Maintaining Your BMP

A Guidebook for Private Owners and Operators in Northern Virginia

Types of BMPs • Maintenance Needs Overview • Who Should Carry Out Maintenance • Inspecting Your BMP • Planning for BMP Maintenance Costs
BMP Resource Guide

A Project of the Northern Virginia Planning District Commission
Division of Environmental Services
February, 2000

BMP Resource Guide

LOCAL GOVERNMENT AGENCIES

Information on maintenance agreements and responsibilities.

Arlington County: Water, Sewers, and Streets Division ..... (703) 228-6485
City of Alexandria: Transportation and Environmental Services ..... (703) 838-4327
Town of Dumfries: Public Works ..... (703) 221-3400
Fauquier County: Community Development ..... (540) 347-8660
Town of Leesburg: Engineering and Public Works ..... (703) 771-2790
Fairfax County: Maintenance and Stormwater Management Division
Engineering Office ..... (703) 934-2860
Public Works ..... (703) 934-2800
City of Fairfax: Public Works, Stormwater Supervisor ..... (703) 385-7979
City of Falls Church: Public Works ..... (703) 248-5080
Town of Herndon: Public Works ..... (703) 435-6853
Loudoun County: Building and Development ..... (703) 777-0397
City of Manassas: Public Works ..... (703) 257-8378
City of Manassas Park ..... (703) 335-8820
Prince William County: Environmental Services ..... (703) 792-7070
Town of Vienna: Public Works ..... (703) 255-6381

SOIL AND WATER CONSERVATION DISTRICTS

Information on erosion and sediment control.

John Marshall SWCD (Fauquier County) ..... (540) 347-3120
Loudoun SWCD ..... (703) 771-8395
Northern Virginia SWCD (Fairfax County) ..... (703) 324-1460
Prince William SWCD ..... (703) 361-1710

VIRGINIA COOPERATIVE EXTENSION

Information on vegetation and landscape management.

Arlington County ..... (703) 228-6400
City of Alexandria ..... (703) 519-3325
Fairfax County ..... (703) 324-8556
Fauquier County ..... (540) 347-8650
Loudoun County ..... (703) 777-0373
Prince William County ..... (703) 792-6289

ADDITIONAL PUBLICATIONS

Planting and Preserving Trees in and around Stormwater Management Ponds (Fairfax County DPWES) ..... (703) 934-2860
How Does Your Garden Grow? A Reference Guide to Enhancing Your Rain Garden (Prince George's County, Maryland) ..... (301) 883-5935
Management of Virginia's Ponds for Fishing (Virginia Department of Game and Inland Fisheries) ..... (804) 367-1000
Simple Things You Can Do to Clean Up Our Urban Streams and the Chesapeake Bay (NVPDC) ..... (703) 642-0700
You and Your Land (NVSWCD) ..... (703) 324-1460

Maintaining Your BMP

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BMPs, or Best Management Practices, are facilities designed to reduce the impacts of pollutants and increased stormwater on local streams caused by development. They are an essential part of the region's efforts to restore aquatic habitats in the Potomac River and the Chesapeake Bay. However, BMPs will fail prematurely if not properly maintained. Once a BMP fails, it will no longer perform its intended functions and it is often very expensive to replace.

Whether you are an individual property owner, a homeowners association representative, or a residential/commercial property manager, this Guidebook outlines basic maintenance and planning tasks that will help keep your BMP functioning properly.

Contents

THIS GUIDEBOOK IS NOT a set of rules and regulations or a manual that provides guidance on how to design or build a BMP.

As you read through this Guide...

A thoughtful BMP maintenance program will save money and time in the long run. Key points to remember as you read through this Guidebook include:

Identify Facility Characteristics and Maintenance Needs. Understand how your facility works and its specific maintenance needs. While this Guidebook includes general information on the maintenance needs of common BMPs, valuable information can also be gained by consulting with your local government.

Check Your Maintenance Agreement. If you have a BMP maintenance agreement with your local government, this document should be consulted often to determine your specific obligations.

Define Maintenance Tasks, Personnel, and Equipment. Defining maintenance tasks and who will undertake these tasks – along with establishing a regular inspection program – is the core of a successful BMP maintenance program.

Identify Costs and Allocate Resources. While routine maintenance costs can typically be predicted for an annual budget, some BMP maintenance tasks will require infrequent but considerable expenses. Non-routine expenses need to be identified, and a long-term fund allocation plan needs to be developed.

Involve the Community. Pollutants treated by your BMP are generated from surrounding yards, streets, and businesses. Implementing a pollution prevention program and educating neighbors on the purpose of the BMP is a cost effective way to prolong its life and to protect water quality.

Establish a Record Keeping Procedure. Establishing a record keeping procedure will help to define chronic maintenance problems and aid in future budget preparation. A periodic examination of maintenance practices will help identify potential problems early.

BMP Lingo

Like many technical professions, the world of BMP maintenance has a language all its own. The following is a glossary of common BMP terms.

- **Access Systems.** Measures and devices that provide access to facility components by maintenance personnel and equipment.
- **Aeration.** The process of introducing air space into soil.
- **Anti-vortex Device.** A device that promotes the settling of pollutants by preventing a whirlpool from occurring at the outlet device.
- **Berm.** An elongated ridge of material that is used to hold or direct stormwater.
- **BMP.** Best Management Practice.
- **Bypass System.** A system which allows maintenance by temporarily diverting stormwater.
- **Dam/Embankment.** The wall or structural fill that impounds runoff in the facility.
- **Emergency Outlet/Spillway.** The structure that safely conveys overflows from the facility.
- **Emergent Plants.** An aquatic plant that is rooted in sediment but whose leaves are at or above the water surface.
- **Filter Fabric/Geomembrane.** A webbed fabric which serves to filter pollutants or to hold a filter medium such as gravel or sand in place.
- **Impervious Cover.** Any hard surface material that prevents water from sinking into the soil.
- **Perimeter.** The outward boundary of the BMP.
- **Principal Outlet.** The structure that controls and conveys the facility's outflow.
- **Pump System.** Electrical/mechanical components including pipework used to convey BMP discharge under pressure.
- **Rip Rap.** A layer or mound of large stones placed to prevent erosion.
- **Riser.** A vertical pipe extending from the bottom of a BMP that is used to control the rate of stormwater discharge.
- **Side Slopes.** Slopes at dams, embankments, spillways, and the facility perimeter.
- **Swale.** An elongated depression in the land used to channel runoff.
- **SWM.** Storm Water Management.
- **Trash Rack.** Device placed upstream of the principal outlet or drain to intercept debris.
- **Trickle Ditch/Low Flow System.** Measures that convey low and dry weather inflows to the principle outlet without detention.
- **Vegetative Cover.** Vegetation used to stabilize surfaces and/or provide stormwater treatment.

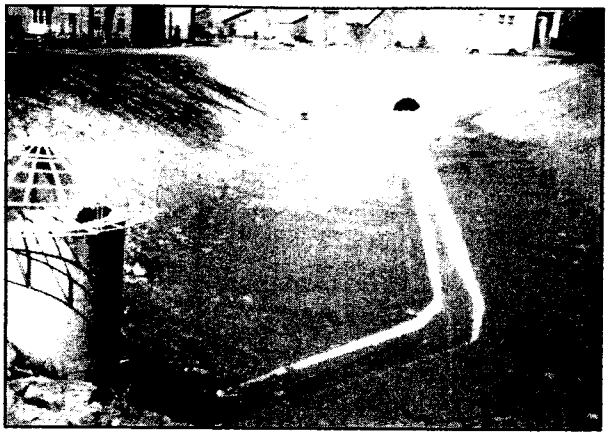
Do You Have a BMP?

Do you have a BMP? Simple depressions, ponds, or ditches that you see every day may actually be engineered facilities designed to improve water quality and reduce flooding.

BMP, which is short for Best Management Practice, is the term used to describe a structure or facility that reduces the impacts of development on water quality and aquatic habitats. Pollutants caused by urban development (called nonpoint source pollution) include sediment, nutrients, motor oil, lawn care products, and anything else that can wash from roof tops, driveways, parking lots, lawns, and streets during a storm event. In addition, urban stormwater drainage patterns, which do not allow stormwater to infiltrate into the ground, can often result in flooding.

BMPs operate by temporarily detaining or slowing stormwater, after which a number of pollutant removal mechanisms are employed (see pages 4 and 5 for additional details). Some BMPs, such as sand filters, can be located completely underground, making their presence difficult to detect. However, most BMPs are located on the surface. The two most common BMPs in Northern Virginia – dry ponds and wet ponds – are pictured to the right.

If you do have a BMP, you are not alone. A variety of laws, including the Virginia Chesapeake Bay Preservation Act, the Virginia Stormwater Management Act, and the federal Clean Water Act, encourage or require the control of urban pollutants. As such, maintaining your BMP is an important part of Northern Virginia's environmental protection efforts.



TYPICAL DRY POND

TYPICAL WET POND

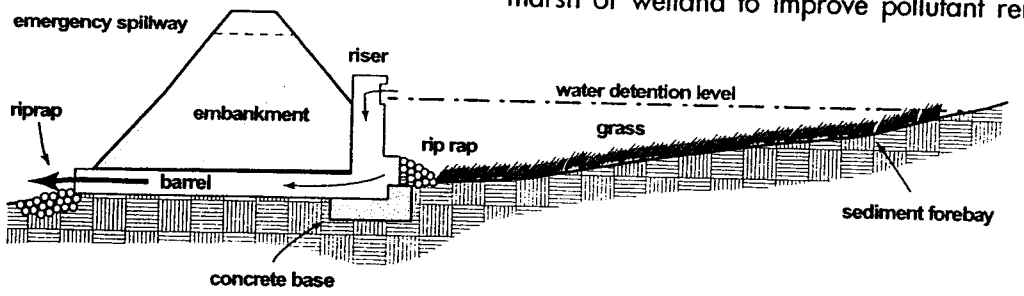
Which Type of BMP Do You Have?

There are many types of BMPs. Taking a moment to understand what kind of BMP you have and how it works will help you to better plan for its maintenance needs.

EXTENDED DETENTION BASINS – "DRY PONDS" [FIG 1] Dry ponds retain water for a specified period of time (usually 48 hours) after a storm. Water is impounded temporarily to allow many of the pollut-

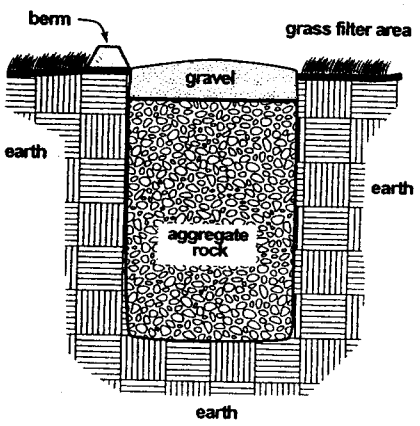
ants to settle to the bottom. The impounded water is discharged through an outlet that provides for prolonged release. These are the most common BMPs in Northern Virginia. Most dry ponds do not contain a permanent pool of water, and no water will remain if it is functioning properly. Some dry ponds, however, incorporate a shallow marsh or wetland to improve pollutant removal. These

FIG 1



facilities are known as extended detention wetland basins or two stage detention ponds. **It is important to determine whether standing water is by design or a sign that maintenance is required.**

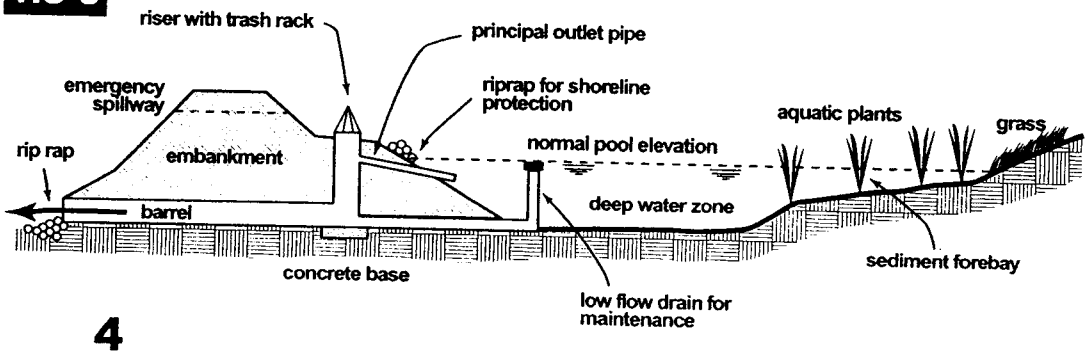
FIG 2



INFILTRATION TRENCHES [FIG 2] Infiltration trenches are gravel-filled excavations that temporarily store stormwater and allow it to sink into the underlying soil. Stormwater can enter the facility in one of two ways. In a dispersed input facility, water from impervious surfaces is directed over a gently sloping grassed area to remove large particles that otherwise might clog the facility. In a concentrated input facility, runoff is transferred to the trench directly from curb inlets, gutters, and pipes.

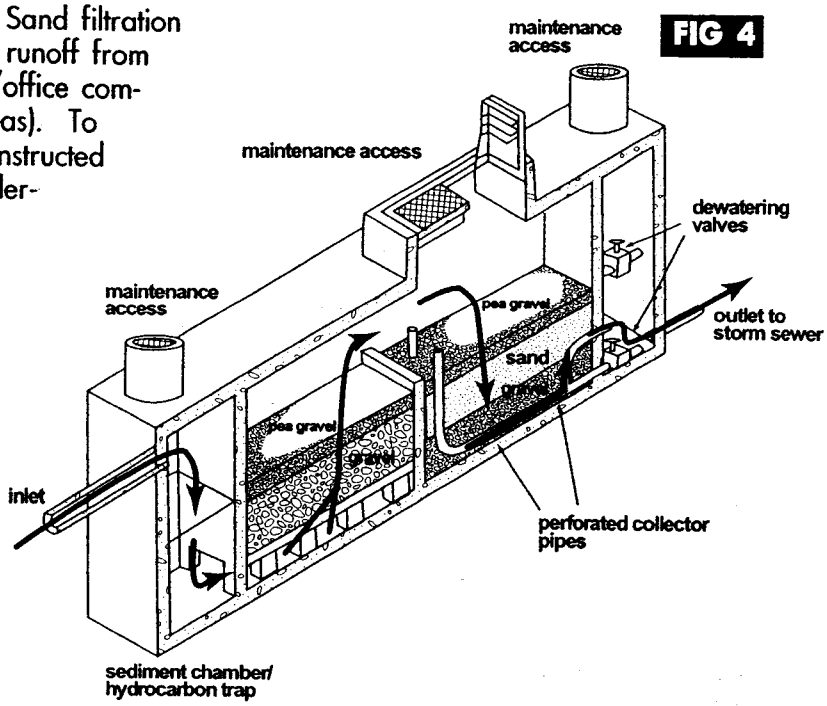
RETENTION BASINS – "WET PONDS" [FIG 3] Wet ponds contain a permanent pool of water much like a lake. The wet pond is designed to hold a permanent pool, above which stormwater runoff is temporarily stored and released at a controlled rate. The release is regulated by an outlet similar to that employed in a dry pond. The advantages of a wet pond over a dry pond are higher pollutant removal and less chance that pollutants will be resuspended during a storm. Wet ponds can also serve as an aesthetic or recreational amenity as well as a habitat for some wildlife. However, wet ponds pose a higher safety liability than other BMPs.

FIG 3



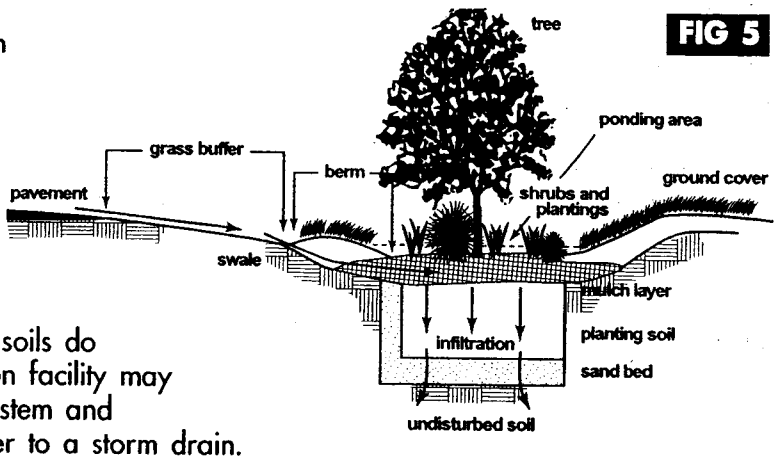
SAND FILTRATION SYSTEMS [FIG 4] Sand filtration systems (sand filters) are used to treat runoff from highly impervious settings (commercial/office complexes and high density residential areas). To save space, sand filters are usually constructed inside a concrete shell and placed underground. Sand filters work by slowly filtering stormwater through a layer of sand (and sometimes a sand/peat mix), and pollutants are removed when they become trapped between sand particles and other filter media. In some filters, microbes help remove pollutants through bio-chemical conversion.

FIG 4



BIORETENTION FACILITIES – "RAIN GARDENS" [FIG 5] Bioretention facilities, or "rain gardens" as they are often called, are basins designed to mimic the conditions found on a mature forest floor. Configured to act as a sink and underlain with specific layers of soil, sand, and organic mulch, runoff is trapped and treated by vegetation and microbes. The facility is planted with specific types of vegetation, some of which are selected because of their ability to bind and convert pollutants to biomass. In areas where the local soils do not support infiltration, a bioretention facility may be underlain by a sand filtration system and underdrain that carries treated water to a storm drain.

FIG 5



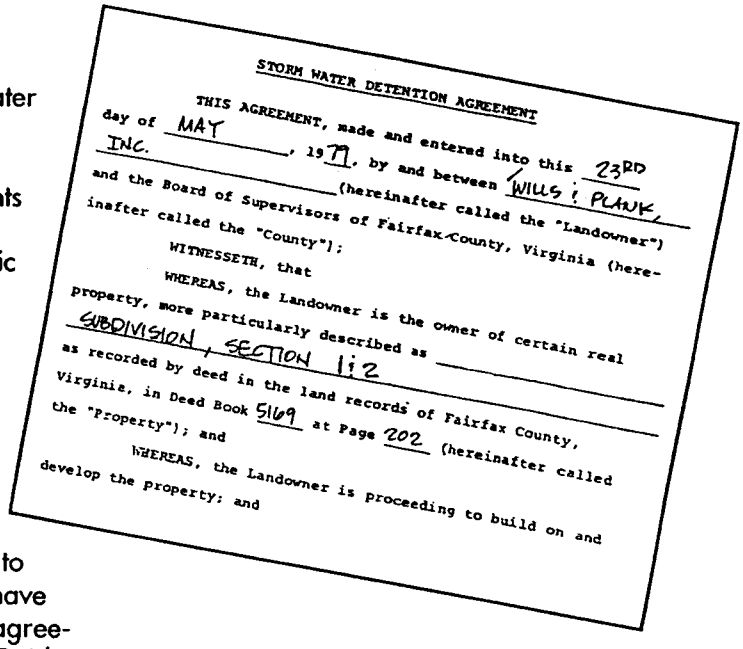
GRASSED SWALES [FIG 6] Grassed swales can be seen along many of Virginia's roadways, although they are not always designed to treat stormwater. Typically, grassed swales are concave, earthen conveyance systems designed to simply transfer runoff. As a water quality device, a grassed swale is constructed to allow stormwater to soak into the soil, and particles are trapped by the groundcover – usually turf grass. Many swales are constructed with berms (small dams made of earth, rock, or wood) to create temporary ponds that prevent erosion and help promote infiltration of stormwater into the soil.

FIG 6

If you don't recognize any of these BMPs, call your local government contact to find out what you have and whether it has special maintenance requirements.

Are You Responsible for BMP Maintenance?

We are all responsible for protecting water quality. But are you responsible for the maintenance and upkeep of your BMP? Many Northern Virginia local governments will maintain stormwater management facilities in residential areas under specific conditions. However, **if your community or business is subject to a BMP maintenance agreement, most likely you are the responsible party.** It is important to check your maintenance agreement to identify your specific legal obligations – although doing a little extra never hurts. If you are not sure who is responsible for maintenance, are unable to locate your maintenance agreement, or have questions about what your maintenance agreement means, refer to the BMP Resource Guide at the front of this Guidebook.



STORM WATER DETENTION AGREEMENT

THIS AGREEMENT, made and entered into this 23RD day of MAY, 19 77, by and between WILLS & PLANK, INC. (hereinafter called the "Landowner") and the Board of Supervisors of Fairfax County, Virginia (hereinafter called the "County");

WITNESSETH, that

WHEREAS, the Landowner is the owner of certain real property, more particularly described as SUBDIVISION, SECTION 1&2 as recorded by deed in the land records of Fairfax County, Virginia, in Deed Book 5169 at Page 202 (hereinafter called the "Property"); and

WHEREAS, the Landowner is proceeding to build on and develop the Property; and

THE BOTTOM LINE. A maintenance agreement sets out your legal obligations.

Maintenance Needs Overview

A consistent maintenance program is the best way to ensure that a BMP will continue to perform its water quality functions. In general, a maintenance program should contain the components listed below.

- Regular Inspections
- Vegetation Management
- Embankment and Outlet Stabilization
- Debris and Litter Control
- Mechanical Components
- Insect Control
- Access Maintenance
- Overall Pond Maintenance
- Sediment/Pollutant Removal
- Components Replacement

Actual maintenance needs will obviously vary according to the specific facility and site conditions. The following are a few factors affecting type and frequency of maintenance that will be needed.

- **Visibility of the Facility.** The needs and preferences of the surrounding community will determine to a large extent the amount of maintenance for aesthetic purposes.

- **Landscaping.** Maintenance needs will vary considerably depending upon the types of vegetation used in landscaping. Rain gardens in particular will require special attention to vegetation management.

- **Upstream Conditions.** The condition of the watershed upstream of the facility can significantly impact the amount of sediment and other pollutants that a facility must manage. Erosion problems upstream can dramatically increase the amount of sediment entering the facility. Upstream commercial and recreational areas may also result in an increased need for litter removal.

UNTIMELY DEMISE. Over half of BMPs fail in the first five years due to lack of proper maintenance.

A BMP maintenance program should also consider the following.

- **Safety.** Since BMPs often involve the impoundment of water, the safety of nearby residents or customers must be considered. This includes maintaining appropriate fencing and signage.

- **Need for Professional Judgment.** BMPs are water treatment facilities. While some maintenance can be undertaken by a non-professional, the judgment of a professional should be consulted regularly.

- **Financing.** The costs associated with non-routine BMP maintenance tasks can be considerable. A fund should be established to provide for the costs of long-term maintenance needs such as sediment removal.

Routine Maintenance Needs

Routine maintenance will keep your BMP functioning properly and will pay off in the long run by preventing unnecessary repairs. The following is an overview of the common routine maintenance needs of most BMPs.

REGULAR INSPECTIONS

Your local government will require a particular schedule of inspections for your BMP. In many instances, an annual or semi-annual inspection, depending on the facility, is required. It will also be necessary to conduct an inspection any time that the BMP's capacity has been surpassed. Some BMPs, such as sand filters, may require more frequent inspections. Additional information on who needs to carry out inspections is provided under *Inspecting Your BMP* on page 14.

VEGETATION MANAGEMENT

Most BMPs rely on vegetation to filter sediment from stormwater before it reaches the BMP and to prevent erosion of the banks and the bottom of the facility. Turf grass is the most common groundcover – although many BMPs use woody vegetation (rain gardens) and wetland plants (wet ponds) to increase pollutant removal.

The following is a quick reference of ways to help your vegetation stay healthy.

- **Mowing.** Most grass is hardiest if it is maintained as an upland meadow, cut no shorter than 6 to 8 inches. If a more manicured look is desired, special attention to the health of the turf is needed. Grass should never be cut below 4 inches. Grass

on embankments should be cut at least twice during both growing seasons and once during the summer. Guidance documents are available to help set your blade at the appropriate height for the specific turf grass (see *BMP Resource Guide*).

- **Pest and Weed Control.** To reduce the amount of pollutants reaching the BMP, avoid overfertilization and excess pesticide use. Your local Virginia Cooperative Extension office (see *BMP Resources Guide*) can provide additional information.

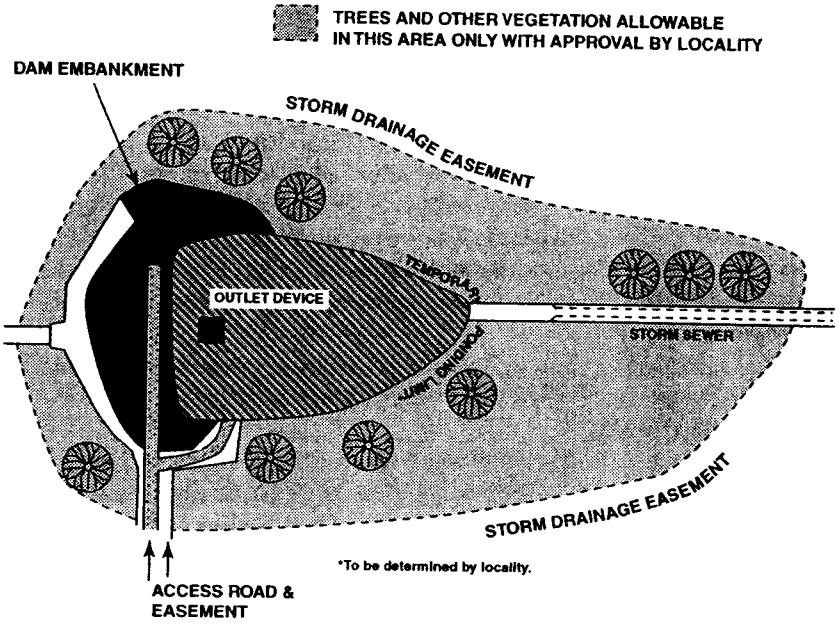
- **Removing Sediment Build-Up.** Because vegetation surrounding a BMP is designed to trap sediment, it is likely to become laden with sediment and bare spots may emerge. Bare areas should be vigorously raked, backfilled if needed, and covered with top soil. Disturbed areas should be seeded (a tall fescue grass seed is recommended) and mulched. Excess material should be taken off-site and can be used as a mulch or soil supplement. If the soil becomes compacted, it will require aeration by a landscape company.

- **Unwanted Vegetation.** Some vegetation is destructive to a BMP. Keeping dam and bottom areas free of deep-rooted vegetation (trees and bushes) is critical because roots can destabilize the structure. Consistent mowing and monitoring will control any unwanted vegetation.

- **No Mow Zones.** For wet ponds, a 10 foot un-maintained vegetated buffer around the perimeter of the facility (exclusive of the dam embankment) may be established to filter pollutants from adjacent properties and to help prevent shoreline erosion.

DESTABILIZING INFLUENCE. Trees on embankments and bottom areas will destabilize the BMP.

Activities that have the potential to damage vegetation or compact the soil should be avoided. What may seem like a harmless activity (sports activities, inappropriate landscaping, etc.) could take years off the life of your facility. **Before altering vegetation in a BMP, contact your local government.**

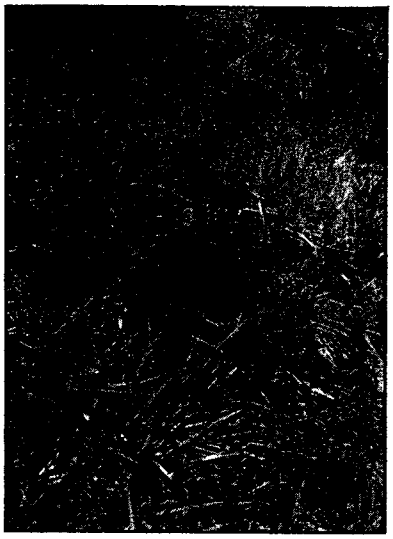


VEGETATION MANAGEMENT. Vegetation management is critical in areas immediately surrounding almost all BMPs. The accompanying figure shows critical management areas for wet and dry ponds. Woody vegetation should be avoided in all areas except where they will not affect structural components or maintenance access. Always check with your local government before planting.

EMBANKMENT AND OUTLET STABILIZATION

A stable embankment is important to ensure that erosion does not contribute to water quality problems and that embankments are not breached – resulting in downstream flooding. Maintaining a healthy vegetative cover and preventing the growth of deep-rooted (woody) vegetation on embankment areas is an important component of stabilization.

Animal burrows will also deteriorate the structural integrity of an embankment. Muskrats in particular will burrow tunnels up to 6 inches in diameter. Efforts should be made to control excessive animal burrowing, and existing burrows should be filled as soon as possible.



BURY THE BURROWS. Fill animal burrows quickly to prevent destabilization.

Outlet structures are particularly prone to undercutting and erosion. Unchecked, a small problem can easily result in the need to replace the entire structure. A professional engineer should be consulted if sink holes, cracking, wet areas around the outlet pipe, pipe displacement, or rusting of the pipe are observed.

DEBRIS AND LITTER CONTROL

Regular removal of debris and litter can be expected to help in the following areas:

- reduce the chance of clogging in outlet structures and trash racks;
- prevent damage to vegetated areas;
- reduce mosquito breeding habitats;
- maintain facility appearance; and,
- reduce conditions for excessive algae growth.

Special attention should be given to the removal of floating debris which can clog inlet and outlet devices. If trash or dumping is particularly problematic, outreach to the local community can help (see *Involving the Whole Community*, page 12).

MECHANICAL COMPONENTS

Some BMPs have mechanical components that need periodic attention – valves, sluice gates, pumps, anti-vortex devices, fence gates, locks, and access hatches should be functional at all times. This type of routine maintenance is best left to a BMP professional.

INSECT CONTROL

Mosquito and other insect breeding grounds can be created by ponded water. Though perceived as a significant nuisance, mosquitos are not as big a problem as is often thought, and there are ways to address the issue. The best control technique is to ensure that stagnant pools of water do not develop. For BMPs that have a permanent pool of water, this means the prompt removal of floatable debris. It may also be possible in larger wet ponds to maintain a stock of fish that feed on mosquito larvae. The Department of Game and Inland Fisheries can provide additional information on this management option (see *BMP Resource Guide*).

The development of a mosquito problem, particularly in dry ponds, infiltration trenches, and rain gardens, is usually an early indication

LITTER REMOVAL. Not only are litter and debris unsightly, they can clog BMP components and create conditions perfect for insects.

that there is a maintenance problem. In such cases, the infiltration capacity of the BMP needs to be increased or sediment needs to be removed.

ACCESS MAINTENANCE
Most BMPs are designed so that heavy equipment can safely and easily reach the facility for non-routine maintenance. Routine maintenance of these areas is particularly important since one never knows when emergency access will be needed. Maintenance includes removal of woody vegetation and upkeep of gravel areas.

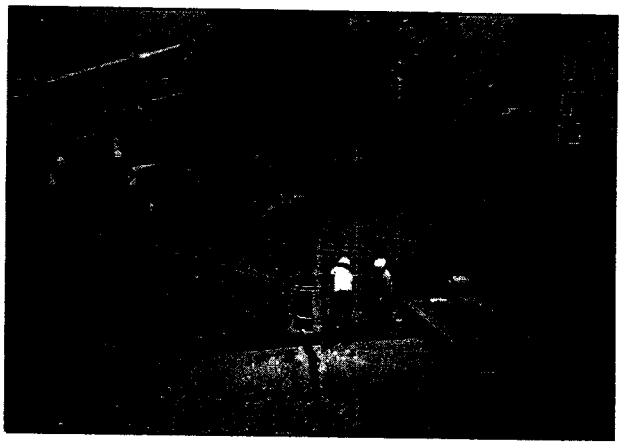
OVERALL POND MAINTENANCE
An often overlooked aspect of maintenance, especially for wet ponds, is the need to ensure a healthy aquatic ecosystem. A healthy ecosystem should require little maintenance. An indicator of an unhealthy system is excessive algae growth or the proliferation of a single species of plant in the permanent pool of a wet pond. This may be caused by excess nutrients from fertilization practices (of a landscape company or surrounding neighbors) or by excess sediment. Steps should be taken to reduce the nutrients at their source and to encourage the growth of more desirable aquatic and semi-aquatic vegetation in and around the permanent pool. The Department of Game and Inland Fisheries can provide additional information on overall pond maintenance practices (see *BMP Resource Guide*).

INVASION. An invasion of a single aquatic species (such as water chestnut), indicates an unhealthy aquatic system.

Non-Routine Maintenance Needs

The non-routine maintenance needs of a BMP, while infrequent, can be major undertakings and should always be performed by a professional. While tasks will vary by facility, they typically include sediment/pollutant removal and replacement of BMP components.

SEDIMENT/POLLUTANT REMOVAL
Since the primary purpose of a BMP is to remove sediment and other pollutants (which are usually attached to sediment) from stormwater, sediment will naturally accumulate in a BMP and eventually need to be removed. Facilities vary so dramatically in terms of removal requirements that there are no fast "rules of thumb" to guide responsible parties. For instance, dry ponds should be cleared of sediment once a significant portion of the BMP volume (25-50%) has been filled. For wet ponds, a minimum water depth of approxi-



REPAIR AND REPLACEMENT. The dam and outlet of a dry pond in the process of repair after failure.

mately 3 feet is desirable. Sediment/pollutant removal needs of individual BMP types are discussed on pages 20 and 21.

Sediment and pollutants will need to be discarded. The best solution is to have an onsite area or a site adjacent to the facility (outside a floodplain) set aside for sediment. When sediment is stored near the facility, it is important to protect the stockpile against erosion. If onsite disposal is not an option, transportation and landfill tipping fees can greatly increase sediment removal costs. Once the sediment is removed, the facility should be quickly restabilized, either through revegetation or, in the case of a sand filter, replacement of sand and other filter media if necessary.

Finally, wet sediment is more difficult and expensive to remove than dry sediment. In some cases, the entire facility can be drained and allowed to dry so that heavy equipment can remove sediment from the bottom. In other cases, it may be necessary to remove sediment from the shoreline or by hydraulic dredging from the surface. A permit may be required for removal and proper disposal of sediment. Contact your local government for assistance.

BMP COMPONENTS REPLACEMENT

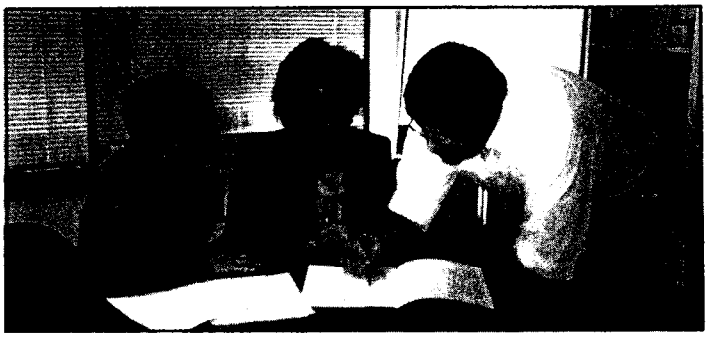
Eventually, like most infrastructure, actual BMP components will need to be replaced. Components may include:

- inflow and outflow devices;
- trash racks and ani-vortex devices;
- valves, orifices, and aerators;
- concrete structures (such as the casing for a sand filter);
- pumps and switches;
- earthworks such as embankments and side slopes; and,
- mulches and vegetation.

While most BMPs will last for a long time with proper maintenance, a community or business should plan long in advance for replacing these facilities.

Who Should Carry Out Maintenance?

In determining who should carry out maintenance activities, safety, cost, and effectiveness need to be balanced. Some activities can be undertaken effectively by a facility owner if desired. Maintenance tasks that are appropriate for a facility owner may include simple landscaping, education of those who are served by the facility, litter removal, and some routine maintenance.



COMMUNICATE. Sit down with your lawn care company to ensure that your BMP is being treated as a water quality protection device.

While engaging a community or business in routine maintenance is a great way to educate people about the facility's purpose, it is strongly recommended that a professional landscaping company be hired for more difficult work. Mowing and handling a wheelbarrow can be dangerous on sloping embankments. Filling eroded areas, and soil disturbing activities, such as resodding and replanting vegetation, are also items that a professional landscaping firm might best manage. Trained personnel may be able to identify problems in their early stages of development when it is most cost effective to make repairs.

Who Should Carry Out Maintenance?

WORKING WITH LAWN CARE COMPANIES

Communicate to your lawn care company that your BMP is a water treatment system and requires special attention. While most companies have the ability to perform special maintenance, many will not unless specifically asked. Contact a company manager to discuss how their services can be tailored to help with BMP maintenance objectives.

- Communicate that the facility is a water quality protection device.
- Communicate specific instructions on mowing practices, for instance mowing at a higher level and perhaps not as frequently. Ask that heavy equipment be avoided where possible and particularly in vegetated pre-treatment areas.
- Communicate the need to keep sediment from building up in grassy areas and the need to keep the BMP facility clear of grass clippings (by the company and residents).
- Ask whether the company follows an integrated pest management (IPM) plan to minimize the application of pesticides and fertilizers. An IPM plan can include:
  - ✓ use of pesticides only as needed and only on trouble spots;
  - ✓ use of alternatives to pest controls or no pesticides; and/or,
  - ✓ policy of not applying chemicals when there is heavy rainfall in the forecast.

If that company cannot oblige, consider switching to a lawn care company that will.

INVOLVING THE WHOLE COMMUNITY

Even if day-to-day maintenance is left to a professional, involving the entire community in certain BMP maintenance activities is a cost-effective way to prolong the life-span of the facility and to prevent pollution. Involving the community can take the form of BMP clean-up days or community education.

In many instances, people are not aware of the cumulative effects of small acts of pollution on local water quality. Others are not aware that their activities contribute to pollution at all. Through public education, people are made aware of how their actions impact water quality, and they become vested in protecting their environment. As your business or community considers developing a public education program, consider the following questions.

- What pollution problems need to be addressed? Is litter a problem? Does the BMP have an oil sheen, or has animal waste created problems?
- What activity or activities are responsible for the pollution? Is the oil coming from automobile leakage? Do residents routinely repair automobiles on community streets?

GET NEIGHBORS INVOLVED. A community BMP clean-up day will help people to understand your facility's purpose.

- Who can help implement a community education program? Can a local Boy/Girl Scout troop, chamber of commerce, school, or environmental group be used?
- How will the message reach the targeted community? Possibilities include community meetings, bulletin boards, local newspapers, signage, assistance from the locality, pamphlets, field days, etc.
- How can alternatives to pollution generating activities be encouraged? Find out where used oil and antifreeze recycling stations are located, organize a hazardous household waste day, find out if public trash cans are an option.

Popular programs that the community may wish to consider include:

- storm drain stenciling;
- education on proper pet waste disposal, lawn and garden care, and automotive care; and,
- finding and sharing information on recycling of used motor oil and antifreeze.

A BMP maintenance day is another way to involve the community. Activities that are appropriate for communities to perform in such an event on a periodic basis include:

- removal of debris and litter;
- seeding of bare spots; and,
- landscaping in areas other than the embankments (wildflowers, etc.).

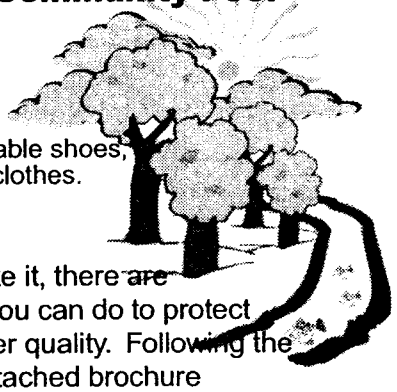
INVOLVE THE COMMUNITY. A BMP maintenance day can help to draw attention to water quality in urban areas. There are a number of resources available to help educate people on ways to protect the environment.

Join Your Neighbors for a BMP Clean Up Day!!

What's a BMP? A BMP, or Best Management Practice, is a facility designed to trap pollutants from our neighborhood before entering Blissful Creek. Blissful Community's BMP is located at the corner of Nice Street and Friendly Court. Keeping our BMP free of debris will help to ensure that it continues to protect downstream aquatic life from harm and to keep our drinking water clean!

Saturday, September 18, 1999
9:00 AM at the Community Pool

Coffee, juice, and doughnuts will be served. Wear durable shoes, gloves, and work clothes.



Even if you can't make it, there are many simple things you can do to protect our community's water quality. Following the suggestions in the attached brochure can help!

Call Concerned Citizen at 555-5252 for more information.

Inspecting Your BMP

Inspecting your BMP allows you to detect problems early and to avoid long term problems. It is also usually a requirement of your maintenance agreement. Inspection requirements vary from jurisdiction to jurisdiction depending on the specific BMP. Some sand filtration systems require monthly inspections while other BMPs can be inspected on a yearly basis. Some localities provide inspections of all facilities while others require that the responsible party arrange for an inspection and send the results for confirmation. **Your local government should be contacted to determine specific requirements and if you need help in selecting a qualified inspector.**

INSPECTIONS. Regular inspections will save headaches and money.

It is unlikely that your lawn care or landscaping company has the know-how or experience to perform a proper, comprehensive BMP inspection. A professional (engineer, landscape architect, surveyor, etc.), or someone who has had appropriate training, should be hired to perform inspections. Since there is no "BMP inspection" listing in the telephone book, call your local government for advice on who to contact and how.

SELF EVALUATION AND WHEN TO CALL A PROFESSIONAL

The development of problems may not coincide with a visit from an inspector – particularly if there are out of the ordinary circumstances. Communities and businesses are encouraged to perform frequent self inspections. It is useful to have an original site plan on hand to help orient yourself. A self inspection should be able to check for:

- unexpected ponding;
- health of vegetation or growth of unwanted vegetation;
- obstructions of the inlet or outlet;
- excessive erosion or sedimentation;
- signs of dumping or pollutants other than sediment;
- cracking or settling of the BMP's structural components;
- wetness on the downstream side of the dam (indicating seepage);
- low spots or sinkholes in bottom areas;
- deterioration of pipes;
- condition of the emergency spillway;
- condition of fences;
- shore erosion;
- stability of the side-slopes and downstream channel conditions; and,
- signs of vandalism.

Inspection of underground systems such as sand filtration systems or infiltration trenches are obviously more difficult. A non-professional should never enter confined spaces meant for maintenance personnel. However, the facility owner should look for:

- water remaining in the system longer than design draw down time;
- obvious signs of excessive sediment build up or debris around the facility; and,
- signs of disturbance of manholes or damage to the structure caused by vehicles or settling.

Depending on the problem, either bring it to the attention of your landscape company or contact a professional BMP inspector.

Sample Self Inspection Checklist

STRUCTURAL INTEGRITY

Yes No N/A
Does the facility show signs of settling, cracking, bulging, misalignment, or other structural deterioration?

Yes No N/A
Do embankments, emergency spillways, side slopes, or inlet/outlet structures show signs of excessive erosion?

Yes No N/A
Is the outlet pipe damaged or otherwise not functioning properly?

Yes No N/A
Do impoundment and inlet areas show erosion, low spots, or lack of stabilization?

Yes No N/A
Are trees or saplings present on the embankment?

Yes No N/A
Are animal burrows present?

Yes No N/A
Are contributing areas unstabilized with evidence of erosion?

Yes No N/A
Do grassed areas require mowing and/or are clippings building up?

WORKING CONDITIONS

Yes No N/A
Does the depth of sediment or other factors suggest a loss of storage volume?

Yes No N/A
Is there standing water in inappropriate areas?

Yes No N/A
Is there an accumulation of floating debris and/or trash?

OTHER INSPECTION ITEMS

Yes No N/A
Is there evidence of encroachments or improper use of impounded areas?

Yes No N/A
Are there signs of vandalism?

Yes No N/A
Do the fence, gate, lock, or other safety devices need repair?

Yes No N/A
Is there excessive algae growth, or has one type of vegetation taken over the facility?

Yes No N/A
Is there evidence of oil, grease, or other automotive fluids entering and clogging the facility?

Yes No N/A
In rain garden BMPs, is there evidence of soil erosion, does mulch cover the entire area, are specified number and types of plants still in place, or is there evidence of disease or plant stress from inadequate or too much watering?

OTHER OBSERVATIONS

_____

_____

_____

_____

_____

_____

A yes answer to any of these items should result in corrective action or a call to a professional inspector.

Planning for BMP Maintenance Costs

BMP maintenance costs can be divided into routine and non-routine. Routine costs can usually be predicted for an annual budget and will range from 4% of original capital costs per year for a dry pond to 9% of original capital costs per year for an infiltration trench. A general rule of thumb is that annual maintenance will run from $100 per acre for minimal maintenance including mowing to $500 per acre for more intensive maintenance including mowing, weed control, fertilization, debris removal, etc.

Non-routine costs, however, can be considerable over the long run, especially when considering the possibility of eventual BMP replacement.

To lessen the immediate financial impact of non-routine costs, it is advised that a BMP maintenance fund, with annual contributions, be established.

As an example, for dry ponds, which need to have sediment removed once every 2 to 10 years, 10% to 50% of anticipated dredging costs should be collected annually. In addition, the average dry pond has a life expectancy of 20 to 50 years. A separate fund that collects 2% to 5% a year should be established for replacement. Anticipated interest may be used to offset the effects of inflation.

ESTIMATING AND PLANNING FOR NON-ROUTINE COSTS OF YOUR BMP

Costs for non-routine maintenance of BMPs are highly specific and will vary depending upon the type, size, and depth of the facility, the volume of the sediment trapped in the BMP, the accessibility of the BMP, and whether or not on-site disposal of the sediment is possible. **The primary non-routine costs are sediment/pollutant removal and BMP renovation/reconstruction.** The following sections provide information on sediment/pollution removal costs for (1) wet ponds and dry ponds, (2) sand filters, (3) infiltration trenches and rain gardens, and (4) grassed swales. General information is also presented on planning for BMP renovation/replacement.

BMP	Sediment Removal Frequency	Facility Life-span
Wet Pond	5 to 15 years	20 to 50 years
Dry Pond	2 to 10 years	20 to 50 years
Infiltration Trench	As needed	10 years
Rain Garden	5+ years	Indefinite
Grassed Swale	As needed	Indefinite
Sand Filter	Every 6 months or as required	20 to 50 years

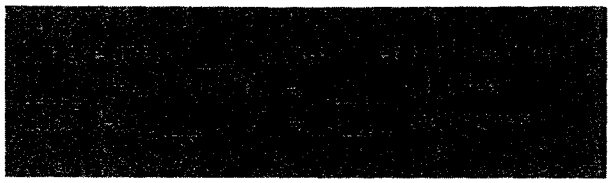
WET AND DRY POND POLLUTANT REMOVAL COSTS

In general, both wet and dry pond pollutant removal costs are similar unless otherwise noted. The chart on page 17 show the ranges of costs associated with sediment removal for various sized wet and dry ponds. The last column is blank and can be used to estimate costs for your particular facility.

- **Mobilization and Demobilization.** One of the larger fixed costs in dredging a BMP facility is mobilization and demobilization of the machinery. Large wet ponds will often require a waterborne operation during which an excavator or a crane must be

mounted to a floating barge and moved into position. The cost associated with such an operation is usually around $10,000. For smaller ponds, larger ponds that can be drained or dredged from the shore, and extended detention basins, a perimeter or dry operation will usually suffice. In this case, a backhoe, truck equipment, or crane may be used to scoop out the sediment. The costs of mobilizing and demobilizing for this type of operation will range from between $1,000 and $7,000. Additional costs for the construction and restoration of access roads for trucks and heavy equipment may be required if not already provided.

- **Dredging.** The cost of dredging a BMP depends on the volume of sediment removed. The cost (expressed by cubic yard) is largely influenced by the depth of the water and the distance between the excavation area and the "staging area" where sediment is transferred to trucks for removal. Another consideration is whether equipment can easily access the BMP bottom. The following equation can be used to estimate the volume of sediment in cubic yards.



- **Disposal.** The primary determinant of disposal costs is whether on-site disposal is an option. If on-site disposal is not available, then landfill and transportation costs are an issue. Dumping at a landfill at current prices (1999) is estimated at $47 per cubic yard ($37 for dumping and $10 for transportation depending on the dump location, mileage, and hourly charges).

Sample Wet and Dry Pond Sediment Removal Costs

Component	Surface Area .25 acre Low	Surface Area .25 acre High	Surface Area 1 acre Low	Surface Area 1 acre High	Surface Area 2 acres Low	Surface Area 2 acres High	Surface Area 10 acres Low	Surface Area 10 acres High	Work Space ____acres Low	Work Space ____acres High
Mobilization/ Demobilization/ Access Road	$1,000	$2,500	$3,000	$5,000	$5,000	$7,000	$5,000	$10,000		
Dredging*	$1,613 ($8/cy)	$3,025 ($15/cy)	$12,090 ($15/cy)	$16,120 ($20/cy)	$24,195 ($15/cy)	$32,260 ($20/cy)	$120,990 ($15/cy)	$161,320 ($20/cy)		
Disposal (Onsite/Offsite)	$1,008 ($5/cy)	$9,478 ($47/cy)	$4,030 ($5/cy)	$37,882 ($47/cy)	$8,065 ($5/cy)	$78,811 ($47/cy)	$40,330 ($5/cy)	$379,102 ($47/cy)		
Typical Equipment	Backhoe		Truck Equipment (1) Loader/Dozer (2) Crane Dragline or Clambucket							

*Dredging calculations assume a sediment accumulation of 6 inches. Costs will vary according to sediment depth. Estimated costs also assume that the facility is drained and the silt is dewatered in place.

By adding the likely costs of these three components in a dredging activity, one can establish a range in which an owner can expect to pay for sediment/pollutant removal.

INFILTRATION TRENCH AND RAIN GARDEN POLLUTANT REMOVAL COSTS

Infiltration-dependent BMPs, including infiltration trenches and rain gardens, require maintenance based upon findings of frequent inspections. For a typical infiltration trench, the major cost will be to remove the top 6 to 12 inches of gravel and to replace the filter cloth sediment barrier. The cost of such an operation is generally between $1,500 to $2,000.

Because rain gardens rely on a special mixture of soils for their operation, non-routine removal of sediments and replacement of some level of soil will be required periodically. The cost associated with such an operation is generally from between $1,500 to $2,000 depending upon the size and complexity of the facility.

Because the cost of infiltration trench and rain garden maintenance will vary depending on the frequency of maintenance, the owner should consult a local government representative to determine an appropriate funding level.

SAND FILTER POLLUTANT REMOVAL COSTS

The most common pollutant removal cost of a sand filter is to remove the top filter cloth (if applicable) and to remove/replace the filter gravel. The cost, expressed as dollar per impervious acre (that is, parking lots, roadways, and rooftops draining to the facility), is generally $1,500 to $2,000. Most sand filters only serve a few acres of land.

The frequency of filter maintenance largely depends on the type of BMP. A D.C. Sand Filter will require that the carbon trap be pumped and refilled every six months ($500 to $700) and the filter cloth and gravel be removed and replaced every 3 to 5 years ($1,500 to $2,000 per impervious acre served). An Austin Sand Filter, which is more commonly used in residential areas, may only need to be cleaned when a semi-annual inspection reveals that it is necessary.

If an oil sheen is present in the facility, the owner will be required to have the oil removed by a qualified oil recycler. Other expenses, such as removal of trash and hydrocarbons from water traps, may also be required.

Again, the owner should consult a local government representative to determine an appropriate funding level.

GRASSED SWALE POLLUTANT REMOVAL COSTS

Unlike other BMPs, grassed swales will last an indefinite period of time given proper maintenance. The primary non-routine maintenance cost associated with grassed swales is to remove accumulated sediments, to replace check dams (often constructed of earth, riprap, or wood), and to reseed. Such an operation should need to be performed only once every two years. When the grassed swale is on highway right-of-way, this type of activity may be covered through State maintenance. To find out if the swale is on State property, call the Virginia Department of Transportation at (703) 383-VDOT.

PLANNING FOR THE RECONSTRUCTION/ RENOVATION OF YOUR BMP

Like all infrastructure, including highways, bridges, schools, etc., BMPs have a life-span. For instance, most infiltration trenches will need to be completely renovated every 10 years. Most BMPs will last from 20 years to as many as 50 years if properly maintained. However, BMP requirements have been in place long enough (since the 1970s and 1980s) for many businesses and communities to have to grapple with the cost of reconstruction and/or renovation.

The reconstruction or renovation costs of any BMP are highly site specific and will be more or less expensive, adjusting for inflation, than the original cost of construction depending on access issues and the items needing replacement.

In all cases, it is recommended that the owner consult the local government to perform a BMP replacement fund study.

What Can You Do To Hold Down BMP Maintenance Costs?

Properly cared for, a BMP can work effectively for years without major maintenance costs. Abused, it can potentially be a continual financial drain. Businesses and homeowners associations can minimize costs and the potential liability of those responsible for BMP maintenance by promoting the following simple rules.

DO NOT!

- ☒ Dump used motor oil, antifreeze, or other oil and grease into storm inlets. This is a criminal offense.
- ☒ Dump grass clippings, leaves, soil, or trash of any kind into a BMP or a storm inlet. Leaves and grass clippings release bacteria, oxygen consuming materials, and nutrients. They will also clog BMP components.
- ☒ Dispose of pet wastes in the storm system – including grassy areas near a BMP. Animal wastes contain disease causing bacteria and release oxygen consuming materials.
- ☒ Wash dirty vehicles on streets or driveways. Whatever comes off the car ends up in the BMP.
- ☒ Overfertilize the lawn. Whatever washes off the lawn or impervious areas (such as driveways or sidewalks) drains into the BMP and shortens its life-span.
- ☒ Leave bare areas unstabilized. Erosion from bare soil results in sediments that can clog a BMP.
- ☒ Dispose of left over paint or hazardous materials into the storm drain. These materials can kill BMP vegetation and aquatic life. Dumping is also a criminal offense.

DO!

- ☑ Keep properties, streets, and gutters free of trash, debris, and lawn clippings.
- ☑ Provide information to those who maintain their own automobiles on where to recycle oil and antifreeze.
- ☑ Encourage residents to take dirty vehicles to a commercial carwash or select a location where water does not enter a storm drain.
- ☑ Put a pan underneath your car if it is leaking to catch the fluids until it is repaired. Spread an absorbent such as cat litter to soak up drippings and dispose of properly.
- ☑ Educate residents on where to properly dispose of hazardous wastes, including oil and latex paints.
- ☑ Plan lawn care to minimize the use of chemicals and pesticides. Sweep paved surfaces and put the sweepings back on the lawn.
- ☑ Limit the amount of impervious surfaces. For patios, walkways, and landscaping, consider porous pavements such as bricks, interlocking blocks, or gravel.
- ☑ Incorporate native trees, shrubs, and groundcovers to help the water soak into the ground. Select species that need little fertilizer or pest control and are adapted to specific site conditions.
- ☑ Sweep up and dispose of ice melting chemical residues in the winter. This will protect grass and other landscaping plants.

Northern Virginia Planning District Commission

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