

SECTION 4

BEST MANAGEMENT PRACTICES MENU

Information sheets for the BMPs listed in the following menu are located at the end of this section.

4.1 BMPS FOR EROSION AND SEDIMENT CONTROL (ESC)

Site Planning

- ESC 1 Project Scheduling
- ESC 2 Site Planning and Design
- ESC 3 Preservation of Existing Vegetation
- ESC 4 Land Grading

Vegetative Stabilization

- ESC 5 Seeding and Planting
- ESC 6 Mulching
- ESC 7 Vegetative Buffer Zones

Physical Stabilization

- ESC 8 Geotextiles
- ESC 9 Temporary Stream Crossing / Culvert
- ESC 10 Temporary Road Stabilization
- ESC 11 Site Entrance Stabilization
- ESC 12 Protection of Stockpiles

Diversion of Runoff

- ESC 13 Earth Dikes and Berms
- ESC 14 Swales
- ESC 15 Slope Drain

Velocity Reduction

- ESC 16 Outlet Protection
- ESC 17 Check Dams
- ESC 18 Slope Terracing / Roughening

Sediment Trapping/Filtering

- ESC 19 Silt Fence
- ESC 20 Sand Bag Barrier
- ESC 21 Brush or Rock Filter
- ESC 22 Sediment Trap

4.2 BMPS FOR SITE MANAGEMENT (SM)

Construction Operations

- SM 1 Good Housekeeping
- SM 2 Paving Operations

Vehicle and Equipment Management

- SM 3 Equipment Cleaning and Maintenance
- SM 4 Equipment Fueling

Materials Management

- SM 5 Materials Management
- SM 6 Material Delivery and Storage
- SM 7 Outdoor Material Storage

Waste Management

- SM 8 Concrete Waste Management
- SM 9 Site Waste Management
- SM 10 Septic System Management
- SM 11 Cesspool Maintenance

4.3 BMP APPLICATION CHECKLIST

Table 4-1 on the following pages presents a BMP application checklist to assist in the selection of control measures appropriate to project needs and storm water control objectives.

Table 4-1: BMP Application Checklist

BMP CATEGORY		BMP OBJECTIVES						
		Maintain Orderly Site	Contain Waste	Minimize Disturbed Area	Stabilize Disturbed Area	Protect Slopes and Channels	Capture Sediment	Control Internal Erosion
EROSION & SEDIMENT CONTROL								
	Site Planning							
ESC 1	Project Scheduling	Y	Y	Y	Y	Y		Y
ESC 2	Site Planning and Design	Y	Y	Y	Y	Y		Y
ESC 3	Preservation of Existing Vegetation			Y	Y	Y	Y	Y
ESC 4	Land Grading			Y		Y		Y
	Vegetative Stabilization							
ESC 5	Seeding and Planting				Y	Y	Y	Y
ESC 6	Mulching				Y	Y	Y	Y
ESC 7	Vegetative Buffer Zones			Y	Y	Y	Y	Y
	Physical Stabilization							
ESC 8	Geotextiles				Y	Y		Y
ESC 9	Temporary Stream Crossing / Culvert	Y		Y	Y	Y		
ESC 10	Temporary Road Stabilization	Y		Y	Y	Y		Y
ESC 11	Site Entrance Stabilization	Y		Y	Y	Y		
ESC 12	Protection of Stockpiles	Y	Y		Y		Y	

Table 4-1: BMP Application Checklist								
BMP CATEGORY	BMP OBJECTIVES							
	Maintain Orderly Site	Contain Waste	Minimize Disturbed Area	Stabilize Disturbed Area	Protect Slopes and Channels	Capture Sediment	Control Internal Erosion	
EROSION & SEDIMENT CONTROL								
	Diversion of Runoff							
ESC 13	Earth Dikes and Berms		Y		Y	Y	Y	Y
ESC 14	Swales				Y	Y	Y	Y
ESC 15	Slope Drain				Y	Y		Y
	Velocity Reduction							
ESC 16	Outlet Protection				Y	Y	Y	Y
ESC 17	Check Dams					Y	Y	
ESC 18	Slope Terracing / Roughening				Y	Y		Y
	Sediment Trapping / Filtering							
ESC 19	Silt Fence		Y		Y		Y	Y
ESC 20	Sand Bag Barrier					Y	Y	Y
ESC 21	Brush or Rock Filter				Y	Y	Y	Y
ESC 22	Sediment Trap						Y	Y

Table 4-1: BMP Application Checklist

BMP CATEGORY		BMP OBJECTIVES						
		Maintain Orderly Site	Contain Waste	Minimize Disturbed Area	Stabilize Disturbed Area	Protect Slopes and Channels	Capture Sediment	Control Internal Erosion
SITE MANAGEMENT								
	Construction Operations							
SM 1	Good Housekeeping	Y	Y	Y		Y		Y
SM 2	Paving Operations	Y	Y					
	Vehicle and Equipment Management							
SM 3	Equipment Cleaning and Maintenance	Y	Y					
SM 4	Equipment Fueling	Y	Y					
	Materials Management							
SM 5	Materials Management	Y	Y	Y	Y			
SM 6	Material Delivery and Storage	Y	Y					
SM 7	Outdoor Material Storage	Y	Y	Y	Y	Y		
	Waste Management							
SM 8	Concrete Waste Management	Y	Y	Y				
SM 9	Site Waste Management	Y	Y	Y				
SM 10	Septic System Management	Y	Y					
SM 11	Cesspool Maintenance	Y	Y					

Reference: *Best Management Practices Manual for Construction Sites in Honolulu*, May 1999

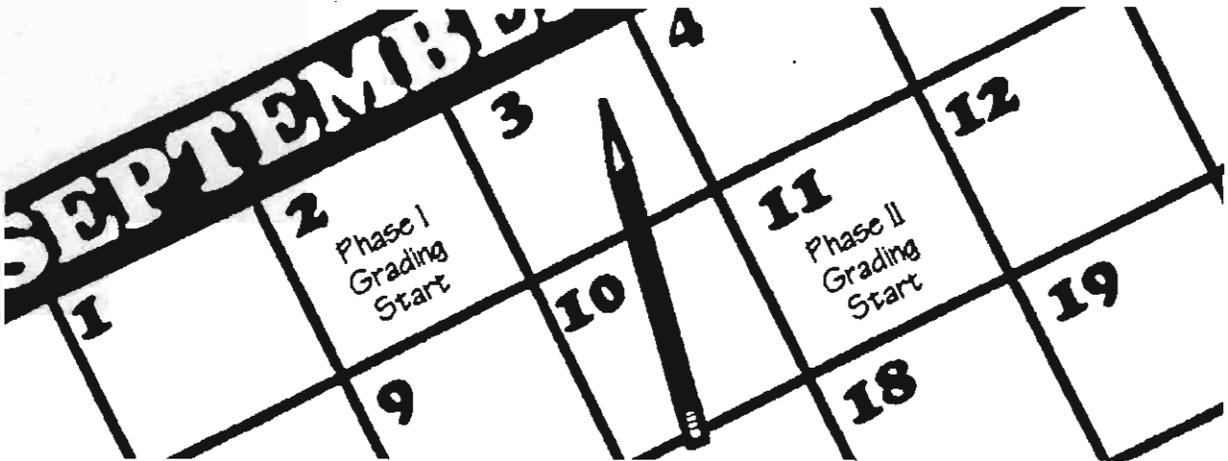
DESCRIPTION

Schedule work activities to minimize soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

APPLICATION

Proper sequencing of construction (work) activities to reduce erosion potential should be incorporated into the schedule of every construction project. Use of other, more costly yet less effective, erosion and sedimentation controls, may often be reduced through proper construction sequencing. General guidance for site planning include:

1. Design project to existing land contours. Grading disturbs soils and may require costly sedimentation and erosion control measures.
2. Minimize disturbance of steep slopes and waterways to improve aesthetics and minimize erosion.
3. Avoid conducting work during rainy periods. Schedule major grading work during dry periods.
4. Do not wait to stabilize soils with vegetation or other physical means.
5. Practice erosion and sediment controls year round.
6. Minimize soil exposed at one time; schedule projects to disturb only small portions of the site at any one time. Complete grading as soon as possible. Immediately stabilize the disturbed portion before grading the next portion.
7. Close and stabilize trenching as soon as possible.



DESCRIPTION

Site planning is the practice of selecting and siting temporary and permanent runoff control measures prior to work activities. Careful site planning helps ensure that drainage ways and permanent runoff control systems are effectively integrated with other project features.

Site planning is particularly important for post-project control measures. It is generally much more difficult and expensive to retrofit a site with control features after the project is completed. For temporary control, implementation begins when the project begins, typically before the initial clearing and grading, thus it must be planned ahead of time.

APPLICATION

Site planning and control measure design should be conducted for all development projects. An Erosion/Sediment Control Plan or Storm Water Control Plan should be prepared and submitted to the ASEPA for review and approval before work activities begin. If the proposed activity will have an impact to receiving waters, then a Water Quality Monitoring Plan shall be prepared.

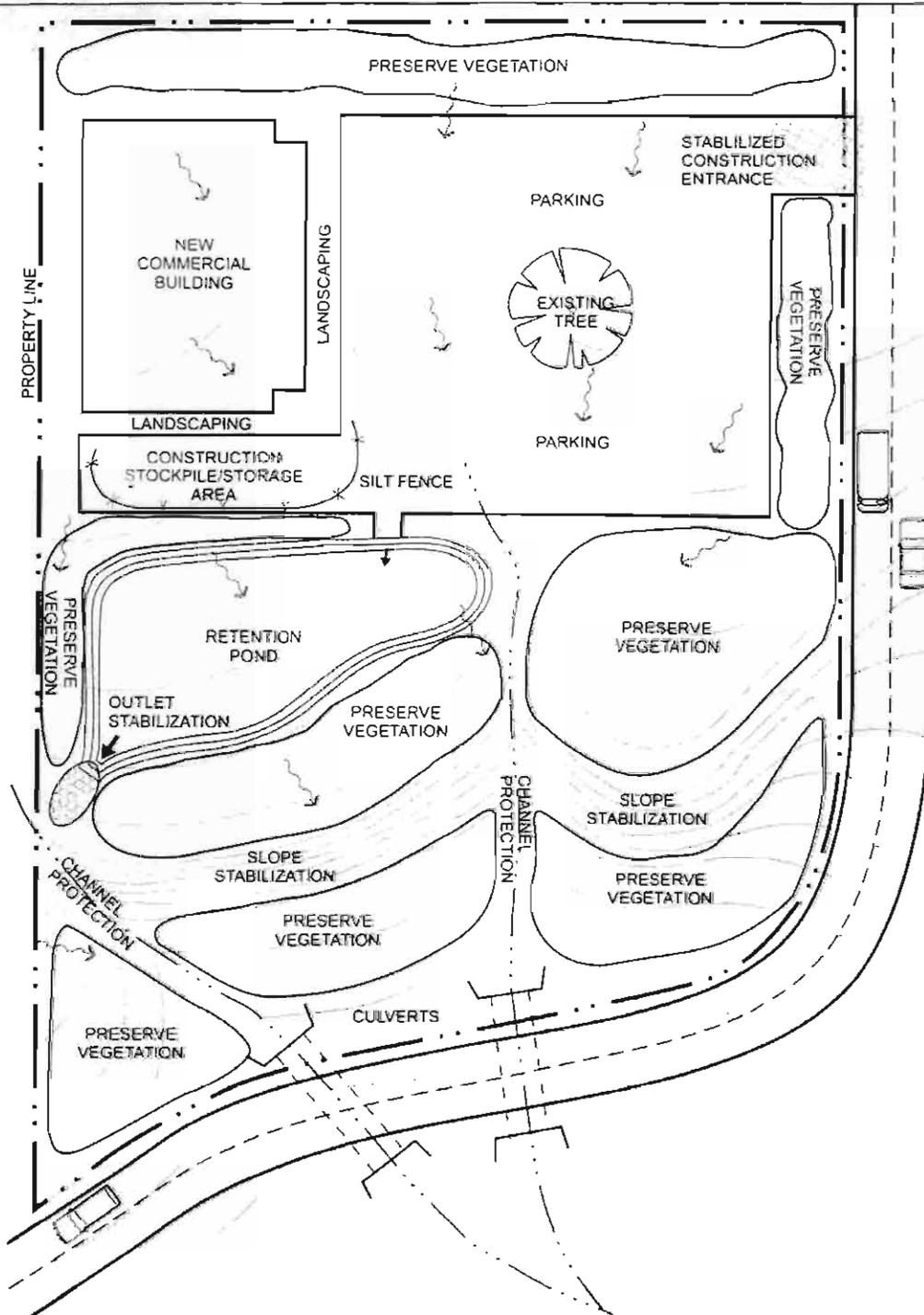
INSTALLATION

Site planning involves preparing a site map and assessing a site's physical conditions, developing plans to identify potential runoff problems. At this stage, areas of existing vegetation can be marked for preservation as vegetative buffers. Unstable and erosive areas can be identified and avoided. Other areas can be set aside for construction or permanent controls such as swales, wet ponds, and sediment traps.

- For activities greater than 1 acre, minimize activities within 100 feet of a surface water body.
- For confined animal facilities, locate the activity more than 50 feet from water bodies.

MAINTENANCE

- Site plans should be referred to frequently during project work and revised as development plans or site information changes.
- Responsibility for operations and maintenance of the temporary and permanent control measures should also be specified in the site plans and periodically reviewed.



DESCRIPTION

Trees, vines, shrubs, and/or grasses serve as erosion controls. Preserving existing vegetation minimizes the amount of exposed soil and minimizes the costs of implementing erosion and sedimentation control measures.

APPLICATION

Vegetation should remain undisturbed in sensitive, erosion-prone areas where natural vegetation exists, such as steep slopes and waterways. Vegetation should also be preserved in areas within the project site where no project activity occurs.

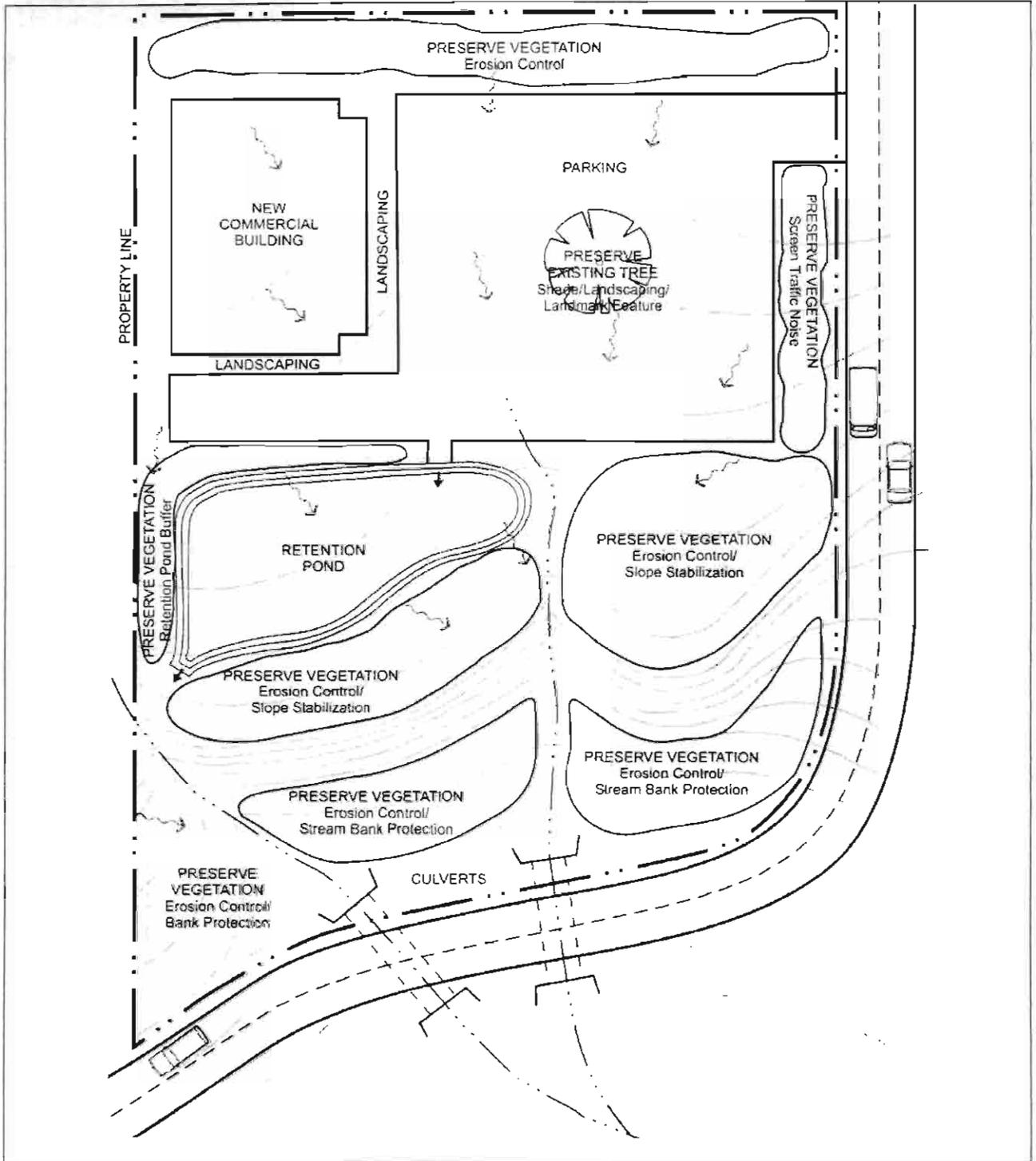
INSTALLATION

- Clearly mark, flag, or fence vegetation or areas where vegetation should be preserved.
- Prepare landscaping plans that include as much existing vegetation as possible and state proper care of the vegetation.
- Define and protect with berms, fencing, signs, etc., setback areas from vegetation to be preserved.
- Do not locate access routes, stockpiles, or staging areas where significant impacts to preserved vegetation could occur.

MAINTENANCE

- Periodically inspect vegetation preservation areas to ensure that markers are in place and clearly visible, and to ensure that project activities are not damaging vegetation.
- Regularly refer to site plans to ensure that project activities correspond with a vegetation preservation plans. Update plans to reflect changing conditions and revisions to preservation plans.





DESCRIPTION

Land grading involves reshaping the ground surface to planned grades designed to control drainage and runoff flows. Land grading provides more suitable topography for buildings, facilities, and other land uses and helps to reduce soil erosion, and sedimentation both during and after project activities.

APPLICATION

Land grading is applicable to sites with steep topography or easily erodible soils because it stabilizes slopes and decreases runoff velocity.

INSTALLATION

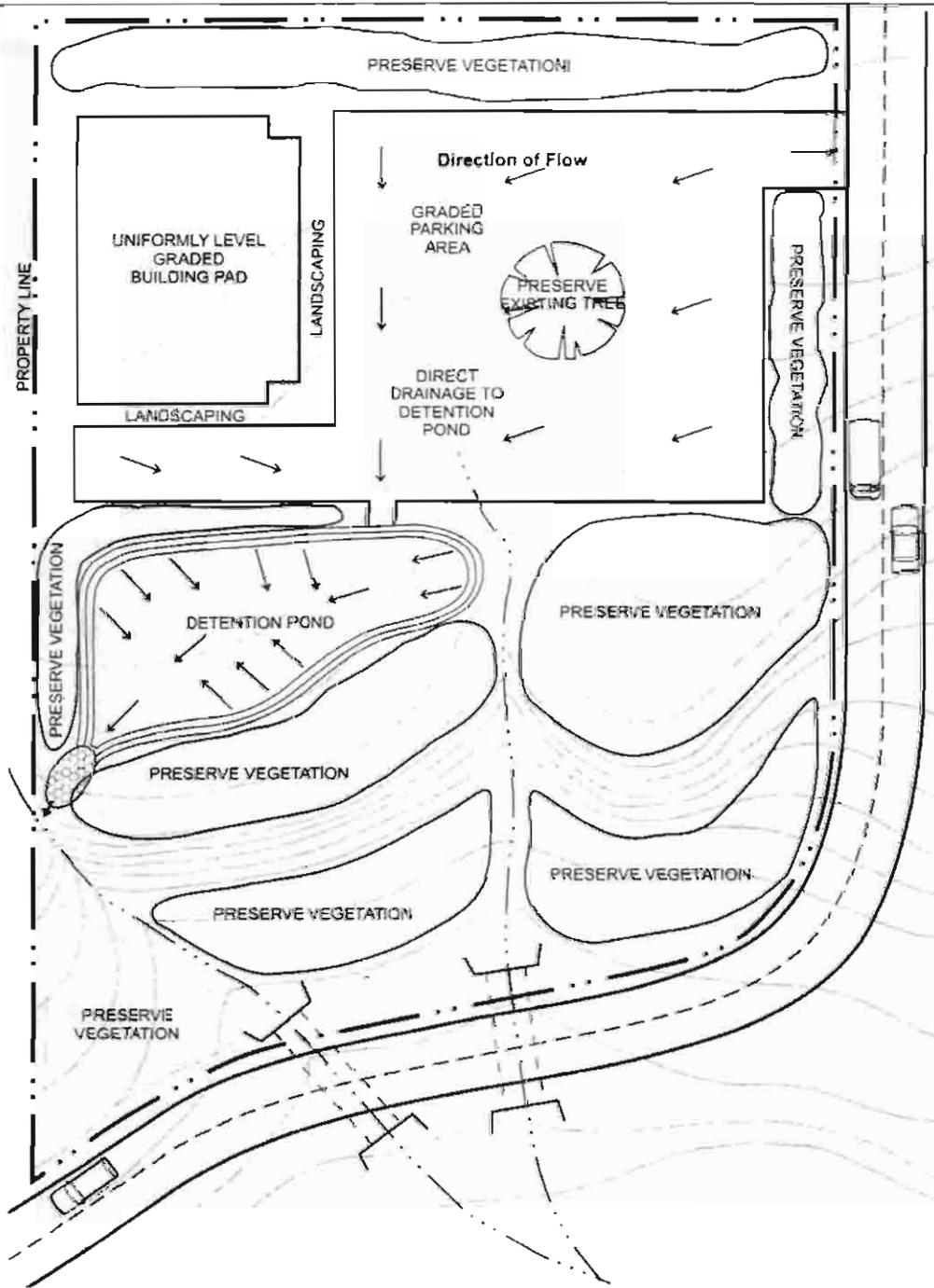
Before grading activities begin, decisions must be made regarding the steepness of cut-and-fill slopes and how the slopes will be: (1) protected from runoff; (2) stabilized; and, (3) maintained.

- Prepare grading plans which:
 - Identified areas of the site that will be graded and how drainage patterns will be directed;
 - Includes information regarding when earthwork will start and stop;
 - Roads should be built with existing contours to the extent they are feasible and steep unpaved driveways and roads should be avoided;
 - Identified where and how excess material will be disposed of (or where borrow materials will be obtained if needed); and
 - Identifies locations of berms, diversion, and other runoff practices that required excavation and filling.
- Grading activities should maintain existing drainage patterns as much as possible.
- Clear and grade only those areas necessary for building activities and equipment traffic.
- Maintain undisturbed, temporary or permanent buffer zones in the site plans as a low-cost sediment control measure that will help reduce runoff and off-site sedimentation.
- The lowest elevation of the site should remain undisturbed to provide a protected runoff outlet until drainage ways or other outlets are installed.
- Special Consideration for Agricultural Activities
 - Land clearing should be minimized and clearing with the contour of the land is recommended.
 - Plan natural vegetated buffers between cultivated areas, especially on sloped lands.
 - Locate animal pens away from streams and other water courses to prevent animal wastes from entering the ocean.
- See also **ESC-2** – Site Planning and Design, and **ESC-3**, Preservation of Existing Vegetation

MAINTENANCE

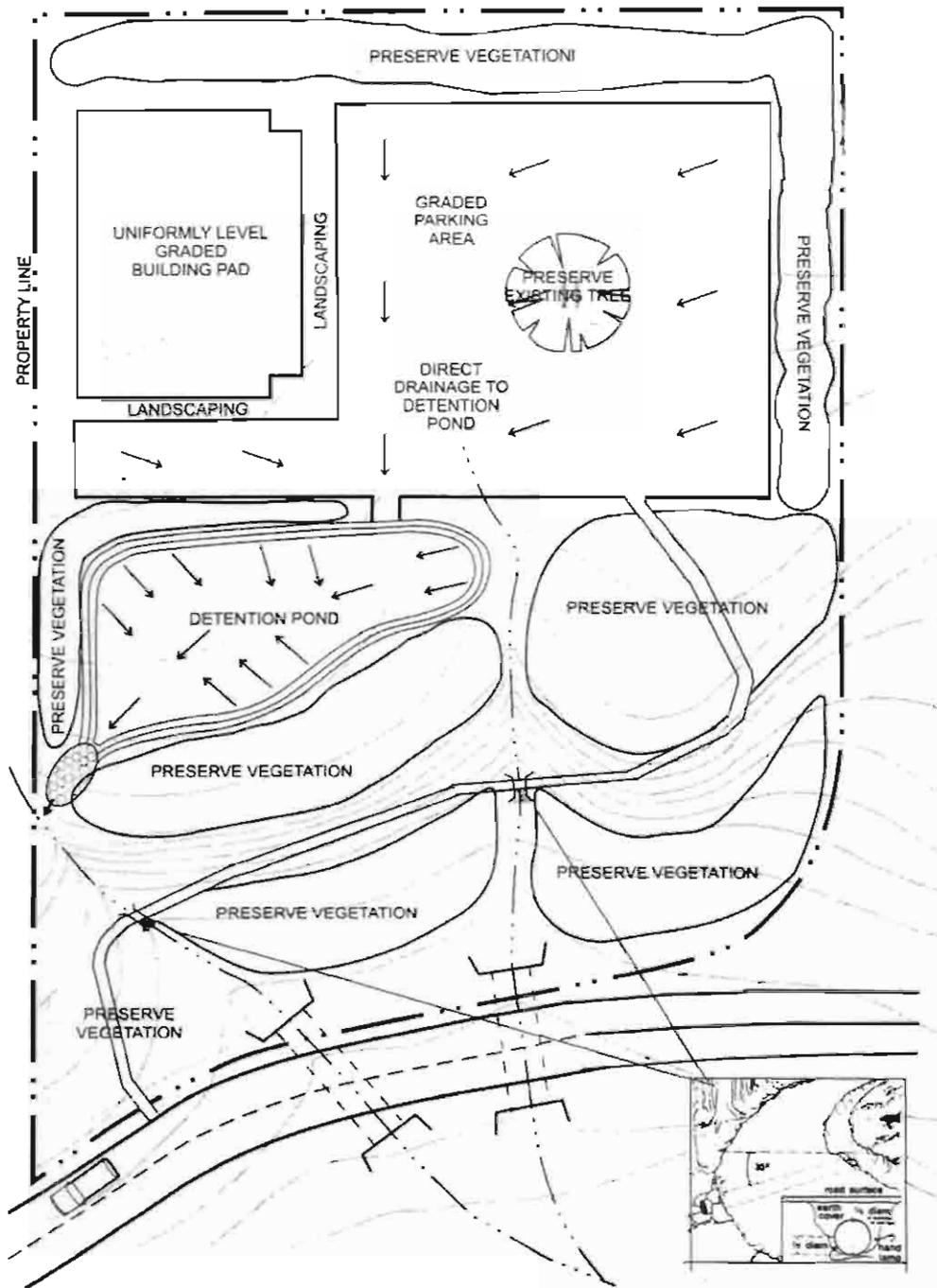
- All graded areas and supporting erosion and sediment control practices should be periodically checked, especially after heavy rainfalls.
- Prompt maintenance of small-scale eroded areas is essential to prevent these areas from becoming significant gullies.





SITE GRADING PLAN





DESCRIPTION

Planting grasses, trees, shrubs, vines, and ground covers provide long-term stabilization of soil. Fast growing grasses and ground cover can be planted for temporary stabilization. Permanent seeding helps reduce erosion by reducing the velocity of runoff, allowing infiltration to occur, filtering sediments, and by holding soil particles in place.

APPLICATION

Seeding and planting is appropriate during construction and post-construction. It can be applied in any area where project activities have ceased, in open space cut and fill areas, steep slopes, spoils piles, vegetated swales, landscape corridors, and stream banks.

- Grasses are good for flat slopes and stable soils.
- Seeding and mulching is effective on moderate to steep slopes and /or erosive soils.
- Vines and ground cover can be applied to flat to steep slopes depending on species.
- Trees and shrubs are good for permanent soil stabilization on flat to steep slopes, and for deeper soils. They are also effective as wind barriers.

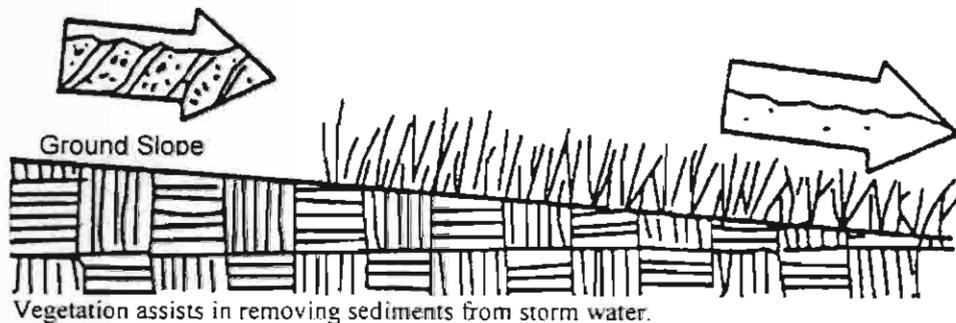
INSTALLATION

Seeding and planting should be applied as soon as final grading is done. The following conditions/applications should be considered when selecting plant types:

- Slope
- Soil type
- Irrigation requirements
- Fertilizer requirements
- Wind exposure
- Seeding rates / seasonal requirements
- Drainage
- Mowing / pruning requirements
- Appearance
- Secondary uses (permanent plantings – e.g. food source, building material, animal habitat)

MAINTENANCE

Shrubs and trees must be adequately watered, fertilized and pruned, if needed. Grasses may need to be watered and mowed.



DESCRIPTION

Mulching is used to temporarily and permanently stabilize cleared or freshly planted areas. Types of mulches include organic materials, straw, wood chips, bark or other wood fibers, decomposed cinder, and gravel. Mulching protects soil from rainfall impacts, increases infiltration, conserves moisture around plantings, and aids plant growth by holding seeds or seedlings, topsoil, and nutrients in place until the plants can sustain themselves.

APPLICATIONS

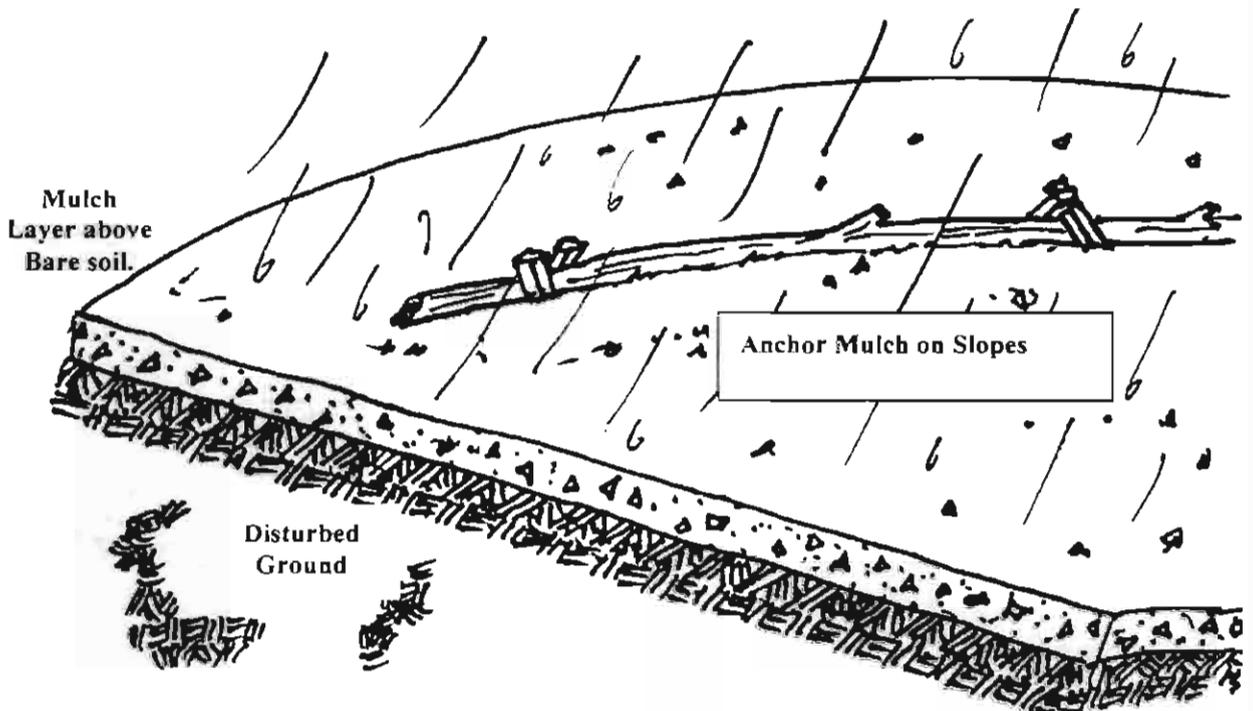
- Temporary stabilization for freshly seeded/planted areas.
- Temporary stabilization during periods unsuitable for growing vegetation.
- Temporary stabilization of areas that cannot be seeded/planted (e.g., steep slopes).

INSTALLATION

- May be used with netting to aid in soil stabilization.
- Apply to planting areas where slopes are 2:1 or greater.
- Should be inspected weekly and after rain for damage or deterioration.
- Straw/grass mulches need to be anchored to prevent the much from being blown or washed away.

MAINTENANCE

Regular inspection to find where mulch material has been loosened or removed. Such areas should be re-planted if necessary, and the mulch cover replaced immediately.



DESCRIPTION

Buffer zones are preserved or planted strips of vegetation at the top and bottom of a slope, outlining property boundaries, or adjacent to receiving waters such as streams or wetlands. Buffer zones can slow runoff flows and thereby decrease erosion and allow sediment deposition.

APPLICATION

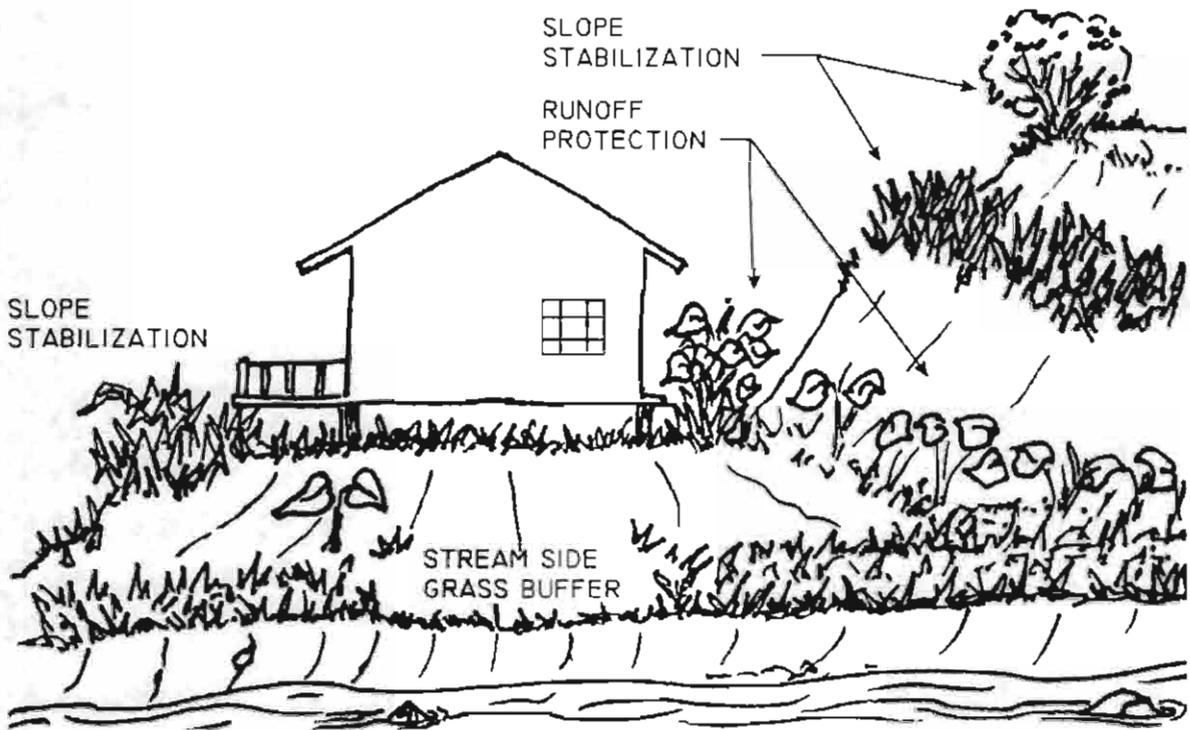
- Buffer zones can be used at any site that supports vegetation.
- Buffer zones are particularly effective on floodplains, next to wetlands, along stream banks, and on steep, unstable slopes.

INSTALLATION

- Carefully plan the project site to preserve existing vegetation in areas where buffer zones are desired.
- Select new grass, ground cover, shrubs and trees based on site needs and personal preference. A combination of plant types can be beneficial.
- Plant types should also be selected for their durability and resilience to environmental conditions.
- Incorporate temporary buffer zones into the permanent landscape plan whenever possible.

MAINTENANCE

Routine maintenance such as mowing, pruning, and fertilizing may be necessary to ensure healthy vegetation. Specific requirements will depend on the plant types selected.



DESCRIPTION

Geotextiles are matting made of natural or synthetic material which are used to temporarily or permanently stabilize soil. Geotextile material include hala (*pandanus*), jute, netting, burlap, cotton, plastic, glass fiber, wood fiber, and paper. They are installed using anchor trenches or stakes at the edges. Geotextiles are generally more expensive than other measures.

APPLICATION

Geotextiles are typically used for post-project site stabilization, but may be used for temporary stabilization of highly erosive soils. Organic matting is effective when used together with seeding and planting. It is especially useful until permanent vegetation is established, or where immediate, temporary stabilization is required. Because they are more expensive than other measures, geotextiles are recommended for areas where other control measures are ineffective, such as stream channels and steep slopes. Matting may be applied to disturbed soils, and where existing vegetation has been removed.

INSTALLATION

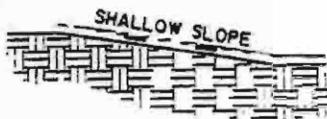
- Geotextiles are suitable for slopes greater than 5%.
- If using commercial matting, follow the manufacture's instruction for installation.
- Clear the surface on which the matting will be placed on rocks.
- When used together with seeding and planting, use matting made from natural materials.
- Tuna (fishing) netting can be used as an alternative to commercial geotextiles for erosion protection on slopes.

MAINTENANCE

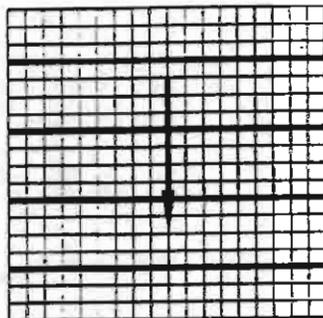
- Inspect monthly and after heavy rainfall.
- Re-anchor loose sections and replace missing pieces.



ON SHALLOW SLOPES, STRIPS OF NETTING MAY BE APPLIED ACROSS THE SLOPE.

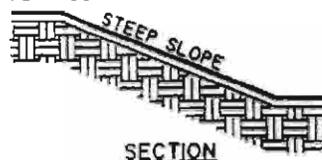


SECTION

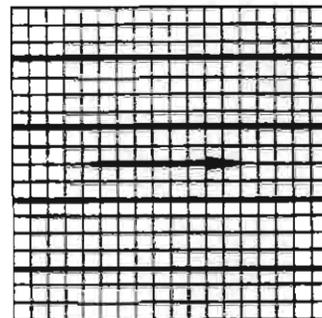


(SHALLOW SLOPES)
PLAN

ON STEEP SLOPES, APPLY STRIPS OF NETTING PARALLEL TO THE DIRECTION OF FLOW AND ANCHOR SECURELY.

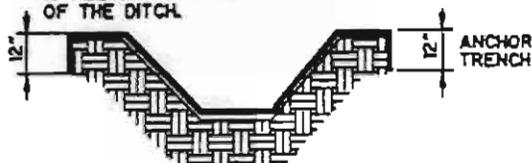


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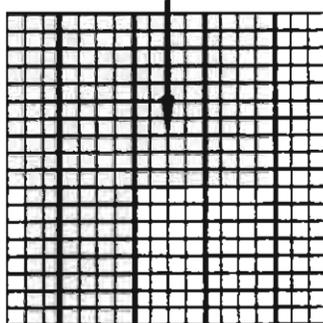
(STEEP SLOPE)
PLAN

IN DITCHES, APPLY NETTING PARALLEL TO THE DIRECTION OF FLOW. USE CHECK SLOTS EVERY 15 FEET. DO NOT JOIN STRIPS IN THE CENTER OF THE DITCH.



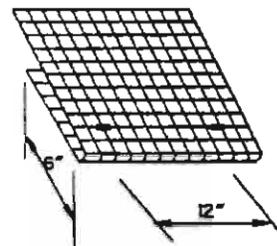
SECTION

FLOW

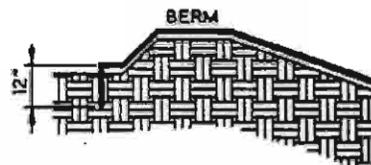


(DITCH)

PLAN



BRING NETTING DOWN TO A LEVEL BEFORE TERMINATING THE INSTALLATION. TURN THE END UNDER 6" AND STAPLE AT 12" INTERVALS.



WHERE THERE IS A BERM AT THE TOP OF THE SLOPE, BRING THE MATTING OVER THE BERM AND ANCHOR IT BEHIND THE BERM WITH A 12" ANCHOR TRENCH.

PLAN



DESCRIPTION

A temporary access crossing is a culvert, ford, or bridge placed across a waterway to provide access for construction purposes for a period of less than one year. Temporary access crossings are not intended to be used to maintain traffic for the general public.

A culvert is effective in controlling erosion but will cause erosion during installation and removal. A temporary culvert is easily constructed and allows for heavy loads.

Note: An access ford provides little sediment and erosion control and is ineffective in controlling erosion in the stream channel. A temporary ford allows for maximum load limits and required little maintenance. Fords are appropriate for dry conditions and should not be used on streams or drainage ways with constant or frequent intermittent water flows.

APPLICATION

Install wherever vehicles required access across streams and drainage ways on the project site. Whenever possible, route access ways to avoid crossing streams and drainage ways.

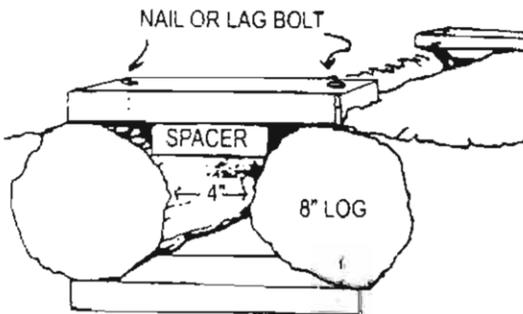
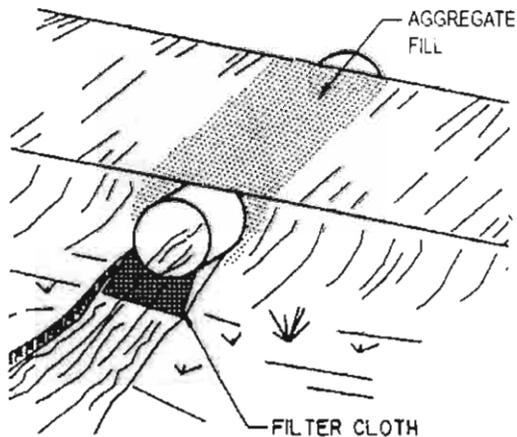
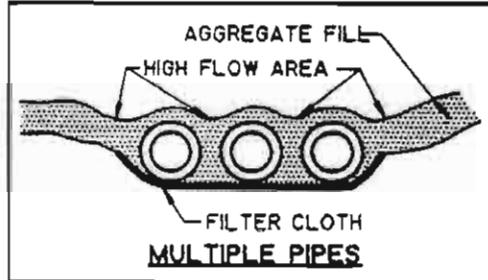
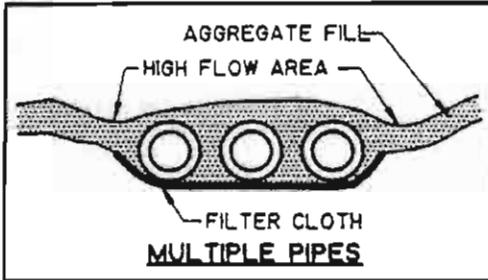
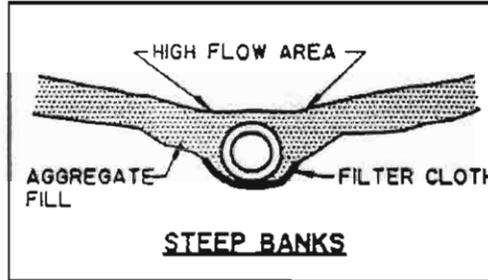
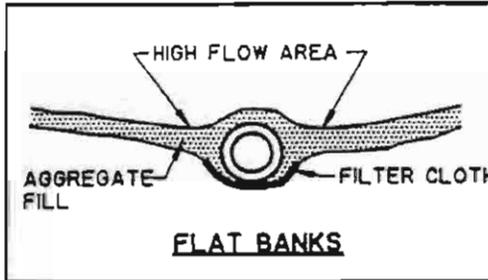
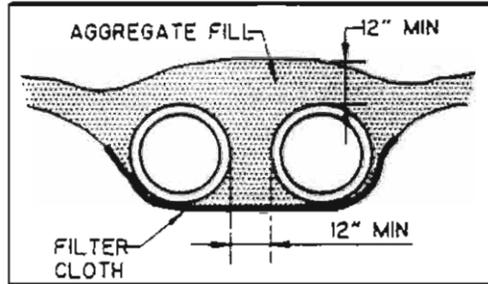
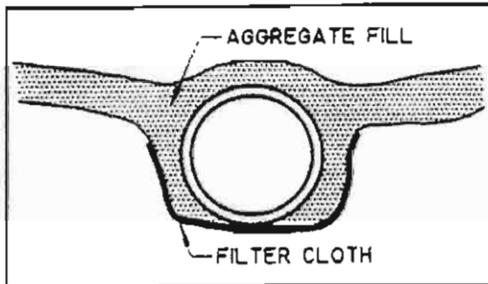
INSTALLATION

- Ideally, stream crossing should be designed and constructed under the direction of an engineer with knowledge of stream flows, hydraulics, and loading requirements for structures.
- Use adequately sized piping or substitute material (aligned hollow-tile/cinder block, PVC pipes, or parallel logs) to accommodate the amount of water in the stream.
- Place filter cloth across stream bed at crossing site. Filter cloth should extend beyond the end of pipe outlet.
- Lay pipe or substitute material in place and fill crossing with aggregate fill material. Cover pipe with a minimum of 12 inches of aggregate material.
- If more than one pipe is used, space pipes a minimum of 12 inches apart and fill space with aggregate fill material.
- Create mini drainage channels across top of access way to direct high water flows.
- Place rock, concrete rubble, or bricks at the culvert outlet to reduce stream flow velocity and prevent erosion scour of the stream bed and banks.
- Use in conjunction with other control measures to minimize soil disturbance and capture sediment.

MAINTENANCE

- Inspect weekly and after each significant rainfall for damage and clogging.
- Periodically remove silt from culvert to prevent clogging.
- Replace lost aggregate from inlets and outlets of culverts.





DESCRIPTION

Access road, parking areas, and other on-site vehicle transportation routes should be stabilized immediately after grading and frequently maintained to prevent the discharge of sediment in storm water runoff.

APPLICATION

- Road stabilization measures should be used wherever temporary roadways are created for construction traffic, site access, and road detours.

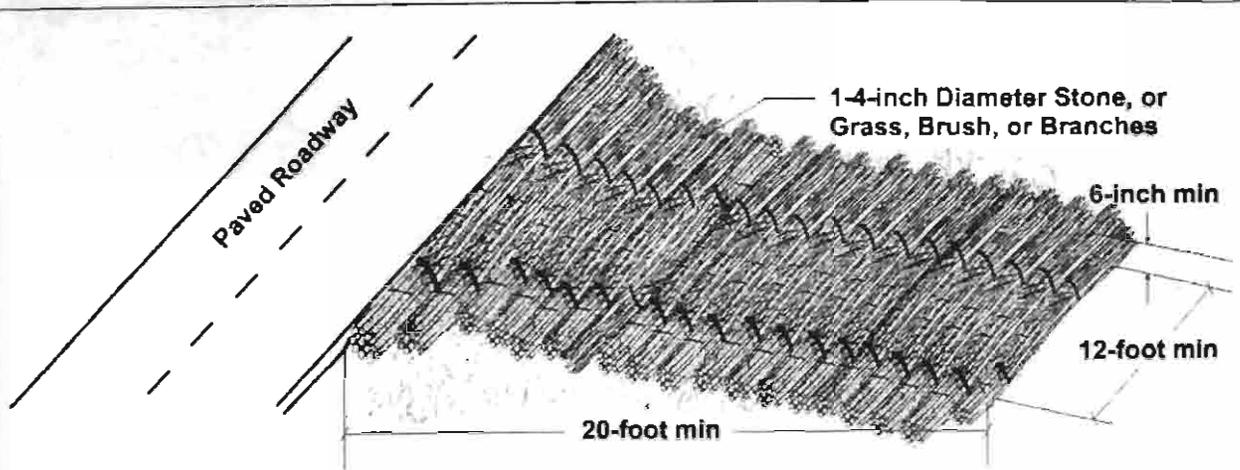
INSTALLATION

- Temporary roadways should be built to follow land contours in order to reduce erosion.
- Roadway slopes should not exceed 15 percent unless they are to be paved with concrete or asphalt.
- Grade roadway to drain transversely. Provide drainage swales or diversion berms on the side of the roadway.
- Direct roadway drainage to a sediment trap or retention basin. See **ESC 22** – Sediment Basin.
- Brush, branches, and small logs (6 to 10-inches diameter) can be placed across temporary roadways to provide roadway stabilization and additional traction for construction vehicles. See figure below.
- Use slope stabilization control measures (e.g., **ESC 5** – Seeding and Planting, **ESC-6** Mulching, and **ESC- 8** Geotextiles) where possible to prevent erosion.
- Gravel roads should be considered for very wet conditions and where slopes exceed 5 percent.
- Gravel roads should be minimum 6-inch thick, 2-4 inches coarse aggregate applied immediately after grading.
- Permanent roads should be paved as seen as possible after grading.

MAINTENANCE

- Periodically apply additional aggregate. Brush or branches on stabilized roads.
- Water temporary roads as needed during the day for dust control.
- Inspect roadways weekly and after each rain event.

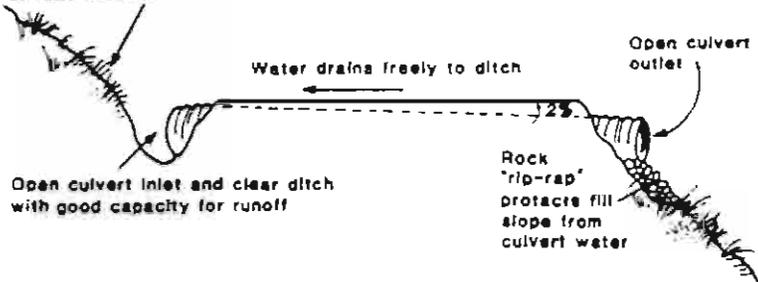




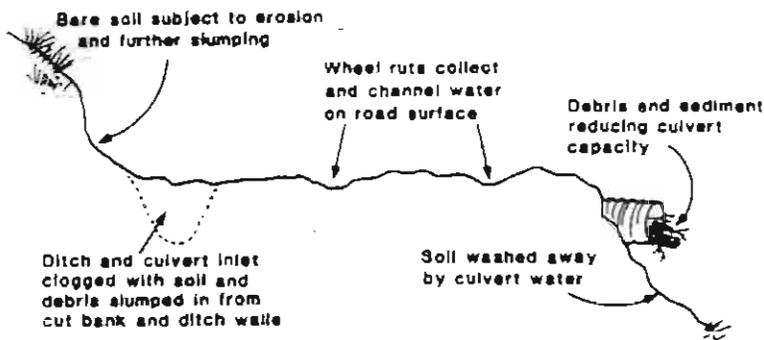
TEMPORARY ACCESS ROAD - STABILIZATION

WELL - MAINTAINED ROAD

Stable cut bank with good plant cover that does not impair visibility and drying of road surface



POORLY MAINTAINED ROAD



DESCRIPTION

Site entrance stabilization is the practice of applying coarse aggregate material or other stabilizing material, preferably underlain with filter cloth, to a project site access way to reduce the amount of sediment tracked off-site.

APPLICATION

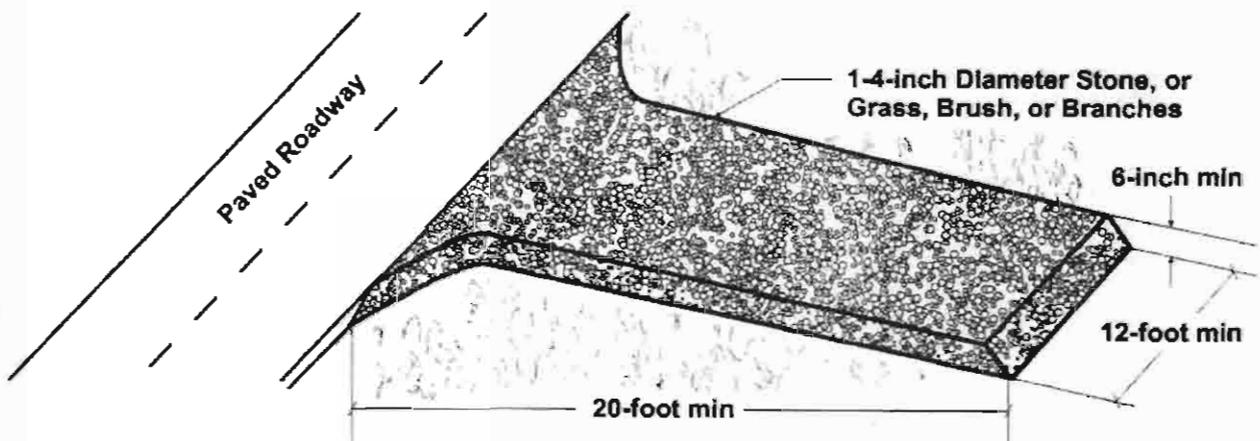
Special soil stabilization should be applied to any point where traffic will be entering or leaving a project site to an improved roadway. This applies to any unpaved areas where sediment tracking occur from the site onto paved roads.

INSTALLATION

- Construct on level ground where possible. Roadway slopes should not exceed 15 percent.
- Direct roadway drainage to a sediment trap or retention basin. (see **ESC-10**)
- Use slope stabilization control measures (e.g., **ESC 5** – Seeding and Planting, **ESC-6** Mulching, and **ESC 8** Geotextiles) where possible to prevent erosion.
- Gravel roads should be considered for very wet conditions and where slopes exceed 5 %
- Gravel roads should be minimum 6-inch thick, 2-4 inches coarse aggregate applied immediately after grading.
- Permanent roads should be paved as seen as possible after grading.

MAINTENANCE

- Periodically apply additional aggregate on gravel roads.
- Water temporary roads as needed during the day for dust control.
- Inspect roadways weekly and after each rain event.
- Repair erosion immediately.
- Remove all sediment deposited on paved roadways within 24 hours.



DESCRIPTION

Containment and stabilization measures are recommended for stockpiled materials in order to minimize or prevent storm water run-on and to prevent sediment and other pollutant discharges in storm water runoff.

APPLICATION

Containment or stabilization measures should be used for:

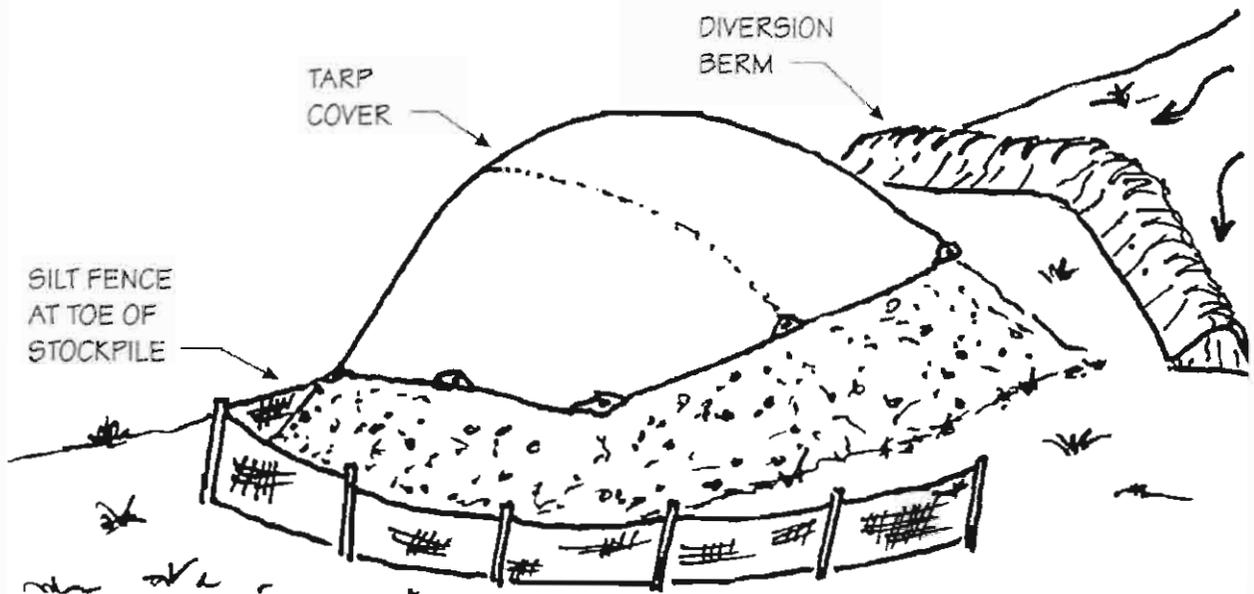
- Stockpiles of gravel or topsoil;
- Stockpiles of excavated material to be moved off-site locations; and
- Stockpiles of imported material (gravel, topsoil, sand, coral, etc.).

INSTALLATION

- Provide adequate setbacks from waterways.
- Provide earth dikes or other diversion to keep runoff water away from stockpiles.
- Provide silt fences, vegetation strips, or berms at the toe of the stockpile to mitigate runoff during rain events.
- Cover, grass, or provide other stabilization measures.
- Provide adequate setback distance from lot lines.
- Provide silt basins where required.
- Erect dust fences to minimize fugitive dust.

MAINTENANCE

- Periodically inspect and after every significant rainfall; repair as necessary.



American Samoa Government
Environmental Protection Agency
Guidance Manual For Runoff Control

PROTECTION OF STOCKPILES



R.M. TOWILL CORPORATION

October 2001

ESC # 12

PAGE 1/1

DESCRIPTION

An earth dike is a berm or ridge of compacted soil that is used to divert runoff or channel water to a desired location.

APPLICATION

Earth dikes are typically used for the following purposes:

- To divert concentrated runoff through disturbed or sensitive areas into another control measures (e.g. sediment trap See **ESC-22**)
- To divert runoff away from steep or unstable slopes.
- To divert off-site runoff from entering the site.
- As containment for construction materials and wastes.

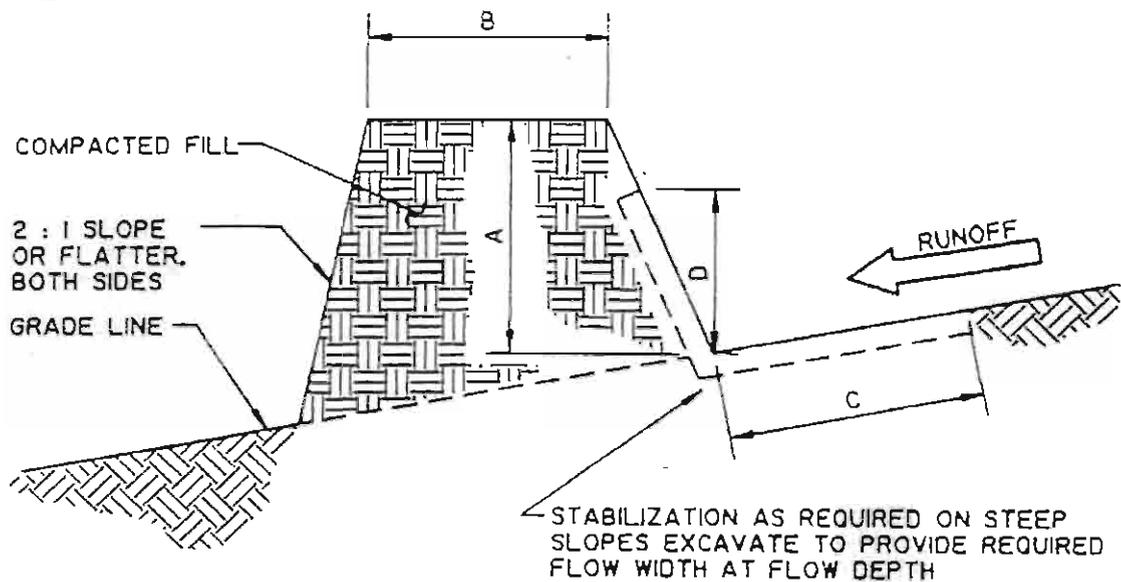
INSTALLATION

- Dikes should be well-compacted, preferably with earth moving equipment.
- Berms should have a minimum 2:1 slope, be at least 18 inches tall and 24 inches wide at the bottom.
- Top width may be wider and side slopes fatter at crossing for vehicle traffic.
- Dikes should have positive drainage to a stabilized outlet.
- Dikes should be stabilized immediately. For slopes less than 5 percent, stabilize by seeding or mulching. For slopes greater than 5 percent, stabilize with sod, rip-rap, geotextiles or concrete rubble pressed into the soil.
- Dikes should direct sediment-laden runoff into a sediment trapping device.
- Dikes should remain in place until disturbed areas are permanently stabilized.

MAINTENANCE

- Inspect for erosion and other damage periodically and after every significant rainfall. Repair as necessary.





REQUIREMENTS BASED ON UPSTREAM DRAINAGE AREA

	DIKE 1 (5 ACRES OR LESS)	DIKE 2 (5-10 ACRES)
A-DIKE HEIGHT	18"	36"
B-DIKE WIDTH	24"	36"
C-FLOW WIDTH	4'	6'
D-FLOW DEPTH	8"	15"

DESCRIPTION

Swales are used to divert of-site runoff around the project site, divert runoff from stabilized areas around disturbed areas, and direct runoff into sediment traps.

APPLICATION

Swales are appropriate for diverting any upslope runoff around unstabilized or disturbed areas of the project site. When properly used, swales are an effective means to:

- To prevent slope failures;
- Prevent damage to adjacent property;
- Prevent erosion and transport of sediments into water ways;
- Improve the potential for infiltration; and,
- Divert sediment-laden runoff into sediment traps. (see ESC-22, Sediment Traps)

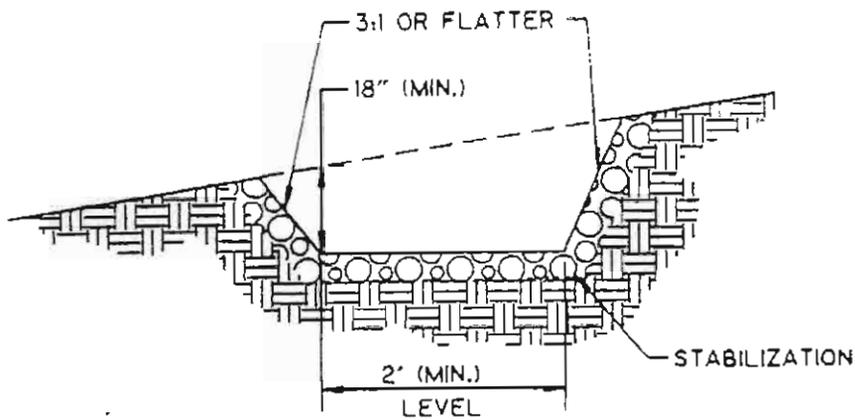
INSTALLATION

- Design swales to conform to existing land forms and drainage patterns.
- Swales should have a minimum side slope of 2:1, be at least 18 inches deep and 24 inches across at the bottom.
- Construct swale with an uninterrupted, positive drain to a stabilized outlet.
- Provide erosion protection or energy dissipation measures if the flow out of the swale can reach an erosive velocity (see ESC 16, Outlet Protection, and ESC 17, Check Dams).
- Stabilize swale using vegetation, matting or other physical means of stabilization.
- Any swale that conveys sediment-laden runoff must be diverted into sediment trap before it is discharged from the side.

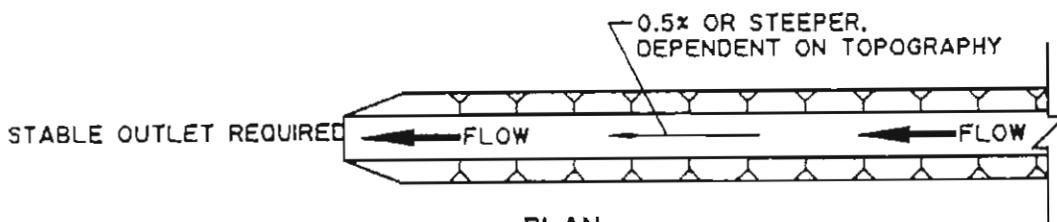
MAINTENANCE

- Inspect weekly and after any significant rain event.
- Repair any erosion immediately.
- Remove sediment built-up that can restrict flow capacity.





CROSS SECTION



PLAN

TEMPORARY DRAINAGE SWALE

DESCRIPTION

A slope drain is a temporary pipe or lined channel used to drain the top of a slope to a stable discharge point at the bottom of a slope without causing erosion. This control measure is typically used in combination with a diversion control, such as a temporary dike or swale (see ESC-14), at the top of a slope, and serves as a temporary measure to reduce or eliminate slope erosion until permanent controls are installed and the slope is stabilized.

APPLICATION

Slope drains can be used in locations where concentrated flow of surface runoff must be conveyed down a slope. Applications include:

- Drainage for top of slope diversion dikes or swales.
- Drainage for top of cut/fill slopes where water can accumulate.
- Emergency spillway for a sediment trap.

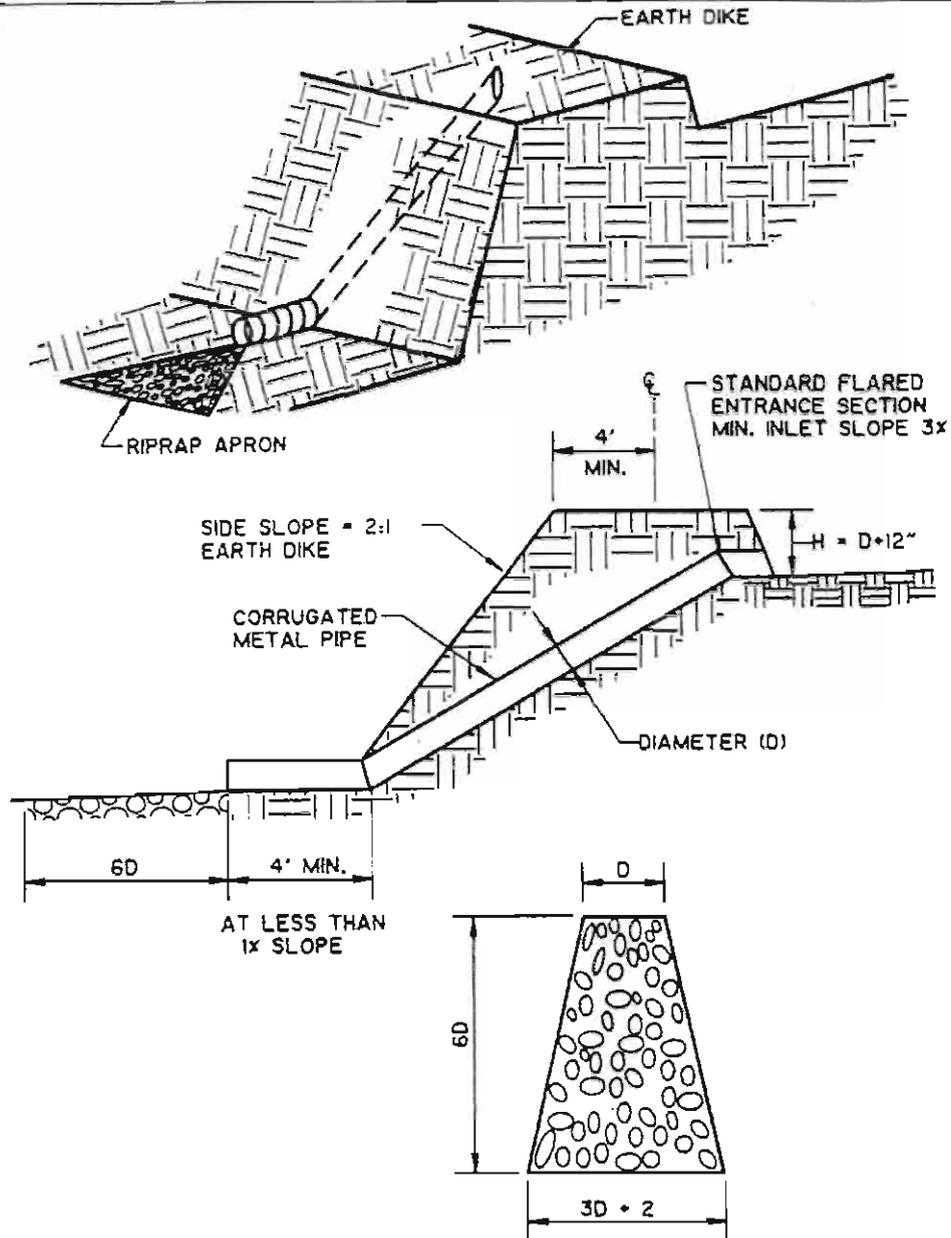
INSTALLATION

- Anchor pipe to slope. The pipe can be a rigid pipe, flexible conduit, or lined terrace drain.
 - Secure inlet at top of slope and surround with earth dikes at least 1-foot taller than the drain inlet to prevent gully erosion. Thoroughly compact the soil around and under the pipe and entrance section.
 - Size pipe to convey amount of water from a significant storm event. As a guide, pipe drains should not be sized smaller than shown in the following table:
- | Minimum Pipe Diameter | Maximum Drainage Area (Acres) |
|-----------------------|-------------------------------|
| 12" | 0.5 |
| 18" | 1.5 |
| 21" | 2.5 |
| 24" | 3.5 |
| 30" | 5.0 |
- If using a large pipe, install a debris trap as a safety device to prevent small children from entering the pipe.
 - Stabilize drain outlet with rock, concrete rubble, or other energy dissipator, or direct outflow into a stable sediment basin. (See ESC-16, Outlet Protection, and ESC-22, Sediment Trap).

MAINTENANCE

- Inspect regularly and after storm events, include inspection of pipe anchors.
- Ensure inlet is free of undercutting.
- Ensure outlet doesn't cause erosion; maintain velocity dissipators.
- Ensure drain pipes are not clogged.





RIPRAP SHOULD CONSIST OF 6" DIAMETER STONE PLACED AS SHOWN AND SHOULD BE A MINIMUM OF 12" IN THICKNESS.



DESCRIPTION

Rock outlet protection is a physical device composed of rock, grouted rip rap, or concrete rubble which is placed at the outlet of a drain pipe to prevent scour to the soil caused by high pipe flow velocities, and to absorb flow energy to produce non-erosive velocities.

APPLICATION

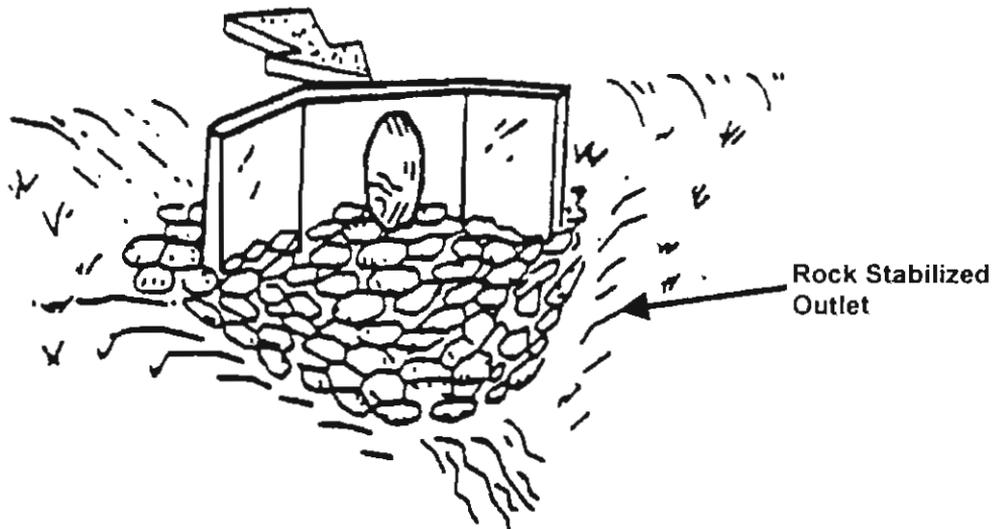
Whenever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. A sediment trap below the pipe outlet is recommended if runoff is sediment laden. See **ESC-22 – Sediment Basin**

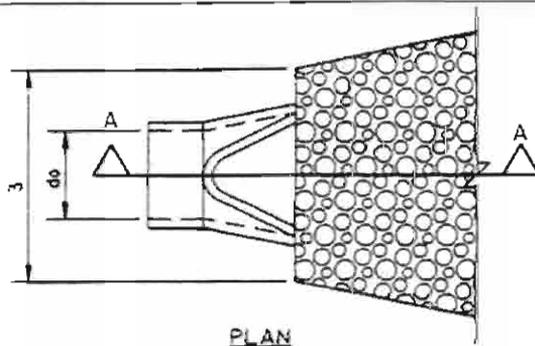
INSTALLATION

Proper rock size, placement, and length or outlet mat are key to the effectiveness of rock outlet protection. Rock size should be increased for high velocity flows. Best results are achieved with durable, angular rock or concrete rubble.

MAINTENANCE

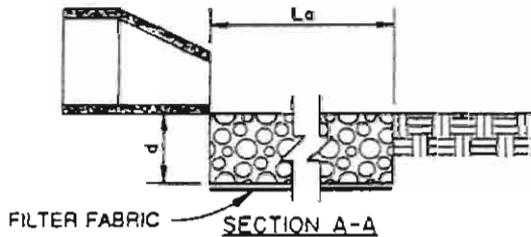
- Inspect after each significant rain event for erosion and/or disruption of the rock.
- Repair any damage immediately.
- Grouted or wire-wrapped rock rip rap can minimize maintenance requirements.



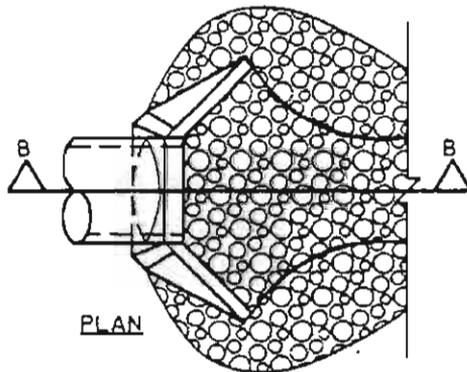


L_a = LENGTH OF APRON
 d_o = INSIDE PIPE DIAMETER
 w = APRON WIDTH
 d = APRON THICKNESS

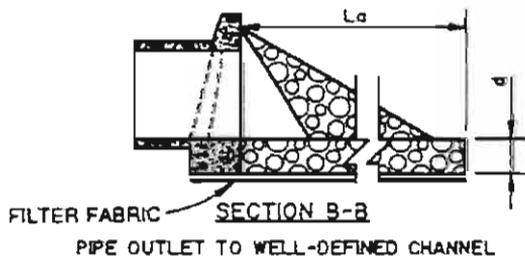
PLAN



FILTER FABRIC
 SECTION A-A
 PIPE OUTLET TO FLAT AREA
 WITH NO DEFINED CHANNEL



PLAN



FILTER FABRIC
 SECTION B-B
 PIPE OUTLET TO WELL-DEFINED CHANNEL

NOTES

1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, OR CONCRETE
2. PIPE DIAMETER, APRON DIMENSIONS, AND AVERAGE ROCK SIZE FOR RIPRAP ARE BASED ON THE DESIGN FLOW RATE AND VELOCITY. LENGTH OF APRON AND ROCK SIZE MUST BE SET TO SLOW THE FLOW TO NON-EROSIVE VELOCITIES (e.g., LESS THAN 10 feet per second). CONSULT WITH THE AMERICAN SAMOA ENVIRONMENTAL PROTECTION AGENCY FOR APPROPRIATE SIZING CRITERIA.
3. $d = 1.5$ TIMES THE MAXIMUM ROCK SIZE DIAMETER BUT NOT LESS THAN 6 INCHES.



DESCRIPTION

Check dams are small temporary dams constructed across a swale or drainage ditch. Check dams reduce the velocity of concentrated stormwater flows, thereby reducing erosion of the swale or ditch and promoting sedimentation behind the dam. If properly anchored, brush or rock filters barriers may be used for check dams.

APPLICATION

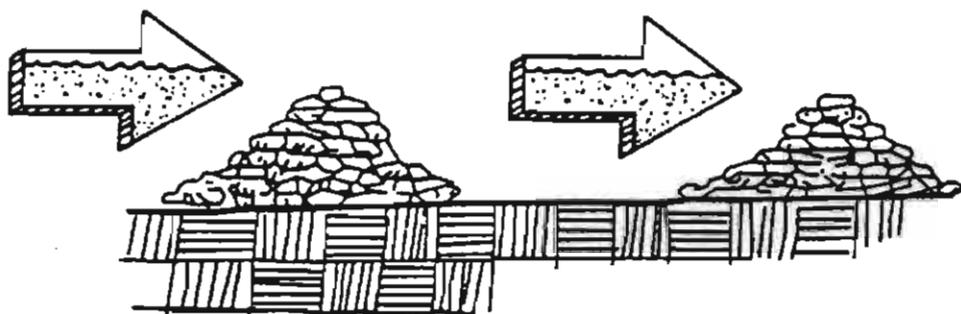
Check dams are used with drainage ditches and swales that may experience high velocity runoff flows. They are used primarily to reduce flow speed and prevent erosion, but also function to capture sediment.

INSTALLATION

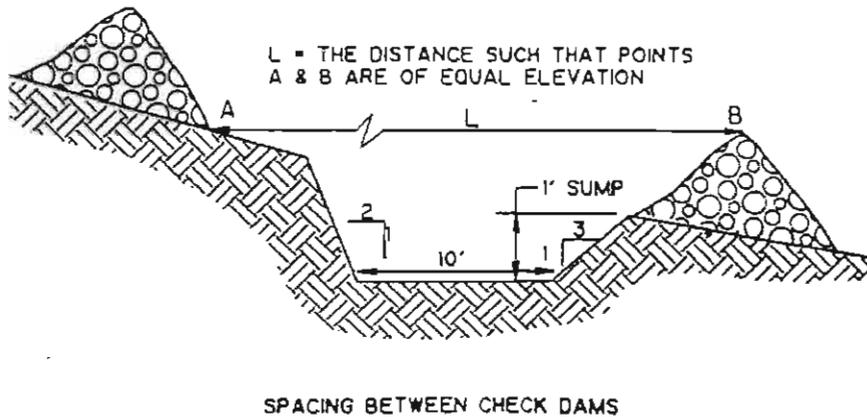
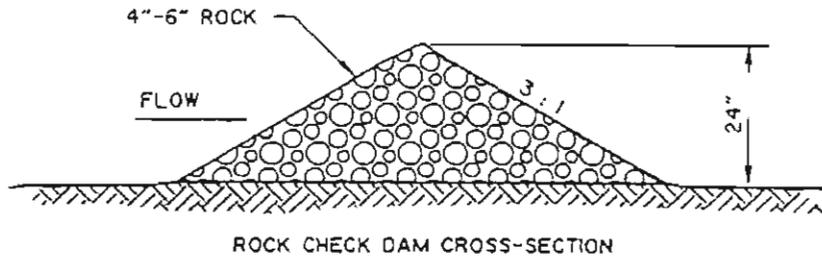
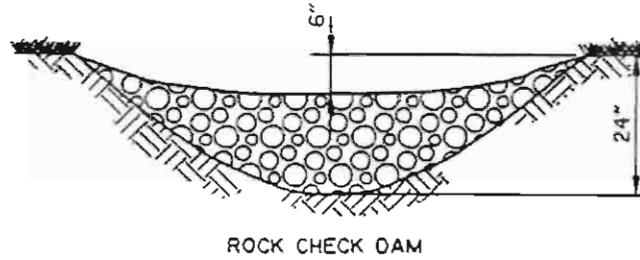
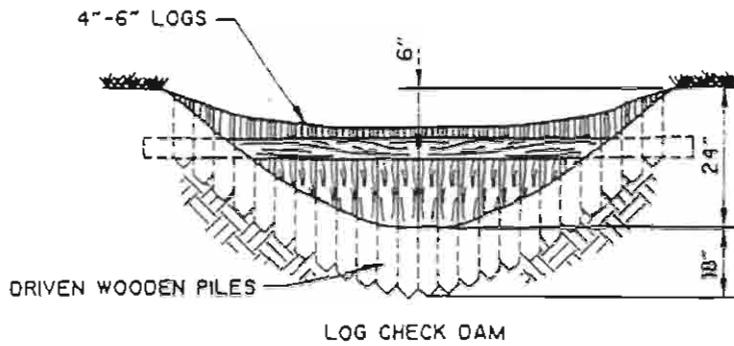
- Check dams should be placed at a distance and height to allow small pools to form between each one.
- Backwater from a downstream check dam should reach the toe of the upstream check dam.
- The center section of the dam should be lower than the edge sections so that check dam will act like a weir during major floods.
- A deep sump may be provided immediately upstream of the check dam to capture excessive sediments.
- Check dams may be built of rocks or logs, gravel-filled sand bags or other natural on-site materials that can withstand flow velocities. They should not be constructed from loose vegetation.
- Rock check dams are usually constructed of 8- to 12-inch rocks. The rock must be large enough to stay in place under high flow through the channel.
- Log check dams are usually constructed of 4- to 6-inch diameter logs. The logs should be embedded in the soil at least 18 inches.
- Dam material must be secured against damage during significant floods.

MAINTENANCE

- Inspect for sediment buildup behind the check dam and signs of erosion around the check dam after each rain.
- Remove accumulated sediment whenever it reached one-half the height of the check dam.
- Remove accumulated sediment from the upstream sump.



Rock berms used to control water flow and trap sediments.



DESCRIPTION

Slope roughening/terracing creates niche platforms for establishing vegetation, reduces runoff velocity, increases infiltration, and provides small depressions for trapping sediment. It's primary usefulness is in speeding re-vegetation. Surface roughening is a simple, short-term erosion control measure for roadway cut slopes. Terracing is a more permanent measure used to stabilize a steep slope.

APPLICATION

Slope roughening or terracing with the contour of the slope is appropriate for any cleared slope prior to seeding and planting. Slope roughening or terracing is necessary on cleared, erodible slopes steeper than 3:1 and higher than 5 feet prior to seeding and planting. This application is especially useful for taro cultivation on slopes.

INSTALLATION

Slope roughening/terracing is performed in several ways:

- Stair-step grading – involves digging large steps (40 to 50 inches wide by 30 to 40 inches high) into a slope using earth moving equipment or manually.
- Grooving – involves cutting smaller furrows (3 inches deep by 12 inches wide) into the contour of a slope. The furrows can be created with tools or machinery.
- Furrowing – similar to grooving.
- Tracking – involves using the treads of earth moving equipment to roughen the soil. This method is less desirable since it also compacts the soil thereby increasing runoff.
- Rough grading – involves creating a rough-textured slope surface with earth moving equipment or hand tools. The roughening surface would function to capture seeds and provide depressions for plants to gain hold. It would also assist in reducing flow velocities and related erosion.

MAINTENANCE

- Inspect roughened slopes weekly and after rainfall for excessive erosion.
- Re-vegetate as quickly as possible.



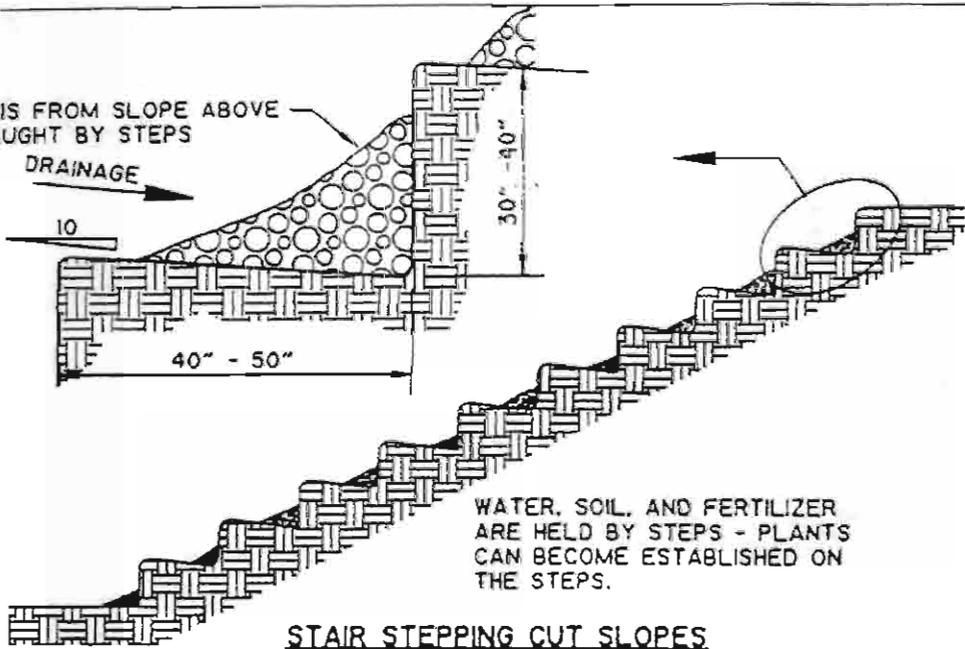
DEBRIS FROM SLOPE ABOVE
IS CAUGHT BY STEPS

DRAINAGE

10

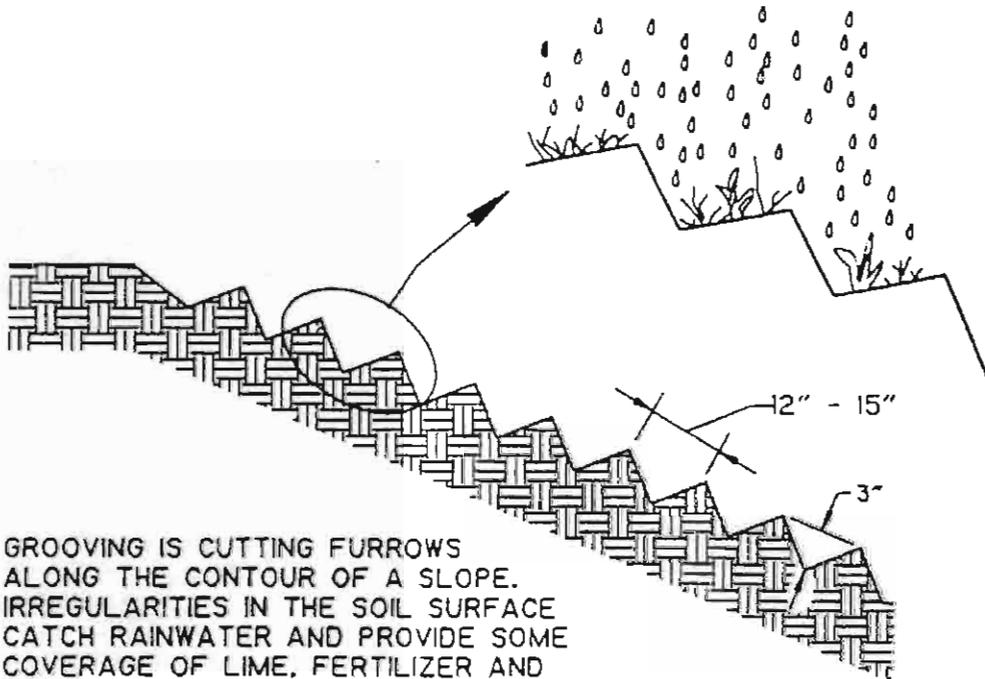
40" - 50"

30" - 40"



WATER, SOIL, AND FERTILIZER
ARE HELD BY STEPS - PLANTS
CAN BECOME ESTABLISHED ON
THE STEPS.

STAIR STEPPING CUT SLOPES



GROOVING IS CUTTING FURROWS
ALONG THE CONTOUR OF A SLOPE.
IRREGULARITIES IN THE SOIL SURFACE
CATCH RAINWATER AND PROVIDE SOME
COVERAGE OF LIME, FERTILIZER AND
SEED.

GROOVING SLOPES



DESCRIPTION

A silt fence is made of a filter fabric that has been entrenched, attached to supporting poles, and sometimes backed by a wire fence for support. A silt fence detains sediment-laden water, promoting sedimentation behind the fence. (see also **ESC 21**, Brush or Rock Filters).

APPLICATION

Silt fencing is primarily used in areas with sheet flow and is generally most effective in locations where slopes do not exceed 1:1. They should not be used across live streams or channels with intermittent flows.

Silt fences can be applied:

- Along the perimeter of a site.
- Below the toe of a cleared slope.
- Along streams and channels.
- Around temporary spoils areas.
- Across swales with catchments less than 1 acre.
- Below other small cleared areas.
- Most effective where slopes do not exceed 1:1.

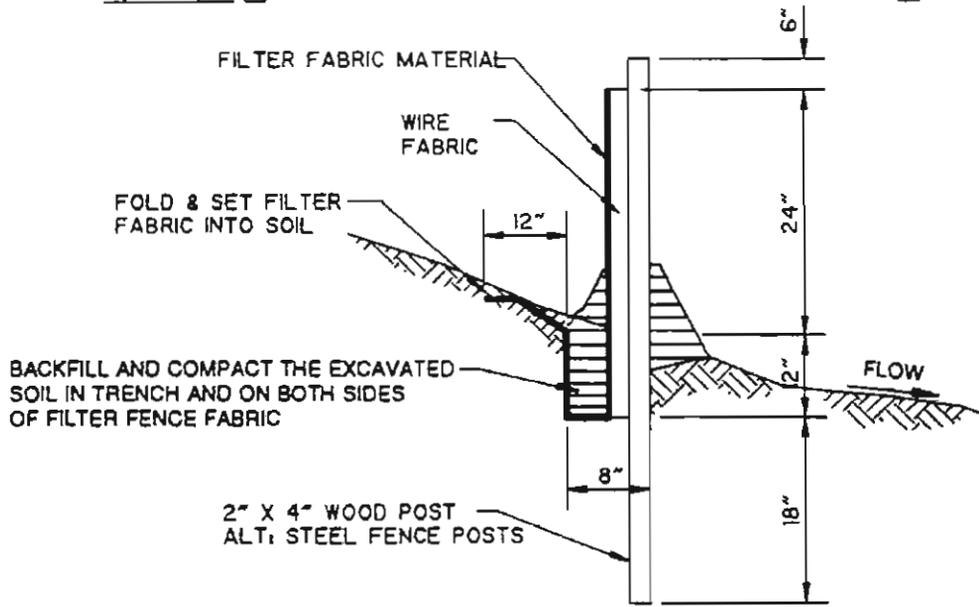
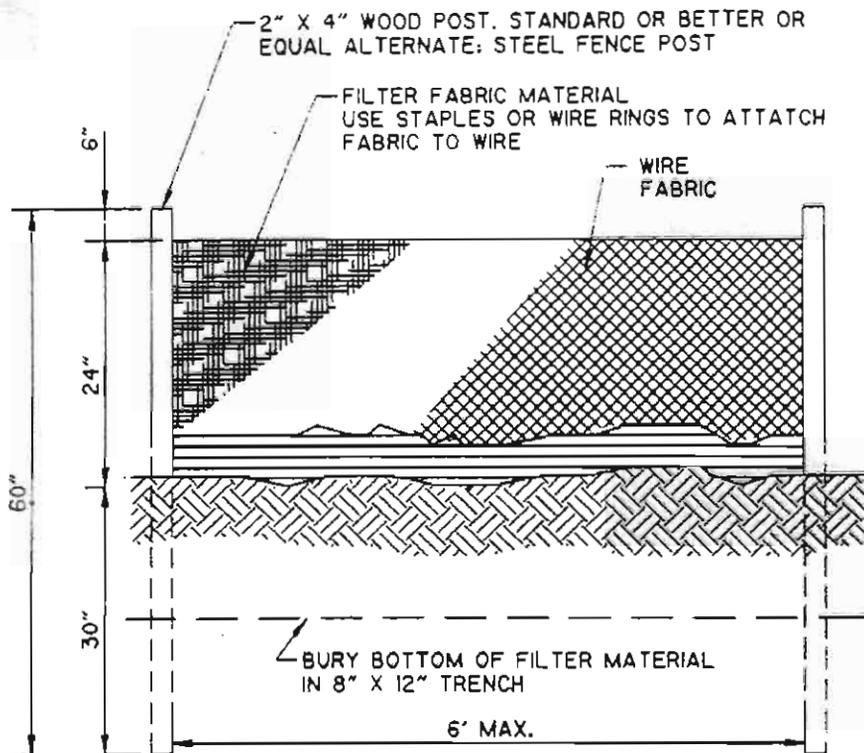
INSTALLATION

- Install along a level contour and provide area behind the silt fence for runoff to pond and sediment to settle (approximately 12 square feet per acre of drainage).
- Support posts should be placed a maximum of 6 feet apart and driven securely into the ground a minimum of 30 inches.
- A trench should be excavated 8 inches wide and 12 inches deep along the line of posts and upslope from the barrier.
- When standard strength filter fabric is used, a wire mesh support fence should be fastened securely to the upslope side of the posts using heavy-duty wire staples or tie wires. The wire mesh should extend into the trench a minimum of 4 inches.
- Standard strength filter fabric should be stapled or wired to the fence and 40 inches of fabric should extend into the trench. When extra-strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated.
- When joining sections of filter fabric, they should be overlapped and spliced together only at a support post.
- The ends of the fence should be turned uphill.
- The trench should be backfilled and compacted.
- No more than 1 acre should drain to a point along the silt fence.
- Select filter fabric that retains 85% of the soil, by weight, based on sieve analysis.

MAINTENANCE

- Inspect weekly and after each rainfall.
- Repair whenever fence is damaged.
- Remove sediment when it reaches 1/3rd the height of the fence.





DESCRIPTION

Stacking sand bags along a level contour creates a barrier that contains sediment-laden water, ponding water upstream of the barrier and promoting sedimentation.

APPLICATION

- Along the perimeter of a site.
- Check dams across streams and channels.
- Across swales with small catchments.
- Barrier for utility trenches in a channel.
- Create a diversion dike or berm.
- Below the toe of a cleared slope.
- Create a temporary sediment trap.
- Around temporary spoils areas.
- Below other small cleared areas.

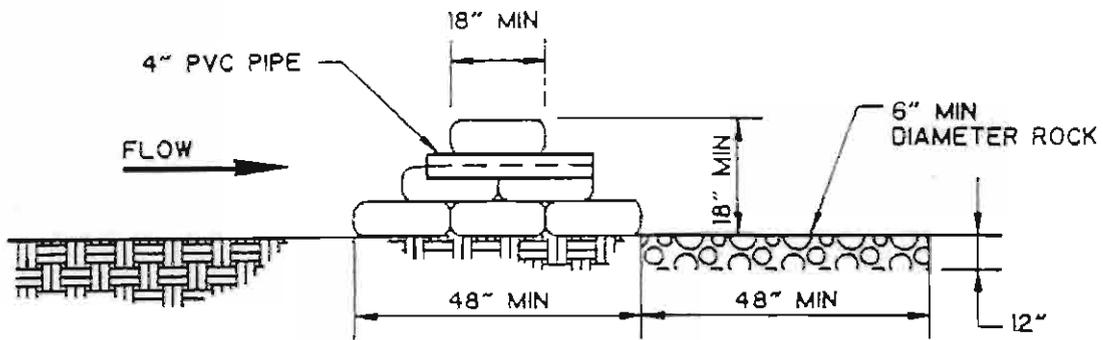
INSTALLATION

- May be used in drainage areas up to 5 acres.
- Install along a level contour.
- Base of sand bag barrier should be at least 48 inches wide.
- Height of sand bag should be at least 18 inches high.
- 4-inch PVC piping may be installed between the top layers of sand bags to drain large flood flows.
- Provide area behind the barrier for runoff to pond and sediment to settle.
- Use sand bags large and sturdy enough to withstand major flooding.

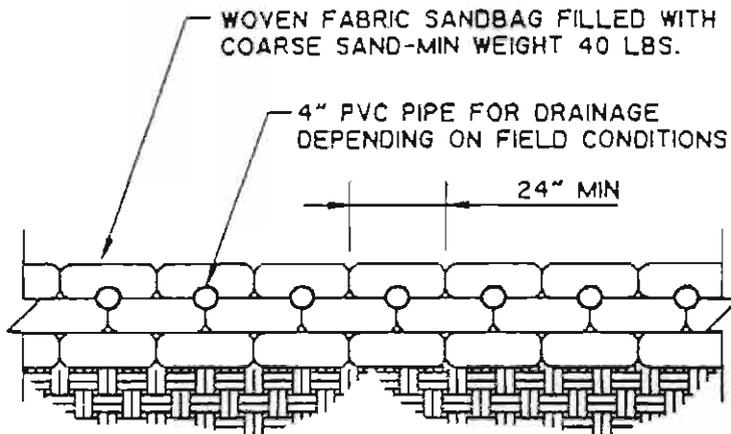
MAINTENANCE

- Inspect after each rainfall.
- Reshape or replace damaged sand bags immediately.
- Remove sediment when it reaches a depth of 6 inches.





CROSS-SECTION



FRONT VIEW

SAND BAG BERM

DESCRIPTION

A brush or rock filter is a berm made of small rocks or bundled or crushed brush placed along a level contour or at the toe of a slope where sheet flow may be detained thereby promoting sedimentation. If properly anchored, brush and rock filters can be used for sediment trapping and reduction of water flow velocities (See also ESC 19, Silt Fence).

APPLICATION

Brush or rock filters are primarily used in areas with sheet flow and are generally ineffective in locations where flow is concentrated. They are most effective where slopes do not exceed 1:1. They should not be used across flowing streams or channels with intermittent flows. Brush or rock filters can be applied:

- As check dams across mild slopes;
- Along the perimeter of a site;
- Along stream and channel banks to minimize sediment entering the stream;
- Around temporary spoils areas; and
- Below other small cleared areas.

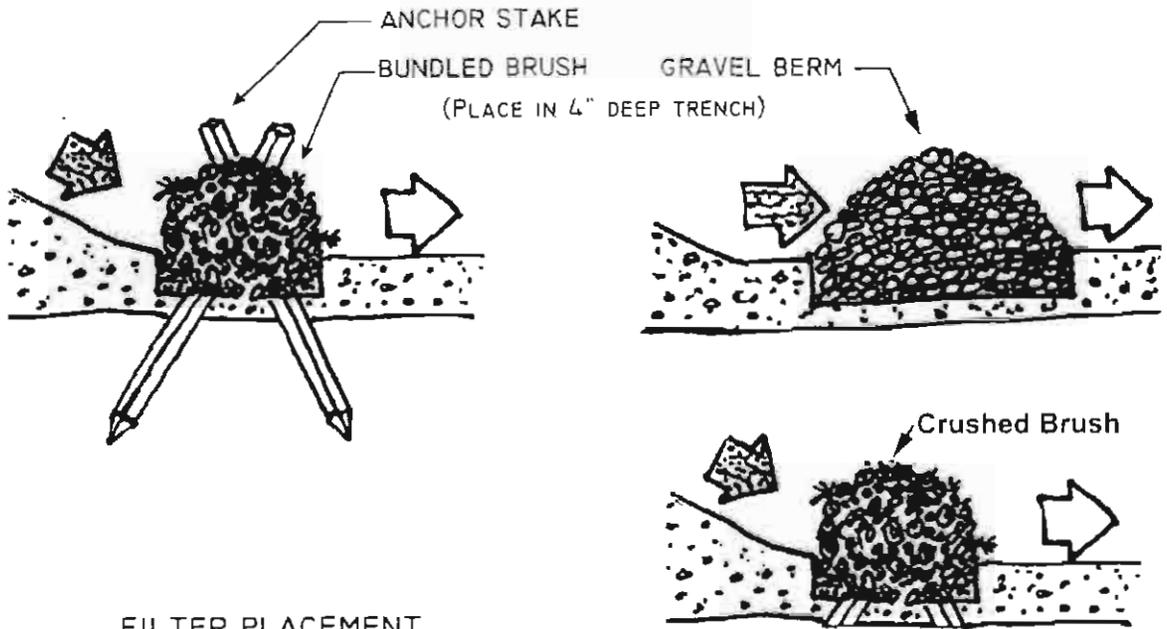
INSTALLATION

- Install along a level contour, if possible, perpendicular to the slope of the land.
- Place rocks or vegetation in a 4-inch (minimum) deep trench.
- Backfill and compact soil (brush) on upstream side of barrier.
- Brush bundles should be bound securely and anchored with stakes (wood or metal). If available, brush bundles can be wrapped in filter fabric before installation.
- If using where concentrated flows occur, use larger rocks and place them in a staked, woven wire sheathing.
- Drainage areas should not exceed 5 acres.
- Provide areas behind the berm for runoff to pond and sediment to settle (approximately 1200 square feet per acres of drainage area).
- Any swale that conveys sediment-laden runoff must be diverted into sediment trap before it is discharged from the side.

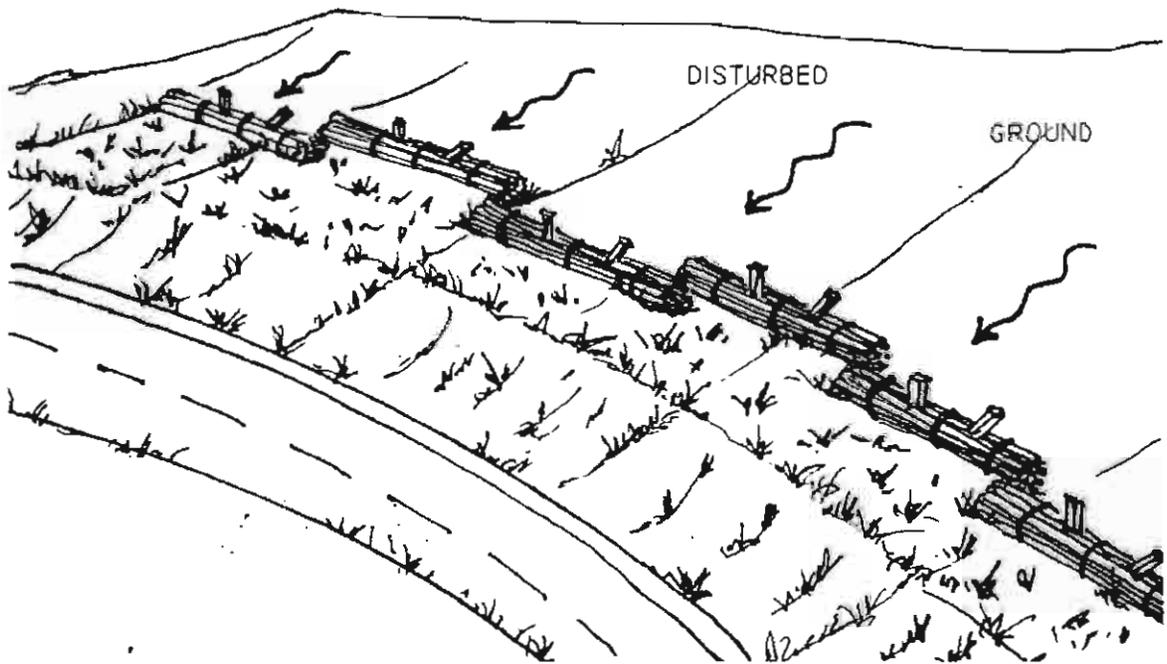
MAINTENANCE

- Inspect monthly and after each rainfall.
- If berm is damaged, reshape and replace dislodged rocks.
- Remove sediment when depth reaches 1/3 or berm height.





FILTER PLACEMENT



DESCRIPTION

A sediment trap is a small, excavated or bermed area where runoff from small drainage areas is detained and sediment allowed to settle.

APPLICATION

Sediment traps can be applied to:

- Any disturbed area less than 5 acres (for areas greater than 5 acres, see **BMP - 19, SEDIMENT BASIN**).
- Along the perimeter of a site where sediment-laden runoff is discharged off-site.
- At any point where sediment-laden runoff can enter stabilized or natural areas or waterways.

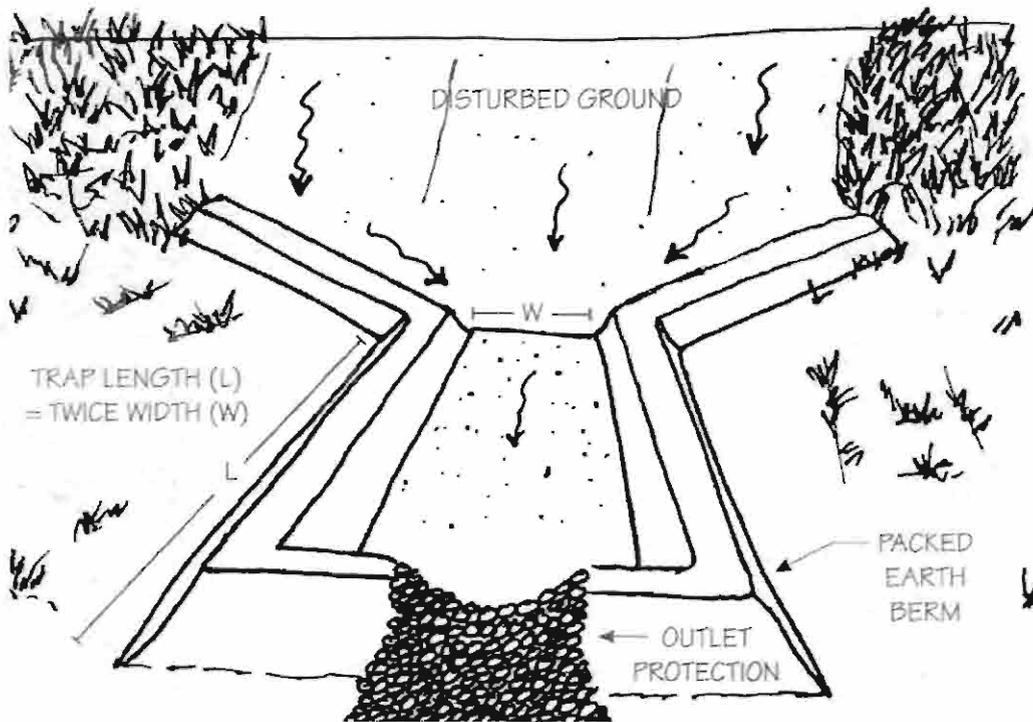
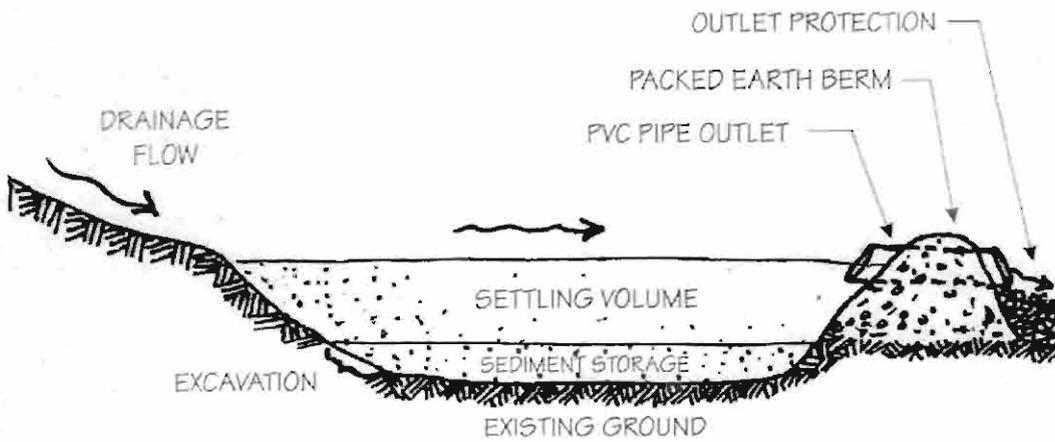
INSTALLATION

- Build outside the area to be graded before clearing, grubbing, and grading begin.
- Locate where the trap can be easily cleared of sediment.
- Trap size depends on the type of soil, size of drainage area, and desired sediment removal efficiency. Runoff volume from a two-year, 24-hour storm is a common design criteria for sedimentation trap volume. If this runoff volume is 0.5 inches, (0.042 ac-ft/ac) then the following criteria should trap moderate to high amounts of sediment:
 - Total trap volume of at least 100 cubic yards (cy) per acre.
 - Trap setline volume of at least 67 cy per acre.
 - Trap sediment storage volume of at least 33 cy per acre (note: the larger this volume, the less frequently the trap must be cleaned out.)
- Trapped sediment storage volume should be at least 1/3rd of the total trap volume.
- Trap length should be greater than twice the trap width.
- The outlet of the trap must be stabilized with rock, vegetation, or another suitable material. The outlet crest should be at least 1 foot below the top of the embankment.
- A stable emergency spillway should be installed to safely convey major floods.
- Do not remove the trap until the upslope drainage area has been stabilized.

MAINTENANCE

- Remove sediment when the sediment storage zone is no more than 1 foot from being full.
- Inspect weekly and after each rain.





DESCRIPTION

Good Housekeeping is the practice of keeping the project site clean and organized, enclosing, covering or berming building material storage areas, and training workers, employees, and contractors in order to prevent or reduce the discharge of pollutants to runoff from routine project operations, construction, and painting activities.

APPLICATION

All development projects should develop Good Housekeeping Practices to prevent runoff discharges from becoming pollutants to nearby streams and ocean.

INSTALLATION

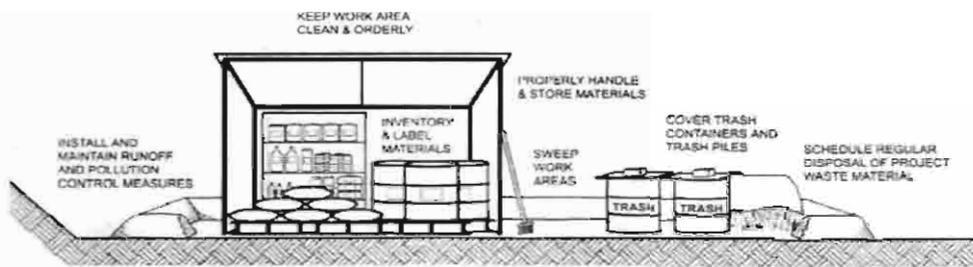
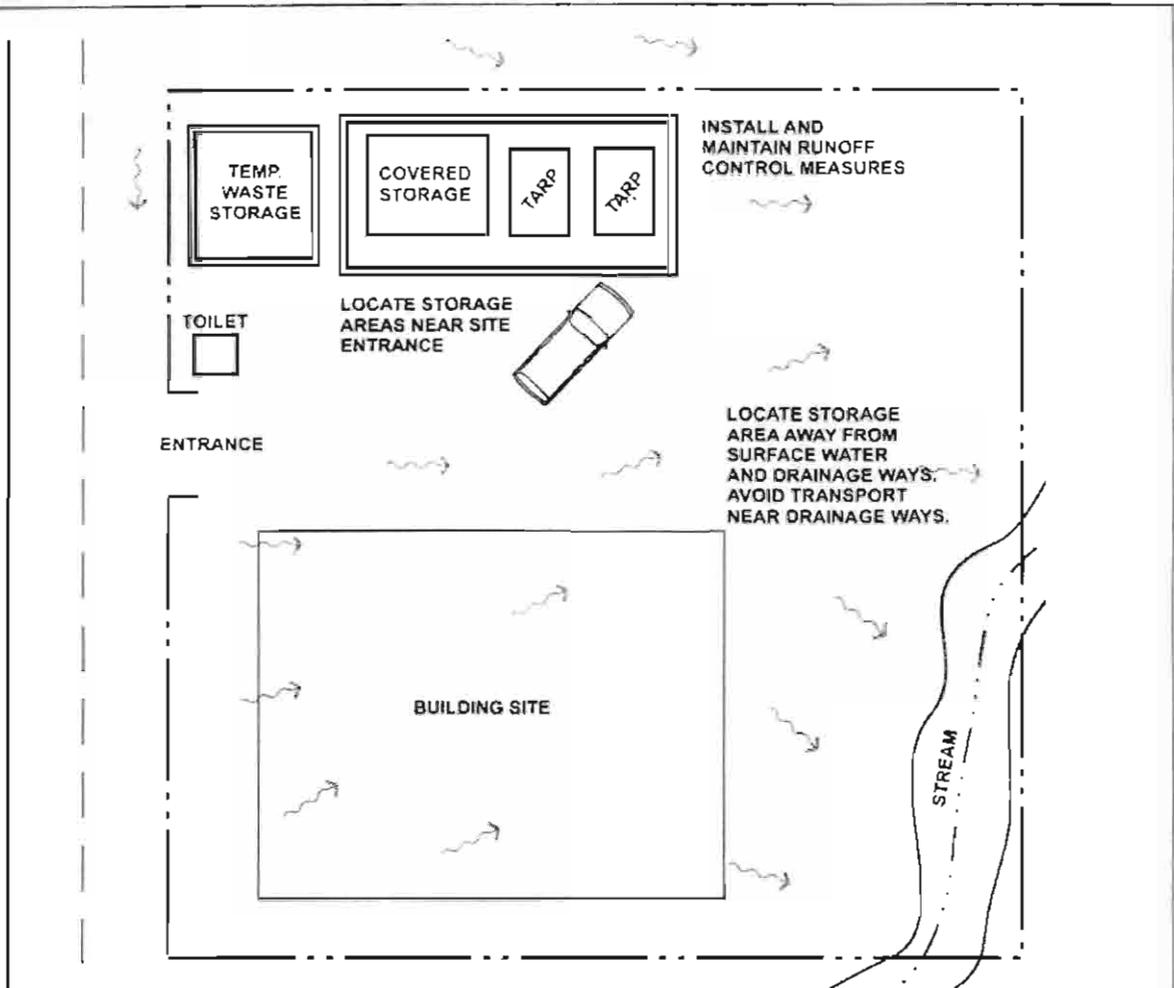
Good Housekeeping Practices include, but are not limited to, the following:

- Keep work area clean and orderly. Remove debris in a timely fashion. Sweep work areas.
- Label all stored materials and keep an accurate list of materials on site. See **SM-5**, Materials Handling, and **SM-6**, Materials Delivery and Storage.
- Properly handle and store paints and solvents.
- Maintain information on materials and their application for workers to reference.
- Maintain records of material use, any spills, and clean up actions, emergency contacts, and manufactures information.
- Properly store and dispose of waste materials generated by project activities. See **SM-9**, Waste Management.
- Maintain procedures for equipment use and maintenance. See **SM-3**, Equipment Cleaning and Maintenance, and **SM-4**, Equipment Fueling.
- Properly contain and dispose of sanitary waste. Locate portable toilets away from drainage ways, streams, and surface water. Schedule regular disposal / pumping of sanitary waste tanks.
- Use soil erosion control techniques if bare ground is exposed or if conducting work near drainage ways. Refer to relevant Erosion / Sediment Control Best Management Practice description sheet.
- Conduct work training for Good Housekeeping Practices and Erosion / Sediment Control measures.

MAINTENANCE

- Regularly inspect site operations and site conditions to ensure good housekeeping practices are followed.
- Regularly dispose of project generated wastes.
- Routinely update materials inventory lists.
- Routinely inspect and repair BMPs.





American Samoa Government
 Environmental Protection Agency
Guidance Manual For Runoff Control

**GOOD HOUSEKEEPING
 PRACTICES**



R.M. TOWILL CORPORATION

October 2001

SM # 1

PAGE 2/2

DESCRIPTION

Prevent or reduce the discharge of pollutants from paving operations by using measures to prevent runoff and runoff pollution, properly disposing of wastes, and training workers and contractors.

APPLICATION

All projects involving paving operations regardless of the scale of the operations, should develop BMPs to prevent storm water from becoming polluted by paving materials and activities.

INSTALLATION

- Avoid paving during wet weather.
- Store materials away from drainage ways to prevent runoff runoff.
- Use diversion and sediment trapping measures to protect drainage ways from project activities, especially in areas with steeper grades. See also **ESC-19**, Silt Fences and **ESC-20**, Sandbag Barriers.
- When cutting pavement, shovel saw-cut slurry and remove from site.
- Do not allow sand or gravel placed over new asphalt to wash into drainage ways.
- If paving operations involve concrete, refer to **SM-8**, Concrete Waste Management.
- Train workers and contractors.

MAINTENANCE

- Inspect workers and contractors to ensure that control measures are being followed.
- Keep ample supply of drip pans and absorbent material on-site.



DESCRIPTION

Maintenance and washing of equipment and vehicles should be conducted using environmentally responsible practices to prevent direct, untreated discharges of nutrient-enriched wastewater or hazardous wastes to surface or ground waters.

APPLICATION

Equipment and vehicle maintenance and washing practices are applicable for every project site to prevent contamination of surface and ground water from wash water, oil, grease, fuel, and coolant spills or leaks. This involves developing a spill prevention and cleanup plan for maintenance areas; maintaining vehicles and other equipment that may leak hazardous chemicals; covering fuel drums and other materials that are stored outdoors; and, properly handling and disposing of automotive wastes and wash water.

INSTALLATION

- Designate separate areas for vehicle repair and for vehicle washing away from drainage areas, streams, and other surface waters.
- Vehicle repairs should not be conducted in vehicle washing areas.
- Whenever possible, use paved areas for maintenance and washing activities.
- If vehicles or equipment are heavily greased or soiled, the maintenance area should be bermed and the equipment covered with a fixed roof or tarp to prevent contamination of rain runoff.
- When working on equipment, use drip pans and a tarp under equipment to catch leaks and spills.
- Inspect vehicles daily for leaks and repair immediately.
- For vehicle washing, use high-pressure water spray without any detergents since water can remove most dirt adequately. If detergents must be used, phosphate- or organic-based cleansers should be avoided to reduce nutrient enrichment and biological oxygen demand in wastewater. Only biodegradable products should be used.
- Use diversions to direct runoff and wastewater into filter berms or sediment traps. See **ESC 13 - Earth Dikes And Berms**, **ESC 21 - Brush Or Rock Filter**, and **ESC 22 - Sediment Trap**.
- Washing areas must be clearly marked and workers should be informed that all washing occur in this area. No other activities, such as vehicle repairs, should be conducted in the wash area.
- Dispose of all used products, including oil, antifreeze, solvents, and other automotive-related chemicals, as directed by the manufacturer. Consult with the American Samoa EPA for guidance in disposing of these materials

MAINTENANCE CONSIDERATIONS

- Clean up all spills and dispose of clean up materials immediately.
- Regularly inspect equipment and storage containers to identify leaks or signs of deterioration.
- Regularly inspect berms, drainage ways, and sediment traps in the vehicle washing area. Repair as necessary. Remove sediment from trap as described in **ESC 22 - Sediment Trap**.

American Samoa Government
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Guidance Manual For Runoff Control

VEHICLE CLEANING AND MAINTENANCE



R.M. TOWILL CORPORATION

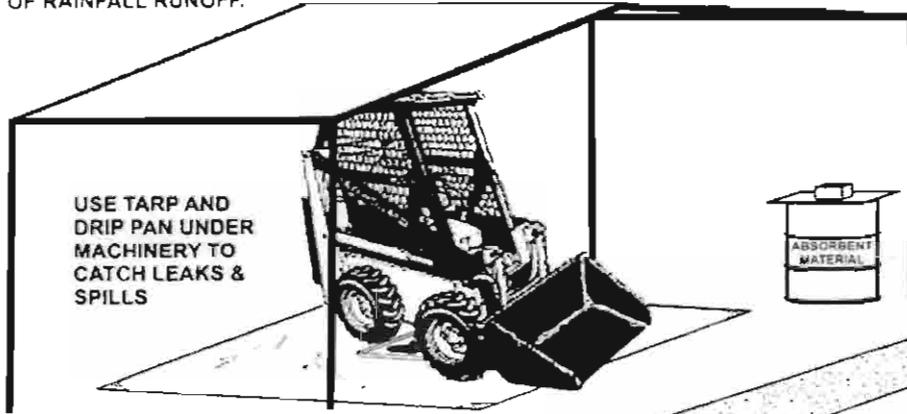
October 2001

SM # 3

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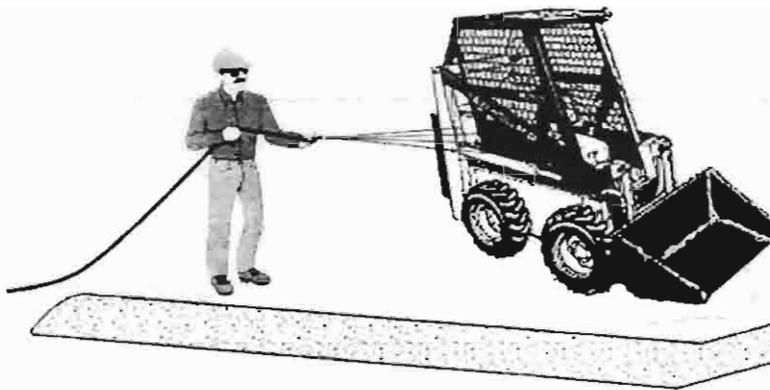
COVER MAINTENANCE AREA
TO PREVENT CONTAMINATION
OF RAINFALL RUNOFF.

USE TARP AND
DRIP PAN UNDER
MACHINERY TO
CATCH LEAKS &
SPILLS



KEEP
ABSORBENT
MATERIAL
NEARBY FOR
ACCIDENTAL
LEAKS & SPILLS

CAPTURE RUNOFF FROM
MAINTENANCE AREA IN FILTER
BERM OR SEDIMENT TRAP



CAPTURE WASTEWATER AND
RUNOFF FROM WASH AREA IN
FILTER BERMS OR SEDIMENT
TRAPS

American Samoa Government
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Guidance Manual For Runoff Control

**VEHICLE CLEANING AND
MAINTENANCE**



R.M. TOWILL CORPORATION October 2001

SM # 3

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DESCRIPTION

Fueling operations should follow measures to prevent spills and leaks from coming into contact with runoff. This can include using off-site fueling facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training workers and contractors.

APPLICATION

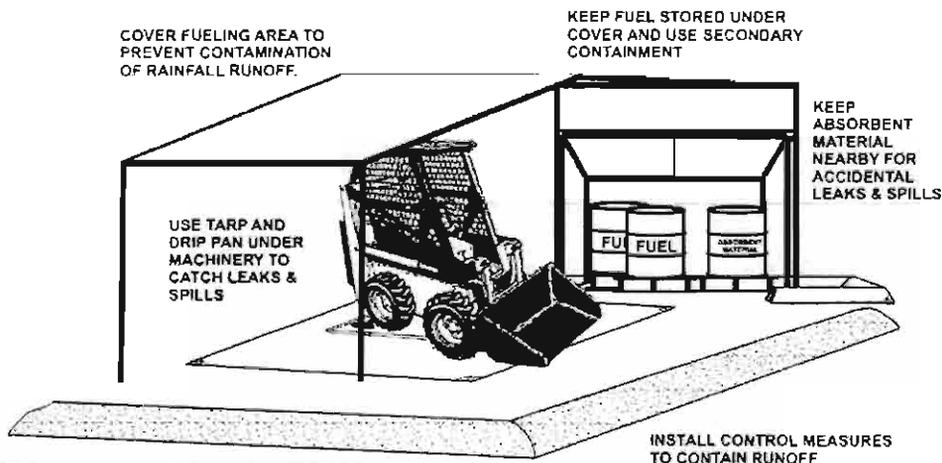
This control measure is applicable to all equipment and vehicle fueling activities

INSTALLATION

- Use off-site fueling stations as much as possible. Fueling vehicles and equipment outdoors or in areas where fuel may spill/leak onto paved surfaces or into drainage pathways can pollute runoff. If you fuel a large number of vehicles or pieces of equipment, consider using an off-site fueling station. These businesses are better equipped to handle fuel and spills properly.
- For on-site fueling, designate a fueling site away from drainage ways to prevent storm water run-on and runoff of spills.
- Discourage “topping-off” of fuel tanks.
- Always use secondary containment, such as a drain pan or absorbent material, when fueling in order to catch spills / leaks.
- Use absorbent material on small spills rather than hosing down or burying the spill.
- Remove absorbent materials used in spill clean up and promptly dispose of properly.
- Avoid mobile fueling of mobile equipment around the site; rather, transport the equipment to designated fueling areas.
- Train workers and contractors in proper fueling and cleanup procedures.
- Keep stored fuel under cover and in secondary containment.

MAINTENANCE

- Keep good supply of spill clean up materials near the fueling area.
- Inspect fueling areas and storage tanks on a regular schedule.
- Train workers and contractors in proper fueling procedures.



DESCRIPTION

Responsibly managing common chemicals, such as fertilizers, solvents, paints, cleaners, and automotive products, can significantly reduce polluted runoff. Materials management involves careful product selection, correct use and storage of the product, and responsible disposal of associated waste(s).

APPLICATION

Materials Management procedures should be developed and followed at all project sites.

INSTALLATION

- Maintain inventories of materials stored on-site. Inventories reduce the occurrence of overstocking hazardous materials, increase knowledge about what hazardous materials are present and how they are stored, and provide documentation of proper handling of hazardous materials.
- An inventory of hazardous materials present at a particular site consists of three major steps:
 - Identify all hazardous and non-hazardous substances present on-site. This can be accomplished by reviewing purchase orders for the project site and walking through the site itself.
 - Label all containers with the following information; the name of the chemical, unit number, expiration date, handling instruction, and health or environmental hazards. Insufficient labeling often leads to improper handling or disposal of hazardous substances.
 - Make special note on the inventory of hazardous chemicals that require special handling, storage, or disposal.
- Follow guidelines for proper collection and disposal of water.
- Train workers to respond to spills or leaks.
- Maintain organized workplaces
- Educate workers about the benefits of the above practices.
- See **SM-1**, Good Housekeeping Practice and **SM-6**, Material Delivery and Storage.

MAINTENANCE

- Regularly review and update inventory lists.
- Regularly inspect material storage areas to ensure containers are properly stored and labeled.



DESCRIPTION

Prevent or reduce pollutant discharge from material delivery and storage activities by minimizing the storage of hazardous materials on-site, storing materials in a designated area, installing secondary containment, conducting regular inspections, and training workers and contractors.

APPLICATION

Material delivery and storage management measures should be employed at all projects requiring storage or stockpiling of materials such as soil, pesticides and herbicides, fertilizers, detergents, plaster, petroleum products, acids, lime, glues, paints, solvents, curing compounds, and other hazardous chemicals.

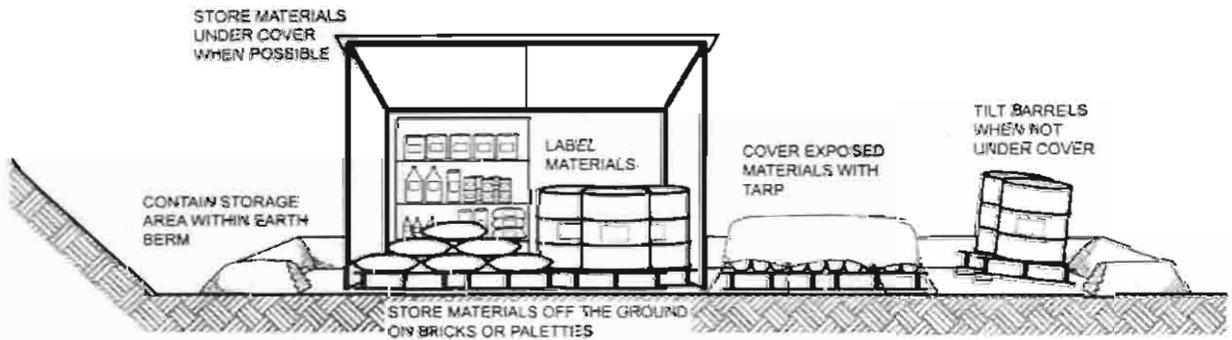
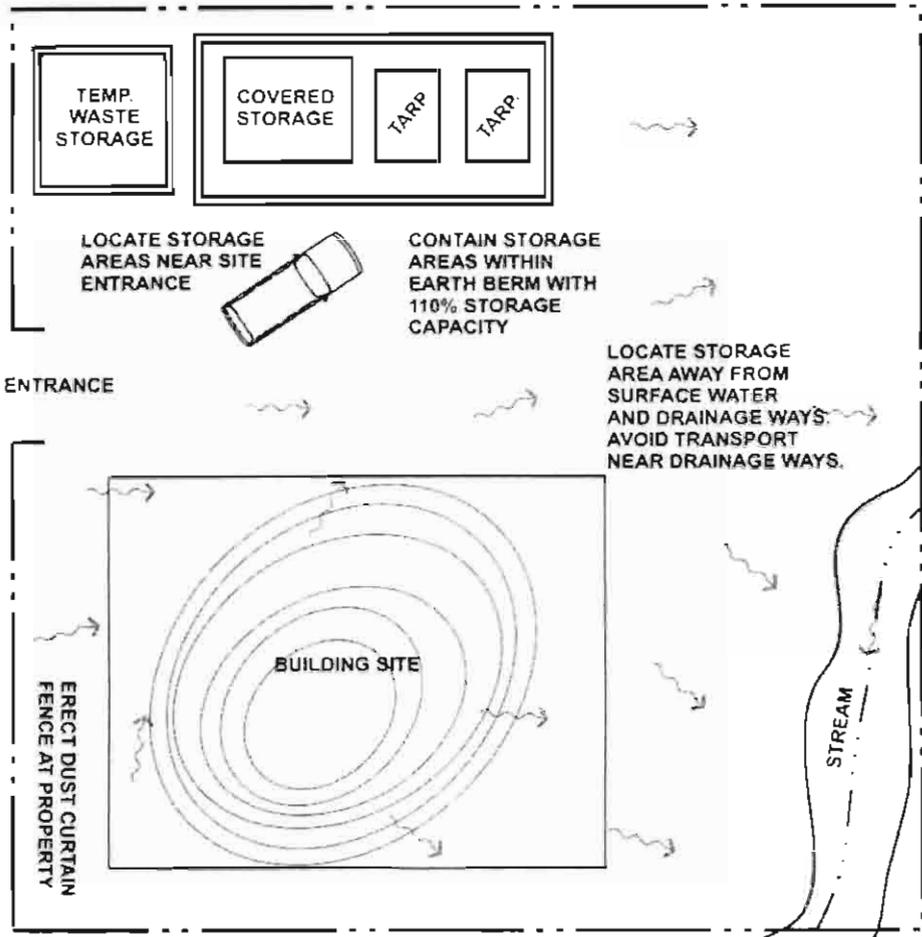
INSTALLATION

- Designate areas of the project site for material delivery and storage.
- Place storage areas near project site entrances, away from drainage paths and waterways.
- Avoid transport near waterways.
- Surround storage areas with earth berms.
- Place in an area which is paved whenever possible. Do not place directly on the ground.
- Keep an inventory of materials delivered to and stored on-site. See also SM-5. Materials Management.
- If storing flammable materials, contact the American Samoa EPA or local fire department for special storage requirements.
- Place chemical drums, and bagged materials on a pallet and, when possible, within secondary containment with 110% storage capacity.
- Keep chemicals in their original containers and keep them well-labeled.
- If drums are stored outdoors, store them in a slight angle to reduce ponding of rainwater on the lids and to reduce corrosion.
- Handle hazardous materials as infrequently as possible.
- Train workers and contractors in proper material handling.

MAINTENANCE

- Keep designated storage areas clean and well organized. See also SM-1, Good Housekeeping.
- Conduct weekly inspections and check for external corrosion of material containers.
- Keep a good supply of spill clean-up materials near the storage area. Absorbent materials that can be used for spill clean-up include sawdust, kitty litter, and sand. Dispose of clean-up materials promptly.
- Keep inventory down. Do not overstock supplies.
- Regularly update the material inventory sheet.





DESCRIPTION

Prevent or reduce the discharge of pollutants to runoff from outdoor material and product storage areas by enclosing or covering materials, installing secondary containment, and preventing storm water run-on.

APPLICATION

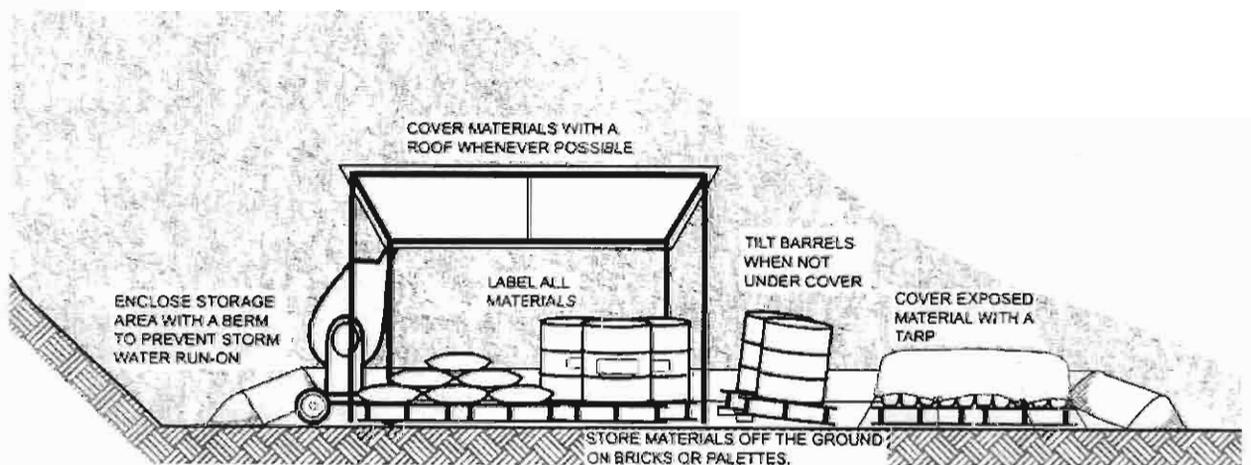
This control measure is applicable for residential lots, construction sites, commercial and industrial facilities, and common lots where materials are stored outdoors.

INSTALLATION

- Protect materials from rainfall, run-on, runoff and wind dispersal:
 - Store materials indoors wherever possible;
 - Cover stored materials with a roof to protect from direct rainfall impacts;
 - Cover material with a tarp.
- If not under cover, store barrels propped up at a slight tilt to avoid water pooling on lids.
- Store liquid containers under tarp cover on an impervious surface or raised platform within a secondary containment such as a berm.
- Minimize storm water run-on by enclosing the storage areas within a berm.
- Keep outdoor storage containers in good condition.
- Label all materials.
- See also **SM-5**, Materials Management, and **SM-6**, Materials Delivery and Storage.

MAINTENANCE

- Routinely inspect storage areas and conditions of containment devices.
- Repair damage to containers and containment covers, berms, and surfaces.



DESCRIPTION

Prevent or reduce the discharge of pollutants to runoff from concrete waste by conducting washout off-site, performing on-site washout in designated areas, and training workers and contractors.

APPLICATION

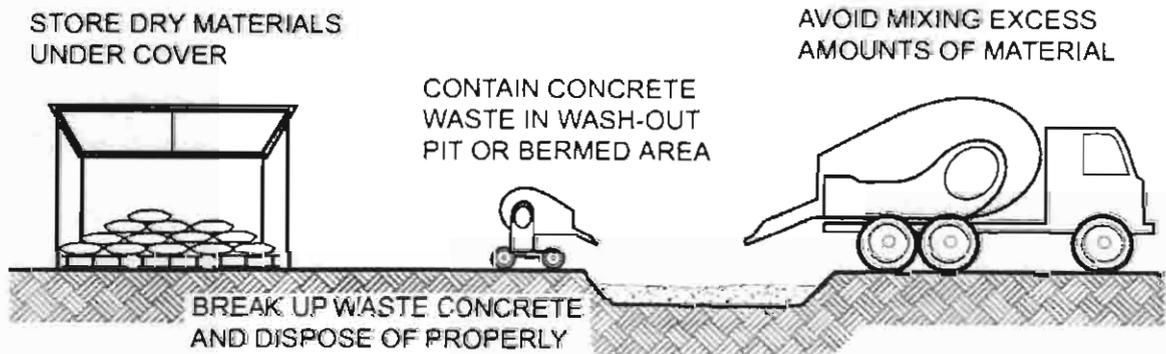
Wherever project activities require concrete mixing and pouring.

INSTALLATION

- Store dry and wet material under cover away from drainage areas. See also SM-5, Material Management, and SM-6, Material Delivery and Storage.
- Avoid mixing excess amounts of fresh concrete or cement on-site.
- Perform washout of concrete trucks off-site or in designated areas only.
- For on-site washout: locate washout areas at least 50 feet from storm drains, open ditches, or water bodies. Contain runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste. Washout waste in the temporary pit or bermed areas where it can set, be broken up, and then be disposed of properly.
- When washing concrete to remove fine particles and expose the aggregate, drain the wastewater into a bermed or level area to avoid creating runoff.
- Do not wash sweepings from exposed aggregate concrete into drainage ways. Collect and return sweepings to aggregate base stockpile or dispose in the trash. See SM-9, Site Waste Management.
- Train workers and contractors in proper concrete waste management.

MAINTENANCE

- Inspect contractors to ensure that concrete wastes are being properly managed.
- If using a temporary pit, dispose hardened concrete on a regular basis.



DESCRIPTION

Building materials and other construction site wastes must be properly managed and disposed of to reduce the risk of pollutant discharge from materials such as surplus or refuse building materials or hazardous wastes.

APPLICATION

The proper management and disposal of wastes should be practiced at all project sites.

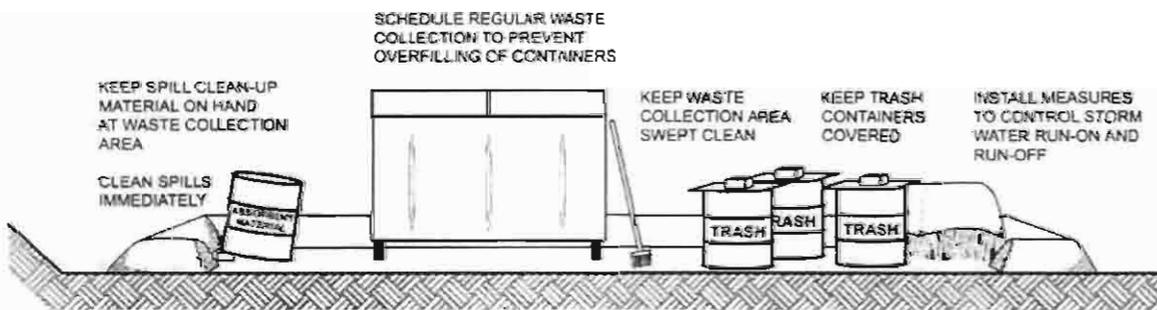
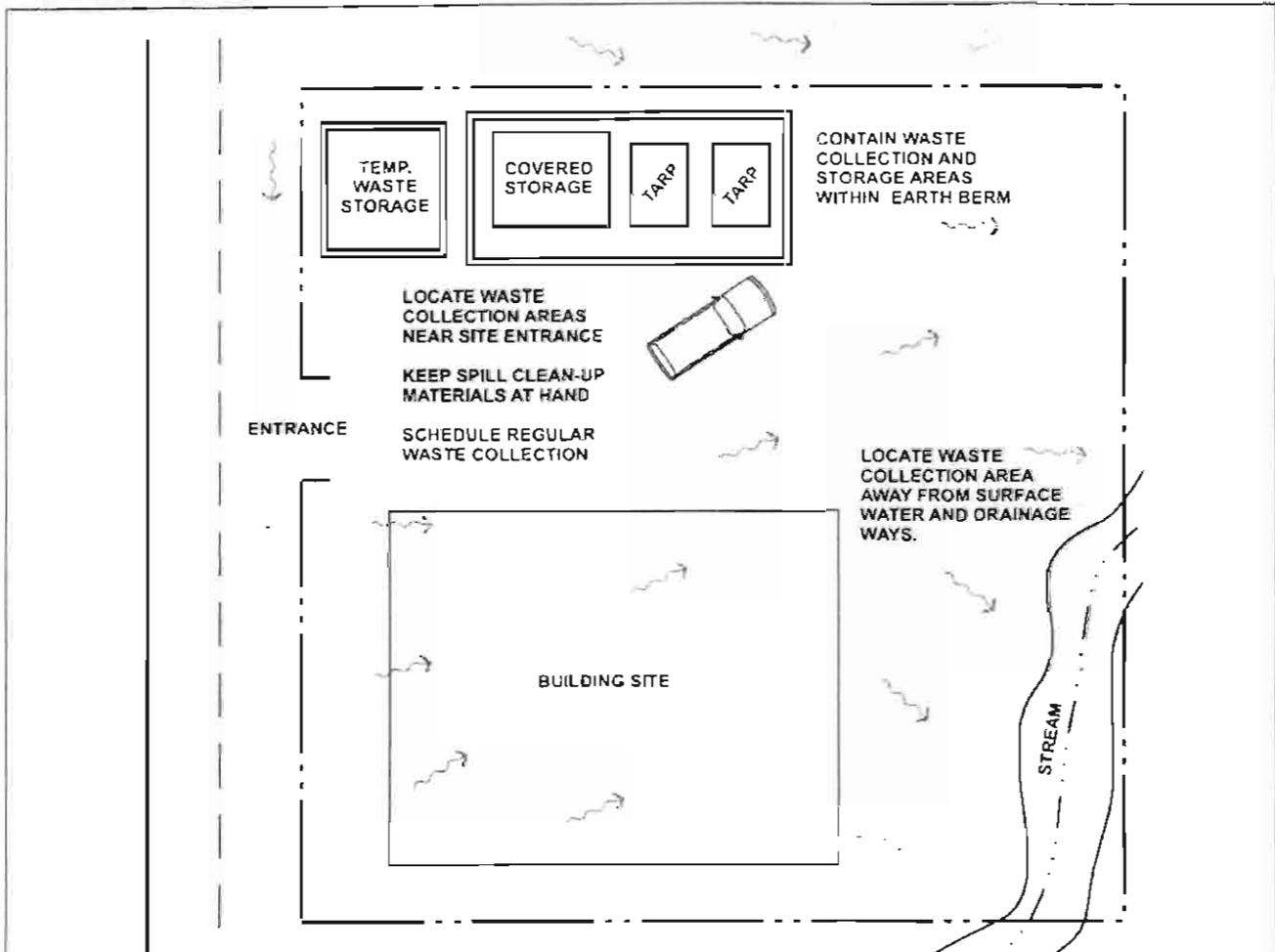
INSTALLATION

- Designate a waste collection area onsite that does not receive a substantial amount of runoff from upland areas and does not drain directly to a water body.
- Ensure containers have lids so they can be covered before periods of rain, and keep containers in a covered area whenever possible.
- Install runoff control measures as necessary to prevent storm water run-on and to prevent pollutant discharges in storm water runoff. See also **ESC-13**, Earth Dikes and Berms.
- Schedule waste collection to prevent the container from overflowing.
- Have equipment and absorbent materials available in waste disposal areas in order to contain and clean up any spills that can occur.
- Clean up spills immediately. For hazardous materials, follow cleanup instructions on the package. Use an absorbent material such as saw dust, kitty litter, or sand to contain the spill.
- If hazardous material products (chemical, solvents, acids, fertilizers, etc.) need to be disposed of, they should never be mixed during disposal unless specifically recommended by the manufacturer. Contact the ASEPA or ASPA for guidance on disposal.
- The original product label should never be removed from the container since it contains important safety information. Follow the manufacturer's recommended method of disposal, which should be printed on the label.

MAINTENANCE

- Regularly inspect waste collection areas and storage sites.
- Make sure waste containers are not overfilled.
- Regularly dispose of collected waste material.
- Regularly inspect containers for leaks, corrosion, or any other signs of deterioration.
- Repair or replace damaged storage containers.
- See also **SM-5**, Material Management and **SM-6**, Material Delivery and Storage.





DESCRIPTION

Regular inspection and maintenance of septic systems is required to ensure proper operations during the design life of the septic system and to prevent system failures that can be expensive and result in ground water pollution and contamination

APPLICATION

Applicable wherever septic systems are used or planned for use. Septic system maintenance is especially important in coastal areas near shellfish, crustacean, and fish spawning habitats where septic effluent discharges can influence water quality and lead to animal contamination and algal blooms.

INSTALLATION

Steps that can reduce pollutant loadings from septic systems include:

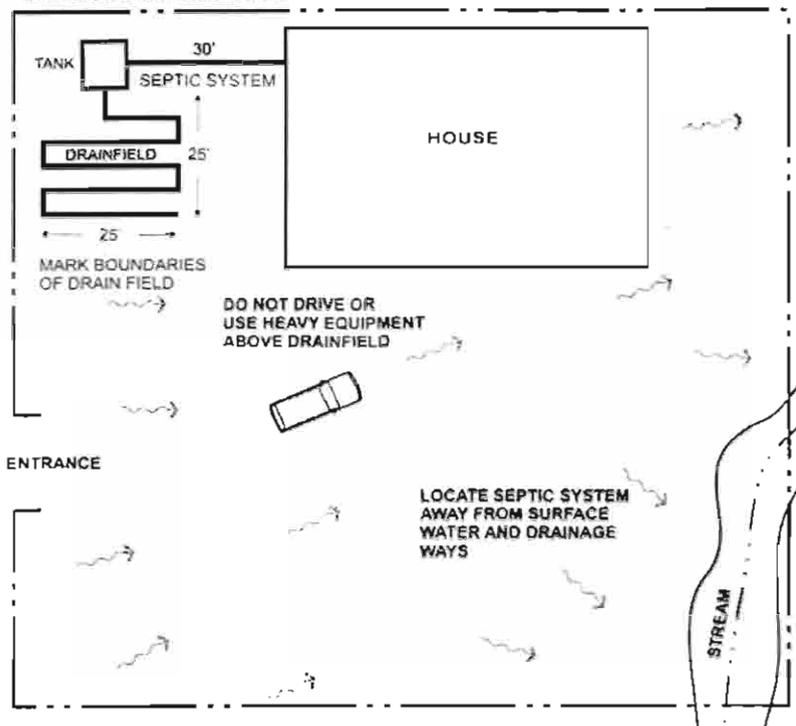
- Do not wait until septic system shown signs of failure. Inspect the system annually and have it pumped-out at least once every three years.
- Keep records of pumping and maintenance and a map of the location of your system and drainfield.
- Practice water conservation indoors and divert roof drains and surface water away from the system.
- Use caution in disposing material down the drain. Household chemicals can kill the bacterial that make the system work and non-degradable materials (cigarette butts, plastic, etc.) can clog the system.
- Keep heavy equipment and vehicles off your system and drainfield.
- Don't cover your drainfield with impermeable surfaces that can block evaporation and the air needed for effluent treatment.
- Restrict use of organic solvents and phosphorous detergents for system cleaning. These additives are not proven effective and can cause ground water contamination.

MAINTENANCE

- Regularly inspect onsite systems to determine whether or not pumping is necessary.
- Open and check the inspection port baffles to ensure that they have not damaged since the last inspection.
- Check the absorption field for flooding or sogginess, which are indicators of a closed system or excessive water use.
- Check the entire area for odors or soggy areas, which might indicate a leak in the system.
- The holding tank should be pumped regularly, with the frequency depending on the capacity of the tank, the flow of wastewater, and the volume of solids in the tank.



MAP LOCATION OF SEPTIC SYSTEM, MEASURE DISTANCES



TANK SIZE (gals.)	TANK HOUSEHOLD SIZE									
	1	2	3	4	5	6	7	8	9	10
	YEARS BETWEEN PUMPING									
500	5.8	2.6	1.5	1.0	0.7	0.4	0.3	0.2	0.1	-
750	9.1	4.2	2.6	1.8	1.3	1.0	0.7	0.6	0.4	0.3
900	11.0	5.2	3.3	2.3	1.7	1.3	1.0	0.8	0.7	0.5
1000	12.4	5.9	3.7	2.6	2.0	1.5	1.2	1.0	0.8	0.7
1250	15.6	7.5	4.8	3.4	2.6	2.0	1.7	1.4	1.2	1.0
1500	18.9	9.1	5.9	4.2	3.3	2.6	2.1	1.8	1.5	1.3
1750	22.1	10.7	6.9	5.0	3.9	3.1	2.6	2.2	1.9	1.6
2000	25.4	12.4	8.0	5.9	4.5	3.7	3.1	2.6	2.2	2.0
2250	28.6	14.0	9.1	6.7	5.2	4.2	3.5	3.0	2.6	2.3
2500	34.9	15.6	10.2	7.5	5.9	4.8	4.0	3.5	3.0	2.6



DESCRIPTION

Careful siting and regular maintenance of cesspool systems is necessary to minimize the risk of surface and ground water pollution. Cesspools located close to drainage ways, streams and other surface waters, or that are dug down to ground water levels, can release bacteria and other harmful pollutants into the water supply.

APPLICATION

This control measure is applicable for all existing cesspools and for construction of new cesspools.

INSTALLATION

- Avoid locating cesspools near drainage ways, streams and other surface waters, or areas of traffic of heavy use.
- Test for the presence and depth of ground water before digging cesspools. If ground water is encountered, relocate cesspool to avoid contamination of water resources.
- If cesspool is not covered and sealed, install diversion measures to prevent storm runoff from entering, and possibly overflowing the cesspool. See also **ESC-13**, Earth Dikes and Berms, and **ESC-14**, Swales.
- Keep records of pumping and maintenance and a map of your cesspool system.
- Use caution in disposing of materials into the cesspool. Household chemicals can kill the bacteria responsible for breaking down wastes and can cause ground water contamination.

MAINTENANCE

- Inspect cesspool system regularly.
- Arrange for regular waste collection by a licensed hauler before facilities overflow.



