Washington State Department of Transportation

Publications Transmittal

Transmittal Number	Date
PT 07-018	March 2007
Publication Distribution To: All holders of the *Highway Runoff Manual* M 31-16	
Publication Title *Highway Runoff Manual*	Publication Number M 31-16
Originating Organization Engineering and Regional Operations Division, Environmental and Engineering Programs Headquarters Environmental Affairs and Hydraulics	

Remarks:

Appendix 2B and Appendix 6A of the Highway Runoff Manual has been revised.

Distribution:

The manual is distributed online: http://www.wsdot.wa.gov/fasc/EngineeringPublications/library.htm

Instructions:

Periodic updates to this manual will be published only on the Internet. If you use a printed or CD ROM copy of the manual, you must consult the *Highway Runoff Manual Resource web page* for post publication updates to verify the information you have is up to date.

For More Information:

Please consult:

WSDOT Intranet's *Highway Runoff Manual Resource webpage*:
http://www.wsdot.wa.gov/Environment/WaterQuality/Runoff/HighwayRunoffManual.htm

WSDOT Internet's *Environmental Services Office Stormwater – Water Quality Program web page*:
http://www.wsdot.wa.gov/Environment/waterquality/

Distributed By	Phone Number	Signature
Administrative and Engineering Publications	(360) 705-7430	Stephanie Williams

Appendix 2B. Table of Contents

Appendix 2B.
Endangered Species Act
Stormwater Design Checklist

2-B.1 Purpose and Use of the Checklist

The Stormwater Design Checklist assists project designers in providing pertinent information about a project's stormwater treatment facilities to biologists responsible for preparing biological assessments required for consultation under Section 7 of the Endangered Species Act. The use of this checklist is necessary to aid in developing biological assessments and to promote consistency in the content provided in the agency's biological assessments.

It is possible that the specific conditions of some projects may warrant modifying or adding certain checklist items. However, to maintain consistency in the type and amount of information collected and submitted for the environmental permitting process, the checklist should be modified only if necessary.

Endangered Species Act
Stormwater Design Checklist

Project Name:_____

Project Location:_____

General Project Information

1. Will work occur outside existing pavement or gravel shoulders? ☐ Yes ☐ No

   If *yes*, describe the nature and extent of the work:

   _____
   _____
   _____
   _____
   _____
   _____
   _____

Existing Impervious Surface and Stormwater Facilities (Preproject)

2. Is there any existing impervious surface within the project area? ☐ Yes ☐ No

   If *yes*, for each threshold discharge area (TDA), identify the amount of existing impervious surface within the project limits:

   TDA Number Square Feet, Acres

   If *no*, go to *#9*.

3. For each TDA, identify the total area of existing pollution-generating impervious surface currently receiving runoff treatment:

   TDA Number Square Feet, Acres

4. For each TDA, identify the total area of existing impervious surface currently receiving flow control:

   TDA Number Square Feet, Acres

5. Is any of the runoff from the existing impervious surface infiltrated? ☐ Yes ☐ No

   If *yes*, what area of the existing impervious surface in each TDA is infiltrated?

   TDA Number Square Feet, Acres

6. Identify the type(s), location(s), footprint(s), and receiving area/water body for each runoff treatment and flow control BMP. If available, provide a map depicting TDA boundaries and BMP locations.

   _____
   _____
   _____
   _____
   _____

7. Describe the nature of the stormwater conveyance (drainage) system (e.g., pipe, culvert, channel, ditch, swale, sheet flow). If available, provide a map of the system depicting TDA boundaries.

   _____
   _____
   _____
   _____
   _____

8. Is off-site stormwater being treated/controlled by WSDOT stormwater facilities prior to initiation of the project? ☐ Yes ☐ No

   If *yes*, will this stormwater continue to be treated/controlled to the same level? ☐ Yes ☐ No

   If off-site stormwater will not continue to be treated/controlled to the same level, explain why not:

   _____
   _____
   _____
   _____
   _____

New Impervious Surface, Retrofitted Existing Impervious Surface, and Stormwater Facilities (Proposed Project)

9. Will the project create a net change in impervious surface? ☐ Yes ☐ No

If *yes*, for each TDA, identify the net change in impervious surface:

TDA Number	Square Feet, Acres

10. Will the project require runoff treatment? ☐ Yes ☐ No

If *yes*, for each TDA, identify the total area of new pollution-generating impervious surface treated and identify the level(s) of treatment required (i.e., *Basic*, *Enhanced*, *Oil Control*, and/or *Phosphorous Control*)*:*

TDA Number	Square Feet, Acres	Level(s) of Treatment

11. Will any of the runoff from the new impervious surface be infiltrated? ☐ Yes ☐ No

If *yes*, what area of the new impervious surface in each TDA will be infiltrated?

TDA Number	Square Feet, Acres

12. Will any existing pollution-generating impervious surface be retrofitted for runoff treatment? ☐ Yes ☐ No

If *yes*, for each TDA, identify how much of the existing pollution-generating impervious surface will be retrofitted for runoff treatment and the level(s) of treatment (i.e., *Basic*, *Enhanced*, *Oil Control*, and/or *Phosphorous Control*):

TDA Number	Square Feet, Acres	Level(s) of Treatment

13. Will any of the runoff from existing impervious surfaces be retrofitted for infiltration?

☐ Yes ☐ No

If *yes*, what area of the retrofitted impervious surface in each TDA will be infiltrated?

TDA Number Square Feet, Acres

14. Will the project require flow control? ☐ Yes ☐ No

If *yes*, for each TDA, identify the total area of new impervious surface to receive flow:

TDA Number Square Feet, Acres

15. Will any existing impervious surface be retrofitted for flow control? ☐ Yes ☐ No

If *yes*, how much of the existing impervious surface in each TDA will be retrofitted for flow?

TDA Number Square Feet, Acres

16. Are any of the project's TDAs exempt from the flow control requirement? ☐ Yes ☐ No

If *yes*, identify the exempt TDA(s):

_____
_____
_____
_____
_____

If *no*, and the project is petitioning for an exemption, has a hydrologic analysis supporting the exemption been approved by Ecology? ☐ Yes ☐ No

- If *yes*, provide a summary of the analysis as an attachment to this checklist.
- If *no*, a hydrologic analysis justifying the exemption must be submitted to Ecology for approval or flow control must be provided.

17. If applicable, identify the type(s), location(s), and footprint(s) for each runoff treatment and flow control BMP. If available, provide a map depicting TDA boundaries and BMP locations.

_____
_____
_____
_____
_____

18. Describe the nature of the stormwater conveyance (drainage) system (e.g., pipe, culvert, channel, ditch, swale, sheet flow). If available, provide a map of the system depicting TDA boundaries.

_____
_____
_____
_____
_____

19. Will the project require construction of a new stormwater outfall structure or a new point of discharge to any water body? ☐ Yes ☐ No

If *yes,* identify the receiving water body and describe areas of permanent and temporary clearing or grading, types of vegetation to be removed, amount of riprap, diameter of outfall pipe(s), and all maintenance/access roads to be constructed. If available, provide a map of outfall locations.

_____
_____
_____
_____
_____

20. If the project is not infiltrating all of the runoff from the new impervious surface and is unable to provide the required runoff treatment or flow control for the entire new impervious surface, explain why not. Documentation should include a completed copy of the *Engineering and Economic Feasibility (EEF) Evaluation Checklist* (Appendix 2A).

_____
_____
_____
_____
_____

21. What stormwater management design standards were applied?

- ☐ WSDOT *Highway Runoff Manual*, version _____ (1995, 2004, 2006, etc.)
- ☐ Ecology's *Stormwater Management Manual*(*s*), version _____ (2001, 2005 Western Washington; 2004 Eastern Washington, etc.)
- ☐ Other: _____
- ☐ Not Applicable

Prepared by_____ Phone_____ Date_____

Project Engineer_____ Office Location_____

APPENDIX 6A

Best Management Practices

List of Tables

List of Figures

Appendix 6A. Best Management Practices

6A-1 Introduction

Read Chapter 6 before applying best management practices (BMPs) to projects.

The following descriptions are provided to aid in the selection of appropriate BMPs for temporary erosion and sediment control (TESC) plans. *Standard Specifications for Road, Bridge, and Municipal Construction* (Standard Specifications) exist for most, but not all, BMPs (the Standard Specifications associated with each BMP are referenced in this section).

General special provisions (GSP) and special provisions must be used to ensure that the other BMPs are effectively employed. Prior to writing a special provision, check the statewide library for existing GSPs and special provisions that can be used to satisfy project needs (http://www.wsdot.wa.gov/eesc/CAE/pse/PLANTBCN.HTM). Regional GSP libraries may also provide useful provisions. Contact region environmental staff or the Statewide Erosion Control Coordinator for assistance in identifying resources when preparing special provisions. The Washington State Department of Ecology's (Ecology's) stormwater management manuals for western Washington (SMMWW) and eastern Washington (SMMEW) are especially useful, as they contain thorough sets of BMP specifications. They can be accessed at the following web site: http://www.ecy.wa.gov/programs/wq/stormwater/index.html

6A-2 Best Management Practices

6A-2.1 Temporary Seeding

WSDOT Standard Specification
8-01.3(2) Seeding, Fertilizing, and Mulching

1. Definition

   The establishment of a vegetative cover on disturbed areas by seeding with plants. Temporary seeding is used in areas where permanent cover is not necessary or appropriate (e.g., stockpiles, over-wintering of incomplete grades). Permanent seeding is intended to restore and provide perennial vegetative cover to disturbed areas.

2. Purpose

   By protecting bare soil from raindrop impact and binding the soil with its roots, a well-established vegetative cover is one of the most effective methods of reducing erosion.

3. Additional Information

Application of agricultural chemicals to promote grass establishment must be conducted in a manner and at application rates that will not result in loss of chemicals to stormwater runoff. Manufacturers' recommendations for application rates and procedures must be followed.

To determine the optimal seed/fertilizer mixes and application specifications for a project, contact the Headquarters (HQ) Roadside & Site Development Unit. Additional information can be found in the Washington State Department of Transportation (WSDOT) *Roadside Manual*, Chapter 800 – Vegetation ~ Seed, Fertilizer, and Mulch.

6A-2.2 Mulching

WSDOT Standard Specification
8-01.3(2)D Mulching

1. Definition

Application of organic material to protect bare soil from raindrop and sheet erosion, in addition to enhancing seed germination.

2. Purpose

Mulch provides immediate temporary protection from erosion. Mulch also enhances plant establishment by conserving moisture; holding fertilizer, seed, and topsoil in place; and moderating soil temperatures. There are numerous mulches that can be used, such as straw, wood chips (hog-fuel), wood fibers, and compost.

3. Additional Information

- Compost is a popular material for mulching and has soil amending properties that benefit continued plant growth. Make sure the material is composted well enough to prevent leaching of nutrients into the runoff.
- Wood chips left over from land-clearing activities also make great mulch. During the decomposition process, however, a nitrogen deficiency can occur in the soil, making it difficult for plants to grow well.
- Wood chip mulch is also a suitable material for stabilizing entrances and haul roads that are not heavily used by construction vehicles.
- Hand-spread straw is less likely to be displaced by wind or runoff, because of its weight and length. Blown straw is smaller and may be more susceptible to wind and rainfall/runoff action.

- Organic and inorganic tackifiers are available to prevent displacement of mulch by wind and rain. Refer to WSDOT Standard Specifications 8-01.3(2)E Soil Binding Using Polyacrylamide (PAM), and 8-01.3(2)D Mulching.

6A-2.3 Blankets

WSDOT Standard Specifications
8-01.3(3) Placing Erosion Control Blanket
9-14.5(2) Erosion Control Blanket

WSDOT Standard Plans
I-12 Erosion Control Blanket Placement on Slope
I-13 Erosion Control Blanket Placement in Channel

1. Definition

   A blanket made of natural plant material or synthetic fibers that is rolled out and fastened to the soil surface to protect soil from raindrop and sheet erosion.

2. Purpose

   Erosion control blankets protect soil from raindrop and sheet erosion until permanent vegetation is established. Organic blankets are made of jute, straw, wood shavings, coconut fiber (coir), or various combinations of each. Product longevity ranges from 6 months to 5 years, depending on the composition of the blanket and environmental conditions. Synthetic blankets often contain materials that resist ultraviolet light and last more than 5 years. While most are suitable for slopes, others can be used in ditches with considerable flow volumes/velocities.

6A-2.4 Plastic Covering

WSDOT Standard Specifications
8-01.3(5) Placing Plastic Covering
9-14.5(3) Clear Plastic Covering

1. Definition

   The covering with plastic sheeting of bare areas that need immediate protection from erosion.

2. Purpose

   The primary uses for plastic are:

   - Coverage of slopes and stockpiles.

- Short-term coverage where mulch or blankets are not an option.
- Protection of seed from cold weather to encourage early growth of vegetation.

3. Additional Information

- Plastic provides 100% protection of the soil; however, it collects 100% of the rain and transfers the erosion potential elsewhere. Therefore, energy dissipation downslope of the plastic, as well as conveyance of runoff, should be anticipated and addressed appropriately with other BMPs.
- As with erosion control blankets, plastic must be keyed in at the top of the slope to prevent water from going under the plastic, and upslope sheets must be placed over downslope sheets like shingles on a roof.
- There is a misconception that plastic is cheaper and easier to use than erosion blankets. The average cost per square yard of installed plastic is often greater than the cost of many erosion control blankets, especially when maintenance, removal, and disposal costs are added.

6A-2.5 Polyacrylamide for Soil Erosion Protection

WSDOT Standard Specification
8-01.3(2)E Tacking Agent and Soil Binders – Soil Binding Using Polyacrylamide

1. Definition

Polyacrylamide (PAM) is a long-chain polymer developed to clarify drinking water. It can be used in erosion and sediment control applications because of its ability to stabilize soils and remove fine suspended sediments from stormwater runoff at highway construction sites. PAM also increases infiltration rates in soils by preventing surface sealing.

2. Purpose

Applying PAM to bare soil in advance of a rain event reduces erosion and controls sediment transport. First, PAM binds soil particles together and reduces the effects of raindrop and sheet erosion. As a result, stormwater infiltration is increased because the soil pore volume is not clogged with fine sediments. Second, stormwater pond performance is enhanced because sediment that reaches the pond contains PAM. The polymer binds the smaller particles together, making longer, heavier particles that settle out of suspension faster than in the absence of PAM. Consequently, PAM can make conventional BMPs much more effective.

3. Additional Information

- PAM products must meet ANSI/NSF Standard 60 for drinking water treatment, and be anionic (i.e., nonionic) and linear (noncross-linked). The minimum average molecular weight should be 5 Mg/mole.
- PAM must not be applied directly to water or allowed to enter a water body. **All soil treated with PAM must drain to a sediment pond or trap prior to discharge.**
- In areas that drain to a sediment pond, PAM may be applied to bare soil under the following conditions:
  - □ During rough grading operations
  - □ In staging areas
  - □ On balanced cut-and-fill earthwork
  - □ On haul roads prior to placement of crushed rock surfacing
  - □ On compacted soil road base
  - □ On stockpiles
  - □ After final grade and before paving or final seeding and planting
  - □ In pit sites
- For sites having a winter shutdown, or where soil will remain unworked for several months, PAM should be used in combination with mulch.
- For small areas that need coverage, PAM can be applied at the dry application rate using a hand-held "organ grinder" seed spreader.
- Depending on site conditions, PAM remains in the soil 3 to 6 months from the date of application. Extreme weather and heavy traffic (if used on haul roads) shorten the lifespan. These conditions require more frequent application.
- Refer to Ecology's SMMWW, Volume II, for more information on PAM.

6A-2.6 Bonded Fiber Matrix & Mechanically Bonded Fiber Matrix

WSDOT Standard Specification
8-01.3(2)E Tacking Agent and Soil Binders

1. Definition

Bonded Fiber Matrix: A combination of wood fiber and organic or synthetic tackifier that can be mixed with seed and applied hydraulically. Requires at least a 48-hour cure time and should not be used on saturated soils that have groundwater seeps.

Mechanically Bonded Fiber Matrix: A combination of wood fiber, organic or synthetic tackifiers, and crimped interlocking poly fibers that can be mixed with seed and applied in advance of or during precipitation and on saturated soil.

2. Purpose

Soil stabilization BMPs that form a permeable crust over disturbed soils to protect from raindrop impacts. Both products provide better protection than wood cellulose fiber alone. They can be applied with seed or as a stand-alone BMP.

6A-2.7 Preserving Natural Vegetation

WSDOT Standard Specification
1-07.16(2) Vegetation Protection and Restoration

1. Definition

Minimizing exposed soils by clearing only where construction will occur or an undisturbed strip of natural vegetation or an established suitable planting between sensitive areas and land-disturbing activities.

2. Purpose

Vegetation provides the following benefits:

- Rainfall impact (energy) absorption
- Reduction of runoff volumes and velocities
- Sediment trapping
- Root stabilization of soil

Preserving natural vegetation reduces the need to spend money on BMPs that try to mimic these natural benefits. Vegetation surrounding sensitive areas (buffer zones) provides critical habitat and assists in controlling erosion, especially on unstable steep slopes.

3. Additional Information

Many local jurisdictions require that buffer zones be identified and protected with signs and fencing around wetlands, streams, and other sensitive areas. These areas should not be used as sediment filters. Check with the local jurisdiction or with WSDOT environmental permitting staff.

6A-2.8 Sodding

WSDOT Standard Specification
9-14.6(8) Sod

1. Definition

   Stabilizing fine-graded disturbed areas by establishing permanent grass stands with sod.

2. Purpose

   To establish permanent turf for immediate erosion protection or to stabilize drainageways where concentrated overland flow will occur.

3. Additional Information

   - Sod may be more expensive than other permanent-cover BMPs, but because the grass is already established, instant protection is provided.
   - In swales, placing sod strips perpendicular to the flow of water increases the ability to resist shear stress.
   - Staggering sod strips produces a more stable soil cover.
   - For maintenance information, refer to WSDOT Standard Specification 8-01.3 (15) Maintenance.

6A-2.9 Topsoiling

WSDOT Standard Specifications
8-02.3(4) Topsoil
9-14.1 Soil

1. Definition

   Preserving or importing topsoil to promote vegetation establishment in nutrient-poor soils.

2. Purpose

   To provide a suitable growth medium for final site stabilization.

6A-2.10 Conveyance Channel Stabilization

WSDOT Standard Specification
For flexible liners, the information below can be used to select appropriate materials. Materials and installation Standard Specifications already exist for these liner types.

If it is determined that a rigid liner is necessary, contact the WSDOT HQ Design Office, Hydraulics Branch. No WSDOT Standard Specification exists for solid liners; therefore, a special provision must be written. For instructions on preparing special provisions, see the Introduction (6A-1).

1. Definition

   Temporary conveyance channels are designed, constructed, and stabilized to prevent erosion from the expected velocity of flow from a 2-year, 24-hour frequency storm for the developed condition. Materials used to stabilize channels against erosion are categorized as flexible and rigid. Flexible channel liners include vegetation, blankets, gravel, and small- to medium-sized riprap. Rigid materials used for conveyance systems include PVC/concrete/metal pipe, asphalt, and large rock.

2. Purpose

   To stabilize the conveyance feature sufficiently to prevent erosion up to the design storm flow.

3. Additional Information

   The following general guidance comes from the *Hydraulic Engineering Circular No. 15 – Design of Roadside Channels with Flexible Linings*, Federal Highways Department publication No. FHWA-IP-87-7.

   The following principles must be considered when designing stable channels:

   - Channels should be sized to convey expected flows.
   - Bare soil has very little resistance to erosion when subjected to concentrated flows. Channels must be protected to withstand expected erosive forces.
   - Flow velocities should be limited, if necessary, to prevent damage to channel liners.
   - Flexible liners are not as strong as rigid liners, but are able to conform to changes in channel shape while maintaining the overall lining integrity. As a general guideline, only rigid liners should be used in channels with shear stresses exceeding 8 lb/ft^2 or on slopes exceeding 10% (unless using properly-sized riprap). Table 6A-1 summarizes the advantages and disadvantages of the two liner types.

     The potential for erosion is based on the shear stress of flow, which is the force required to pull or peel (erode) material off the bottom or sides of a ditch. Shear stress can be calculated using the following formula:

     Shear Stress = WHG where:
     W = Weight of water (62.4 lb/ft^3)

H = Height of water in feet
G = Channel gradient in ft/ft

(Channel gradient and water height in this formula assume an unobstructed flow of water in the ditch.)

- Using shear stress to determine effective liner types:

  Table 6A-2 indicates the maximum shear stresses that several types of flexible liner materials can withstand. As a general guideline when rock lining is used, multiply the expected maximum shear stress by 3 to apply a 30% safety factor, to obtain the mean diameter of rock or riprap needed to stabilize the ditch. Manufacturers provide the shear strength ratings for erosion control blankets.

  Selection of liner material should be based upon the maximum shear stress that products or specified rock sizes can withstand.

- Sample calculation and product selection process:

  What flexible liner materials are adequate to stabilize a ditch with a 3% slope and an expected flow depth of 1.5 feet?

  Shear stress = $(62.4\ lb/ft^3)(1.5\ ft)(.03) = 2.81\ lb/ft^2$

  If rock is used, stone size should be a minimum mean stone size of at least 8.4 inches, because (2.81) (3.0 conversion factor) = 8.4

  Numerous erosion control blankets made of coir and synthetic turf reinforcement products could be substituted for rock with potentially significant cost savings. A well-established healthy stand of grass could also withstand the expected shear stresses in the ditch and help purify the runoff.

  Consider coupling other BMPs with the channel lining to ensure channel stability. Check dams can greatly reduce the velocity of flowing water, thereby reducing shear stress. Check dams can prevent erosion until the permanent grass liner is established. Temporary slope drains provide rigid lined conveyances until the permanent rigid or flexible lined channels are completed.

Table 6A-1. Flexible versus rigid lined conveyances.

Flexible	Rigid
Advantages ▪ Inexpensive to install and maintain (grass-lined ditches are self-healing) ▪ Provide runoff treatment ▪ Allow some infiltration ▪ Cause less increase in peak flows	*Advantages* ▪ Maximize conveyance capacity using limited space ▪ Fully effective immediately (no need to wait for grass to grow) ▪ Can be designed to withstand any level of shear stress
Disadvantages ▪ Excessive flows can cause erosion ▪ Vegetation requires time to become established ▪ Require more space ▪ Not to be used in channels where shear stress exceeds 8 lb/ft^2 or slopes exceed 10% (except riprap)	*Disadvantages* ▪ Expensive to build, maintain, and repair ▪ Increased peak discharge rates more likely to cause downstream erosion ▪ Minimal, if any, infiltration ▪ No runoff treatment

Table 6A-2. Maximum permissible shear stresses for flexible liners.

Liner Category	Liner Type	Permissible Shear Stress (lbs/ft^2)
Bare soil – No liner	Noncohesive soil	0.01-0.04
	Cohesive soil	up to 0.1 (noncompacted)/ up to 0.8 (compacted)
Erosion control blankets (temporary/permanent)*	Jute	0.45-1.0
	Curlex wood or straw	1.0-2.5
	Coir	2.0-4.0
	Organic, synthetic, or mix	10.0-12.0
Vegetative**	Uncut stand	2.1-3.7
	Cut grass	0.6-1.0
Gravel/riprap	1-inch	0.33
	2-inch	0.67
	6-inch	2.0
	12-inch	4.0

* Permissible shear stresses based on products chosen at random to give a general idea of blanket strengths by material type. This table does not reflect the full range of permissible shear stresses for each product type.

** Varies with type and density of grass stand.

6A-2.11 Fencing

WSDOT Standard Specifications
1-07.16(2) Vegetation Protection and Restoration
1-07.16(3) Fences, Mailboxes, Incidentals

WSDOT Standard Plan
I-15 High Visibility Construction Fencing

A special provision must be prepared if a particular fencing design or material is necessary. For instructions on preparing special provisions, see the Introduction (6A-1). *Project Delivery Memo #04-04* dated August 11, 2004 addresses high-visibility construction fencing. Regions should adapt the special provision to best fit their methods of presentation, while retaining the intent.

1. Definition

   Installing a physical barrier to define a project boundary or protect a sensitive feature.

2. Purpose

   Fencing restricts clearing to approved limits, prevents disturbance of sensitive areas, and limits construction traffic to designated roads and entrances.

3. Additional Information

   - Suitable fencing materials include plastic safety fence, metal fence, and silt fence. Plastic safety fence or high-visibility fence should be installed in advance of clearing and grubbing to delineate sensitive areas. Silt fence is appropriate in areas where there is concern about turbid runoff leaving the site. However, safety fence and other material should always be considered in place of silt fence where there is no concern about runoff.
   - Fencing is used to meet Elements 1 (high-visibility fencing) and 4 (silt fencing) of a TESC plan (see Chapter 6).
   - Maintenance – Refer to WSDOT Standard Specification 8-01.3(15) Maintenance.

6A-2.12 Stabilized Construction Entrance

WSDOT Standard Specification
8-01.3(7) Stabilized Construction Entrance

WSDOT Standard Plan
I-14 Miscellaneous Erosion Control Details

1. Definition

   A temporary stone-stabilized pad located at points of vehicular ingress and egress on a construction site.

2. Purpose

   To reduce the amount of mud, dirt, rocks, etc., transported onto public roads by motor vehicles or runoff.

3. Additional Information

   - The same practice can be implemented for all staging and employee parking areas for the project.
   - Maintenance – Refer to WSDOT Standard Specification 8-01.3(15) Maintenance.

6A-2.13 Tire Wash

WSDOT Standard Specification
8-01.3(7) Stabilized Construction Entrance

1. Definition

   A system using sump and spray equipment to remove sediment from vehicles during site egress.

2. Purpose

   A wheel wash is used when a stabilized construction entrance does not prevent sediment from being tracked onto off-site pavement.

3. Additional Information

   - Effective function requires participation by and communication with vehicle drivers.
   - Wash water must be disposed of in a way that does not violate water quality standards.
   - Local jurisdictions may require a wheel wash as a permit condition.

6A-2.14 Construction Road Stabilization

WSDOT Standard Specification
Material specifications exist for road stabilization materials, but a special provision must be

written describing when, where, and how much material is to be used. For instructions on preparing special provisions, see the Introduction (6A-1).

1. Definition

   The temporary stabilization of access roads and other on-site vehicle transportation routes immediately after grading.

2. Purpose

   To reduce erosion of temporary roadbeds by construction traffic during wet and dry weather. Construction road stabilization eliminates the need for regrading of permanent road beds between the time of initial grading and final stabilization, and reduces dust emissions.

3. Additional Information

   - If the area will not be used for permanent roads, parking areas, or structures, a 6-inch depth of hog fuel may also be used (but this is likely to require more maintenance). Whenever possible, construction roads and parking areas are placed on a firm, compacted subgrade.
   - On areas that will receive asphalt as part of the project, install the first lift as soon as possible.
   - A 6-inch depth of 2- to 4-inch crushed rock, gravel base, or crushed surfacing base course can be applied immediately after grading or utility installation. A 4-inch course of asphalt treated base (ATB) may also be used, or the road/parking area may be paved. It may also be possible to use cement or calcium chloride for soil stabilization.
     If cement or cement kiln dust is used for roadbase stabilization, pH monitoring and other BMPs are necessary to evaluate and minimize the impact on stormwater.
   - Roadways must be carefully graded to drain effectively. Drainage ditches are required on each side of the roadway in the case of a crowned section, or on one side in the case of a super-elevated section. Drainage ditches should be directed to a sediment control BMP.
   - Rather than relying on ditches, it may also be possible to grade the road so that runoff sheet-flows into a heavily vegetated area with well-developed topsoil. If the vegetated area has at least 50 feet of vegetation, it is generally preferable to use the vegetation, rather than a sediment pond or trap, to treat runoff.
   - Storm drain inlets receiving runoff from temporary construction roadways must be protected to prevent sediment-laden water from entering the storm drain system.
   - Inspect stabilized areas regularly, especially after large storm events.

- Crushed rock, gravel base, hog fuel, etc., should be added as required to maintain a stable driving surface and to stabilize any areas that have eroded.

6A-2.15 Dust Control

WSDOT Standard Specification
No WSDOT Standard Specification exists, so a special provision must be written. For instructions on preparing special provisions, see the Introduction (6A-1).

1. Definition

   Reducing the movement of dust during land-disturbing, demolition, and construction activities.

2. Purpose

   To prevent movement of dust where on-site and off-site impacts to roadways, drainage ways, or surface waters are likely.

3. Additional Information

   - Vegetate or mulch areas that will not receive vehicle traffic. In areas where planting, mulching, or paving is impractical, apply gravel or landscaping rock.
   - Limit dust generation by clearing only those areas where immediate activity will take place.
   - Construct natural or artificial windbreaks or windscreens.
   - Spray the site with water until the surface is wet. Repeat as needed. To prevent mud being carried onto adjacent streets, install a Stabilized Construction Entrance and/or a Wheel Wash as necessary.
   - Spray exposed soil areas with a dust palliative, following the manufacturer's instructions and cautions regarding handling/application. Used oil is prohibited as a dust suppressant. Local governments may approve other dust palliatives (e.g., calcium chloride or PAM).
   - Techniques that can be used for unpaved roads and lots include:
     - Lower speed limits.
     - Upgrade the road surface strength by improving particle size, shape, and mineral types that make up the surface and base materials.
     - Add surface gravel to reduce the source of dust emission. Limit the amount of fine particles (those passing a #200 screen) to 10–20%.

- □ Use geotextile fabrics to increase the strength of new roads or roads undergoing reconstruction.
- □ Encourage the use of alternative, paved routes, if available.
- □ Restrict use by tracked vehicles and heavy trucks, to prevent damage to the road surface and base.
- □ Apply chemical dust suppressants using the admix method: blending the product with the top few inches of surface material. Suppressants may also be applied as surface treatments.
- □ Pave permanent roads and other high-traffic areas.
- □ Use vacuum street sweepers.
- □ Remove mud and other dirt promptly so it does not dry and turn into dust.
- □ Limit dust-causing work on windy days.

g. Contact the local air pollution control authority for guidance and training on other dust control measures. Compliance with the local air pollution control authority constitutes compliance with this BMP.

6A-2.16 Surface Roughening

WSDOT Standard Specification
8-01.3(2)A Preparation for Application

1. Definition

   Creating longitudinal depressions perpendicular to the natural flow of runoff by using a cleated roller, crawler tractor, or similar equipment.

2. Purpose

   To aid in the establishment of vegetative cover by reducing runoff velocity, increasing infiltration, and providing for sediment trapping.

3. Additional Information

   There are different methods for achieving a roughened soil surface on a slope; the selection of an appropriate method depends on the type of slope. Roughening methods include stair-step grading, grooving, contour furrows, and track walking. Factors to be considered in choosing a method are slope steepness, mowing requirements, and whether the slope is formed by cutting or filling.

   - Disturbed areas that will not require mowing may be stairstep graded, grooved, or left rough after filling.

- Stairstep grading is particularly appropriate in soils containing large amounts of soft rock. Each step catches material that sloughs from above, and provides a level site where vegetation can become established. Stairs should be wide enough to work with standard earth-moving equipment. Stairsteps must be on contour, or gullies will form on the slope.
- Areas that will be mowed (these areas should have slopes less steep than 3H:1V) may have small furrows left by disking, harrowing, raking, or seed-planting machinery operated on the contour.
- Graded areas with slopes greater than 3H:1V, but less than 2H:1V, should be roughened before seeding. This can be accomplished in a variety of ways, including track walking or driving a crawler tractor up and down the slope, leaving a pattern of cleat imprints parallel to slope contours.

6A-2.17 Pipe Slope Drains

WSDOT Standard Specification
8-01.3(14) Temporary Pipe Slope Drain

1. Definition

   A pipe extending from the top to the bottom of a cut or fill slope and discharging into a stabilized water course, a sediment- trapping device, or a stabilized outfall.

2. Purpose

   To carry concentrated runoff down slopes without causing the formation of rills and gullies, and to minimize saturation of slide-prone soils.

3. Additional Information

   - The WSDOT *Hydraulics Manual* provides information on calculation of flow rates and selection of pipe diameters large enough to convey the flow.
   - Pipe slope drains can be used when a temporary or permanent stormwater conveyance is needed to move the water down a slope to prevent erosion.
   - Pipe slope drains can be used at bridge ends to collect runoff and pipe it to the base of the fill slopes along bridge approaches. These can be designed into a project and included as bid items.
   - Another use on road projects is to collect runoff from pavement and pipe it away from side slopes. This is useful, because there is generally a time lag between installation of the first lift of asphalt and installation of curbs, gutters, and permanent drainage.
   - Water can be collected and channeled to pipe slope drain inlets with sand bags, triangular silt dikes, berms, or other material.

- Use temporary drains on new cut or fill slopes.
- Compact the soil around and under the pipe and entrance section to prevent undercutting.
- Securely connect prefabricated flared inlet sections to the slope drain pipe.
- Securely fasten multiple slope drain sections together, or use gasketed watertight fittings.
- If 90º bends cannot be avoided in the drain pipe, install thrust blocks constructed from sandbags, straw bales staked in place, "t" posts and wire, or ecology blocks to anchor the bends. For pipe slope drains that are to remain as permanent features, the thrust block materials must be capable of lasting for the expected life of the pipe.
- Secure pipe along its full length to prevent movement. This can be done with steel "t" posts and wire. A post is installed on each side of the pipe and the pipe is wired to them. This should be done approximately every 10–20 feet of pipe length, depending on the size of the pipe and quantity of water to be diverted.
- Pipe slope drains can be used to convey water collected by interceptor dikes. Ensure that the height of the dike is at least 1 foot higher at all points than the top of the inlet pipe.
- The area below the outlet must be stabilized with an energy-dissipating material (such as riprap).
- If the pipe slope drain is conveying sediment-laden water, direct all flows into a sediment-trapping facility.

6A-2.18 Level Spreader

WSDOT Standard Specification
No WSDOT Standard Specification exists, so a special provision must be written. For instructions on preparing special provisions, see the Introduction (6A-1).

1. Definition

   A slightly elevated structure made of wood, sandbags, pipe, compost, gravel, or compacted earth that spans an area and converts concentrated runoff into sheet flow.

2. Purpose

   To reduce shear stress by converting concentrated runoff to sheet flow, resulting in less erosion.

3. Additional Information

- Use when a concentrated flow of water needs to be dispersed over a large area with existing stable vegetation.
- Use only where the slopes are gentle, the water volume is relatively low, and the soil will absorb most of the low flow events.
- Use above areas that are stabilized by vegetation.
- If the level spreader has any low points, flow will concentrate, creating channels and possibly causing erosion.
- Design the level spreader so that runoff does not reconcentrate after release, unless intercepted by another downstream measure.
- Level spreaders consisting of gravel or organic material should have a minimal amount of fine particles that could negatively influence turbidity.
- The spreader should span the full width of the channel. Use multiple spreaders for higher flows.
- The depth of the spreader, as measured from the lip, should be uniform across the entire width.
- Level spreaders should be set back from the property line unless there is an easement for flow.

6A-2.19 Interceptor Dike and Swale

WSDOT Standard Specification
No WSDOT Standard Specification exists, so a special provision must be written. For instructions on preparing special provisions, see the Introduction (6A-1). The design criteria shown in Table 6A-3 apply.

1. Definition

A ridge of compacted soil with a parallel swale placed on a slope. These structures may or may not be vegetated. They differ from water bars, in that they are of greater scale and complexity.

2. Purpose

To intercept runoff and/or groundwater from drainage areas on slopes and direct it to a stabilized outlet.

3. Additional Information

Use the dike and swale to intercept the runoff from unprotected areas and direct it to areas where erosion can be controlled. This can prevent runoff from entering the work area, or sediment-laden runoff from leaving the construction site.

- When placed horizontally across a disturbed slope, the dike and swale reduces the amount and velocity of runoff flowing down the slope.
- Stabilization of the dike and swale with temporary or permanent vegetation depends on soil characteristics and gradient. Low-gradient, highly porous soils may not require a higher level of protection, because much of the water infiltrates the ground, reducing erosion potential.
- Steeper grades require swale protection, check dams, or level spreaders.
- Provide energy dissipation measures at swale outlet.
- Sediment-laden runoff must be released to a sediment-trapping facility.
- Minimize construction traffic over temporary dikes. Use temporary cross culverts for channel crossing.

Table 6A-3. Design criteria.

Interceptor dikes meet the following criteria:	
Top width	2 feet (600 mm) minimum.
Height	18 inches (450 mm) minimum. Measured from upslope toe and at a compaction of 90% ASTM D698 standard proctor.
Side slopes	3H:1V or flatter.
Grade	Topography dependent, except that dike is limited to grades between 0.5 and 1.0%.
Horizontal spacing of interceptor dikes	Slopes <5% = 300 feet (90 m) Slopes 5-10% = 200 feet (60 m) Slopes 10-40% = 100 feet (30 m)
Stabilization	Slopes = <5%. Seed and mulch applied within 5 days of dike construction. Slopes = 5-40%. Dependent on runoff velocities and dike materials. Stabilization should be done immediately, using either sod or riprap, to avoid erosion.
Outlet	The upslope side of the dike must provide positive drainage to the dike outlet. No erosion can occur at the outlet. Provide energy dissipation measures as necessary. Sediment-laden runoff must be released through a sediment-trapping facility.
Other	Minimize construction traffic over temporary dikes.
Interceptor swales meet the following criteria:	
Bottom width	2 feet (600 mm) minimum; the bottom is level.
Depth	1 foot (300 mm) minimum.
Side slope	3H**:**1V or flatter.
Grade	Maximum 5%, with positive drainage to a suitable outlet (such as a sediment trap).
Stabilization of swale bottom and side slopes	Seed per Standard Specification 8-01.3(2) Temporary seeding, or riprap 12 inches (300 mm) thick, pressed into the bank and extending at least 8 inches (200 mm) vertical from the bottom.
Swale spacing	Slope of disturbed area: <5% = 300 feet (90 m) 5-10% = 200 feet (60 m) 10-40% = 100 feet (30 m)
Outlet	Level spreader or riprap to stabilized outlet/sedimentation pond.

6A-2.20 Stormwater Infiltration

WSDOT Standard Specification
8-01.3(1)D Dispersion/Infiltration

1. Definition

   The process of treating water in engineered infiltration ponds, naturally occurring closed depressions, and vegetated areas with soils or duff that can absorb stormwater.

2. Purpose

   To treat turbid stormwater that otherwise would not meet water quality standards if discharged to a surface water body. If a standard BMP is not providing sufficient treatment prior to discharge, additional treatment may include dispersion into WSDOT-owned vegetated strips and grass-lined channels that can be expected to infiltrate runoff or reduce turbidity prior to discharging from a site. Prior written authorization must be obtained from adjacent landowners before water can be dispersed onto adjacent non-WSDOT properties. Dispersion, infiltration, and bioinfiltration areas will be labeled on the TESC plan sheets, and visual inspections must be completed daily to verify that they function as intended. Flow to such areas will be controlled to encourage complete infiltration and avoid discharges whenever possible. If discharges occur, however, runoff will be sampled at the dispersion area discharge point in accordance with permit conditions. Inspection frequency will increase (daily inspections during dispersion operations) whenever there are discharges or whenever weather conditions are likely to limit the capacity or effectiveness of treatment areas. Use of dispersion areas will immediately cease if they stop providing improved treatment compared to direct discharges from traditional BMPs.

   Ditched stream channels and other sensitive areas shall never be considered for dispersion, infiltration, or biofiltration activities. Dispersion and infiltration in Critical Aquifer Recharge Areas will not be allowed in areas identified in the Geotechnical Report as having less than five feet between the ground surface and the seasonal high groundwater table. Roadside ditches shall only be used when they can reasonably be expected to prevent runoff or fine sediments from reaching receiving streams based on field observations and soils information. (Note: WSDOT maintenance staff is an excellent resource, with many years of observations about flow under wet weather conditions.) Check dams and other BMPs shall be installed where necessary to enhance the effectiveness of the dispersion and biofiltration BMPs. The BMPs will be maintained and deposited sediment will be removed if necessary to eliminate the possibility of sediment resuspension during future rain events. If present, deposited sediment shall be stabilized or removed at the end of the project.

   This method can often be employed to create a zero discharge site, thereby eliminating the possibility of impacting surface waters.

3. Additional Information

- Infiltration ponds work best on highly porous soils. Silt and clay deposits reduce infiltration capacity. Upslope erosion/sediment control BMPs, especially sediment traps/basins, are essential to ensure consistent performance of infiltration facilities, whether used as temporary or permanent water quality/quantity BMPs.
- Infiltration rates are usually higher in undisturbed, vegetated areas.
- Infiltration rates are limited on most sites, so creative methods are often required to meet infiltration needs.
- Infiltration can be maximized by spreading water over the largest possible area, discharging water at a slow and constant rate, and using vegetated areas whenever possible.
- If an area becomes saturated, give it a break and try it again later.
- Design infiltration areas to empty between storm events.
- Monitor infiltration areas and nearby surface waters. Infiltrating water on slopes may destabilize the slope, causing structural failure.
- Always consult with and get approval from the WSDOT Project Engineer before dispersing or infiltrating water.

6A-2.21 Check Dams

WSDOT Standard Specifications
8-01.3(6) Check Dams
8-01.3(6)A Geotextile-Encased Check Dam
8-01.3(6)B Rock Check Dam
8-01.3(6)C Sandbag Check Dam
8-01.3(6)D Wattle Check Dam

*WSDOT Standard Plan*s
I-10 Geotextile-Encased Check Dam Installation
I-11 Check Dams

1. Definition

Small dams constructed across a swale or drainage ditch. Suitable materials include quarry spalls, riprap, washed gravel, sandbags, and prefabricated structures.

2. Purpose

   To reduce the velocity of concentrated flows, reduce erosion of the swale or ditch, and cause some suspended sediment to settle in ponded areas upstream of check dams.

3. Additional Information

   - Whatever material is used, the cross section of the dam crest should form a triangle. This prevents undercutting at the downstream toe, as water flows over the face of the dam rather than falling directly onto the ditch bottom.
   - The material used to fill sand bags should be selected so that it does not contribute to turbid runoff. For example, use washed rock or pea gravel instead of silty sand.
   - Keep the center of the check dam lower than the outer edges at natural ground elevation, to prevent flooding of roads, dikes, or other structures.
   - Placing rock, geotextile, or erosion control blankets in the conveyance channel reduces or eliminates scouring.

6A-2.22 Triangular Silt Dike (Geotextile-Encased Check Dam)

WSDOT Standard Specifications
8-01.3(6) Check Dams
8-01.3(6)A Geotextile-Encased Check Dam

1. Definition

   A prefabricated check dam consisting of a urethane foam core encased in geotextile material.

2. Purpose

   To reduce the velocity of concentrated flows, reduce erosion of the swale or ditch, and cause some suspended sediment to settle in ponded areas upstream of check dams. A triangular silt dike can be mobilized and placed quickly. If they are taken care of, triangular silt dikes can be reused.

3. Additional Information

   - The flexibility of the materials in triangular silt dikes allows them to conform to all channel configurations.
   - Triangular silt dikes can be fastened to soil with staples or rock, and to pavement with adhesives.

- Triangular silt dikes have been used to build temporary sediment ponds, diversion ditches, concrete wash-out facilities, curbing, water bars, level spreaders, and berms.

6A-2.23 Outlet Protection

WSDOT Standard Specification
No WSDOT Standard Specification exists, so a special provision must be written. For instructions on preparing special provisions, see the Introduction (6A-1). The region's Hydraulics Office should be consulted whenever shear stresses require solid liners.

1. Definition

   A protective barrier of rock, erosion control blankets, vegetation, or sod constructed at a conveyance outlet.

2. Purpose

   To prevent erosion and scour at drainage conveyance outlets and minimize the potential for downstream erosion by reducing the velocity of concentrated stormwater flows.

3. Additional Information

   - Common locations for outlet protection include discharge points for ponds, pipes, ditches, or other conveyances.
   - Size the scale of the outlet protection based on expected flow volumes and velocities.
   - Refer to the WSDOT *Hydraulics Manual* for guidance in choosing appropriate-sized rock outlet protection or alternative materials.

6A-2.24 Vegetated Filter Strip

WSDOT Standard Specification
No WSDOT Standard Specification exists, so a special provision must be written. For instructions on preparing special provisions, see the Introduction (6A-1).

1. Definition

   A strip of dense vegetation adjacent to a land-disturbing activity.

2. Purpose

   To reduce the transport of sediment from a construction site by providing a physical barrier that reduces runoff velocities.

3. Additional Information

Vegetated filter strips may be used downslope of all disturbed areas. The strips are not intended to treat concentrated flows, nor are they intended to treat substantial amounts of overland flow. Any concentrated flows must be conveyed through the drainage system to a sediment pond or a comparable BMP. The only circumstance in which overland sheet flow can be treated solely by a strip, rather than by a sediment pond or comparable BMP, is when the criteria shown in Table 6A-4 are met.

Table 6A-4. Vegetated filter strips.

Average Slope	Slope Percent	Flowpath Length
1.5H:1V or less	67% or less	100 feet
2H:1V or less	50% or less	115 feet
4H:1V or less	25% or less	150 feet
6H:1V or less	16.7% or less	200 feet
10H:1V or less	10% or less	250 feet

Ideally, vegetated filter strips consist of undisturbed native growth with a well-developed soil that allows for infiltration of runoff.

6A-2.25 Wattles

WSDOT Standard Specification
8-01.3(10) Wattles

WSDOT Standard Plan
I-8 Wattle Installation On Slope

1. Definition

Temporary erosion and sediment control barriers consisting of any plant material that is wrapped in biodegradable fiber, tubular plastic, or similar encasing material. Wattles are greater than 5 inches in diameter and 25 to 30 feet in length.

2. Purpose

The two main purposes of wattles are to reduce slope length and to trap sediment. Cutting a slope length in half reduces erosion potential by a factor of four. Wattles also trap sediment, whether used on a slope or as a perimeter control device.

3. Additional Information

   Wattles can also be used as temporary curbs for conveying water to catch basins, check dams, and pipe slope drain inlets.

6A-2.26 Silt Fence

WSDOT Standard Specification
8-01.3(9)A Silt Fence

WSDOT Standard Plans
I-4 Silt Fence
I-6 Temporary Silt Fence for Inlet Protection In Unpaved Areas

1. Definition

   A temporary sediment barrier consisting of a geotextile fabric stretched across and attached to supporting posts, which are entrenched. Adding rigid wire fence backing can strengthen silt fence.

2. Purpose

   To reduce the transport of sediment from a construction site by providing a temporary barrier to sediment and reducing the runoff velocities of sheet flow.

3. Additional Information

   - Place fence below disturbed areas subject to sheet and rill erosion.
   - Place fence on contour to maximize sediment-trapping performance.

6A-2.27 Straw Bale Barrier

WSDOT Standard Specification
8-01.3(9)C Straw Bale Barrier

WSDOT Standard Plan
I-9 Straw Bale Barrier

1. Definition

   A temporary sediment barrier consisting of a row of entrenched and anchored straw bales.

2. Purpose

   To intercept sheet flow and detain small amounts of sediment from disturbed areas.

3. Additional Information

   - Place straw bale barriers below disturbed areas subject to sheet and rill erosion.
   - Straw bale barriers are more suitable for low-gradient slopes and small drainage areas.
   - The longevity of the barrier is dependent on the time of year and climate.
   - Under no circumstances should straw bale barriers be constructed in streams, channels, or ditches.

6A-2.28 Filter Berm

WSDOT Standard Specification
8-01.3(9)B Gravel Filter, Wood Chip or Compost Berm

WSDOT Standard Plan
I-14 Miscellaneous Erosion Control Details

1. Definition

   A berm consisting of gravel, wood chips, or compost.

2. Purpose

   Filter berms have two main functions: to prevent concentrated flows from damaging exposed cut/fill slopes, and to provide perimeter containment of sediment at the toe of a slope.

3. Additional Information

   - Construction vehicles and equipment can easily damage filter berms, so traffic must be routed around them.
   - To prevent blowouts, pipe slope drains may be needed to convey water that accumulates along the filter berm.

6A-2.29 Storm Drain Inlet Protection

WSDOT Standard Specification
8-01.3(9)D Inlet Protection

WSDOT Standard Plan
I-7 Storm Drain Inlet Protection

1. Definition

   A device or mechanism (internal or external) for trapping sediment within or immediately adjacent to a catch basin. Prefabricated devices are available for both situations.

2. Purpose

   To prevent sediment from entering an enclosed drainage system where the material can be readily washed downstream. Inlet protection is often the last opportunity to minimize sediment impact to a receiving water body.

3. Additional Information

   - There is a difference in how internal and external inlet protection devices function.
   - Internal devices tend to consist of a nonwoven material that is semiporous. Larger sediments are trapped, but silt and clay-sized particles pass through. They are most appropriate in situations where roadway flooding is a concern or construction traffic will damage an external device.
   - External devices may be prefabricated or assembled in the field using silt fence. Both types trap sediment by creating a ponding area surrounding the inlet. The reduced velocities allow sediment to settle. This process allows external devices to be more efficient at trapping greater volumes of smaller-sized sediment.
   - In an emergency, berms of sand bags or washed gravel can be placed around the inlet.

6A-2.30 Sediment Trap

WSDOT Standard Specification
No WSDOT Standard Specification exists, so a special provision must be written. For instructions on preparing special provisions, see the Introduction (6A-1).

WSDOT Standard Plan
I-14 Miscellaneous Erosion Control Details

1. Definition

   A small, temporary detention basin using a natural depression or constructed pond.

2. Purpose

   To settle suspended sediments from concentrated flows.

3. Additional Information

- Trap efficiency is enhanced when runoff is passed through multiple sediment control BMPs.
- A sediment trap does not have to be an engineered structure; however, prior to implementing this BMP, consult with the WSDOT inspector or engineer.
- Sediment traps are limited to removing silt/larger-sized sediment particles.
- Trap effectiveness increases with trap size.

6A-2.31 Temporary Sediment Pond

WSDOT Standard Specification
8-01.3(1)E Detention/Retention Pond Construction

1. Definition

A basin with a controlled stormwater release structure sized to detain the peak flow for the 2-year runoff event. Temporary sediment ponds are usually located where the permanent detention facilities are built. In such cases, more stringent permanent facility-sizing criteria are used to size temporary sediment ponds. All design criteria for permanent detention facilities should be applied to temporary ponds, unless no permanent pond is to remain or be built.

2. Purpose

To collect stormwater runoff and detain it long enough to trap sediment.

3. Additional Information

- The use of infiltration facilities for sedimentation basins clogs the soils and reduces infiltration capacity.
- Use sediment traps as pretreatment devices to minimize the need for pond maintenance and prevent soil clogging. If pretreatment is not possible, install a permeable rock divider within the pond.
- Pond outlets must be designed to provide flow control. WSDOT does not yet have a standard temporary pond outlet design. Design outlets in accordance with Figures 6A-1 to 6A-3. Contact the region's Hydraulics Office if site conditions warrant any modification of the figures below.

6A-2.32 Concrete Handling

WSDOT Standard Specification
No WSDOT Standard Specification exists, so a special provision must be written. For instructions on preparing special provisions, see the Introduction (6A-1).

WSDOT has created a GSP for treatment of pH for concrete work, which can be found at: http://www.wsdot.wa.gov/eesc/design/projectdev/GSPS/egsp8.htm. In situations where the GSP does not appear adequate, contact region environmental staff and the HQ Environmental Services Office (360-570-6649 or 360-570-6648) for more information or additional guidance for extreme situations where neutralizing the high pH water with dry ice or CO2 sparging may be necessary.

1. Definition

   A BMP designed to control concrete wastes and concrete leachate.

2. Purpose

   To reduce the impact of fresh concrete on regulated water bodies that results from concrete work, including sawing, grinding, and resurfacing. Turbidity and pH are typically the water quality problems of concern with concrete work.

3. Additional Information

   - Stormwater inlet protection measures should be placed around all catch basins in the vicinity of concrete work.
   - Performing concrete work in advance of storm events reduces the risk of generating concrete leachate and violating water quality standards.
   - BMPs designed for spill prevention and containment can be used to eliminate the risk of discharging concrete runoff to receiving waters.
   - Areas designated to hold process water and to serve as tool-washing stations reduce the risk of concrete leachate being entrained in runoff. Cover these areas with plastic in advance of storms if possible. Dewatering in such areas needs to be done in a way that does not violate water quality standards.

6A-2.33 High pH Neutralization

WSDOT Standard Specification
No WSDOT Standard Specification exists, so a special provision must be written. For additional information, contact region environmental staff or the HQ Environmental Services Office. For instructions on preparing special provisions, see the Introduction (6A-1).

1. Definition

The process of neutralizing stormwater when pH is over 8.5 pH units prior to discharge to waters of the state.

2. Purpose

When pH levels in stormwater rise above 8.5, it is necessary to lower the pH levels to the acceptable range of 6.5 to 8.5 prior to discharge to waters of the state. This process is called pH neutralization. Neutralized stormwater may be discharged to surface waters under the General Construction NPDES permit.

Process water includes wastewaters such as concrete truck wash-out, hydrodemolition, or saw-cutting slurry. Process water cannot be discharged to surface waters under the General Construction NPDES permit. Under certain circumstances, however, neutralized process water can be discharged. Contact region or HQ Environmental Office staff for more information.

Additional Information

- High pH stormwater can be treated by infiltration, dispersion in vegetation or compost (see Section 6A-2.20), pumping to a sanitary sewer, disposal at a permitted concrete batch plant, or carbon dioxide sparging (see methods below).

  Methods for CO2 sparging:

  - Every effort should be made to isolate the high pH water in order to treat it separately from other stormwater on-site.
  - Transfer water to be treated to the treatment structure (baker tank). Ensure that treatment structure size is sufficient to hold the amount of water that is to be treated.
  - Sample the pH of the water. As a rule of thumb, less CO_2 is needed for clearer water.
  - In the pH adjustment structure (baker tank), add CO_2 until the pH drops as close to 7 as feasible. Compressed carbon dioxide gas should be introduced using a carbon dioxide diffuser located near the bottom of the tank.
  - Release water, making sure that deposited sediment does not discharge in the process.

- Discharge water in a manner—such as dispersion, infiltration, or dilution in a pond or drainage system—that maximizes treatment potential prior to entering waters of the state.

- Dispose of sludge as concrete waste. If several batches of water are undergoing pH treatment, sludge can be left in the treatment structure. Dispose of sludge as necessary to ensure adequate storage volume and effective treatment.

- Operator Records: Include a diagram of the monitoring and treatment equipment and a description of the pumping rates and capacity the treatment equipment is capable of treating. Keep a record in the Site Log Book of the volume of water treated daily; the pH of untreated water; the amount of CO_2 needed to adjust water to as close to a pH of 7 as feasible; the pH of treated water; and the discharge point location and description.

- Refer to Ecology's SMMWW, Volume II, for more information on CO_2 sparging.

6A-2.34 Construction Stormwater Chemical Treatment

WSDOT Standard Specification
No WSDOT Standard Specification exists, so a special provision must be written. Region environmental staff and the HQ Environmental Services Office must be notified of intent to use chemical treatment to determine if it is necessary. For instructions on preparing special provisions, see the Introduction (6A-1).

1. Definition

   The use of a chemical to encourage flocculation of fine sediments entrained in construction site runoff.

2. Conditions of Use

   Chemical treatment must be approved by the HQ Environmental Services Office, Water Quality and region environmental staff. This ensures that the environmental offices can:

   - Provide input on whether or not chemical treatment is necessary/appropriate.
   - Provide technical assistance.
   - Ensure that Ecology is properly notified.
   - Track usage, effectiveness, and cost/benefit information.

Formal written approval from Ecology is required for the use of chemical treatment regardless of site size. When approved, the chemical treatment system must be included in the TESC plan.

3. Purpose

Polymers improve the removal of fine sediment that would not normally settle out through gravity alone. Their usage is only warranted when:

- Large volumes of highly turbid water cannot possibly be prevented due to unusual circumstances (such as projects requiring large dewatering or horizontal drilling operations, or slides), and there is no reasonable possibility of effectively employing any standard sediment control BMP or dispersal/infiltration technique.
- Chemical treatment system costs enable the recovery of costs by other means, such as accelerated construction rates.

4. Additional Information

- This process is sometimes used in conjunction with stormwater filtration (refer to BMP 6A-2.35, Construction Stormwater Filtration).

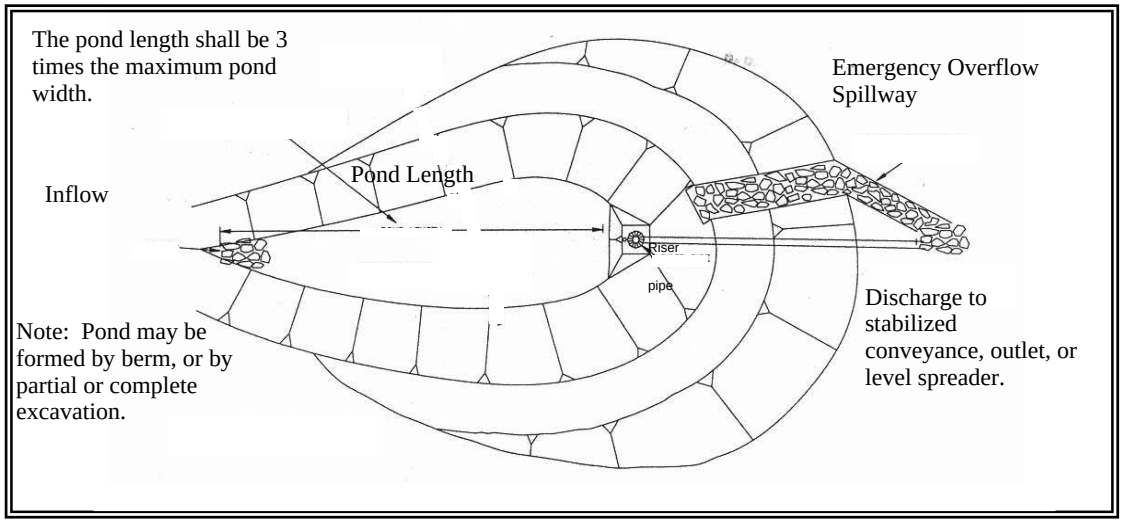

Figure 6A-1. Sediment pond plan view.

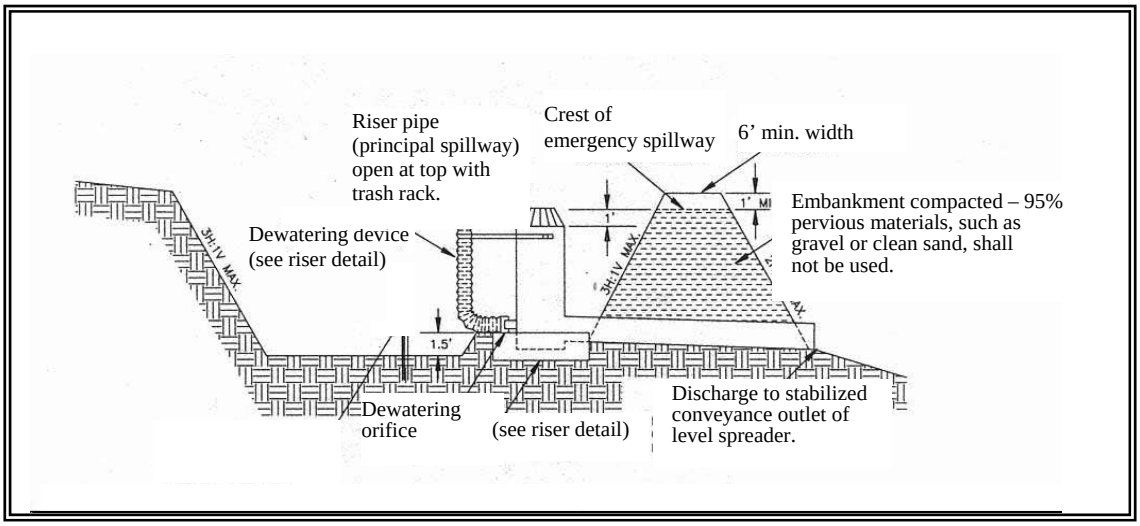

Figure 6A-2. Sediment pond cross section.

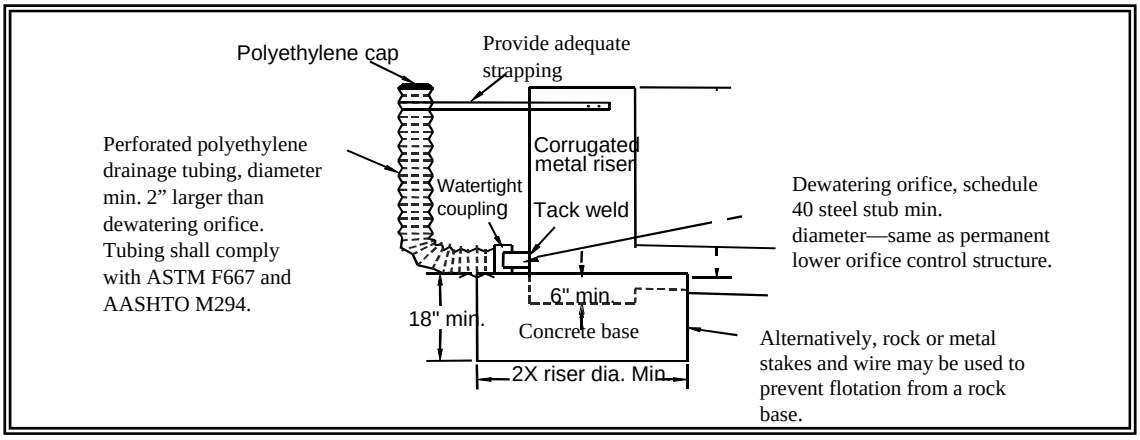

Figure 6A-3. Sediment pond riser detail.

6A-2.35 Construction Stormwater Filtration

WSDOT Standard Specification
No WSDOT Standard Specification exists, so a special provision must be written. For instructions on preparing special provisions, see the Introduction (6A-1).

1. Definition

   The process of pumping construction stormwater through a series of filters—primarily sand. Filters remove sediment from construction site stormwater by trapping sediment on or in filter media. Many of these systems are mobile and can be set up on any construction site.

2. Purpose

   To remove sediment from construction site stormwater ponds that cannot be removed through other conventional means.

3. Additional Information

   - Unlike chemical treatment, the use of construction stormwater filtration does not require approval from Ecology.
   - Two types of filtration systems may be applied to construction stormwater treatment: rapid and slow. Rapid sand filters are typically used for water and wastewater treatment. They can achieve relatively high hydraulic flow rates, on the order of 2 to 20 gallons per minute per square foot of filter area (gpm/sf), because they have automatic backwash systems to remove accumulated solids. In contrast, slow sand filters have very low hydraulic flow rates, on the order of 0.02 gpm/sf, because they do not have backwash systems. To date, slow sand filtration has generally been used to treat stormwater. Slow sand filtration is mechanically simple in comparison to rapid sand filtration, but requires a much larger filter area.
   - Filtration Equipment – Sand media filters are available with automatic backwashing features that can filter to 50 µm particle size. Screen or bag filters can filter down to 5 µm. Fiber-wound filters can remove particles down to 0.5 µm. Filters should be sequenced from the largest to the smallest pore opening. Sediment removal efficiency is related to particle size distribution in the stormwater.
   - Treatment Process Description – Stormwater is collected at interception point(s) on the site and diverted to a sediment pond or tank for removal of large sediment and storage of the stormwater before it is treated by the filtration system. The stormwater is pumped from the trap, pond, or tank through the filtration system in a rapid sand filtration system. Slow sand filtration systems are designed as flow-through systems using gravity.

- If large volumes of concrete are being poured, pH adjustment may be necessary.
- Filtration may also be used in conjunction with polymer treatment in a portable system to ensure capture of the flocculated solids.