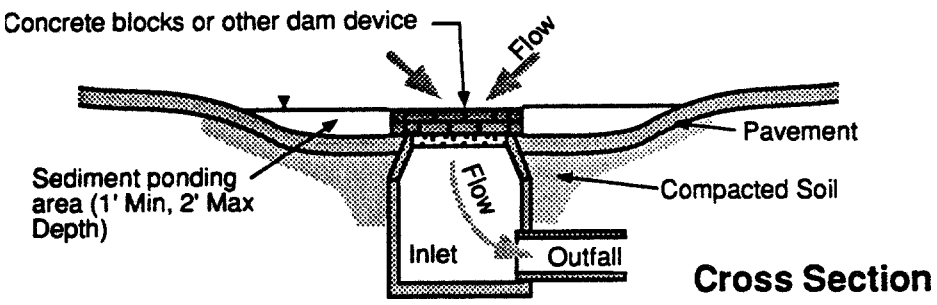
INLET PROTECTION



APPLICATIONS

Sediment Trapping

POLLUTANT REMOVAL

MED	Sediment Floatables
LO	Oil & Grease Nutrients & Toxics Other Construction Wastes

IMPLEMENTATION REQUIREMENTS

HI	Capital Costs
HI	Maintenance
LO	Training
LO	Suitability to slopes >5%

BMP - 11

DESCRIPTION

Inlet protection includes a variety of techniques used for intercepting sediment at low point inlets through the use of stone, concrete blocks, filter fabric and other materials. Normally located at an inlet to the storm drainage system, these techniques work by providing either detention or filtration to prevent sediment and floatable materials from entering the drain.

APPLICATIONS

Due to limited effectiveness, inlet protection is typically used as a secondary defense in site erosion control to prevent the introduction of sediment or floatables to the storm drain system. A common usage is in new residential or commercial developments where roadways and storm inlets are installed prior to development of individual lots. Inlet protection is also useful during repairs on existing roadways although care must be taken to avoid the potential for flooding, traffic or pedestrian safety or maintenance problems.

Different configurations of inlet protection are used depending upon site conditions and the desired results. Some of these include:

- Filter barrier protection (similar to silt fencing) is appropriate around an inlet when the drainage area is less than one acre and the basin slope does not exceed 5 %. This type of protection is not applicable to paved areas.
- Block and gravel protection (crushed stone or recycled concrete are also appropriate) is used for flows exceeding 0.5 cubic feet per second. An allowance for overtopping should be provided to prevent flooding problems.
- Wire mesh and gravel protection is used when flows exceed 0.5 cubic feet per second and when construction traffic will occur over the inlet. This technique is useful for both curb and drop inlets.
- Excavated impoundment protection around a drop inlet may be used to protect against sediment entering a storm drain system. It is necessary to install weep holes in order for the impoundment to drain completely.

INLET PROTECTION

DESIGN CRITERIA

- Filter fabric protection shall be designed and maintained in a manner similar to silt fencing. For instance:
  - If 50% or less of the soil to be contained, by weight, passes the U.S. Standard Sieve No. 200, select the equivalent opening size (EOS) to retain 85% of the soil.
  - The maximum opening size shall be 70 (#70 sieve) and the minimum opening size shall be 100 (#100 sieve).
  - If 85% or more of the soil to be contained, by weight, passes the U.S. Standard Sieve No. 200, silt fencing shall not be used due to clogging potential.
- The maximum depth of flow shall not exceed 8 inches depending upon vehicular and pedestrian traffic.
- Positive drainage is critical in the design of inlet protection. If overflow is not provided at the inlet, flows which exceed the capacity of the inlet protection system should be routed to established swales, streets or other watercourses to minimize potential for damage due to ponding or flooding.
- Inlet protection is only viable at low point inlets. Inlets which are on a slope cannot be effectively protected because storm water will bypass the inlet and continue downstream, causing potential overload conditions at the downstream inlets.

MAINTENANCE REQUIREMENTS

Inlet protection systems should be inspected on a weekly basis and especially following significant storm events of 0.5 inches or greater. If filter fabric is a component of the system and becomes clogged, it should be cleaned or replaced, as necessary. Sediment should be removed when it reaches a height approximately one-half the inlet opening height. If a sump is used, the sediment should be removed when the volume of the sump has been reduced by half.

If the inlet protection system includes stone filters, the stones must be pulled away from the inlet and cleaned or replaced when the stone filter becomes clogged. Since cleaning the clogged stone may be difficult, the clogged stone can be used for fill material on the construction site and new stone placed around the inlet for protection.

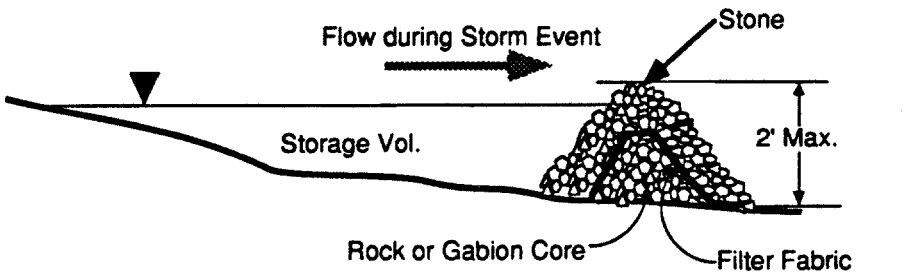
ADVANTAGES

+ Prevents clogging of existing storm drainage systems and the siltation of receiving water.
+ Reduces the amount of sediment leaving the site.

DISADVANTAGES

- May be difficult to remove the collected sediment.
- May cause erosion elsewhere as clogging occurs.
- Is practical only for low sediment, low volume flows (disturbed areas less than one acre).

STONE OUTLET SEDIMENT TRAP



APPLICATIONS

Sediment Trapping

POLLUTANT REMOVAL

HI	Sediment
MED	Floatables
LO	Oil & Grease
	Nutrients & Toxics
	Other Construction Wastes

IMPLEMENTATION REQUIREMENTS

HI	Capital Costs
MED	Maintenance
LO	Training
HI	Suitability to slopes >5%

BMP - 12

DESCRIPTION

A stone outlet sediment trap consists of the formation of a small ponding area (sediment trap) behind a stone and filter fabric berm which allows sediment deposition from the collected runoff. The stone and filter fabric berm has a stone filter outlet at the top to allow passage of treated water. This is used for treatment of concentrated flows which are collected in drainage swales or channels.

APPLICATIONS

Stone outlet sediment traps are used to reduce the velocity of runoff flow and capture entrained sediments. These are typically used for long term (up to 18 months) applications where a sediment basin would not be feasible due to site or construction method restrictions. The use of a stone and filter fabric berm rather than compacted earth provides additional filtration and aids in preventing overtopping of the stone filter.

DESIGN CRITERIA

- Maximum drainage area contributing to the trap shall be 3 acres or less. For larger drainage areas, a sediment basin should be used.
- The minimum length (in feet) of the crest of the stone outlet shall be equal to 6 times the size (in acres) of the contributing drainage area.
- Deposited sediment shall be removed when the depth of sediment is equal to one-third of the height of the outlet structure as measured from the original toe of the slope to the crest of the outlet, or has reached a depth of one foot, whichever is less.
- The minimum width of the embankment at the top shall be 3 feet.
- The maximum slope of the embankment shall be 3:1.
- The maximum height of the embankment shall be 2 feet as measured from the toe of the slope to the crest of the stone outlet. The height of the compacted earth embankment (adjacent to the sides of the stone outlet sediment trap) shall be one foot higher than the crest.
- The effective life of the stone outlet sediment trap is approximately 18 months.

STONE OUTLET SEDIMENT TRAP

MAINTENANCE REQUIREMENTS

Stone outlet sediment traps should be inspected routinely, and immediately following significant storm events of 0.5 inches or greater for accumulation of sediment. Sediment shall be removed and the area directly behind the berm regraded to its original dimensions when the capacity of the impoundment has been reduced by one-half of its original storage capacity. The removed sediment shall be stockpiled or redistributed across the site in areas which are protected from erosion.

The stone outlet should be inspected for clogging of the void spaces between the stones. If the aggregate appears to be clogged such that efficiency has been reduced, the stone should be replaced.

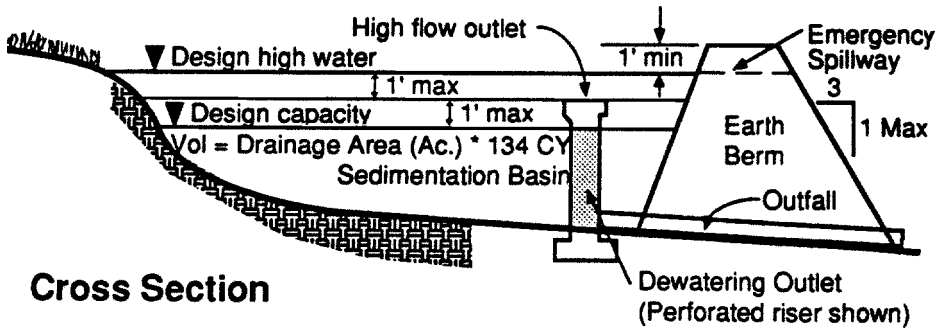
ADVANTAGES

+ Simple and inexpensive to install.
+ Protects downstream areas from clogging or damage due to sediment deposits.
+ Can simplify the drainage design process by trapping sediment at specific spots onsite.

DISADVANTAGES

- Is suitable only for limited areas.
- Is effective only if properly maintained.
- Will not remove fine silts and clays.

SEDIMENT BASIN



APPLICATIONS

Sediment Trapping

POLLUTANT REMOVAL

HI	Sediment
MED	Nutrients & Toxics
MED	Floatables
LO	Other Construction Wastes
	Oil & Grease

IMPLEMENTATION REQUIREMENTS

HI	Capital Costs
MED	Maintenance
LO	Training
HI	Suitability to slopes >5%

BMP - 13

DESCRIPTION

A sediment basin is a settling pond with a controlled outlet used to collect and store sediment produced by construction activities. Sediment-laden runoff is directed to the basin to allow settling of the suspended sediment. It provides treatment for the runoff as well as detention and controlled release of runoff, minimizing potential flood impacts downstream.

APPLICATIONS

Sediment basins can be used at sites with adequate open space to place the basin and the ability to direct a majority of the site drainage to the basin. For sites with disturbed areas of 10 or more acres that are part of a common drainage area, sediment basins should be used for temporary or permanent control of storm water runoff, unless specific site conditions limit their usefulness.

Sediment basins are highly effective in reducing sediment and other types of pollutants for design storm conditions. They also reduce maintenance requirements due to the central location of the sediment and the minimal structural requirements of the basin.

DESIGN CRITERIA

- Maximum drainage area contributing to the basin should be 10 acres or less. Larger sediment basins will require specific measures to address the potential for overtopping the basin and possible failure of the berm.
- Minimum capacity of the basin shall be 3600 cubic feet per acre of disturbed, contributing drainage area.
- Deposited sediment shall be removed when the storage capacity has been reduced to 20% of the original capacity.
- The minimum embankment width at the top shall be 8 feet.
- The maximum embankment slope shall be 3:1.
- The maximum embankment height shall be 6 feet as measured from the toe of the slope on the downstream side.
- The basin outlet shall be designed to accommodate the 10-year design storm without causing damage to the containment structure.
- Minimum outlet capacity shall be 0.2 cubic feet per second per acre of contributing drainage area.

SEDIMENT BASIN

DESIGN CRITERIA (cont.)

- The sediment basin shall have a minimum design dewatering time of 36 hours.
- The basin must be laid out such that the effective flow length of the basin should be at least twice the effective flow width.
- The sediment basin outfall pipe discharge point shall be stabilized with riprap or other form of stabilization for design flows and velocities based on the 25-year design storm peak flows. For velocities in excess of 5 feet per second, velocity dissipation measures should be used to reduce outfall velocities.
- Fencing around the basin may be required to prevent vandalism or unauthorized entry.

MAINTENANCE REQUIREMENTS

Sediment shall be removed and the basin regraded to its original dimensions at such point that the capacity of the impoundment has been reduced to 20% of its original storage capacity. The removed sediment shall be stock-piled or redistributed in areas which are protected from erosion.

The basin outlet structure and emergency spillway (if applicable) should be inspected frequently and after each significant storm event 0.5 inches or greater to check for damage and to ensure that obstructions have not diminished the effectiveness of the structure.

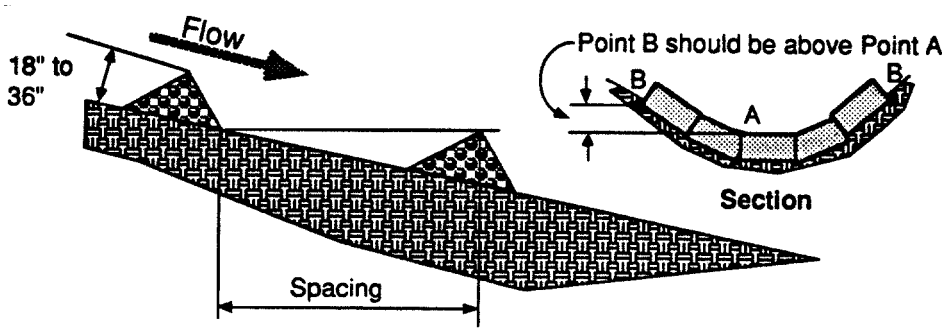
ADVANTAGES

+ Protects downstream areas from clogging or damage due to sediment deposition during construction activities.
+ Can trap smaller sediment particles than sediment traps because of the longer detention time.
+ Can be converted to a permanent storm water detention structure, once construction is completed.

DISADVANTAGES

- Is generally suitable for small areas (less than 10 acres).
- Requires regular maintenance and cleaning.
- Will not remove very fine silts and clays unless used in conjunction with other measures.
- Requires careful adherence to safety practices since ponds are attractive to small children.

CHECK DAMS



APPLICATIONS

Sediment Trapping

Channel Protection

POLLUTANT REMOVAL

MED	Sediment
MED	Floatables
LO	Oil & Grease
	Other Construction Wastes
	Nutrients & Toxics

IMPLEMENTATION REQUIREMENTS

MED	Capital Costs
HI	Maintenance
LO	Training
MED	Suitability to slopes >5%

BMP - 14

DESCRIPTION

A check dam is a small, temporary or permanent, barrier constructed across a drainage ditch, swale, or channel to reduce the velocity of concentrated flows. Check dams are constructed of straw bales, logs, stone, pea gravel-filled sandbags, or earth berms. Reduced velocity reduces the potential for erosion in the channel and allows time for some deposition of sediment.

APPLICATIONS

Check dams are used to protect long drainage swales where protective vegetation has not been established and where erosive velocities are present. Because check dams offer limited treatment, they are used in conjunction with other treatment techniques such as inlet protection, riprap, or other sediment-reducing treatments. Check dams are frequently used early in construction to protect swales in linear projects such as roadway construction. They are also useful in short swales which are located on steep slopes to reduce unacceptable flow velocities.

DESIGN CRITERIA

- Check dams shall be placed at a distance and height to allow small pools to form between each one. Typically the dam height should be between 18 and 36 inches. On steep slopes, the dams should be spaced such that the top of the downstream dam should be at the same elevation as the toe of the upstream dam.
- See design criteria for straw bale and sand bag berms for specific design criteria. Maximum allowable flow shall be based on the specific technique used and the velocity of flow.
- Major flows (greater that the 2-year design storm) must pass the check dam without causing excessive upstream flooding.
- Check dams should be used in conjunction with other sediment reduction techniques prior to releasing the flow offsite.

CHECK DAMS

MAINTENANCE REQUIREMENTS

The maintenance requirements for check dams depend upon the maintenance requirements of the management practice used for the dam. In general, however, the check dams should be inspected weekly and following any significant storm events greater than 0.5 inches for damage and excessive clogging. Repairs should be undertaken in a timely manner to prevent the potential for upstream flooding.

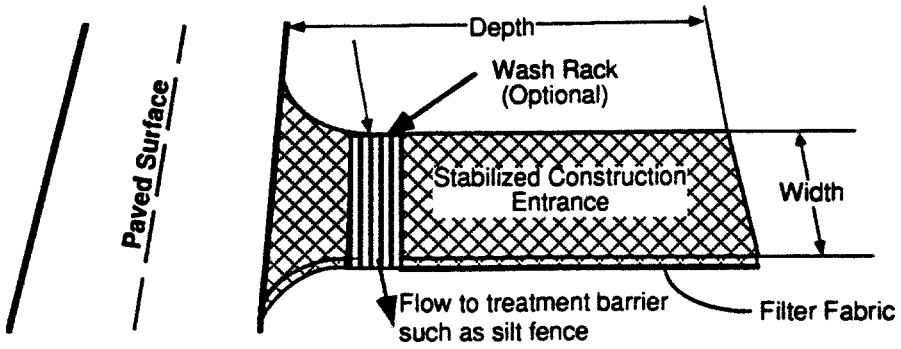
ADVANTAGES

+ Are inexpensive and easy to install.
+ May be used permanently if designed properly.
+ Allow a high proportion of sediment in runoff to settle out.
+ Reduce the velocity and may provide aeration of the water.
+ May be used where it is not possible to divert the flow or otherwise stabilize the channel

DISADVANTAGES

- May kill grass linings in channels if the water level remains high after storm events or if there is significant sedimentation.
- Reduces the hydraulic capacity of the channel.
- May create turbulence which erodes the channel banks.

STABILIZED CONSTRUCTION ENTRY



APPLICATIONS

Temporary Stabilization

POLLUTANT REMOVAL

MED Sediment

LO Oil & Grease
Nutrients & Toxics
Floatables
Other Construction Wastes

IMPLEMENTATION REQUIREMENTS

HI Capital Costs

MED Maintenance

LO Training

LO Suitability to slopes >5%

BMP - 15

DESCRIPTION

A stabilized construction entrance is used to facilitate the wash down and removal of sediment and other debris from construction equipment prior to exiting the construction site. The entrance typically consists of a gravel, crushed stone, recycled concrete or other rock material pad underlain by a filter fabric. For improved effectiveness, a washdown rack can be incorporated into the design. A stabilized construction entrance specifically addresses the problem of silt and mud deposition in roadways used for construction site access.

APPLICATIONS

Usually used for sites with significant daily truck traffic, stabilized construction entrances shall be a required part of an erosion control plan for all site developments greater than 5 acres in size. These are not suitable for use in long linear projects. When used properly, construction entrances also direct the majority of traffic to a single location, reducing the number and quantity of disturbed areas on the site and providing protection for other structural controls onsite.

DESIGN CRITERIA

- Stabilized construction entrances are to be constructed such that drainage across the entrance is directed to a controlled, stabilized outlet on-site with provisions for storage, proper filtration and removal of washwater.
- The entrance must be properly graded so that storm water is not allowed to leave the site and enter roadways.
- The minimum width of the entrance shall be 15 feet, but in no case shall the width be less than that of the entryway to be used.
- The minimum sediment depth of the entrance shall be 8 inches for the entire length of the control.

STABILIZED CONSTRUCTION ENTRY

DESIGN CRITERIA (cont.)

- Minimum dimensions for the entrance shall be as follows:

Tract Area	Avg. Lot Depth	Min Width of Entrance	Min Length of Entrance
< 1 acre	100 feet	15 feet	20 feet
< 5 acres	200 feet	20 feet	30 feet
<10 acres	>200 feet	20 feet	40 feet
>10 acres	> 200 feet	25 feet	50 feet

- Selection of the location for the construction entrance is critical. It must be used exclusively in order to be effective in controlling tracking of sediments offsite.
- Construction entrances may be more cost-effective than labor-intensive street cleaning.

MAINTENANCE REQUIREMENTS

The construction entrance must be inspected daily to determine if sediment and other materials are being effectively detained onsite. When sediment has substantially clogged the void area between the rocks, the aggregate mat must be washed down or replaced. Periodic regrading and top dressing with additional stone will be required to keep the efficiency from being diminished.

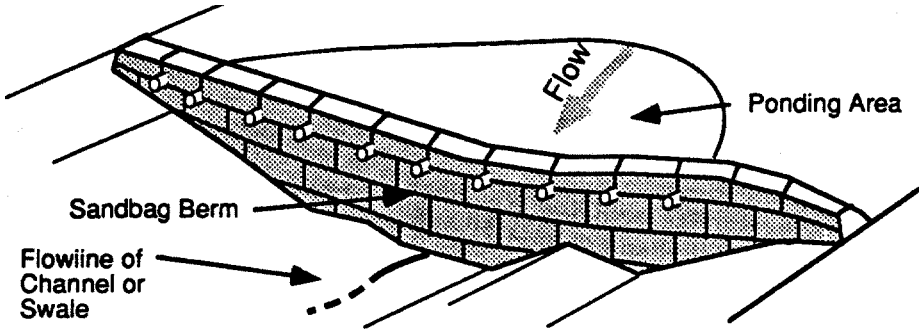
ADVANTAGES

+ Simple and effective for preventing silt and sediment deposition on adjacent roadways by construction traffic.
+ Protects other structural controls by channeling construction traffic to one exit location.
+ Cost-effective when compared to labor-intensive street cleaning.

DISADVANTAGES

- Moderate initial expense.
- Reduced effectiveness if not maintained properly or if bypassed.
- Requires ongoing maintenance, inspections and repairs.

SANDBAG BERM



APPLICATIONS

Sediment Trapping

Channel Protection

POLLUTANT REMOVAL

MED	Sediment
LO	Oil & Grease
LO	Nutrients & Toxics
MED	Floatables
LO	Other Construction Wastes

IMPLEMENTATION REQUIREMENTS

HI	Capital Costs
HI	Maintenance
LO	Training
HI	Suitability to slopes >

BMP - 16

DESCRIPTION

A sandbag berm consists of stacked sandbags installed across a watercourse or channel to direct flow around construction or to allow sedimentation to occur for flows downstream of disturbed areas. There are overflow pipes located in the top of the berm to allow controlled outflow of water after sedimentation occurs.

APPLICATIONS

A sandbag berm is a temporary sediment control method that addresses the problem of construction in creeks, channels and other watercourses which carry a constant flow and are subjected to high, concentrated flows. Sandbag berms can also be used to create a small sedimentation pond prior to completion of a permanent detention basin.

Sandbag berms can also be used as check dams in temporary swales or borrow ditches. Another useful application is the installation of sandbag berms parallel to a roadway providing a corridor of control similar to that provided by a silt fence or straw bales. The sandbag berm, however, is capable of controlling much higher flows and is more durable.

DESIGN CRITERIA

- Berms are to be constructed along a line of constant elevation for use as perimeter control devices.
- The maximum flow through rate shall be 0.1 cubic feet per second per square foot of berm surface.
- The minimum width of the berm shall be 18 inches at the top and 54 inches measured at the bottom
- The maximum side slopes shall be 2:1.
- The maximum design freeboard shall be 0.3 feet.
- Sandbags shall be made of jute, polypropylene, polyethylene or polyamide fabric. Jute shall be composed of a uniform weave of undyed and un-bleached single jute yarn weighing an average of 1.2 pounds per linear yard of cloth with approximately 78 warp ends per width of cloth. Polypropylene, polyethylene or polyamide fabric shall have a minimum unit weight of 4 ounces per square yard, a mullen burst strength of 300 psi minimum and ultraviolet stability exceeding 70 percent. The bags shall be filled with coarse sand or pea gravel.

SANDBAG BERM

DESIGN CRITERIA (cont.)

- To provide flowthrough capability, 4 inch diameter Schedule 40 or greater PVC pipe segments approximately 24 inches long shall be installed immediately below the top layer of sandbags.
- For severe velocities or high flows, woven wire mesh can be used to maintain the integrity of the berm.
- Sufficient room for the operation of sediment removal equipment shall be provided between the berm and other obstructions in order to properly move the sediment.
- The ends of the berm shall be turned upgrade or shall tie into natural grades to prevent bypasses of stormwater.
- For applications within the flow path of channels, the center of the berm must be lower than the outside ends to prevent bypass around the berm.

MAINTENANCE REQUIREMENTS

Sandbag berms must be inspected daily and following each significant rain event 0.5 inches or greater. The sandbags shall be reshaped or replaced as necessary during the inspection. Sediment shall be removed when it reaches a depth of 6 inches. In addition, the PVC overflow pipes shall be inspected weekly to ensure unobstructed flow.

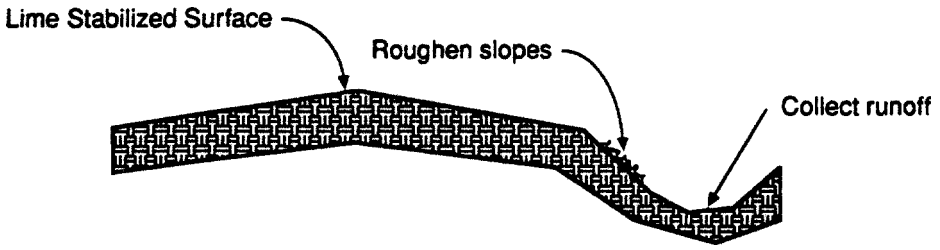
ADVANTAGES

+ Materials readily available on construction sites.

DISADVANTAGES

- Expensive and labor-intensive.
- Require ongoing maintenance, inspections and repairs

LIME STABILIZATION CONTROL BMP



APPLICATIONS

Housekeeping Practices

POLLUTANT REMOVAL

MED Nutrients & Toxics

LO Oil & Grease
Sediment
Floatables
Other Construction Wastes

IMPLEMENTATION REQUIREMENTS

MED Maintenance

LO Capital Costs
Training
Suitability to slopes >5%

BMP - 17

DESCRIPTION

Lime stabilization is used to treat high plasticity soils such as clay to limit the future impacts on shrink-swell potential on the constructed project, particularly roadways, parking lots and other paved surfaces. During lime stabilization, hydrated lime is applied to the soil, disked into the soil and then allowed to cure. This BMP is used to reduce the potential impacts to aquatic life caused by changes in water pH due to the introduction of lime entrained in site runoff.

APPLICATIONS

These techniques are applicable to a wide variety of sites and the engineer will determine which technique to apply based on site conditions such as the amount of available open space, the size of the area being stabilized, and proximity of nearby water courses. The engineer will also take into account the other BMPs already in use on-site. The use of diversion dikes and interceptor swales to redirect upslope water away from the area being stabilized will also reduce potential lime impacts to water bodies.

DESIGN CRITERIA

- The contractor shall limit lime operations to those which can be thoroughly mixed and compacted by the end of each work day.
- No traffic other than the water trucks and mixing equipment shall be allowed to pass over the spread lime until after completion of mixing and curing.
- Areas adjacent and downslope of stabilized areas shall be roughened to intercept lime from runoff and to reduce runoff velocity.
- Geotextile fabrics should not be used to control lime since the grain size of the lime is significantly smaller than the equivalent opening size of the fabric.
- For areas where phasing of lime stabilization is impractical, a curing seal such as Liquid Asphalt, Grade MC-250 or MC-800, shall be applied at a rate of 0.15 gallons per square yard of surface to protect the base.
- Use of a sediment basin with a significant (>36 hours) drawdown time is encouraged for large stabilized areas.

MAINTENANCE REQUIREMENTS

There are generally no maintenance requirements for this BMP. If excess lime appears in the roughened areas, swales or sedimentation basins in use, however, the lime shall be removed and disposed of properly.

ADVANTAGES

+ Protects nearby water courses from harmful impacts of chemical construction practices.
+ Inexpensive and easy to implement.

DISADVANTAGES

- May not provide adequate protection during heavy rain events.

SOLID WASTE MANAGEMENT

APPLICATIONS

Waste Management

Housekeeping Practices

POLLUTANT REMOVAL

LO Sediment
Oil & Grease

HI Nutrients & Toxics
Floatables
Other Construc-
tion Wastes

IMPLEMENTATION REQUIREMENTS

MED Capital Costs
Maintenance
Training

LO Suitability to
slopes >5%

BMP - 18

DESCRIPTION

Large quantities of solid waste are generated at construction sites and include such items as: packaging, pallets, wood waste, concrete waste, soil, electrical wiring, cuttings, and a variety of other material. This BMP addresses techniques which can be used to minimize the potential for storm water contamination from solid waste through appropriate storage and disposal practices.

APPLICATIONS

The solid waste management practice for construction sites is based on proper storage and disposal practices by construction workers and supervisors. Key elements of the program are education and modification of improper disposal habits. Cooperation and vigilance is required on the part of supervisors and workers to ensure that the recommendations and practices are followed. The following list describes the targeted materials:

- Paper and cardboard containers
- Plastic packaging
- Styrofoam packing and forms
- Insulation materials (non-hazardous)
- Wood pallets
- Wood cuttings
- Pipe and electrical cuttings
- Concrete, brick and mortar waste
- Shingle cuttings and waste
- Roofing tar
- Steel (cuttings, nails and rust residue)
- Gypsum board cuttings and waste
- Sheathing cutting sand waste
- Miscellaneous cuttings and waste
- Food waste
- Demolition waste

STORAGE PROCEDURES

- ♦ Wherever possible, minimize the production of solid waste materials.
- ♦ Designate a foreman or supervisor to oversee and enforce proper solid waste procedures.
- ♦ Instruct construction workers in proper solid waste procedures.
- ♦ Segregate potentially hazardous waste from non-hazardous construction site debris.
- ♦ Keep solid waste materials under cover in either a closed dumpster or other enclosed trash container that limits contact with rain and runoff.
- ♦ Store waste materials away from drainage ditches, swales, and catch basins.
- ♦ Prohibit littering by workers and visitors.

SOLID WASTE MANAGEMENT

STORAGE PROCEDURES (cont.)

- Police site daily for litter and debris.
- Enforce solid waste handling and storage procedures.
- Do not allow trash containers to overflow.
- Do not allow waste materials to accumulate on the ground.

DISPOSAL PROCEDURES

- If feasible, segregate recyclable wastes from non-recyclable waste materials and dispose of properly.
- General construction debris may be hauled to a licensed construction debris landfill (typically less expensive than a sanitary landfill).
- Use waste facilities approved by local jurisdiction.
- Runoff which comes into contact with unprotected waste material shall be directed into a structural treatment unit such as silt fencing to remove debris.

EDUCATION

- Educate ALL workers on solid waste storage and disposal procedures.
- Instruct workers in differentiation between solid and hazardous waste.
- Have regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety seminars).
- Clearly mark all solid waste containers to indicate which materials are acceptable for placement into the container.

QUALITY CONTROL

- Foreman and/or construction supervisor shall monitor onsite solid waste storage and disposal procedures.
- Discipline workers who repeatedly fail to follow proper procedures.

REQUIREMENTS

- Jobsite waste handling and disposal education and awareness program.
- Commitment by management to implement and enforce Solid Waste Management Program.
- Compliance by workers.
- Sufficient and appropriate waste storage containers.
- Timely removal of stored solid waste materials.
- Possible modest cost impact for additional waste storage containers.
- Small cost impact for training and monitoring.
- Minimal overall cost impact.

HAZARDOUS WASTE MANAGEMENT

APPLICATIONS

Waste Management

Housekeeping Practices

POLLUTANT REMOVAL

LO Sediment
Floatables

HI Oil & Grease
Nutrients &
Toxics
Other Construc-
tion Wastes

IMPLEMENTATION REQUIREMENTS

MED Capital Costs
Maintenance
Training

LO Suitability to
slopes >5%

BMP - 19

DESCRIPTION

The hazardous waste management BMP addresses the problem of storm water polluted with hazardous waste through spills or other forms of contact. The objective of this BMP is to minimize the potential of storm water contamination from common construction site hazardous wastes through appropriate recognition, handling, storage and disposal practices.

It is not the intent of this BMP to supersede or replace normal site assessment or remediation procedures. Significant spills and/or contamination warrant immediate response by trained professionals. Suspected jobsite contamination should be immediately reported to regulatory authorities and protective actions taken. The Construction General Permit requires reporting of significant spills to the National Response Center at 800/424-8802.

APPLICATIONS

The hazardous waste management techniques presented here are based on proper recognition, handling, and disposal practices by construction workers and supervisors. Key elements of the program are education, proper disposal practices, as well as provisions for safe storage and disposal. The following list describes the targeted materials:

- Paints
- Solvents
- Stains
- Wood preservatives
- Cutting oils
- Greases
- Roofing tar
- Pesticides
- Fuels and lube oils
- Lead based paints and asbestos (demolition)

STORAGE PROCEDURES

- ♦ Wherever possible, minimize the use of hazardous materials.
- ♦ Minimize the generation of hazardous wastes on the jobsite.
- ♦ Segregate potentially hazardous waste from non-hazardous construction site debris.
- ♦ Designate a foreman or supervisor to oversee hazardous materials handling procedures.
- ♦ Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.
- ♦ Store waste materials away from drainage ditches, swales and catch basins.
- ♦ Use containment berms in fueling and maintenance areas and where the potential for spills is high.
- ♦ Ensure that adequate hazardous waste storage volume is available.

HAZARDOUS WASTE MANAGEMENT

STORAGE PROCEDURES (cont.)

- Ensure that hazardous waste collection containers are conveniently located.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Enforce hazardous waste handling and disposal procedures.
- Clearly mark all hazardous waste containers to indicate which materials are acceptable.

DISPOSAL PROCEDURES

- Regularly schedule hazardous waste removal to minimize onsite storage.
- Use only reputable, licensed hazardous waste haulers.

EDUCATION

- Instruct workers in identification of hazardous waste.
- Educate workers of potential dangers to humans and the environment from hazardous wastes.
- Instruct workers on safety procedures for common construction site hazardous wastes.
- Educate all workers on hazardous waste storage and disposal practices.
- Have regular meetings to discuss and reinforce identification, handling and disposal procedures (incorporate into regular safety seminars).
- Establish a continuing education program to indoctrinate new employees.

QUALITY CONTROL

- Foreman and/or construction supervisor shall monitor on-site hazardous waste storage and disposal procedures.
- Educate and if necessary, discipline workers who repeatedly fail to follow proper procedures.
- Ensure that the hazardous waste disposal contractor is reputable and licensed.

REQUIREMENTS

- Jobsite hazardous waste handling and disposal education and awareness program.
- Commitment by management to implement and enforce Hazardous Waste Management Program.
- Compliance by workers.
- Sufficient and appropriate hazardous waste storage containers.
- Timely removal of stored hazardous waste materials.
- Possible modest cost impact for additional hazardous waste storage containers.
- Small cost impact for training and monitoring.
- Potential cost impact for hazardous waste collection and disposal by licensed hauler. The actual cost depends on the type of material and volume.

CONCRETE WASTE MANAGEMENT

APPLICATIONS

Waste Management

Housekeeping Practices

POLLUTANT REMOVAL

LO Sediment
Oil & Grease

HI Nutrients & Toxics
Floatables
Other Construction Wastes

IMPLEMENTATION REQUIREMENTS

MED Capital Costs
Maintenance
Training

LO Suitability to slopes >5%

BMP - 20

DESCRIPTION
Concrete waste at construction sites comes in two forms: (1) excess fresh concrete mix including truck and equipment washing residue, and (2) concrete dust and debris resulting from demolition. Both of these have the potential to impact water quality through storm water runoff contact with the waste materials.

APPLICATIONS
The introduction of concrete, especially fresh concrete, to a water body can impact a number of water quality parameters such as pH and suspended solids. Changes in pH and the amount of suspended solids significantly impacts the aquatic life.

UNACCEPTABLE DISPOSAL PRACTICES
- Dumping in vacant areas of the jobsite
- Illicit dumping off the jobsite
- Dumping into ditches or drainage facilities

DISPOSAL PRACTICES
- Avoid the unacceptable disposal practices listed above.
- Develop a pre-determined, safe concrete disposal area.
- Provide a truck washout area with a minimum of 6 cubic feet of containment volume for every 10 cubic yards of concrete poured.
- Never dump waste concrete illicitly or without the property owner's knowledge and consent.
- Treat runoff from storage areas through the use of structural controls as required.

EDUCATION
- Driver and equipment operators should be instructed on proper disposal and equipment washing practices (see above).
- Supervisors must be made aware of the potential consequences of improperly handled concrete waste.

ENFORCEMENT
- The construction site manager or foreman must ensure that employees and pre-mix companies follow proper procedures for concrete disposal and equipment washing.

CONCRETE WASTE MANAGEMENT

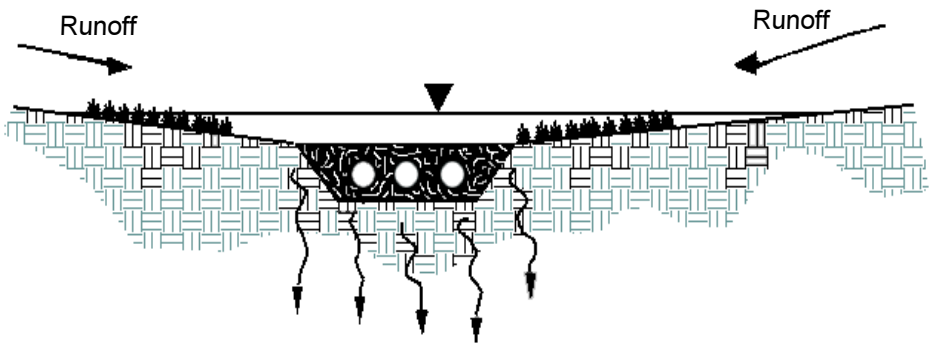
DEMOLITION PRACTICES

- Monitor weather and wind direction to ensure that concrete dust is not entering drainage structures or surface waters.
- Where appropriate, construct sediment traps or other types of sediment detention devices downstream or demolition activities.

REQUIREMENTS

- Use pre-determined disposal sites for waste concrete.
- Prohibit dumping waste concrete anywhere but at the pre-determined areas.
- Assign pre-determined truck and equipment washing areas.
- Educate drivers and operators on proper disposal and equipment cleaning procedures.
- Minimal cost impact for training and monitoring.
- Concrete disposal cost depends on availability and distance to suitable disposal areas.
- Additional costs involved in equipment washing could be significant.

INFILTRATION



APPLICATIONS

POLLUTANT REMOVAL

HI Heavy Metals, Bacteria and Viruses, Toxic Chemicals, Sediment, Oil and Grease, Oxygen Demanding Substances

MED Nutrients

IMPLEMENTATION REQUIREMENTS

MED Capital Costs, Operation and Maintenance Costs, Maintenance

DESCRIPTION
Storm water infiltration involves a variety of systems where surface runoff is infiltrated into the ground rather than discharged to a surface water body. Infiltration systems typically include: ponds, basins, trenches, dry wells, buried perforated pipe, porous pavement, and concrete grids.

APPLICATIONS
Infiltration BMPs should be used as a final treatment for urban runoff following pretreatment for suspended solids and oil. Infiltration techniques are useful for ground water recharge. These BMPs have residential applications for removal of organic material and phosphates and are applicable in areas where land area is limited such as retrofits in existing developments in residential areas, commercial districts, and parking lots. Infiltration basins are typically used for areas less than 5 acres, but may handle up to 50 acres if the soil is very permeable. Other infiltration methods are applicable only for smaller sites.

DESIGN CRITERIA
- Should be sized to capture a particular fraction of the surface runoff.
- Should be located off-line from the primary detention / conveyance systems.
- A Darcy's Law approach should be considered when sizing the BMP.
- Pretreatment is required in areas where fine soils are present.
- An overflow should be provided with capacity to convey runoff from larger storms.

BMP - 21

INFILTRATION

MAINTENANCE REQUIREMENTS
Remove sediment frequently to avoid build-up and clogging of infiltration surfaces.

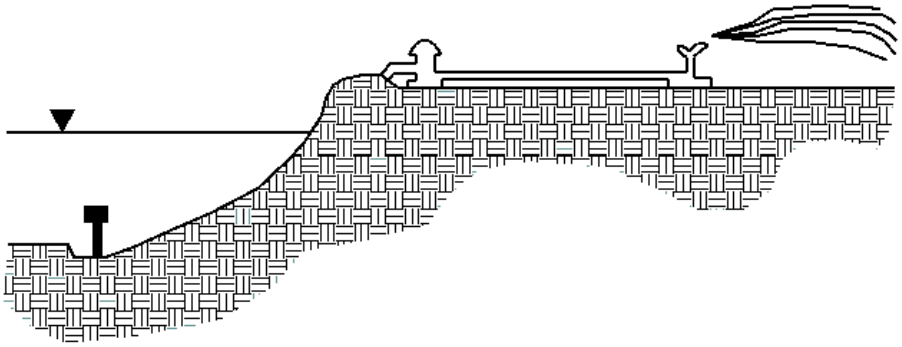
ADVANTAGES

+ Attenuate peak flows.
+ Provides a groundwater recharge.
+ Can effectively remove pollutants based on design and maintenance
+ Can reduce the size requirement of the storm drain system since less surface runoff is present.
+ Medium capital cost.

DISADVANTAGES

- Can result in infiltration of contaminated water.
- Poor pollutant removal during large storm events as a result of flows bypassing the BMP.
- High failure rates due to problems with site conditions, design, construction and lack of maintenance.
- Potentially high maintenance if fine silts affect infiltration.
- Moderate maintenance costs associated with sediment removal from the associated settling basin.
- May not be considered aesthetically pleasing.

RETENTION PONDS



APPLICATIONS

POLLUTANT REMOVAL

HI Sediment
Toxic Chemicals

MED Heavy Metals, Nurtients, Bacteria and Viruses, Oil and Grease, Oxygen Demanding Substances

IMPLEMENTATION REQUIREMENTS

MED Capital Costs,

O&M Costs

BMP - 22

DESCRIPTION
Retention ponds are designed to hold surface runoff for periods of days or weeks. Retention ponds are appropriate where storm water runoff from a relatively small area needs to be treated prior to its release or reuse. A continual flow of water should be provided in order to make up for loss due to evaporation and infiltration.

APPLICATIONS
Retention ponds work well in areas that receive urban runoff from roads, parking lots, residential neighborhoods, commercial areas, and industrial sites. Retention ponds can provide effective pretreatment for surface runoff prior to release or reuse. Retention ponds should not be utilized in areas where surface runoff may contain soluble metals or toxic organic material.

Retention is effective at reducing the size of oil/water separators because total suspended solids concentrations are reduced and flows are detained and may be passed through an oil/water separator at a lower rate of flow. When surface runoff from industrial areas is received in a retention pond and volatiles are in excess, adding aeration equipment to the retention pond can reduce the amount of volatiles discharged into the storm water. Application of this method to reduce volatiles should be coordinated with the Texas Air Control Board.

DESIGN CRITERIA

- The amount of directly connected impervious area in the contributing watershed will significantly impact the storage volume required and the time required to treat the captured runoff.
- Retention ponds should be located off-line from other controls.
- Ponds are typically sized for the one year storm event.
- A water budget analysis should be completed to ensure that available base flow will be greater than water losses.

RETENTION PONDS

MAINTENANCE REQUIREMENTS

Sediments, litter and trash must be removed regularly. Landscape surrounding the wet pond must be maintained. Control insect populations by installing predacious bird and bat nesting boxes. Outlet structures should be maintained regularly to prevent clogging.

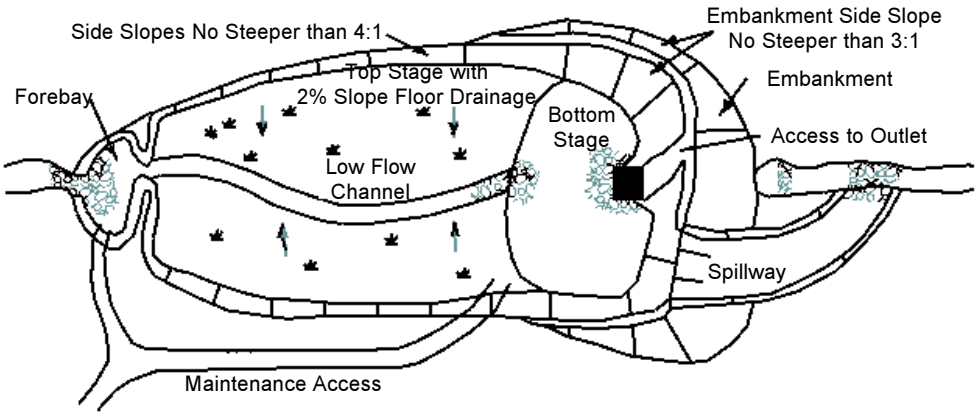
ADVANTAGES

+ Creates a permanent habitat supporting a wide range of species.
+ Attenuates peak flow.
+ Provides aesthetic benefits.
+ Potentially very effective in removal of pollutants and sediments.
+ Able to develop into diverse habitats supporting a wide range of species.
+ Able to be designed to capture the first flush.
+ Wetland vegetation is conducive to the uptake of contaminants and nutrients.

DISADVANTAGES

- Regular maintenance is required.
- Floating litter, scum and algal blooms, nuisance odors, and possible mosquito problems.
- Water fowl attracted to the pond may create nutrient imbalances.
- Regular maintenance will disturb biological communities that establish themselves in the pond.
- Safety concerns for the general public associated with bodies of deep water.
- Provides limited groundwater recharge
- May lead to contamination of fish and wildlife through bio-accumulation of metals and toxic chemicals in habitats.
- Can disrupt the existing habitat and alter the stream hydrology in an area.

EXTENDED DETENTION BASIN



APPLICATIONS

Perimeter Control

Slope Protection

POLLUTANT REMOVAL

HI Floatable Materials, Sediment

MED Heavy Metals, Nutrients, Toxic Chemicals, Oil and Grease, Oxygen Demanding Sub-stances

LO Bacteria and Viruses

IMPLEMENTATION REQUIREMENTS

MED Operation Maintenance, Maintenance Costs, Capital Costs

BMP - 23

DESCRIPTION

Extended detention basins are normally dry between storm events, however, water is detained in the pond from one to two days following a storm event. An outlet is located at the bottom of the pond that allows waters to be released slowly after a storm event and provide time for sediments to settle prior to discharge into receiving waters.

APPLICATIONS

Extended detention basins are applicable in areas where water availability is limited and unable to support a wet pond. Extended detention basins can be used to enhance storm water runoff quality and reduce peak storm water runoff rates. Existing detention basins can be retrofitted to extended detention basins through modification of the outlet structure to limit flows and extend the draw-down time.

DESIGN CRITERIA

- The extended detention basin is typically sized to capture the first inch of runoff.
- Soil maps and boring tests should be conducted prior to design/construction in order to establish geotechnical parameters.
- Perforated riser pipes or submerged orifices are typically used as outlet structures.
- An armored or geotextile reinforced embankment and overflow spillway must be incorporated in the basin to prevent catastrophic failure of the basin.
- A shallow basin with maximum surface area performs better than a deep basin with the same volume.
- The length of the basin should be greater than three times its width.
- Energy dissipators should be utilized at all inlets to the pond to minimize erosion in the pond.
- The length between inlets and outlets should be maximized to prevent short circuiting and encourage sedimentation in the basin.
- Inclusion of a small shallow wetland in the basin's bottom can improve nutrient removal rates.

EXTENDED DETENTION BASIN

MAINTENANCE REQUIREMENTS

Orifice and/or riser pipe should be checked regularly for clogging. The banks and the bottom should be checked for signs of erosion. Sediments should be removed when accumulation depths are greater than 6 inches or resuspension of sediments is observed. Landscape surrounding the facility must be maintained to meet aesthetically pleasing standards. Insect populations may be controlled through installation of predacious bird and bat nesting boxes.

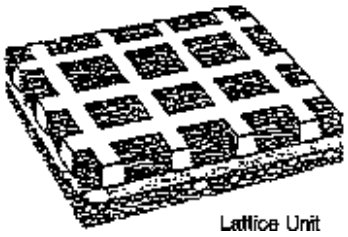
ADVANTAGES

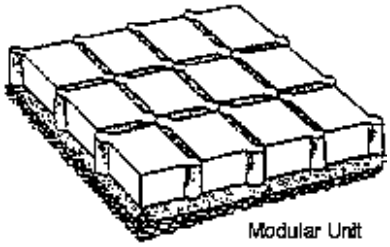
+ Provides flood control.
+ Reduces downstream erosion.
+ Effective removal rate of 70-80% of total suspended solids.
+ Can be designed to incorporate recreational and open space uses available for the general public.
+ Has the ability to capture and treat the first flush.
+ Shallow wetlands can be easily incorporated into the design to enhance the pollutant removal capabilities of the pond.

DISADVANTAGES

- Pollutant removal efficiency is dependent upon the designed detention period.
- Removal of soluble pollutants and bacteria may be poor.
- Has a limited groundwater recharge ability.
- Large tracts of land are required for the storage area.
- Floatables accumulate and require regular litter and trash pickups.
- Clogging can shorten the design life if not maintained.

POROUS PAVEMENT





APPLICATIONS

POLLUTANT REMOVAL

HI	Sediment
LO	Oil & Grease
MED	Other Construction Wastes

IMPLEMENTATION REQUIREMENTS

MED	Maintenance
LO	Training
HI	Suitability to slopes >5%

DESCRIPTION
Porous pavements may consist of porous graded asphaltic concrete or interlocking paving blocks with open spaces.

APPLICATIONS
Porous pavements are often used in walkways, lightly traveled areas and as overflow parking in parking lots.

DESIGN CRITERIA
- A base course of graded gravel is often used that is typically capable of storing 0.25-inch of runoff from the paved surface.
- Underlying soil conditions should be investigated in order to determine the infiltrative properties of the subgrade and the effectiveness of the BMP.
- In high clay conditions, underdrain systems should be installed that will drain the base material and discharge as sheet flow through vegetated buffers or other on-site water quality treatment systems.

MAINTENANCE
Porous pavements should be routinely vacuumed and swept in order to remove sediments and debris that are too large to pass through the voids in the concrete. Use of a high pressure washing following vacuuming has been found to be effective in unclogging porous pavement. Other maintenance to porous pavements may be performed as with conventional pavements.

BMP - 24

POROUS PAVEMENT

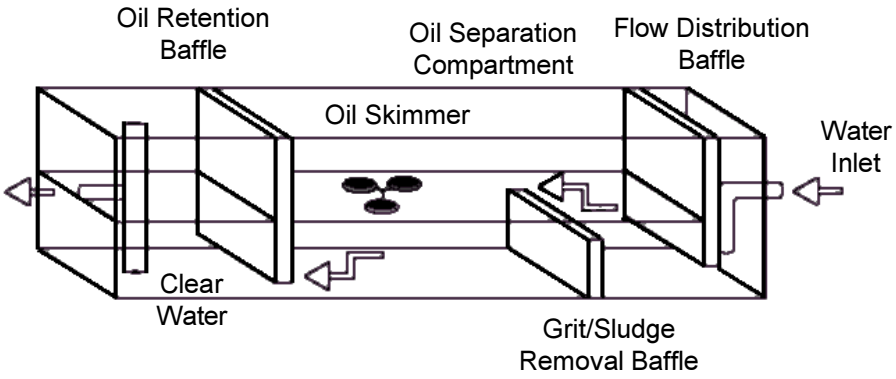
ADVANTAGES

+ Attenuates peak flow during small events.
+ Improves erosion control.
+ Provides some groundwater recharge.
+ May be able to reduce the size of storm drain systems as less water is to be conveyed through them.

DISADVANTAGES

- Does not create habitat.
- Risk of groundwater contamination.
- Improper installation can lead to structural failure of the pavement.
- Potentially high maintenance costs.
- Not suitable for large or heavily traveled areas.

OIL/WATER SEPARATORS



APPLICATIONS

POLLUTANT REMOVAL

LO	Sediment Floatable Materials
MED	Bacteria/viruses Heavy metals Nutrients Toxic chemicals Sediment Oxygen demanding substances
HI	Oil & Gas

IMPLEMENTATION REQUIREMENTS

MED	Capital Costs, Training
HI	O&M Costs Maintenance

DESCRIPTION
Oil/water separators are designed to remove oil, other water-insoluble hydrocarbons, and settleable solids from storm water runoff. Separators are also effective at removing floatable debris and settleable solids. Two general types of oil/water separators are the conventional gravity separator and the coalescing plate interceptor (CPI).

APPLICATION
Oil/water separators will be needed for industrial and commercial sites where activities result in abnormal amounts of petroleum products lost to exposed pavements, either by accidental small spills or normal dripping from vehicle undercarriages. Conventional separators are capable of removing oil droplets with diameters equal to or greater than 150 micrometers. Separators are often used in airfields, fleet vehicle maintenance, washing facilities and mass transit park-and -ride lots.

DESIGN CRITERIA
When designing, the sizing is related to anticipated influent flow rate, oil concentration, water temperature, and the effluent goal. To maintain reasonable separator size, it should be designed to bypass flows in excess of first flush and should avoid hydraulic overloading. Systems should have traffic rated lids, where appropriate.

Oil/water separators used in conjunction with and proceeded by retention basins can reduce the size of the oil/water separator because of the reduction in sediment loads and the slower rates.

Specify appropriate performance tests after installation and shakedown, and/or certification by a professional engineer that the separator is functioning in accordance with design objectives.

Do not use oil/water separators for the removal of dissolved or emulsified oils such as coolants, soluble lubricants, glycols, and alcohols.

BMP - 25

OIL/WATER SEPARATORS

MAINTENANCE REQUIREMENTS

Effectiveness depends on routine maintenance. Therefore, inspection of the facility should take place at least twice a year. Preferably more often after long dry periods, large storms, or spills. Maintenance involves the removal of accumulated oil, grease, and floating debris, and proper disposal.

ADVANTAGES

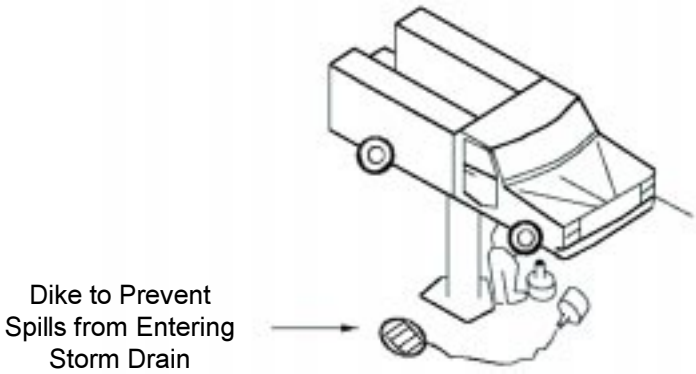
+ Provides pre-treatment of runoff before it is discharged into infiltration systems, retention/detention systems, or into sewers discharging directly into aquatic systems.
+ The design life is 20 plus years.

DISADVANTAGES

- No direct provision of a habitat.
- Little data on oil characteristics in storm water leads to considerable uncertainty about BMP performance
- High maintenance requirements
- Oil/water separators may not be suitable for large areas.
- Ineffective for erosion or flood control.

VEHICLE AND EQUIPMENT MAINTENANCE / REPAIR

APPLICATIONS



POLLUTANT REMOVAL

LO	Floatable Materials Bacteria & Viruses Nutrients Sediment
HI	Heavy metals Toxic chemicals Oil and grease Oxygen Demanding Substances

IMPLEMENTATION REQUIREMENTS

	Capital Costs (site specific)
MED	O&M Costs
	Training

BMP - 26

DESCRIPTION

The maintenance of vehicles and equipment is a potentially significant source of storm water pollution. Activities such as engine repair and service, replacement of fluids, and outdoor equipment storage and parking will contaminate storm water.

APPROACH

The discharge of pollutants into storm waters from vehicle and equipment maintenance can be prevented and reduced by observing some of the following procedures and techniques:

This practice involves using off-site facilities, performing work in designated areas only, providing cover for materials stored outside, checking for leaks and spills, containing and cleaning up spills immediately.

- Employees and subcontractors should be trained to use proper maintenance and spill cleanup procedures.
- Equipment should be kept clean in order to prevent the excessive build up of oil and grease.
- Use designated areas when performing maintenance work on equipment or when changing motor oil. Use drip pans, drop clothes or containers under the areas that might drip while working on a vehicle outdoors.
- Incoming vehicles should be checked for leaking oil and fluids. Wrecked vehicles should be kept in a covered area, all fluids should be drained, and cracked batteries should be stored in a secondary container.
- Maintain a yard storm drain inlet(s).
  - Clean regularly and especially after large storms.
  - Do not hose down work areas.
- Regularly inspect equipment and vehicles for leaks and repair immediately. Keep the equipment yard clean.
- Recycle greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids.
- Separate wastes such as hazardous and nonhazardous wastes, oils and solvents, chlorinated solvents and unchlorinated solvents. This allows for easier recycling and the reduction of disposal costs.

VEHICLE AND EQUIPMENT MAINTENANCE / REPAIR

APPROACH (cont.)

Make sure oil filters are completely drained and crushed before recycling or disposal.
Use recycled products and non-toxic chemicals.
Small spills should be cleaned-up with rags and without large amounts of water. Damp mops can be used for general cleanups, while larger spills will require dry absorbent materials.
Waste oil, antifreeze, detergents, solvents or other vehicle fluids should not be discharged into a storm drain.
Signs should be painted on storm drain inlets to indicate that they are not to receive liquid or solid waste.
Dumpsters that store items awaiting transfer to a landfill such as used oil filters should be covered or located in a lean-to and should not have the drain plug removed.

MAINTENANCE REQUIREMENTS

Inspection maintenance areas on a regular schedule.

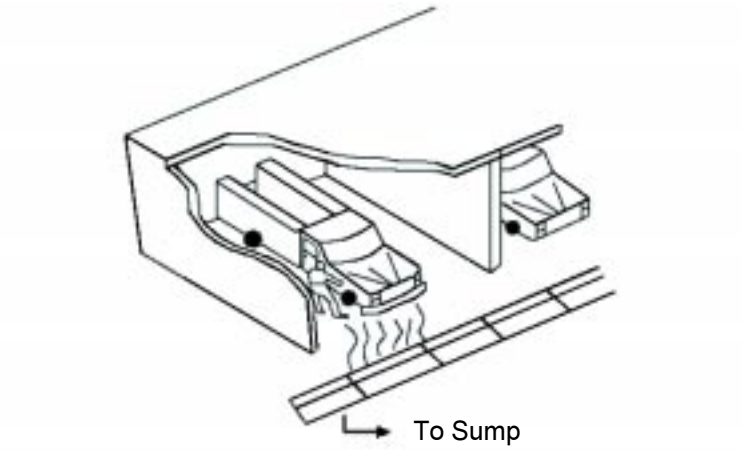
ADVANTAGES

+ All of the application techniques listed above involve low cost measures depending on the size of the facility.
+ Maintenance should be low if the procedures as outlined above are properly followed.

DISADVANTAGES

- Inspections of maintenance areas are needed on a regular basis.
- Space and time limitations may preclude all work being conducted indoors. Vehicles/equipment brought on-site after working hours may not be able to have spills contained and cleaned-up.
- Drip pans (3-ft. x 3-ft.) should be purchased or fabricated in order to contain antifreeze.
- The identification of engine leaks may require the use of solvents.

VEHICLE AND EQUIPMENT WASHING, CLEANING



APPLICATIONS

POLLUTANT REMOVAL

LO	Sediment Nutrients Heavy Metals Bacteria & Viruses
MED	Floatable Materials
HI	Toxic Materials Oxygen Demanding Substances Oil & Grease

IMPLEMENTATION REQUIREMENTS

MED	Capital Costs O&M Costs Maintenance Training

DESCRIPTION
BMPs should be used wherever vehicles and equipment are washed. The washing of vehicles can contribute to the pollution of storm water if performed outdoors, or in areas where the wash is able to flow onto the ground. High concentrations of oil and grease, phosphates, surfactants, suspended solids, heavy metals and organics are contained within the wash water.

APPROACH
Employees should be educated on pollution prevention measures.

Use either a designated wash area or an off-sight commercial washing facility where the site is covered, paved, and runoff of storm water is prevented. Create a berm outside this area to contain wash water if needed.

Phosphate free detergents should be used.

Filter, recycle, or discharge wash water to a sanitary sewer, process treatment, or a dead-end sump.

Steam cleaning wash water should not be disposed of in a storm drain.

BMP - 27

VEHICLE AND EQUIPMENT WASHING, CLEANING

DESIGN CRITERIA

- ♦ Wash water from vehicles and equipment cleaning should be discharged to the sanitary sewer whenever possible. The discharge pipe should have a positive control valve that can be shut when washing is not occurring in order to prevent the entry of storm water. If this is not possible and washing is conducted in an outside area, then this area should be designated as a wash zone, and the following elements should be incorporated in the wash area design:
  - Pave with Portland Cement
  - Berm the area to prevent runoff from entering the wash area
  - Slope wash area for wash water collection
  - discharge wash water to the sanitary sewer, process treatment , or a dead-end sump
  - Clearly mark the wash zone

MAINTENANCE REQUIREMENTS

Berms will need repair and patching.
Sumps will need to be cleaned-out.

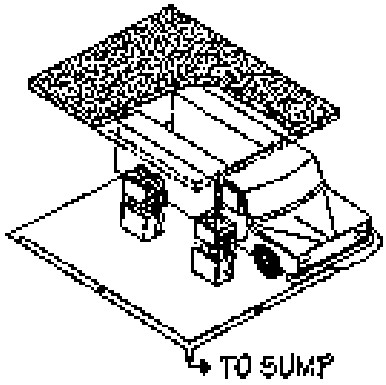
ADVANTAGES

+ The costs are low for the repair and patching of berms.

DISADVANTAGES

- Some municipalities may require pretreatment (such as sand and grit traps) and monitoring of wash water discharges to the sanitary sewer.
- Steam cleaning can generate significant pollutant concentrations requiring permitting, monitoring, pretreatment, and inspections.
- Generally a permit is required if wash water is discharged off the property.

VEHICLE AND EQUIPMENT FUELING



APPLICATIONS

POLLUTANT REMOVAL

LO	Sediment Nutrients Heavy Metals Bacteria & Viruses Floatable Materials
MED	Oil & Grease
HI	Toxic Materials Oxygen Demand-ing Substances

IMPLEMENTATION REQUIREMENTS

MED	Capital Costs O&M Costs Maintenance Training

DESCRIPTION

Most transportation and repair facilities have to deal with fuel spills and leaks. Fuel spills and leaks contaminate storm water with sediment, toxic materials, floatable materials, oxygen-demanding substances, and oil/grease. BMP measures should be practiced.

APPROACH

- Use off-site fueling stations as much as possible. Performing this work off-site can also be economical by eliminating the need for a separate fueling area at your site.
- If fueling occurs on-site, use designated areas.
  Install spill overflow prevention equipment.
  Minimize exposure to storm water by covering fueling area.
  Install oil/water separators and/or grease traps in nearby storm drains.
  Locate designated area away from drainageways to prevent the runoff of storm water and the runoff of spills.
  Discourage “topping-off” of fuel tanks.
- Always use a secondary containment, such as a drain pan or drop cloth, to catch spills or leaks.
- Use dry cleanup methods instead of washing down or burying spills. Place a stockpile of spill cleanup materials where it will be readily accessible.
- Use absorbent materials on small spills. Remove the absorbent materials promptly and dispose of the materials properly.
- Comply with all federal and state requirements regarding stationary above ground storage tanks.
- If using underground storage tanks (US) then install US leak detection equipment or procedures.
- Educate employees and subcontractors in proper fueling and cleanup procedures and encourage them to participate.

BMP - 28

VEHICLE AND EQUIPMENT FUELING

DESIGN CRITERIA

Install spill overflow prevention equipment, and US leak detection equipment.
Cover fueling area to minimize exposure to storm water. Install oil/water separators and/or grease traps in nearby storm drains.

MAINTENANCE REQUIREMENTS

Inspections of fueling areas and storage tanks should be carried out on a regular basis. Covered fueling areas require routine maintenance for oil/water separators and grease traps. For spill control maintenance, an ample supply of spill cleanup materials should be kept on-site.

ADVANTAGES

+ Costs of the above measures should be low except for cover installation. However, the costs for covering will vary depending on the size of the area.

DISADVANTAGES

- The capital costs of above ground tanks are higher. Above ground tanks are required to meet strict environmental, zoning, and fire code regulations.
- The oil/water separators associated with vehicle equipment fueling have to be maintained to prevent the pollution of storm water.

SPILL PREVENTION AND CONTROL

APPLICATIONS

POLLUTANT REMOVAL

LO Sediment, Nutrients, Floatable Materials, Other Construction Waste

MED Oil & Grease Toxic Materials

IMPLEMENTATION REQUIREMENTS

LO Capital Costs Maintenance

MED O&M Costs Training

BMP - 29

DESCRIPTION

In order to prevent and reduce the discharge of contaminants into storm water, leaks and spills can be reduced by making an effort to stop the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees and subcontractors.

APPROACH

- General measures can be taken to reduce the impacts of leaks and spills to storm water. Such as:
  - Storing hazardous materials and wastes in covered containers and protecting them from vandalism.
  - Making spill cleanup materials easily accessible.
  - Training employees in spill prevention and cleanup techniques.
- In the case of a significant spill, different materials pollute at different levels. If employees are educated about the substances that they come in contact with they will be able to identify a “significant spill” versus an “insignificant spill” and react with the necessary appropriate response.
- Cleanup leaks and spills immediately. If spills occur on paved surfaces, use as little water as possible. A rag can be used for small spills, a damp mop for general cleanups, and absorbent materials for larger spills. If dealing with a hazardous material, cleanup materials must be disposed of as hazardous waste.
- Cleanup as much of the material as possible and dispose of properly. Dry materials spilled should never be hosed down or buried.
- In the case of a significant spill, a report should be made to local agencies, such as the Fire Department, who can assist in the cleanup.
- For any significant oil spill into a water body or onto an adjoining shoreline, federal regulations require that the National Response Center (NRC) be reported to at 800-424-8802 (24 hours).

Vehicle and Equipment Maintenance

- During on-site maintenance, maintain it away from drainage courses in a designated area and/or a secondary containment (drain pan or drop cloth), that is located away from drainage courses.
- Regularly inspect on-site vehicles and equipment. Repair leaks immediately. Check incoming vehicles and equipment for leaks.
- Place drip pans or absorbent materials under paving equipment when not in use.
- For small spills use absorbent materials. Never hose down or bury the spill.
- Remove the cleanup materials, used fluids, and other materials promptly and dispose of properly (Oil filters can be recycled).
- Keep cracked batteries in a secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

SPILL PREVENTION AND CONTROL

APPROACH (cont.)

Vehicle Equipment Fueling
- For on-site fueling, use designated areas located away from drainage courses.
- Use a secondary containment, such as drain pan, when fueling to catch spills/leaks. Discourage "top-ping-off" of fuel tanks.

MAINTENANCE REQUIREMENTS

Keep ample supplies of spill control and cleanup materials on-site, near storage, unloading, and maintenance areas. Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals on-site.

ADVANTAGES

+ Prevention of leaks and spills is inexpensive

DISADVANTAGES

- An experienced spill cleanup company may be required for certain types of spills.
- Treatment and/or disposal of contaminated soil or water can be quite expensive.