PANHANDLE
Stormwater and Erosion Education Program

North Idaho

Stormwater Erosion & Sediment Control Field Guide

www.PanhandleSEEP.org

Acknowledgements

This Field Guide represents the work of dozens of dedicated individuals from agencies and organizations, both government and private; municipalities large and small; and business, industry and private citizens.

So many talented, experienced, committed professionals have participated in the development of this handbook, it is not possible to individually describe their contributions or adequately express our appreciation for their efforts toward reducing the negative impacts of construction activities and preserving water quality in the Inland Northwest.

Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has.
Margaret Mead, US anthropologist (1901-1978)

First Printing 2009

This Field Guide is intended to provide simple, effective instruction to allow workers in the field to identify, install, inspect and maintain the appropriate Best Management Practices (BMPs) for common construction site situations.

This Guide is NOT designed to replace elements of a professionally developed Erosion Control Plan (ESC) or Stormwater Pollution Prevention Plan (SWPPP).

Inspection Criteria

Effective erosion control depends on proper installation of the correct BMP followed by consistent and timely inspection and maintenance. Regardless of the size or type of site, inspection activities should follow a predetermined routine:

Inspections of site conditions and BMPs should be conducted at a minimum - once every 7 days, or once every 14 days and within 24 hours of a .5-inch rain event. (CGP 4 A) Document each inspection and all repairs or modifications.

Any damaged BMPs should be repaired or replaced. If it is evident that a BMP is not providing the control for which it was intended, the situation should be re-evaluated, and if appropriate, another, more effective BMP installed. It may be prudent to consult a design professional if modifications are needed.

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Definitions

Best Management Practices (BMP) – Techniques to prevent or minimize water pollution caused by development or construction. A BMP can be any policy, practice, procedure, technology, structure, or device that controls, prevents or removes pollution.

Critical areas-
Areas of special value that should be identified during site assessment. Floodplains, wetlands, riparian areas, and aquifers near construction sites are all critical areas.

Erosion-
The wearing-away of the land surface by water, wind, ice, or gravity. Types of erosion:

- Impact (raindrop)
- Sheet
- Rill
- Gully
- Channel
- Wind

Erosion and Sediment Control (ESC) Plan-
A plan prepared during the project design phase of construction to show the BMPs and techniques that will be used to control stormwater pollution during and after construction.

Impervious Surface-
Material that resists or blocks the infiltration or passage of water. Driveways, sidewalks, and roofs are examples of impervious surfaces.

Runoff –
Precipitation that does not infiltrate into the soil but instead runs over the surface of the land, where it eventually finds its way into rivers, lakes, or streams.

Sedimentation –
Deposition of soil that has been moved from site of origin due to erosion.

Stormwater pollution prevention plan (SWPPP)-
A plan that describes how stormwater runoff from a construction site will be controlled.

Planning BMPs

Structural, non-structural or planning practices that control, prevent or minimize pollution including site run-off, spillage, leaks and waste disposal.

Contractor Education - Provide the crew leaders with copies of the BMP plan. Clearly mark vegetation to be retained and other sensitive areas, conduct regular meetings, establish inspection and maintenance schedule and protocols and provide contact information.

Buffer Zone - Protect existing vegetation (including trees, grasses, and other plants) by preventing disturbance or damage to specified areas of a construction site or right-of-way. Preserving natural vegetation provides buffer zones and stabilized areas, which help control erosion, protect water quality, and enhance aesthetic benefits.

Phase Construction – The project schedule should sequence construction activities with the installation of erosion and sediment control practices. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking and to perform the construction activities and control practices in accordance with the planned schedule.

Clearing Limits - Clear the smallest area practical for the shortest possible time. The shorter the amount of time that land is left cleared, the lower the risk of erosion; the smaller the area the less significant the cost of stabilizing the soil.

Perimeter Control – Before construction starts, it is important to apply perimeter control BMPs to prevent sedimentation damage to either the construction site or nearby property.

Source Control –
Material storage and handling BMPs are designed to prevent and reduce the discharge of pollutants into groundwater systems. This is done by:

- ☑ Minimizing the storage of hazardous material on-site.
- ☑ Storing materials in a designated area.
- ☑ Installing secondary containment.
- ☑ Conducting regular inspections.
- ☑ Training employees and subcontractors.

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

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

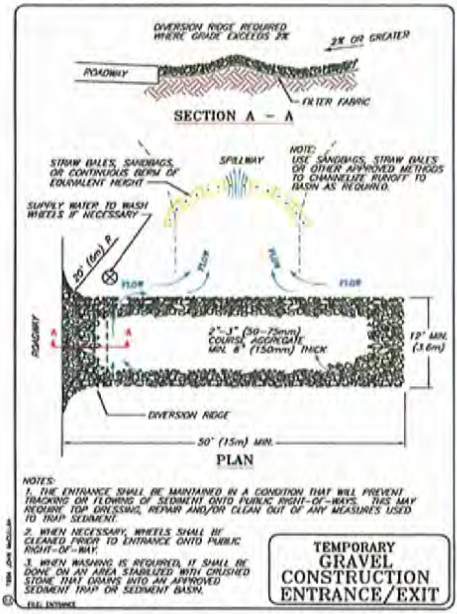
Concrete Washout Area – A containment area should be designated for the washout of cement truck delivery chutes and other equipment.

- ☑ Locate at least 50 feet from storm drains or receiving waters.
- ☑ Ensure pit is large enough to contain all waste from washout.
- ☑ Berm containment area so that wash water is totally contained.
- ☑ Allow water discharged into the containment area to infiltrate or evaporate.
- ☑ Remove and properly dispose of the dried cement waste.

Temporary Restrooms –

- ☑ Position sanitary facilities in a convenient location.
- ☑ Avoid discharging or burying untreated raw wastewater.
- ☑ Ensure that a licensed service maintains sanitary/septic facilities in good working order.
- ☑ Stake or secure portable units to a fixed object, as needed.

Stabilized Construction Entrance/Exit -
A stabilized construction entrance/exit should minimize tracking of mud and dirt onto public roads. The entrance/exit should consist of an aggregate pad, underlain with filter cloth and located at any point where traffic will be entering or leaving the site. This BMP should be inspected weekly and after each rainfall for gravel loss or sediment buildup.



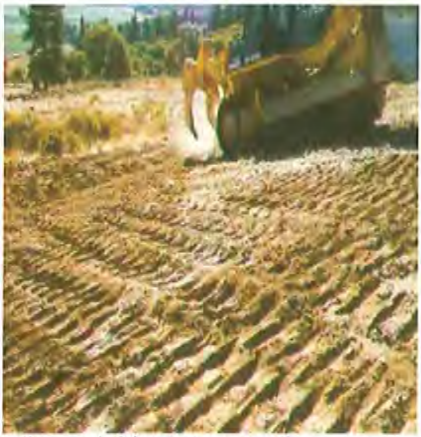
Entrance/exit should be at *least:

- ☑ 50' long
- ☑ 12' wide
- ☑ 6" – 12" deep (large angular rock over geotextile fabric.)
- ☑ Vehicles exiting site should experience two complete tire rotations while on the angular rock. *adjust size to accommodate largest vehicles.
- ☑ All vehicles should use the stabilized entrance/exit.
- ☑ Sediment that is tracked on to the roadway should be collected and disposed in an approved location.
- ☑ If gravel entrance does not adequately remove sediment, a tire wash may be necessary.

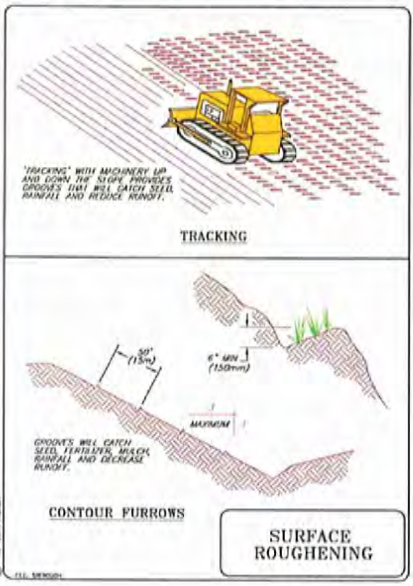
Erosion Control BMPs

Slope Roughening

A roughened surface is an easy and inexpensive way to stabilize soils to reduce runoff velocity, encourage the growth of vegetation, increase runoff infiltration, and trap some sediment.



- ☑ Surface roughening should be applied immediately after grading activities have ceased (temporarily or permanently) in an area.
- ☑ There are several methods of roughening a surface, all of which involve forming horizontal depressions with equipment.
  - ➢ Tracking perpendicular to the slope direction.
  - ➢ Driving treaded equipment along the slope direction to get grooves perpendicular to the slope.
  - ➢ Tilling (preferred because it avoids compaction).



Roughening is best used on 3:1 slopes that do not require mowing. On steeper slopes, 2:1 or greater, a stair-step pattern (terracing) should be formed. Adding organic material such as straw mulch prior to tracking will further reduce erosion by up to an additional 80%.

Mulching

Mulch is an immediate, effective, and inexpensive means of controlling dust and erosion and aiding re-vegetation of construction sites. It provides timely protection to soils that are exposed and that are subject to heavy erosion; it retains moisture (which may minimize the need for watering) and it requires no removal because of natural decomposition of most mulching materials.

Mulching is often used alone in areas where temporary seeding cannot be used because of the season or climate. It may be used in conjunction with other treatments for increased effectiveness. Use of mulch may or may not require a binder, netting, or tacking agent to hold the mulch in place.

The choice of materials for mulching will be based on the type of soil to be protected, site conditions, season, and economics. Seeding (temporary or permanent) can take place prior to or concurrent with mulching. Other surface runoff control measures should be installed prior to seeding and mulching. If seeding is prior to mulching, mulches should be applied to seeded areas immediately after seeding.

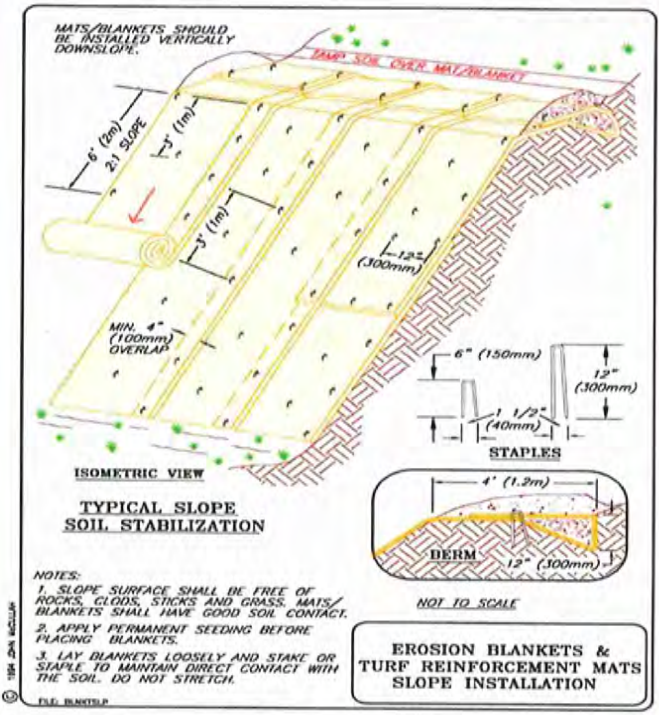
- ☑ Tacking agents may be used on any type of site, but are best used on very stony or rocky soils or small, steep slopes.
- ☑ Inspect all mulched areas. Repair damaged areas of the mulch immediately. Reseed or replant damaged areas if necessary, before replacing the mulch cover.
- ☑ Straw mulch and other organic products do not have to be removed when the vegetation becomes established.

Hydro-Mulching/Seeding - Describes a planting technique that uses a wet mixture of mulch fiber and water. This practice stabilizes disturbed soils, protects the soil surface from raindrop impact to conserve moisture, prevents soil compaction or crusting and decreases runoff. Seed selection is site specific, wholesale suppliers can assist with type and strain.

- ☑ Mulch is mixed in the tank along with water. When sprayed on the ground, it forms a continuous blanket that protects the ground and retains soil moisture.
- ☑ Coverage consistency is critical; each sprayed area should look about the same.
- ☑ Application of the slurry should proceed until a uniform cover is achieved. The applicator should not be directed at one location for too long a period of time or the applied water will cause erosion.
- ☑ The mulch application rate will vary depending on the desired depth and coverage for the type of mulch used. The amount of tackifier used will also vary between products. Tackifier application rate information can be obtained from the product manufacturer.
- ☑ Wood and bark chips are suitable for areas that will not be mowed closely or for ground cover in ornamental or landscape plantings.
- ☑ Hydraulically mulched slopes should be inspected periodically for damage due to wind, water, or human disturbance. Repair all damaged areas immediately using hydraulic mulching at the original specifications.

Erosion Control Blankets - Matting is a porous net or fibrous sheet that is laid over the ground surface for slope stabilization and erosion control, or to hold mulch in place and protect it against wind or water damage.

- ☑ Smooth soil surface
- ☑ Anchor the blanket at top of slope
- ☑ Backfill and tamp, anchor ends
- ☑ Roll blanket from top to bottom
- ☑ **Do not stretch blankets**
- ☑ Overlap sides at least 4 inches
- ☑ Overlap uphill/downhill rolls by 3 feet
- ☑ Securely staple per instructions



Dust Control

Dust Prevention: The best method of controlling dust is to prevent dust production:

- ☑ Limit the amount of bare soil exposed at one time.
- ☑ Identify all areas where ground disturbance will not be allowed.
- ☑ Avoid using areas that are the most susceptible to wind erosion.
- ☑ Cover haul trucks with a tarp.
- ☑ Drive no faster than 15 miles per hour when leaving or entering a construction site.

Vegetative Cover:
Follow recommended seeding and planting specifications, or leave existing vegetation in place.

Sprinkling: Apply so that the soil is wet but not saturated or muddy and so that air quality requirements are maintained.

Stone: Provide a minimum 2-inch thick layer of fractured stone at access points to public highways and for detours, haul roads or temporary traffic routes through the construction site.

Surface Roughening: Tilling or disking should leave 6-inch (minimum) furrows, preferably perpendicular to the prevailing wind direction. (See page 7)

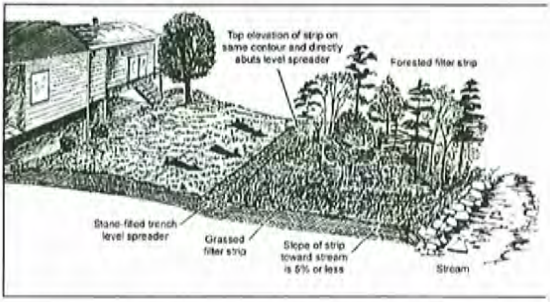
Barriers: A wind barrier generally protects soil downwind for a distance of 10 times the height of the barrier.

Tackifiers are chemical or organic compounds sprayed on loose soil to hold it in place.

Sediment Control BMPs

Vegetative Buffer Strip –

Gently sloping area of vegetative cover that provides a living filter for runoff water before the flow enters a stream, storm sewer, or other water body.

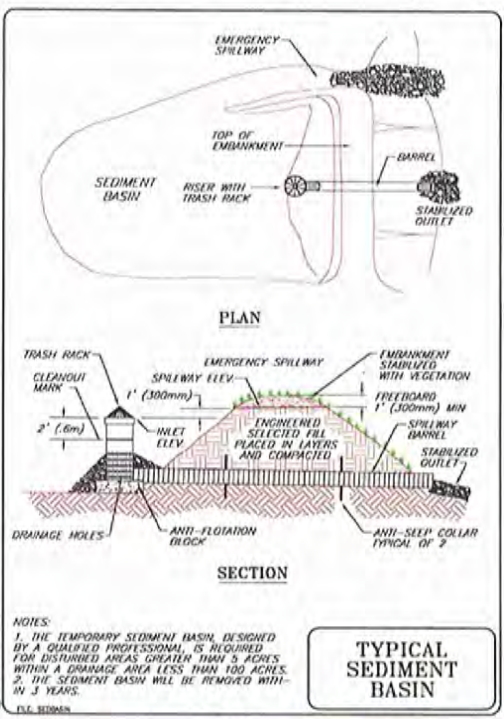


- ☑ Minimum buffer strip width -25 feet.
- ☑ Minimum width along live streams or above wetlands - 100 feet.
- ☑ Steeper slopes require wider buffers.
- ☑ Vegetative cover should be at least 75 percent of background:
  - ➢ Tall, dense stands of grass.
  - ➢ Trees such as, willows and alder.
  - ➢ Forested strips are preferable to vegetated strips.
  - ➢ Existing vegetation is often superior to planted vegetation.
- ☑ No equipment, construction debris, or extra soil in the buffer strip (or the strip will be damaged).
- ☑ Inspect the buffer strip at regular intervals; check for damage by equipment and vehicles.
- ☑ Buffer strips of natural vegetation do not generally require maintenance; however, on some sites it may be necessary to remove sediments and replant on a regular basis. Promptly repair any damage from equipment, vehicles, or erosion.

Sediment Traps and Basins

Sediment traps are containment areas formed by excavation and/or embankment to intercept sediment-laden runoff and to retain the sediment. A sediment basin or trap detains sediment-laden runoff long enough to allow most of the sediment to settle out.

- ☑ Sediment trap (< 5 acres) for smaller drainage areas
- ☑ Sediment basin (> 5 acres) for larger areas.
- ☑ Hold sediment-laden water long enough for the sediment to drop to the bottom and then discharge the runoff.
- ☑ Traps and basins should be designed by a professional because of the factors that affect sizing including;
  - ➢ Drainage area
  - ➢ Storm potential
  - ➢ Settling velocities of soil particles and the relationship to the length of the pond
  - ➢ Soil loss estimation to determine depth of pond

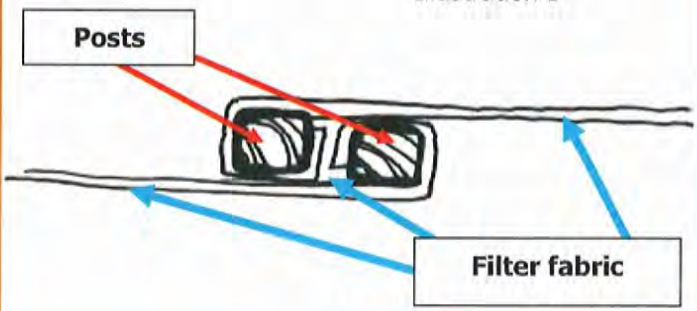


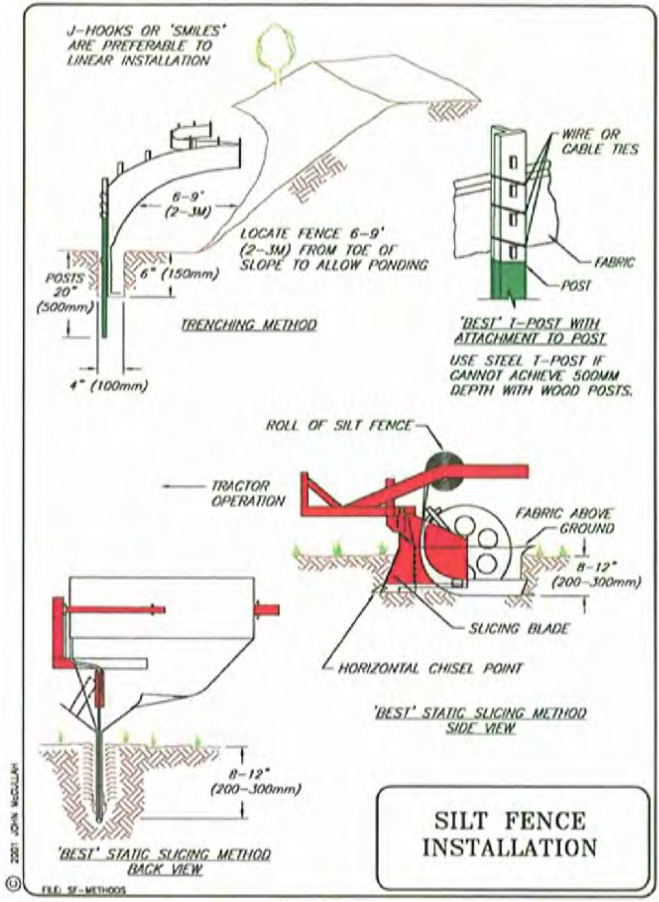
Silt Fence –

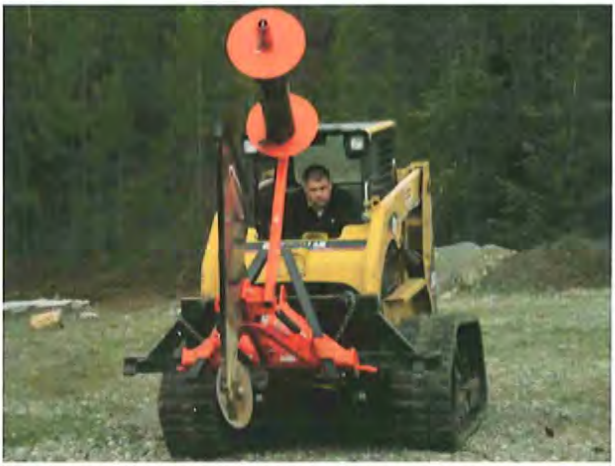
A silt fence is a temporary sediment barrier consisting of a filter fabric stretched and attached to supporting posts. Silt fences assist in sediment control by retaining some of the eroded soil particles and slowing the runoff velocity to allow particle settling.

- ☑ Position fence a minimum of 6 feet from toe of slope to allow for maintenance.
- ☑ Install silt fences as close to the contour as possible, turn last 6 feet uphill (smiley face); the area below the fence should be undisturbed or stabilized.
- ☑ Key-in (bury) bottom six inches of silt fence, backfill and compact.
- ☑ Space posts no more than 6 ft apart when using extra-strength filter fabric (without a wire fence); 10 ft apart when a wire mesh support fence is used.
- ☑ Drive posts at least 16 inches into the ground.
- ☑ Staple or wire the filter fabric directly to the upslope side of the posts. *Do not attach filter fabric to trees!*
- ☑ Join fence sections by wrapping ends together. (see illustration B)
- ☑ Inspect periodically for tears, weathering and disrupted anchoring.
- ☑ Remove the sediment when it reaches one-third the height of the silt fence.

Illustration B




J-HOOKS OR 'SMILES' ARE PREFERABLE TO LINEAR INSTALLATION
6-9' (2-3M)
LOCATE FENCE 6-9' (2-3M) FROM TOE OF SLOPE TO ALLOW PONDING
POSTS 20" (500mm)
6" (150mm)
4" (100mm)
TRENCHING METHOD
WIRE OR CABLE TIES
FABRIC
POST
'BEST' T-POST WITH ATTACHMENT TO POST
USE STEEL T-POST IF CANNOT ACHIEVE 500MM DEPTH WITH WOOD POSTS.
ROLL OF SILT FENCE
TRACTOR OPERATION
FABRIC ABOVE GROUND
8-12" (200-300mm)
SLICING BLADE
HORIZONTAL CHISEL POINT
'BEST' STATIC SLICING METHOD SIDE VIEW
8-12" (200-300mm)
'BEST' STATIC SLICING METHOD BACK VIEW
SILT FENCE INSTALLATION
© 2001 JOHN McCULLAH
FILE: SF-METHODS

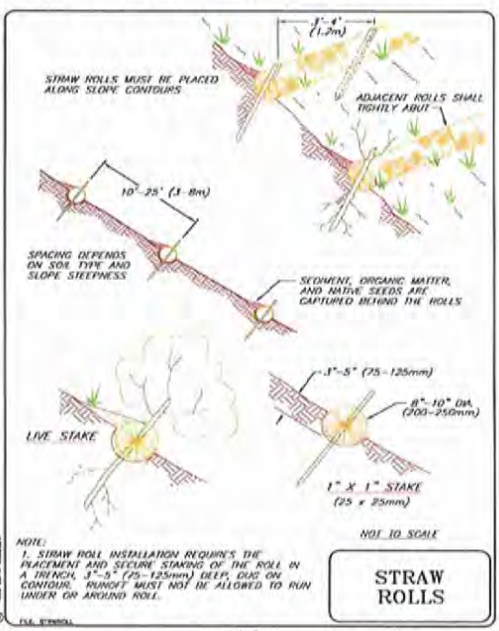


Fiber Roll - aka Wattle

A fiber roll (wattle/compost-filled socks) consists of straw, flax, or other similar materials bound into a biodegradable tubular plastic or similar encasing material. When fiber rolls are placed at the toe and on the face of slopes, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff.

- ☑ Install on contour, perpendicular to flow.
- ☑ Trench roll 3-4 inches into soil.
- ☑ Stake ends and along roll at a maximum of 4 ft. on center.
- ☑ Adjoin ends by overlapping not abutting.
- ☑ Place at intervals of 10-20 ft. – depends on slope steepness – closer spacing is more effective.
- ☑ Turn the final ends of the roll uphill to prevent runoff from going around the roll.
- ☑ Remove sediment if it reaches ½ the height of the roll, or install additional rolls.
- ☑ Inspect prior to storms, daily during extended rain events and after storms for breaches, tears and undermining

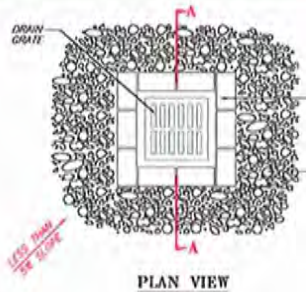
Fiber rolls can be left in place after the site is stabilized



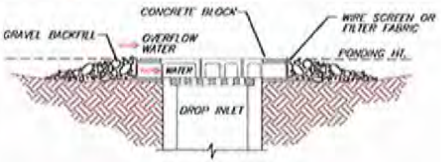
Inlet Protection

Temporary devices constructed to improve the quality of water being discharged to dry wells, drop inlets or catch basins by ponding sediment-laden runoff and increasing settling time. Appropriate for small drainage areas only.
Factors to consider when choosing an appropriate inlet protection BMP:

- ☑ Type of inlet to be protected.
- ☑ Time inlet protection will be in place, and predicted weather conditions. Gravel filled sandbags will remain viable longer than fiber rolls.
- ☑ Vehicular and foot traffic. Damage to inlet protection renders it ineffective, and can result in unnecessary expense.
- ☑ Potential to reuse inlet protection, many inserts may be used multiple times.
- ☑ Amount of room that will be needed to maintain, repair and remove the inlet protection.
    - Inlet inserts should be installed according to the manufacturer's instructions.
    - Do not locate inlet protection in street or bicycle travel lanes, or pedestrian crosswalks.
    - Inspect regularly and after every storm. Make any repairs necessary to ensure the measure is in good working order.
    - Remove accumulated sediment and restore the trap to its original dimensions when sediment has accumulated to half the design depth of the trap. All sediments removed should be disposed of properly.
    - All inlet inserts should be removed after construction is completed (or after permanent vegetation is established).



PLAN VIEW



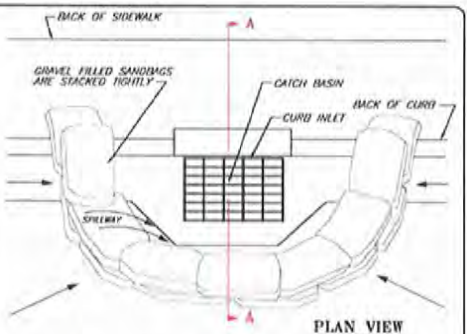
SECTION A – A

NOTES:

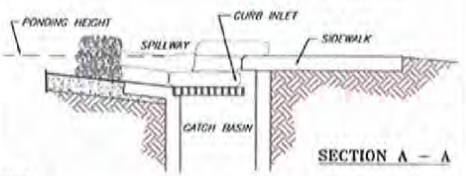
1. DROP INLET SEDIMENT BARRIERS ARE TO BE USED FOR SMALL, NEARLY LEVEL DRAINAGE AREAS. (LESS THAN 5%)
2. EXCAVATE A BASIN OF SUFFICIENT SIZE ADJACENT TO THE DROP INLET.
3. THE TOP OF THE STRUCTURE (PONDING HEIGHT) MUST BE WELL BELOW THE GROUND ELEVATION DOWNSLOPE TO PREVENT RUNOFF FROM BYPASSING THE INLET. A TEMPORARY DIKE MAY BE NECESSARY ON THE DOWNSLOPE SIDE OF THE STRUCTURE.

BLOCK AND GRAVEL DROP INLET SEDIMENT BARRIER

FILE: BDROPBAR



PLAN VIEW



SECTION A – A

NOTES:

1. PLACE CURB TYPE SEDIMENT BARRIERS ON GENTLY SLOPING STREET SEGMENTS WHERE WATER CAN POND AND ALLOW SEDIMENT TO SEPARATE FROM RUNOFF.
2. SANDBAGS, OF EITHER BURLAP OR WOVEN GEOTEXTILE FABRIC, ARE FILLED WITH GRAVEL, LAYERED AND PACKED TIGHTLY.
3. LEAVE ONE SANDBAG GAP IN THE TOP ROW TO PROVIDE A SPILLWAY FOR OVERFLOW.
4. INSPECT BARRIERS AND REMOVE SEDIMENT AFTER EACH STORM EVENT. SEDIMENT AND GRAVEL MUST BE REMOVED FROM THE TRAVELED WAY IMMEDIATELY.

CURB INLET SEDIMENT BARRIER (SANDBAGS)

FILE: SANDCURB

Run-off Control BMPs

Swales and dikes (as a conveyance device)

A temporary swale is an excavated drainage way designed to prevent runoff from entering disturbed areas by intercepting and diverting it to a stabilized outlet or a sediment-trapping device.

- ☑ The temporary swale should be designed with an outlet that functions with a minimum of erosion, and dissipates runoff velocity prior to discharge off the site.
- ☑ Runoff should be conveyed to a sediment-trapping device such as a sediment trap or sediment basin until the drainage area above the swale is adequately stabilized.
- ☑ The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet condition.
- ☑ If a swale is used to divert flows from entering a disturbed area, a sediment-trapping device may not be needed.

Design criteria relevant to the drainage area served by the swale:

Drainage Area	**5 ac or less**	**5-10 ac**
Bottom Width of Flow Channel	4 feet	6 feet
Depth of Flow Channel	**1 foot**	**1 foot**
Side Slopes	2:1 or flatter	2:1 or flatter
Grade	**0.5% min** **20% max**	**0.5% min** **20% max**

Grassed Infiltration Areas (aka Grassy swales/Bioswales)
Grassed Infiltration Areas (GIA) are widely used, notably over sensitive resource aquifers and deserve special attention. GIAs are shallow depressions created in the earth to hold stormwater runoff long enough to allow it to enter the underlying soil, where the soil and plants filter out pollutants such as bacteria, heavy metals, oils, gases, nitrogen, phosphorus and pesticides that the runoff may be carrying.

The DOs and DON'Ts of Grassy Infiltration Areas:

- **Do** use roughed-in GIAs for construction site sedimentation ponds if suitable.
- **Don't** ignore pre-silting during construction.

- **Do** tread lightly. Scarify the GIA floor to loosen soils after grading is complete.
- **Don't** over-compact soils during construction

- **Do** till in topsoil and amendments a minimum depth of six inches.
- **Don't** leave abrupt transitions between native and imported soils.

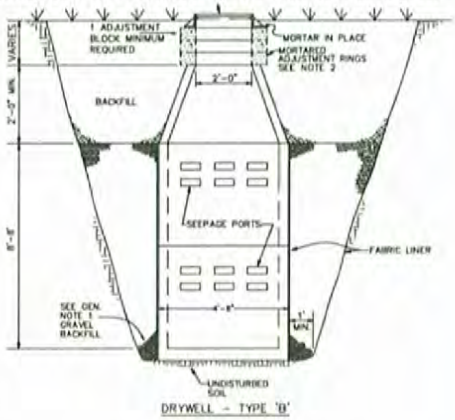
- **Do** plan for final vegetation height of turf relative to the scupper.
- **Don't** locate scuppers where they are impeded by grass or other vegetation.

- **Do** an infiltration test to ensure soils have not been compacted. A double ring infiltrometer test will determine if the soils can accept water at a rate of between 0.5 and 3 inches per hour. **Consult the local permitting jurisdiction (City/County) for performance requirements.**

- **Do** establish vegetation **before** allowing stormwater flows into the GIA.

Swales near the final stages of excavation should never be used prematurely for runoff disposal. Drainage from untreated, freshly constructed slopes within the watershed area could load the newly formed basin with fine sediment. This could seriously plug the swale floor. It is also necessary to protect the dry well from siltation after installation.

Specifications for swale construction should state the earliest point in construction progress when storm drainage may be directed to the swales, and the means by which this delay in use should be accomplished. Due to the wide variety of conditions encountered among projects, each should be separately evaluated in order to postpone use as long as reasonably possible.



(Shallow injection wells must be registered with PHD)

County Contacts for Panhandle Health District (PHD)

Benewah	(208) 245-4556
Bonner	(208) 265-6384
Boundary	(208) 267-5558
Kootenai	(208) 415-5220
Shoshone	(208) 786-7474

Check Dams

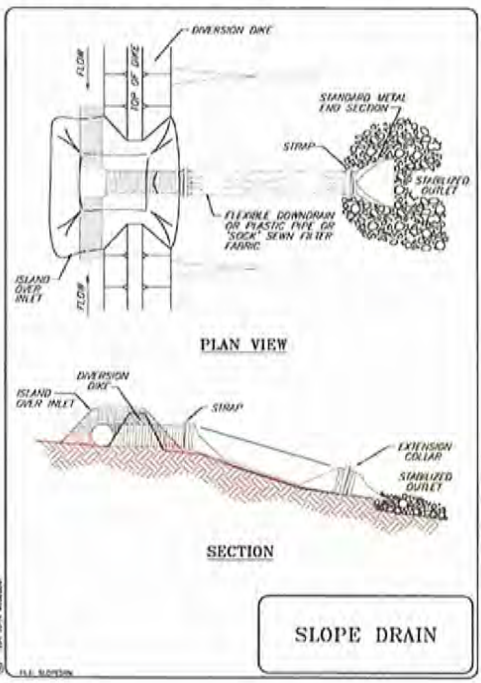
A check dam is a small dam constructed in an open channel, swale, or drainage way. Check dams may be temporary or permanent barriers made of logs and brush, stone, or other materials. Check dams are used to reduce or prevent excessive bank and bottom erosion by reducing the gradient or runoff velocity.

- ☑ Space dams so that the toe of the upstream dam is never any higher than the top of the downstream dam.
- ☑ Ensure center of the dam is 10 to 16 inches lower than either edge, to form a weir for the outfall.
- ☑ Construct check dam to be as much as 20 inches wider than the banks of the channel to prevent undercutting as overflow water re-enters the channel.
- ☑ Provide outlet stabilization below the lowest check dam (where the risk of erosion is greatest) and consider the use of channel linings or protection such as plastic sheeting or riprap where there may be significant erosion or prolonged submergence.
- ☑ Materials:
  - Stone 2 to 16 inches in diameter
  - Logs 6 to 8 inches in diameter
  - Sandbags filled with pea gravel
  - Filter fabric meeting the standard specifications
- ☑ Drive logs into the ground a minimum of 28 inches.
- ☑ Install riprap if necessary on the downstream side of the dam to protect the streambed from scour.
- ☑ Inspect the check dams regularly and after every runoff-producing storm. Make any repairs necessary to ensure the measure is in good working order.
- ☑ Remove accumulated leaves and sediments from behind the dam when they reach a depth of one-half the original height of the dam.

Slope Drains

A slope drain is a device used to carry concentrated runoff from the top to the bottom of a slope that has already been damaged by erosion or is at high risk for erosion.

- ☑ Place the slope drain on undisturbed or well-compacted soil.
- ☑ Securely stake the slope drain to the slope.
- ☑ Make sure that all slope drain sections are securely fastened together and have watertight fittings.
- ☑ Extend the pipe beyond the toe of the slope and discharge into a stabilized area or to a sedimentation trap or pond. Use rock outlet protection if necessary.
- ☑ Immediately stabilize all areas disturbed by installation or removal of the pipe slope drain.
- ☑ Check to see that water is not bypassing the inlet or undercutting the inlet or pipe. If necessary, install headwalls or sandbags to prevent bypass flow.
- ☑ Check for erosion at the outlet point and check the pipe for breaks or clogs. Install additional outlet protection if needed and immediately repair the breaks and clean any clogs.
- ☑ Inspect the drain regularly and after every storm. Make any necessary repairs within 7 days or before the next storm (whichever comes first).



Outlet Protection

Outlet protection reduces the speed of concentrated stormwater flows and reduces erosion or scouring at stormwater outlets. Outlet protection should be installed at the outlets of all pipes, culverts, catch basins, sediment basins, ponds, interceptor dikes, and swales or channel sections where the velocity of flow may cause erosion in the receiving channel.

- ☑ The design of rock outlet protection depends entirely on the location.
- ☑ The outlet protection may be constructed using rock riprap, grouted riprap or gabions.
- ☑ Complete construction of the outlet protection before allowing erosive flows to pass through the outlet.
- ☑ May require a Stream Channel Alteration Permit (Idaho Department of Water Resources)

New products for erosion and sediment control are being introduced frequently. Visit the Panhandle SEEP website:

www.PanhandleSEEP.org

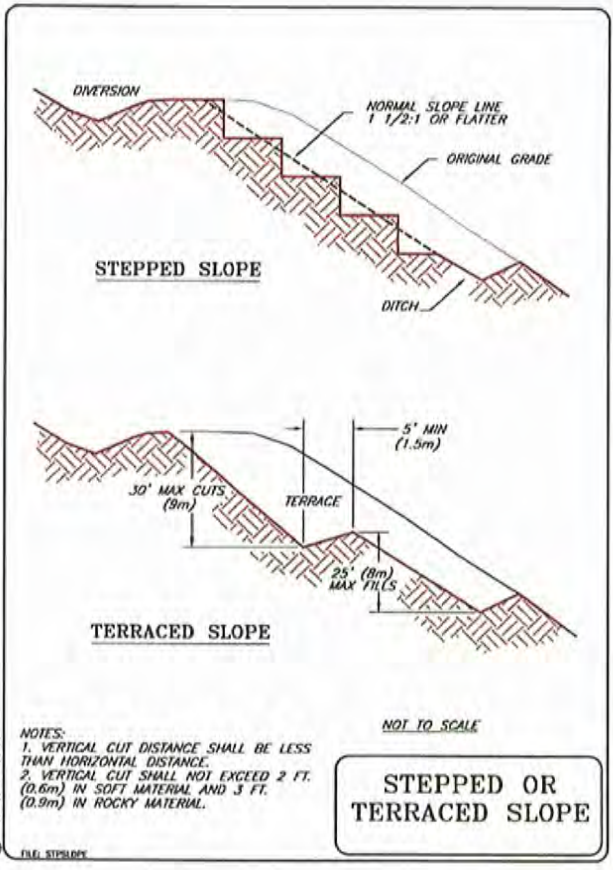
to check out the resources section and explore new ideas and technology, or ask questions about erosion and sediment control.

PANHANDLE Stormwater and Erosion Education Program

Terracing

Gradient terracing is a term used to describe an earth embankment or ridge-and-channel arrangement constructed along the face of a slope at regular intervals.

- ☑ Terraces should be designed and installed according to a plan determined by a design professional.
- ☑ Design should include adequate outlets, such as a grassed waterway, vegetated area, or tile outlet.
- ☑ Outlet must direct the runoff from the terrace system to a point where the outflow will not cause erosion or other damage.
- ☑ Vegetative cover should be used in the outlet where possible.



Stabilization BMPs

Retaining Walls

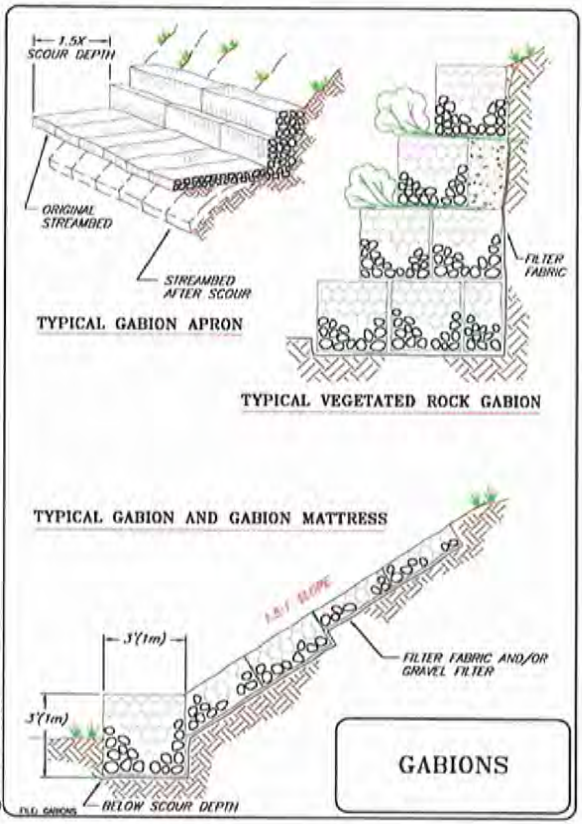
- ☑ Retaining walls require a site-specific design. Wall heights, requirements for drainage, and suitable materials should be determined through on-site inspections.
- ☑ All types of retaining walls should conform to local building codes and ordinances. Most installations will necessitate that a professional engineer prepare the plans and specifications.
- ☑ Retaining walls should be inspected on regular intervals to detect signs of structural failure, and to check for damage caused by subsurface drainage or material sloughing. In stream bank installations, inspect for signs of undercutting and other instability. Make all repairs promptly, as needed.

Gabions

Gabions are rectangular wire-mesh cages that are filled with rock and wired together to form a protective but permeable structure for slope stabilization and erosion control.

- ☑ Gabions to be installed in streambanks should be designed and installed according to Rule #9.3 of the Stream Channel Alterations, Rules & Regulations and Minimum Standards, Idaho Department of Water Resources, 1978.

- ☑ Empty gabion baskets should be placed on a smooth, firm foundation then fastened to the adjacent baskets along the top and vertical edges. Each layer should be fastened to the underlying layer along the front, back and ends.
- ☑ The structure should be capable of handling expected storm and flood conditions.
- ☑ The fill material for the wire gabions should be rock ranging in size from a minimum of 4 inches to a maximum of 8 inches.
- ☑ The layer of rock should completely fill the gabion basket so that the lid will bear on the rock when it is secured.
- ☑ The area behind the gabion structure should be backfilled with granular material; geotextile, may also be required. When joining geotextile fabric the edges should be overlapped a minimum of 12 inches and should be anchored in position with approved anchoring devices.



Troubleshooting
Common Construction Site Compliance Problems

Problem	Potential Solution	Pg
Too much soil exposed at one time	Schedule construction activities to minimize land disturbance. Sequence clearing with installation of erosion and sediment control practices. Mulch/hydromulch/seed exposed soils.	3
Poor management of Stock Piles	Locate stockpiles away from drains, inlets and storm water flows; berm if necessary. Protect piles from run-on. Cover piles with a barrier or vegetation.	4
Vehicle tracking onto roadways	Verify correct installation of stabilized entrance. Ensure all vehicles use stabilized entrance. Route run-off from the entrance through a sediment trapping device prior to discharge. If stabilized entrance is not adequate to remove sediment, a tire wash may be necessary.	6
Pollutant – concrete/paint/etc discharges	Prepare and implement a spill prevention plan. Provide contractor education. Establish concrete washout containment area. Use secondary containment where appropriate.	4
Rill & Gullies forming	Identify cause of erosion, install appropriate erosion control BMPs. Divert and/or contain stormwater flows. Roughen (till) or cover (mulch/seed/matting) eroding soils.	7
Run-off leaving the site	Assess current run-off controls; replace, repair or modify as necessary.	19

Troubleshooting
Common Construction Site Compliance Problems

Problem	Potential Solution	Pg
Excessive sediment accumulation	Assess erosion control BMPs; install, replace, repair as needed. Assess current run-off controls; replace, repair or modify as necessary. Remove and properly dispose of sediment when it reaches one-third the height of a silt fence; one-half the height of a fiber roll; one-half the design depth of inlet protection (or manufacturer's recommended volume); one-half the height of a check dam.	7
Inlet protection failing	Determine if current inlet protection is best application; replace if appropriate. If vehicular or pedestrian traffic is disturbing BMP, consider different (e.g. internal insert) type BMP. Assess run-off controls; replace, repair or modify as necessary.	17
Ineffective BMPs installed	Reassess site and BMP installations. Consult design professional if needed. Objective: **Prevent/reduce erosion, control sediment and run-off, stabilize soil as soon and completely as possible.**	3
BMPs installed incorrectly	Follow manufacturers/suppliers directions. Provide training to contractors. Observe installation and correct deficiencies immediately.	3
Inadequate BMP Maintenance	Inspect site and BMPs on schedule. (Every seven days and after rain event of .5 inches or greater) Document inadequacies and repair actions. Provide contractor with written copy of rules and regulations, including consequences for non-compliance.	3

BMP	Condition	Need Repair?
Slopes Terracing Pipe slope drains - -	 G F P G F P G F P G F P	 Y N Y N Y N Y N
Notes		
Drain Inlets Exterior protection Inserts - -	 G F P G F P G F P G F P	 Y N Y N Y N Y N
Notes		
Channels and Outlets Conveyance channels Energy dissipaters - -	 G F P G F P G F P G F P	 Y N Y N Y N Y N
Notes		
Control Pollutants Chemical Storage Area Concrete washout -	 G F P G F P G F P	 Y N Y N Y N
Notes		
- -	 G F P	 Y N
Notes		

G – Good F – Fair P - Poor

Will existing BMPs need to be modified or removed, or other BMPs installed? IF YES, list the action items to be completed on the following table.

Actions to be Completed	Date Completed/ Initials
1.	
2.	
3.	
4.	
5.	
6.	

Stormwater and Erosion Control
Construction Site Inspection Checklist

BMP	Condition	Need Repair?
Clearing Limits		
Buffer Zones	G F P	Y N
-	G F P	Y N
Notes		
Access/Roads		
Stabilized site entrance	G F P	Y N
Stabilized roads/parking area	G F P	Y N
-	G F P	Y N
Notes		
Flow Rates Controlled		
Swale	G F P	Y N
Dike	G F P	Y N
Sediment Pond	G F P	Y N
Sediment Trap	G F P	Y N
-	G F P	Y N
Notes		
Sediment Controls		
Sediment pond/Trap	G F P	Y N
Silt fence	G F P	Y N
Wattles	G F P	Y N
-	G F P	Y N
-	G F P	Y N
Notes		
Preserve Vegetation		
-	G F P	Y N
Notes		
Stabilize Soils		
Erosion Control Blankets	G F P	Y N
Matting	G F P	Y N
Mulch	G F P	Y N
Hydromulch	G F P	Y N
Seeding/hydroseeding	G F P	Y N
-	G F P	Y N
Notes		

CITY OF COEUR D' ALENE
24-Hour Hotline: (208) 676-7405
Customer Service: (208) 769-2285

CITY OF POST FALLS
Stormwater Program: (208) 777-9857

LAKES HIGHWAY DISTRICT
(208) 772-7527 or info@lakeshighwaydistrict.com

POST FALLS HIGHWAY DISTRICT
(208) 765-3717 or www.postfallshd.com

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