface waters are in relatively close proximity to the access road. At such locations it may still be possible to treat the runoff by means of a compost sock sediment trap. These structures can be installed, used and later removed with relatively little disturbance to the area. In fact, the compost within the sock can be used during cleanup as a vegetative growth medium. Runoff may be directed into the trap using any of the devices described above. Compost sock sediment traps are addressed in this chapter to emphasize their usefulness in controlling runoff from access roads. However, these devices may be used at some other locations where a temporary sediment trap is appropriate. Installation of an excavated sump immediately above the socks may increase trap efficiency where soil conditions permit their construction.

Figure IV.3 Compost Sock Sediment Trap

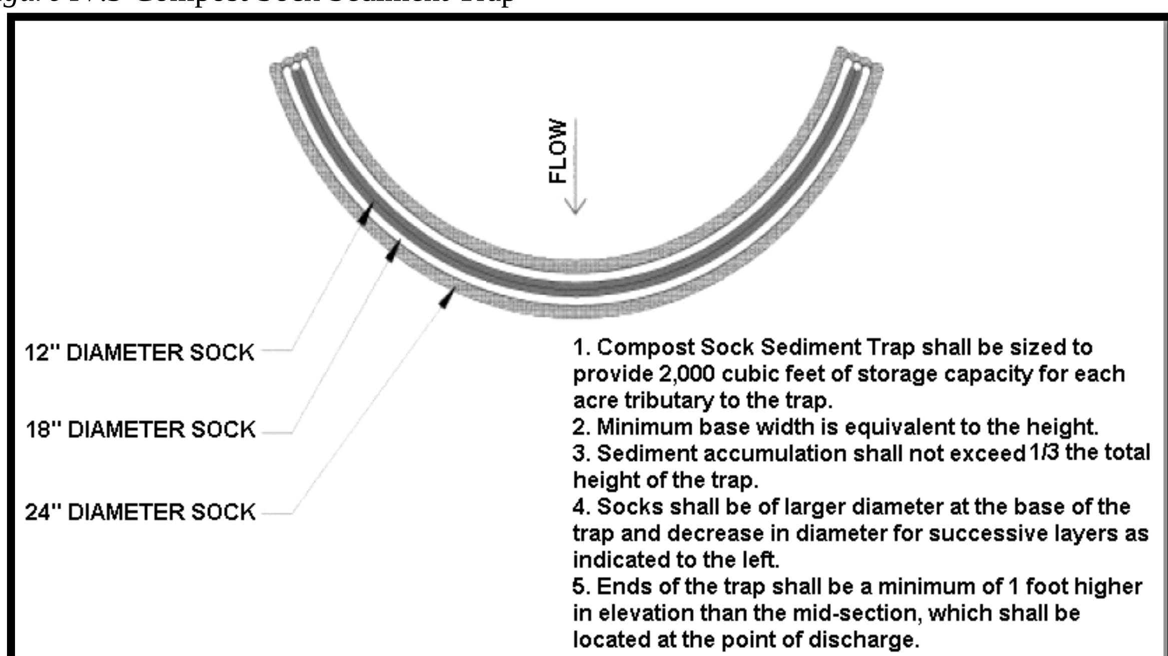


Figure IV.4 Compost Sock Sediment Trap Plan View

IV.1.3 Dewatering Work Areas

Wherever water is pumped from a disturbed area, it must be treated for sediment removal prior to discharging to a surface water unless it can be shown that the quality of the water being pumped already meets discharge standards. If a properly functioning sediment basin or sediment trap is available, the pump discharge may be routed through the trap or basin. While pumping, the maximum water level in the trap or basin should not exceed the cleanout elevation. Water pumped from disturbed areas may not be discharged directly to detention ponds, since they are not designed to be efficient sediment removal structures. Straw bale structures and filter fabric structures are not acceptable for filtering pumped water due to their history of ineffectiveness. Filter bags may be used to filter pumped water as described in the following section. Other devices for filtering water pumped from excavations will be reviewed on a case-by-case basis.

The topography and conditions of the ground cover between the discharge point and the receiving surface water should be evaluated for potential erosion. Appropriate stabilization measures should be incorporated where needed to prevent erosion.

IV.1.4 Pumped Water Filter Bag

Filter bags may be used to filter water pumped from disturbed areas prior to discharging to surface waters. They may also be used to filter water pumped from the sediment storage areas of sediment basins and sediment traps.

The maximum pumping rate for any bag in use or proposed for use on a site should be available at the site at all times during pumping operations. Pumping rates will vary depending on the size of the filter bag, and the type and amount of sediment discharged to the bag.

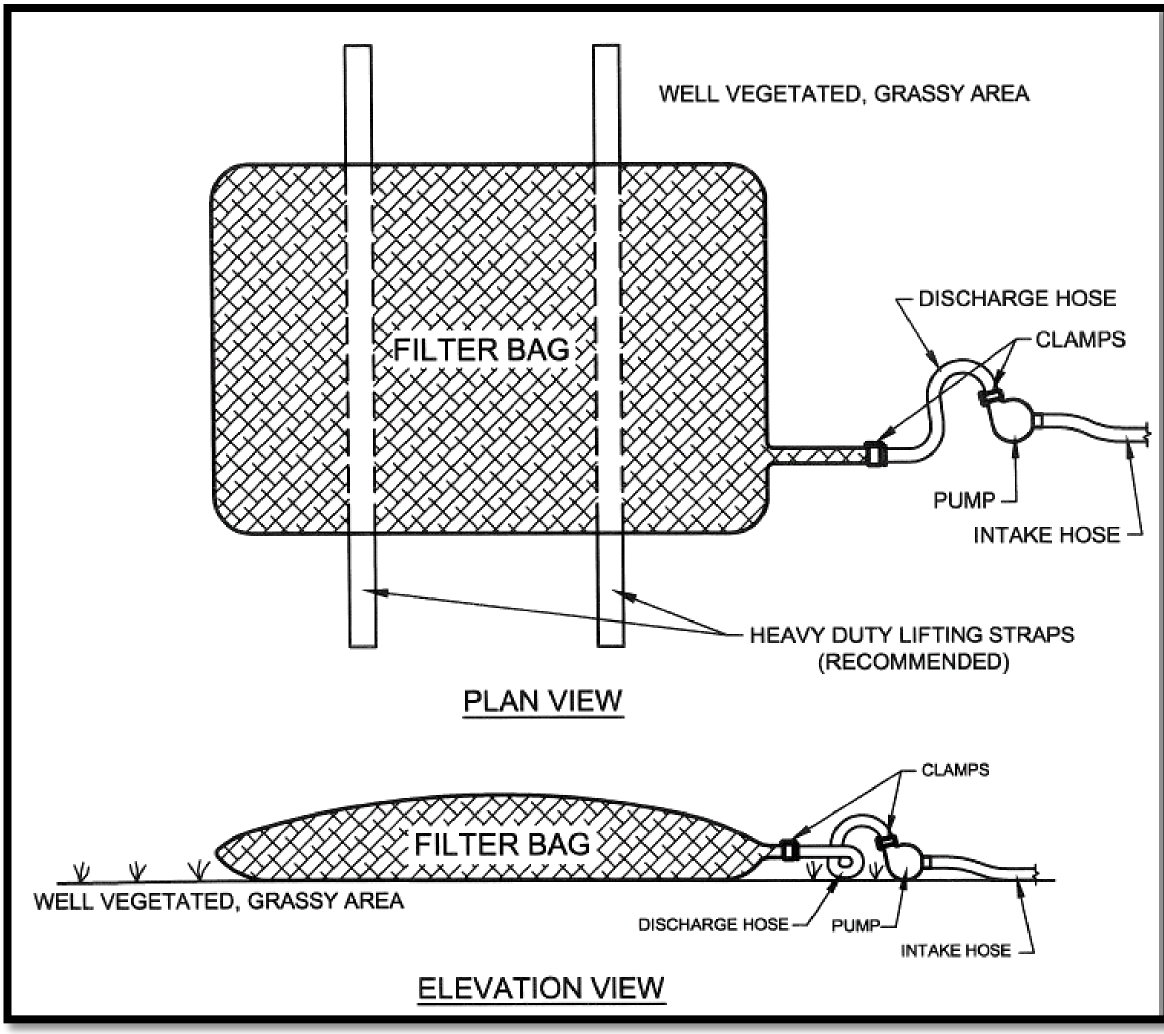


Figure IV.5 Pumped Water Filter Bag

IV.2 Site Housekeeping and Materials Management

IV.2.1 Waste Management

Building materials and other construction site wastes must be properly managed and disposed of to reduce potential for pollution to surface and ground waters as per 25 Pa. Code § 102.4(b)(5)(xi). Proper trash disposal, recycling of materials, proper materials handling, and spill prevention and clean-up reduce the potential for construction site wastes to be mobilized by stormwater runoff and conveyed to surface waters. Under no circumstances may erosion control BMPs be used for temporary storage of demolition materials or construction wastes.

Wherever heavy equipment will be used during construction of the cuts and fills or proposed buildings, a Pollution Prevention and Contingency (PPC) plan must be available on site. This plan does not have to be included in the permit application package submitted for an NPDES construction permit in Pennsylvania but should be available on the project site. The applicant must prepare and implement a PPC plan when storing, using or transporting materials including: fuels, chemicals, solvents, pesticides, fertilizers, lime, petrochemicals, wastewater, wash water, core drilling wastewater, cement, sanitary wastes, solid wastes, or hazardous materials onto, on, or from the project site during earth disturbance activities.

IV.2.2 Concrete Washout

For any project on which concrete will be poured or otherwise formed on site, a suitable washout facility must be provided for the cleaning of chutes, mixers, and hoppers of the delivery vehicles unless such a facility will be used at the source of the concrete. Under no circumstances may wash water from these vehicles be allowed to enter any surface waters. Make sure that proper signage is provided to drivers so that they are aware of the presence of washout facilities.

Washout facilities should not be placed within 50 feet of storm drains, open ditches or surface waters. They should be in a convenient location for the trucks, preferably near the place where the concrete is being poured, but far enough from other vehicular traffic to minimize the potential for accidental damage or spills. Wherever possible, they should be located on slopes not exceeding a 2% grade.

IV.2.3 Compost Sock Washout

Wherever compost sock washouts are used, a suitable impervious geomembrane should be placed at the location of the washout. Compost socks should be staked in the manner recommended by the manufacturer around perimeter of the geomembrane so as to form a ring with the ends of the sock located at the upslope corner. Care should be taken to ensure continuous contact of the sock with the geomembrane at all locations. Where necessary, socks may be stacked and staked so as to form a triangular cross-section.

IV.2.4 Prefabricated Washout Containers

Care should be taken to ensure that the containers are intended by the manufacturer for use as concrete washout BMPs, that they are watertight, and appropriately sized. Accumulated materials must be properly disposed of (preferably recycled) when they reach the cleanout level.

IV.2.5 Self-installed Washouts

These types of washouts should be excavated below grade to prevent runoff of the wash water and minimize the potential for breaching. They should be sized to handle solids, wash water, and rainfall. A good rule of thumb is that 7 gallons of wash water are required to wash one truck chute and 50 gallons for the hopper of a concrete pump truck.

For larger sites, a below-grade washout should be a minimum of 10 feet wide and provide at least 12 inches of freeboard above the liquid and solid waste anticipated between cleanout intervals. The pit should be lined with plastic sheeting of at least 10-mil thickness (with no holes or tears) to prevent leaching of liquids into the ground.

IV.3 Sediment Barriers and Filters

Sediment barriers are typically used as perimeter controls for small disturbed areas and as initial protection against sediment pollution during construction of other BMPs such as sediment basins or traps. Each type of sediment barrier has specific advantages and limitations. Care should be exercised in the selection of any sediment barrier to ensure it is suited to the particular site conditions where it is proposed.

Sediment barriers should be installed on existing level grade in order to be effective. Barriers which cross contours divert runoff to a low point where failure usually occurs. The ends of sediment barriers should be turned upslope at 45 degrees to the main barrier alignment for a distance sufficient to elevate the bottom of the barrier ends to the elevation of the top of the barrier at the lowest point. This is to prevent runoff from flowing around the barrier rather than through it. For most locations, a distance of 8 feet will suffice. In locations where the topography is such that the barrier would have to extend for a long distance, a compacted berm tying into the ends of the barrier may be substituted for the upslope extension.

IV.3.1 Compost Filter Sock

Compost filter socks are a type of contained compost filter berm. They consist of a biodegradable or photodegradable mesh tube filled, typically using a pneumatic blower, with a coarse compost filter media that meets certain performance criteria (e.g. hydraulic flow through rate, total solids removal efficiency, total suspended solids removal efficiency, turbidity reduction, nutrient removal efficiency, metals removal efficiency, and motor oil removal efficiency).

Figure IV.6 Compost Filter Sock

Compost filter socks are flexible and can be filled in place or in some cases filled and moved into position. They are especially useful on steep slopes. Heavy vegetation should be removed prior to installing the sock. Compost socks can also be used on rocky slopes if sufficient preparation is made to ensure good contact of the sock with the underlying soil along its entire length. They may also be used on pavement as a perimeter control. Socks used in this manner range in diameter from 8” to 32”. Note: The flat dimension of the sock should be at least 1.5 times the nominal diameter. Also, some settlement of the tube typically occurs after installation. The nominal diameter of the tube is the dimension to be used for design purposes. Socks with diameters less than 12” should only be used for residential housing lots of ¼ acre or less that are tributary to a sediment basin or sediment trap.

As with other sediment barriers, filter socks should be placed parallel to contour with both ends of the sock extended upslope at a 45 degree angle to the rest of the sock to prevent end-arounds. Socks placed on earthen slopes should be anchored with stakes driven through the center of the sock or immediately downslope of the sock at intervals recommended by the manufacturer. Where socks are placed on paved surfaces, concrete blocks should be used immediately downslope of the socks (at the same intervals recommended for the stakes) to help hold the sock in place.

The anticipated functional life of a biodegradable filter sock should be 6 months; for photodegradable socks it is 1 year. Some other types may last longer. Projects with disturbances anticipated to last longer than the functional life of a sock should plan to replace the socks periodically or use another type of BMP.

Upon stabilization of the tributary area, the filter sock may be left in place and vegetated or removed. In the latter case, the mesh is typically cut open and the mulch spread as a soil supplement. In either case, the stakes should be removed.

Compost should be a well decomposed, weed-free organic matter derived from agriculture, food, stump grindings, and yard or wood/bark organic matter sources. The compost should be aerobically composted. The compost should possess no objectionable odors and should be reasonably free of man-made foreign matter. The compost product should not resemble the raw material from which it was derived. Wood and bark chips, ground construction debris or reprocessed wood products are not acceptable as the organic component of the mix.

IV.3.2 Compost Filter Berm

Although compost is typically viewed as a means of stabilization, it may also be used to construct a filter berm for sediment control. Composts denser in nature and containing particles that range in size produce the most stable berms. Do not use compost filter berms in channels or other concentrated flows. As with other types of sediment barriers, compost filter berms should be located where runoff is anticipated to be in sheet flow. Concentrated or channelized flows should be directed to sediment basins or traps, not filter berms.

Figure IV.7 Compost Filter Berm

Compost filter berms may be vegetated or unvegetated. Vegetated filter berms are usually left in place and provide long-term filtration of stormwater as a post-construction BMP. Unvegetated berms are typically broken down after stabilization of the tributary drainage area is achieved. The compost is spread around the site as a soil amendment or mulch. Compost filter berms may not be used to construct sediment traps or other impoundments.

Installation**:** Compost filter berms may be installed by hand, by using construction equipment (e.g. backhoe, wheel loader, or skid loader), or with specialized equipment such as a pneumatic blower or side discharge spreader with a berm attachment. The compost should be uniformly applied to the soil surface, compacted, and shaped into a rough trapezoid. Filter berms may be installed on frozen or rocky ground. Heavy vegetation should be cut down or removed to ensure proper contact with the underlying soil surface.

Vegetated berms may be seeded by hand, by incorporating seed into the compost prior to installation — a typical procedure when installed by pneumatic blower or mixing truck with side discharge — or by hydraulic seeding after berm construction.

IV.3.3 Weighted Sediment Filter Tube

Weighted sediment filter tubes are tube-shaped devices filled with non-biodegradable filter materials for longevity and reuse. They may be used to control runoff from small disturbed areas where silt fence would normally be used as well as certain locations where a silt fence is not typically effective (e.g. above headwalls and endwalls). In general, the maximum slope length for standard silt fence may be used for 12” diameter tubes and slope lengths for reinforced silt fence may be used for 18” to 20” diameter tubes. However, longer slope lengths may be considered by the Department on a case-by-case basis. The tubes can also be used instead of rock filters or as filters for storm sewer inlets located in sump areas.

Figure IV.8 Weighted Sediment Filter Tube

IV.3.4 Silt Fence (Filter Fabric Fence)

Silt fence may be used to control runoff from small disturbed areas when it is in the form of sheet flow, and the discharge is to a stable area. Only those fabric types specified for such use by the manufacturer should be used. In order to provide sufficient fabric for proper anchoring of the fence, standard filter fabric width should be 30” min.; reinforced and super filter fabric width should be 42” min.

Figure IV.9 Silt Fence

Do not use silt fence in areas of concentrated flows (e.g. channels, swales, erosion gullies, across pipe outfalls, as inlet protection, etc.). Filter fabric should not be wrapped around the principal spillway risers of sediment basins or traps. Silt fence should not be used in areas where rock or rocky soils prevent the full and uniform anchoring of the fence. Forested areas are not recommended unless tree roots can be severed during excavation of the anchor trench.

Silt fence should not be installed on uncompacted fills or in extremely loose soils (e.g. sandy loam), since this will likely result in undermining of the fence. Silt fence should be installed at existing level grade. Both ends of each fence section should be extended at least 8 feet upslope across undisturbed ground at 45 degrees to the main fence alignment to allow for pooling of water.

A 6” deep trench should be excavated, minimizing the disturbance on the downslope side. The bottom of the trench should be at level grade. Note: Standard silt fence may be installed using the slicing method provided manufacturer’s recommendations are followed. Where this method is chosen, show all standard details and instructions provided by the manufacturer on the plan drawings.

Support stakes that are 2” X 2” (+ 3/8”) hardwood (minimum cross-sectional area of 3.0 square inches) or equivalent steel (U or T weighing not less than 1.33 pound per linear foot) should be driven 18” below the existing ground surface at 8-foot (max.) intervals. The filter fabric should be stretched and fastened to the upslope side of the support stakes.

Wherever reinforced silt fence is installed, the reinforcement mesh should be fastened to the stakes prior to the fabric. At fabric ends, both ends should be wrapped around the support stake and stapled. If the fabric comes already attached to the stakes, the end stakes should be held together while the fabric is wrapped around the stakes at least one revolution (360 degrees) prior to driving the stakes.

The bottom of the fence should be anchored by placing the fabric in the bottom of the trench, then backfilling and compacting the fill material in the trench (an acceptable alternative is the use of a machine which slices the soil to a depth of at least 6 inches and inserts the fabric in a continuous operation.)

Guy wires should be attached to the support stakes of reinforced silt fence. An acceptable alternative to the guy wires is to stake a continuous row of straw bales on the downslope side of the fence. Silt fence alignment should be at least 8’ from the toe of fill slopes.

IV.4 Storm Inlet Protection

Storm sewer inlets should be protected from sediment pollution wherever the sewer system does not discharge into a functioning sediment basin or sediment trap. (NOTE: Since detention ponds are not typically designed to effectively remove sediment prior to discharging, storm sewers discharging to detention ponds should be protected from sediment pollution.) Inlet protection may also be desirable in cases where it would be difficult or expensive to clean accumulated sediment from sewer lines, or where a temporary riser may have to be removed from a permanent basin prior to completion of all earthmoving. Inlet protection should be maintained (i.e. kept in good repair and free from straw, grass clippings, sediment, construction debris, litter, snow and ice) until all earthwork within the tributary drainage area has been completed and stabilized. To minimize potential clogging problems, consideration should be given to beehive grates for Type M inlets during construction. Inlet protection is not recommended for catch basins located near the edges of fill slopes, because clogging of the inlet could result in erosion of the fill slope. For these inlets, sediment removal BMPs should be provided at the discharge end of the system.

Silt fence and straw bale barriers are not effective when used in areas of concentrated flow as is common at storm sewer inlets. Typically, silt fence and straw bales fail, allowing unfiltered water to enter the inlet. In those rare instances where the silt fence or straw bales do not fail, runoff usually either bypasses the inlet, causing erosion and/or capacity problems down gradient, or backs up to the point of creating flooding. This can create traffic hazards for inlets located along active roadways.

IV.4.1 Inlet Filter Bag

Filter bags should be capable of trapping all particles not passing a No.40 Sieve. Wherever filter bags are used they should be installed according to the manufacturer's specifications. Typical installation details should be provided on the drawings. Filter bags designed to fit over the inlet grate are not recommended for most storm sewer inlets. Use of such filter bags could result in a severe reduction of the inlet capacity resulting in flooding or runoff bypassing the inlet. Wherever such bags are used, they should be located at topographic low points and limited to ¼ acre maximum drainage areas. Inlet filter bags are not acceptable as the primary BMP to remove sediment from site runoff water.

Figure IV.10 Inlet Filter Bag

Inlet filter bags should be inspected on a weekly basis and after each runoff event. Filter bags should be cleaned and/or replaced when the bag is half full or when flow capacity has been reduced so as to cause flooding or bypassing of the inlet. Accumulated sediment should be disposed in the approved manner. Bags that will be reused should be rinsed at a location where the rinse water will enter a sediment trap or sediment basin. Damaged filter bags should be replaced.

IV.4.2 Stone Inlet Protection

Wherever stone and concrete block inlet protection is proposed, it should be installed according to the details shown in Standard Construction Details # 4-17 or # 4-18. This type of inlet protection should not be used where ponding of water would cause a traffic hazard.

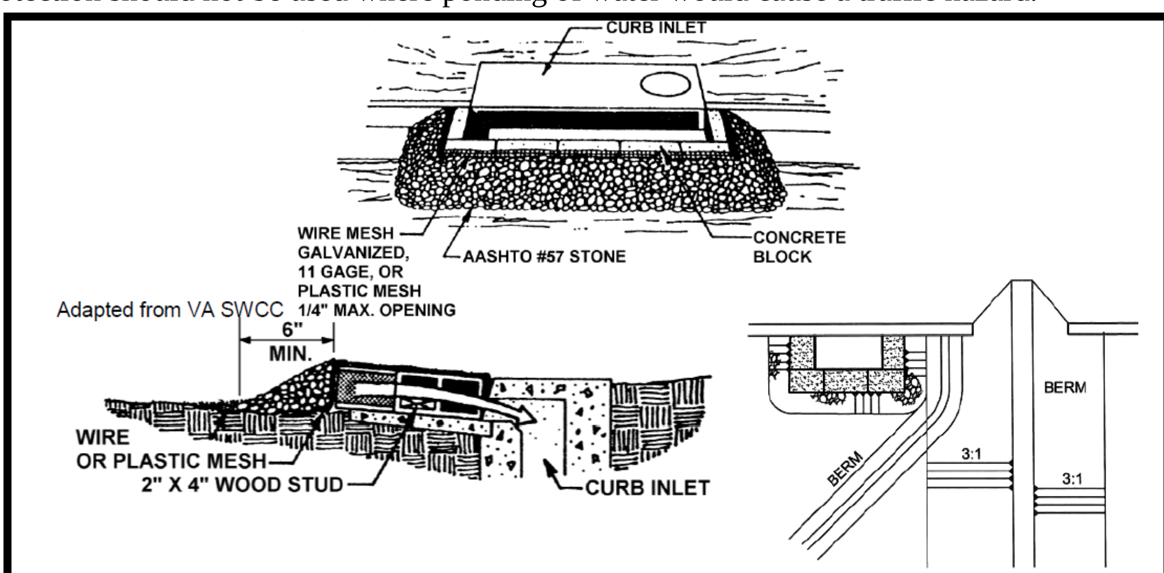


Figure IV.11 Standard Construction Details #4-17 Stone and Concrete Block Inlet Protection – Type C Inlet

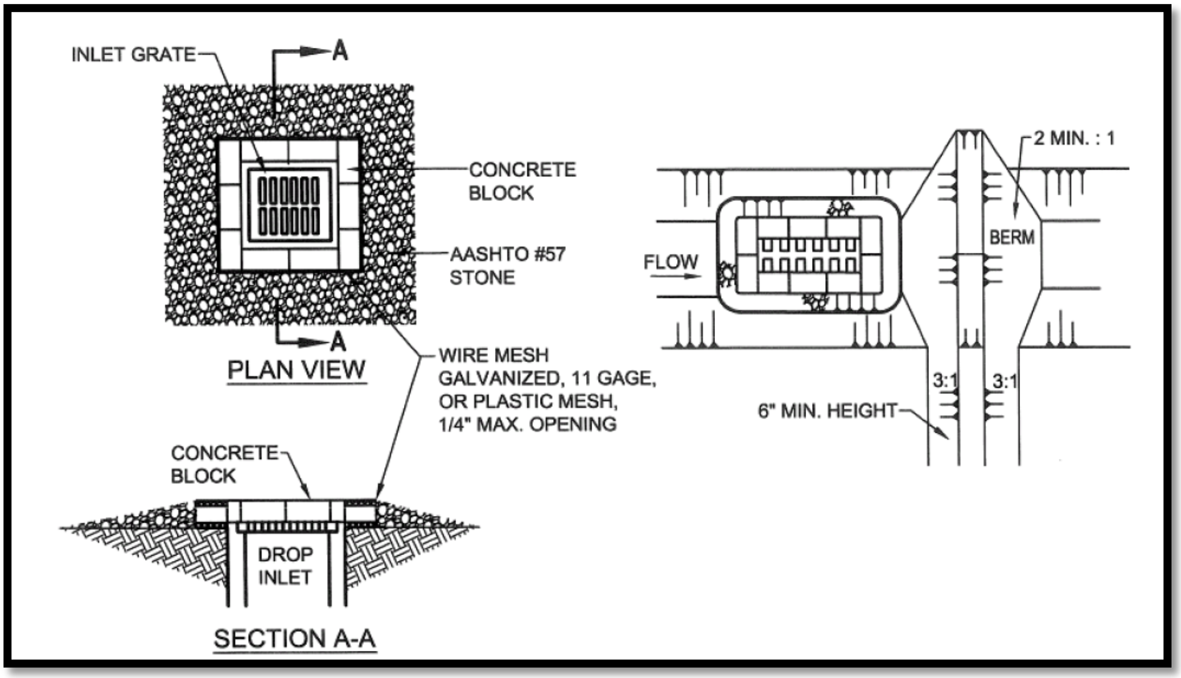


Figure IV.12 Standard Construction Details #4-18 Stone and Concrete Block Inlet Protection - Type M Inlet

IV.5 Runoff Conveyance BMPs

IV.5.1 Channels

Channels are used for several purposes. Collector channels are used to collect runoff from disturbed areas and convey it to a sediment removal facility prior to discharge into receiving surface waters. Diversion channels are used to divert runoff from undisturbed upslope areas and convey it around areas of earth disturbance. Conveyance channels are used to convey discharges from sediment removal facilities or stormwater outfalls to receiving surface waters. (NOTE: Berms, whether used as diversions or collectors, should be designed and stabilized in the same manner as channels.) In steep slope situations (bed slope > 10%) consideration should be given to the use of slope pipes.

Design temporary channels to convey the required capacity (Qr), which is either 1.6 cfs/acre or the calculated peak discharge from a 2-year/1-hour storm event. In special protection watersheds, design temporary channels to convey 2.25 cfs/acre or the peak discharge from a 5-year/1-hour storm. Design all permanent channels to convey either 2.75 cfs/acre or the calculated peak discharge from a 10-year/1-hour storm event.

Designs for temporary and permanent channels should include calculations that clearly demonstrate that the channels have sufficient capacity to safely convey the design flows to the points of discharge and that the channel beds and side slopes will be stable.

Align all channels and berms so as to provide positive drainage throughout. Sharp turns, high angles of confluence, and very low gradients (< 1% bed slope) should be avoided wherever possible. Channels typically require protective linings. The permissible velocity design method may be used for linings of channels with bed slopes less than 10%, while the allowable shear method is acceptable for all channel bed slopes. Use of rock check dams is not an acceptable alternative to a properly designed channel lining. Wherever it is necessary for construction vehicles to cross one of these channels, an adequately sized temporary crossing pipe with clean rock fill and clean rock approaches should be provided.

The permissible velocity or allowable shear stress used for lining design should be sustainable for a reasonable period of time (20 minutes minimum). Using a manufacturer's permissible velocity or allowable shear stress that is only sustainable for a short period of time can result in failure of the channel lining during design storm events; therefore the long-term values should be used for design purposes.

Channels requiring protective liners should be either trapezoidal or parabolic in cross-section. V-shaped channels are not recommended for channels having fabric or geotextile liners due to the tendency for gaps to be left under the lining at the bottom of the channel. Where it is necessary to construct V-shaped channels with fabric or geotextile liners, manufacturer’s recommendations or PennDOT PUB 72 9RC-73M standards should be strictly followed.

IV.5.2 Berm

Berms may be used in a similar manner to channels so long as flow can be maintained along the upslope side of the berm. The maximum tributary area to a berm should be 5.0 acres unless otherwise permitted by the reviewing agency. Objectionable materials should be removed from the berm alignment prior to construction. All berms must be properly compacted. Other design criteria for berms are the same as for channels.

IV.5.3 Top of Slop Berm

Top-of-slope berms are typically used to prevent runoff from running over the edge of a fill and causing erosion on the fill slope. Berms capture runoff from the top of the fill and convey it to a temporary slope pipe or groin ditch leading to a collector channel, sediment trap or sediment basin. Top-of-slope berms should be maintained with successive lifts. As a fill is being constructed, the berm should be raised prior to placement of the next fill lift.

IV.5.4 Temporary Slope Pipe

Temporary slope pipes, also called temporary slope drains or pipe slope drains, are flexible conduits for conveying runoff down existing or constructed steep slopes. Wherever they are used to convey discharges from sediment basins or traps, they should be connected to the principal spillway outlet barrel. When used to convey runoff from unstabilized areas, they should discharge to a sediment basin, trap, or collector channel. The end of a pipe discharging to a collector channel should be oriented to facilitate flow in the channel and located so as to avoid obstructing flow from any upgradient section of the channel.

IV.6 Stabilization Methods and Standards

As soon as slopes, channels, ditches, and other disturbed areas reach final grade they must be stabilized. Upon completion or temporary cessation of the earth disturbance activity in a special protection watershed, that portion of the project site tributary to the special protection waters must be immediately stabilized. In all other watersheds, cessation of activity for at least 4 days requires temporary stabilization. Keeping stabilization current with earthmoving is recommended for all projects, regardless of watershed classification. This chapter is intended to provide guidance and specifications for stabilization as well as information that is useful in achieving stabilization in the least amount of time.

IV.6.1 Surface Roughening

The practice of providing a rough soil surface with horizontal depressions for the purpose of reducing runoff velocity, increasing infiltration, aiding the establishment of vegetation, and reducing erosion. Surface roughening should be applied to slopes 3H:1V or steeper unless a stable rock face is provided or it can be shown that there is not a potential for sediment pollution to surface waters. For roughened surfaces within 50 feet of a surface water, and where blanketing of seeded areas is proposed as the means to achieving permanent stabilization, spray-on type blankets are recommended. Details for stair stepping, grooving, and tracking are provided below.

IV.6.2 Vegetative Stabilization

All disturbed areas that have not otherwise been stabilized and have significant potential for erosion should be stabilized with vegetation. This includes graded areas where it is anticipated that future earthmoving will take place within the coming year. Areas that will be subject to earthmoving within 12 months may be stabilized with temporary seed mixtures, predominantly annual grasses. All others should be stabilized with permanent seed mixtures — predominantly perennial grasses. When final grade is achieved during non-germinating months, the area should be mulched until the beginning of the next planting season. However, the area will not be considered stabilized until a minimum uniform 70% vegetative cover of erosion resistant perennial species has been achieved. Critical areas — erodible soils, within 50 feet of a surface water, etc. — should be blanketed. Temporary erosion control BMPs that were installed for the earthmoving phase of the project must remain in place and be maintained in working order until permanent stabilization is achieved.   Areas that do not receive sufficient sunlight to support vegetation (e.g. under bridge decks) should be stabilized by some means other than vegetation.

As disturbed areas within a project approach final grade, preparations should be made for seeding and mulching to begin (i.e. anticipate the completion date and schedule the seeder). In no case should an area exceeding 15,000 square feet, which is to be stabilized by vegetation, reach final grade without being seeded and mulched. Waiting until earthmoving is completed before making preparations for seeding and mulching is not acceptable. This requirement should be clearly stated in the seeding and mulching specifications contained on the plan drawings.

Before the seeding begins, topsoil should be applied and any required soil amendments worked into the soil to a depth of 4 to 6 inches. If compost is to be added to the topsoil, it should be worked into the soil with the other soil amendments unless it is being applied as an erosion control BMP.

IV.6.3 Topsoil Application

Graded areas should be scarified or otherwise loosened to a depth of 3 to 5 inches to permit bonding of the topsoil to the surface areas and to provide a roughened surface to prevent topsoil from sliding down slope.

Topsoil should be uniformly distributed across the disturbed area to a depth of 4 to 8 inches minimum — 2 inches on fill outslopes. Spreading should be done in such a manner that sodding or seeding can proceed with a minimum of additional preparation or tillage. Irregularities in the surface resulting from topsoil placement should be corrected in order to prevent formation of depressions unless such depressions are part of the PCSM plan.

Topsoil should not be placed while the topsoil or subsoil is in a frozen or muddy condition, when the subsoil is excessively wet, or in a condition that may otherwise be detrimental to proper grading and seedbed preparation. Compacted soils should be scarified 6 to 12 inches along contour wherever possible prior to seeding.

IV.6.4 Seeding

Seed mixtures appropriate for site conditions (e.g. soil pH and fertility, slope, available sunlight, anticipated use, etc.) should be specified. Specifications for these items may be obtained from PennDOT's Publication # 408, Section 804 or from the local conservation district. Other sources can be approved on a case-by-case basis. Upon selection of a reference, that reference should be used to provide all specifications for seeding, mulching, and soil amendments unless otherwise approved. Indicate the reference being used in the plan submittal. Seed mixtures that contain potentially invasive species or species that may be harmful to native plant communities should be avoided.

Seeding rates are stated as pounds per acre (lb/A) of pure live seed (PLS). PLS is the product of the percentage of pure seed times the percentage of germination divided by 100 (e.g. [85% pure seed 72% germination] ÷ 100 = 61% PLS). Seed should not be used later than one year after the test date that appears on the label. Use of seed older than one year could result in less than satisfactory vegetative coverage and the need to re-seed the disturbed area.

Actual seeding rates may be determined by dividing the PLS seeding rate by the %PLS shown on the seed tag. If more than one species is used, indicate the application rate for each species. A nurse crop may be necessary if the selected species do not rapidly germinate. If a nurse crop is used in conjunction with permanent seeding, the nurse crop should not hinder the establishment of the permanent vegetation. A nurse crop should not be applied at a rate exceeding 50% of its temporary seeding rate. Legumes should be inoculated in accordance with the supplier's recommendations. Inoculants should not be mixed with liquid fertilizer.

The Department also recommends that soil testing be done prior to seeding and mulching to determine the proper soil amendments and application rates for the proposed seed mixture(s). Soil test kits are inexpensive and may be obtained from the county Cooperative Extension Service offices. When done properly, soil tests can actually save money that would otherwise be lost on improper soil amendments, unsuccessful seeding, and damage caused by erosion of unstabilized areas. In the absence of a soil test, soil amendments should be added at the rates specified by the selected seeding reference.

IV.6.5 Mulching

Mulches absorb rainfall impact, increase the rate of infiltration, reduce soil moisture loss due to evaporation, moderate soil temperatures, provide a suitable environment for germination, and protect the seedling from intense sunlight. All seeded areas should be mulched or blanketed to minimize the potential for failure to establish an adequate vegetative cover. Mulching may also be used as a temporary stabilization of some disturbed areas in non-germinating seasons.

Straw and hay mulch should be anchored or tackified immediately after application to prevent being windblown. A tractor-drawn implement may be used to “crimp” the straw or hay into the soil — about 3 inches. This method should be limited to slopes no steeper than 3H:1V. The machinery should be operated on the contour. Note: Crimping of hay or straw by running over it with tracked machinery is not recommended.

Polymeric and gum tackifiers mixed and applied according to manufacturer’s recommendations may be used to tack mulch. Avoid application during rain and on windy days. A 24-hour curing period and a soil temperature higher than 45° F are typically required. Application should generally be heaviest at edges of seeded areas and at crests of ridges and banks to prevent loss by wind. The remainder of the area should have binder applied uniformly. Binders may be applied after mulch is spread or sprayed into the mulch as it is being blown onto the soil. Applying straw and binder together is generally more effective.

Synthetic binders, or chemical binders, may be used as recommended by the manufacturer to anchor mulch provided sufficient documentation is provided to show they are non-toxic to native plant and animal species. Mulch on slopes of 8% or steeper should be held in place with netting. Lightweight plastic, fiber, or paper nets may be stapled over the mulch according to manufacturer’s recommendations. Shredded paper hydromulch should not be used on slopes steeper than 5%. Wood fiber hydromulch may be applied on steeper slopes provided a tackifier is used. The application rate for any hydromulch should be 2,000 lb/acre at a minimum.

SECTION 5: SEDIMENT BASINS

V.1 Design Criteria Summary

1. Sediment basins may not be located within the drainage area of a sediment trap or another sediment basin (unless the sediment basins are integral to the permanent stormwater design and are properly sized for storage and discharge capacities). Sediment basins also may not be located within a live stream channel, or a wetland. The bottom elevation should not be located below the seasonal high water table, adjacent wetlands, or perennial stream channels. Unanticipated springs and seeps intercepted during excavation should be safely conveyed around the basin to a suitable down gradient discharge point.

2. In karst topography, impounded water causes soil saturation and loss of cohesion, and produces stress from the weight of the water. Differences in hydraulic head and steep hydraulic gradients can result in sinkhole development. To ensure that these facilities are kept small and shallow, it is recommended that drainage areas be kept to 5 acres or less and that sediment traps be utilized to the maximum extent practicable so that the total depth is kept below 5 feet. For areas where a sediment basin cannot be avoided, the designer should keep the depth to the minimum (4 feet to the top of the settling volume). At the discretion of the designer, it may be necessary to install an impermeable liner based on geotechnical testing, known occurrences of sinkhole development, and whether the basin will be converted to a permanent stormwater management facility. Maintenance instructions should emphasize the importance of ensuring the integrity of all pipes. Pipe leakage or sagging can become the focus of soil loss into subsurface voids leading to subsidence and the development of sinkholes. Should sinkholes develop, they should be promptly and properly repaired. Information regarding sinkhole repair should be placed on the plan drawings.

3. Access to proposed and existing basins should be maintained for the life of the basin. When no longer needed, accesses should be regraded and stabilized.

4. Permanent basins which are used temporarily as sediment basins must be designed to meet the requirements of the permanent basin (e.g. inside and outside slopes, permanent outlet structures, benches, forebays, access ramps, and preservation/remediation of subsoils for infiltration rates). Sediment basins that will be converted to infiltration basins should be constructed in accordance with the Pennsylvania Stormwater Best Management Practices Manual or other appropriate design standard at the discretion of the Department. Note that the risk of infiltration failure may increase significantly for infiltration basins used as sediment basins during construction.

5. A sediment storage zone of 1,000 cubic feet per disturbed acre — over the life of the project within the watershed of the basin is required. The sediment storage zone should be at least 1 foot in depth. This zone is in addition to any permanent pool requirement.

6. A dewatering zone of 5,000 cubic feet for each disturbed and undisturbed acre disturbed and undisturbed tributary to the basin is also to be provided. Reductions in the dewatering zone are allowed unless the basin is in an HQ or EV watershed. However, the minimum required dewatering zone in non-special protection watersheds is 3,600 cubic feet per acre. The minimum depth of the dewatering zone is 3 feet.

7. Greater surface areas increase trapping efficiency of sediment basins. The recommended minimum surface area (SA min) at the top of the sediment storage zone is:

SA min = 1.2 (qout/ s), where:

qout = basin discharge rate

Уs = Particle settling velocity as follows:

For sand, loamy sand, & sandy loam soils:	*Уs = 1.2 X 10 -3 ft/sec*
For loam, silt, & silt loam soils:	*Уs = 7.3 X 10 -5 ft/sec*
For clay loam, silty clay, & clay soils:	*Уs = 1.2 X 10 -5 ft/sec*

An acceptable alternative is the use of a soil stabilizer on disturbed surfaces to reduce sediment load in runoff.

8. Sediment basins should have a flow length to width ratio of at least 2L:1W unless a turbidity barrier or a suitable sediment forebay is provided. For sizing and shaping of forebays, see Pennsylvania Stormwater Best Management Practices Manual. Forebays should be cleaned when accumulated sediment reaches half the total depth. In special protection watersheds a 4L:1W flow length to width ratio should be provided.

9. Sediment basins should dewater in a period ranging from 2 to 7 days (4 to 7 days in special protection watersheds). Skimmers are the preferred dewatering devices; however, perforated risers are also acceptable. For perforated risers, sediment removal efficiency can be increased, particularly for the smaller storm events, by providing a less proportional amount of perforations on the bottom row (or two for risers having 5 or more rows of holes) of the riser. Unless otherwise approved, there should be no more than 2 holes difference between upper and lower rows. The “rule of thumb” for dewatering time calculations of perforated risers may not be used on risers designed in this way

10. Every sediment basin should be provided with an emergency spillway with a minimum bottom width of 8’. Emergency spillways not designed to convey part of the required discharge capacity should have a minimum depth of 6”. All others should have sufficient depth to convey the design discharge while providing the required freeboard above the elevation at which the design discharge is provided.

11. The elevation of the emergency spillway crest should be at least 6” above that of the principal spillway — top of dewatering zone.

12. Sediment basin spillways should be able to discharge at least 2 cfs/acre from the entire contributing watershed or route the anticipated peak flow from the 25-year, 24-hour storm event, assuming all dewatering perforations are clogged and standing water not encroaching upon the

required freeboard. Discharge capacity may be provided by the principal spillway, or a combination of the principal and emergency spillways. At a minimum, the principal spillway should be designed to convey the calculated peak flow from a 10-year, 24-hour storm event. Spillways of permanent basins used as temporary sediment basins may require greater discharge capacities.

13. Outlet barrels for permanent basins — and temporary basins with tributary drainage areas of 10 acres or more — should be set in a concrete cradle. Outlet barrels should be constructed of a material that is not susceptible to crushing or other damage during construction. Limitations of piping are often given by the manufacturer. PVC and other materials requiring gravel enclosures to prevent crushing are not acceptable for use as outlet barrels. Anti-seep collars or filter diaphragms should be provided wherever soils having piping potential are used to construct the embankment.

14. The discharge from a sediment basin should be safely conveyed to a surface water or adequately sized storm sewer. Where an outlet channel extending between a sediment basin and a receiving stream is proposed, it should be designed to safely convey the same flow which is computed to discharge from the basin. The design flow for the outlet channel would depend upon a number of factors:

A. If a portion of the discharge from the sediment basin is being diverted into another conveyance system that is not interconnected (e.g. storm sewer), then that portion should be subtracted from the design flow for the outlet channel. In these instances, approval would be needed from the owner of that sewer system. Consideration for impacts to receiving waters may also be necessary for the destination point of the diverted flow.

B. For sediment basins that will be converted to permanent basins, the outlet channels should be designed for the maximum anticipated flows, which could be either the discharge from construction or post-construction conditions (e.g. 2 cfs/acre discharge or 100-year discharge, respectively).

C. For sediment basins used solely for temporary purposes, the designer may use either the 2 cfs/acre discharge or the routed 25-year, 24-hour storm.

15. An analysis of the proposed discharge should be conducted in the following instances to demonstrate that no accelerated erosion or damage from stormwater will occur:

A. Wherever the discharge from a permanent or temporary basin is to a flow path other than a surface water (e.g. a natural swale).

B. Wherever the tributary drainage area of a temporary basin is at least 10% greater than the preconstruction condition.

C. Wherever discharges increase peak flow — up to the 100-year event— in a surface water by more than 10%, or as required by the Department.

The analysis should follow the sequence of bulleted and numbered items listed in the Department's factsheet on off-site discharges (Off-Site Discharges of Stormwater to Areas That Are Not Surface Waters, Document #3930-FS-DEP4124). Storm frequency may vary on a site to site basis and whether it is a temporary or permanent discharge, but at a minimum, the effects of the 10-year, 24-hour storm should be analyzed

The first step in the analysis is to show no increase in discharge rate from pre-construction to post-construction conditions. If this is not possible, the flow path below the basin should be analyzed to determine whether accelerated erosion is likely to occur, based upon the calculated peak flow from the 10-year, 24-hour storm event. A written analysis that evaluates and identifies existing land cover and vegetation, topography, geology, and soils on down slope properties should be included. The analysis should be done at the point most vulnerable to erosion (e.g. steepest slope, erodible soil, least protective cover, etc.) between the point of discharge and the receiving surface water. For relatively uniform or extremely long flow paths, a point within 500 feet of the discharge point may be chosen. For discharges increasing the flow rate onto a neighboring property prior to entering a surface water, an easement should be obtained.

16. Soils acceptable for embankment construction should be limited to GC, GM, SC, SM, CL or ML as described in ASTMD-2487 (Unified Soils Classification). Other soils may be acceptable on a case-by-case basis for temporary basins, or permanent basins with drainage areas less than 10 acres.

17. The foundation of the embankment should be stripped and grubbed to a depth of two feet prior to any placement and compaction of earthen fill.

18. A key trench, or cutoff trench, is recommended for all basin embankments with heights exceeding 8 feet and is required for all permanent basins. Minimum trench depth = 2', minimum width = 4', maximum side slope steepness is 1H:1V. The trench should extend up both abutments to the riser crest elevation. Compaction requirements should be the same as those for the embankment. The trench should be dewatered during backfilling and compaction operations. NOTE: A key trench may not be required wherever it can be shown that another design feature, such as the use of an impermeable liner, accomplishes the same purpose.

19. Any springs encountered in the foundation area of a basin embankment should be drained to the outside/downstream toe of the embankment with a drain section two feet by two feet in dimension consisting of PennDOT Type A sand, compacted by hand tamper. No geotextiles are to be used around the sand. The last three feet of this drain at the outside/downstream slope should be constructed with AASHTO #8 material. Other methods of draining spring discharges may be accepted on a case-by-case basis.

20. All basin embankments should be compacted by sheepsfoot or pad roller. The loose lift thickness should be 9 inches or less, depending on roller size, and the maximum particle size is 6 inches or less — 2/3 lift thickness. Five passes of the compaction equipment over the entire surface of each lift is required. Embankment compaction to visible non-movement is also required.

21. The minimum embankment top width is 8 feet. The maximum constructed embankment slope is 2H:1V. The sum of the horizontal components of the inside and outside embankment slopes (Z1 + Z2) should total at least 5. The maximum steepness of slopes for constructed embankments in permanent basins is 3H:1V inside and outside. Embankments and other disturbed areas in and around the basin should be stabilized immediately upon completion of the basin. Trees may not be planted on any basin embankment, because the root systems may compromise the integrity of the berm over time. Trees may be planted in the non-embankment (pool) areas of permanent basins.

22. A minimum of 24 inches of freeboard is required above the elevation at which the 2 cfs/acre discharge capacity or the routed peak flow from the 25-year, 24-hour storm is provided. If the emergency spillway is being used to provide part of the design discharge, the freeboard should be provided above the design flow elevation in the emergency spillway. An acceptable alternative is to provide a discharge capacity equal to the 100-year, 24-hour storm event, assuming maximum runoff conditions, with 12 inches of freeboard.

23. All exposed embankment slopes should be limed, fertilized, seeded and mulched. Permanent vegetative ground cover in compliance with 25 Pa. Code § 102.22 (relating to site stabilization) should be established upon completion of basin construction. Outside slopes should be blanketed.

24. Embankments should be maintained with a grassy vegetative cover, free of brush and trees.

25. When a perforated riser is selected as the means to dewater a temporary sediment basin, the diameter of the riser should be at least 1.25 times that of the outlet barrel. The minimum riser diameter is 15”. The minimum barrel diameter is 12”.

26. In those instances when a sediment basin will be later used as a stormwater management pond, a temporary riser may be attached to the permanent riser to dewater the dewatering zone within the required time period while the basin is acting as a sediment basin. The diameter of a temporary riser attached to a permanent riser need not be 1.25 times that of the permanent outlet barrel. Temporary dewatering holes may also be drilled into the permanent riser — with permanent orifices temporarily sealed — instead of attaching a temporary riser to the permanent riser. For this option, the same number of holes, rows and vertical spacing with the same size of holes and elevations of the rows should be used as would have been used on the temporary riser. It should be noted that storm sewer inlets tributary to such a basin should be maintained at elevations above the crest of the embankment while the basin is functioning as a sediment basin to prevent flooding of streets.

V.2 STANDARD E&S WORKSHEET # 12

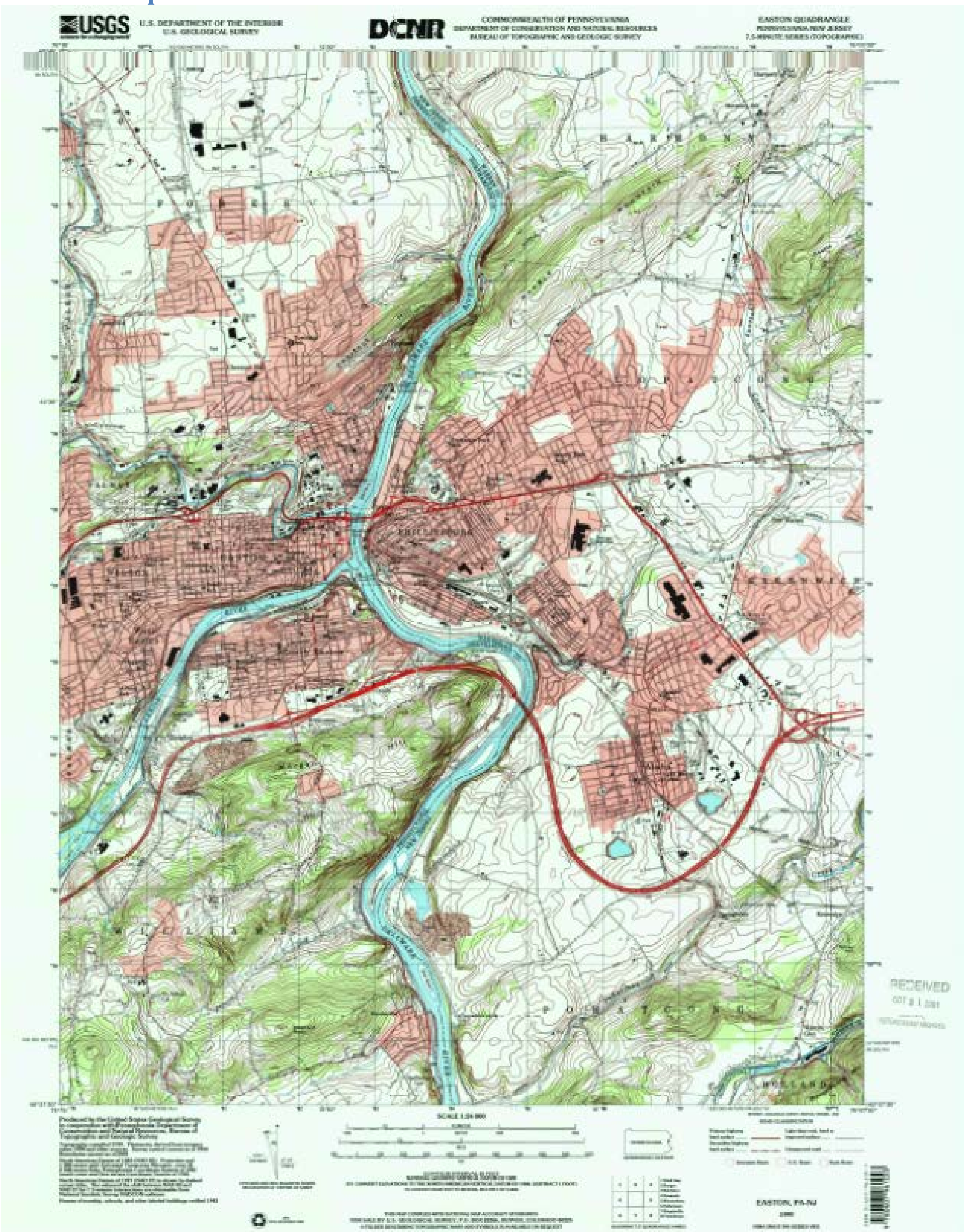
Sediment Basin Capacity Requirements

PROJECT: Hummel Lumber Site
LOCATION: Bushkill Drive Easton, PA 18042
PREPARED BY: LUNA, PLATIA DATE:4/15/14
CHECKED BY: ______________________ DATE:

BASIN NUMBER		1	
PERMANENT OR TEMPORARY BASIN?	(P or T)	T	
SPECIAL PROTECTION WATERSHED?	(YES OR NO)	NO	
Karst soils?	(YES OR NO)	NO	
(A) MAXIMUM TOTAL DRAINAGE AREA	(AC)	4 acres	
IS DRAINAGE AREA (A) MORE THAN 10% LARGER THAN THE PRECONSTRUCTION CONDITION?	(YES OR NO)	YES	
(A_1) DISTURBED ACRES IN DRAINAGE AREA (AC)		4 acres	
(I) INITIAL REQ'D DEWATERING ZONE (5,000 X A)	(CF)	20,000	
(T) REDUCTION FOR TOP DEWATERING (-700 X A)	(CF)	-2,800	
(P) REDUCTION FOR PERMANENT POOL (-700 X A)	(CF)	-2,800	
(L) REDUCTION FOR 4:1 FLOW LENGTH:WIDTH (-350 X A)	(CF)	-1,400	
(D) REDUCTION FOR 4 TO 7 DAY DEWATERING (- 350 X A)	(CF)	-1,400	
(Sv) REQUIRED DEWATERING ZONE [I - (T+P+L+D)][1]	(CF)	11,600	
(Sd) REQUIRED SEDIMENT STORAGE VOLUME (1000 X A_1)	(CF)	4,000	
(St) TOTAL REQUIRED STORAGE VOLUME (Sv + Sd)	(CF)	15,600	
TOTAL STORAGE VOLUME PROVIDED (@ ELEV 3)[2]	(CF)	16,000	
DEWATERING TIME FOR DEWATERING ZONE	(DAYS)	5	
REQUIRED DISCHARGE CAPACITY (2 X A)	(CFS)[3]	8	
PRINCIPAL SPILLWAY TYPE (PERFORATED RISER, SKIMMER, etc.)		SKIMMER	
PEAK FLOW FROM 10 YR/24 HR STORM FOR DRAINAGE AREA (A)		13.85 cfs	
PRINCIPAL SPILLWAY CAPACITY (@ ELEV 5)	(CFS)[4]	------	
EMERGENCY SPILLWAY CAPACITY (@ ELEV 5)	(CFS)[4]	8	
TOTAL BASIN DISCHARGE CAPACITY (@ ELEV 5)	(CFS)	3	
EMERGENCY SPILLWAY PROTECTIVE LINING[5]		GRASS	
OUTLET TO A SURFACE WATER?	(YES OR NO)[6]	NO	
PEAK FLOW FROM A 100 YR/24 HR STORM FOR DRG. AREA (A)		22.66 cfs	

1 The minimum dewatering zone capacity for sediment basins is (3,600 X A). No reduction is permitted in Special Protection (HQ and EV) Watersheds.
2 Total Storage Volume provided at riser crest.
3 Or provide calculations to show peak flow from 25 yr./24 hr. storm for area (A) is routed through the basin.
4 Provide supporting computations.
5 If grass lining is proposed, spillway should be constructed in original ground unless a suitable TRM lining is used. Wherever a TRM is used, riprap should be placed at the bottom of the embankment to prevent scour.
6 If no, and basin is permanent or drainage area is more than 10% larger than pre-construction, provide supporting calculations to show accelerated erosion will not result from the proposed discharge. For discharges increasing volume or rate of flow onto a neighboring property prior to entering a surface water, an easement should be obtained prior to plan submittal.

V.3 USGS Map


USGS
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
DCNR
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY
EASTON QUADRANGLE
PENNSYLVANIA-NEW JERSEY
7.5-MINUTE SERIES (TOPOGRAPHIC)
EASTON, PA-NJ
RECEIVED