

Care & Feeding of Your Stormwater Management Facility

A guide for Homeowners' Associations

Your Homeowners' Association is legally responsible for the operation and maintenance of one or more stormwater management facilities!!!

Property owners are legally responsible for inspecting and maintaining the stormwater management facilities on their sites. Required maintenance is outlined in the operations and maintenance (O&M) plan for your facility. Here, we provide additional information about what you need to do, why, and how.

What Are Stormwater Management Facilities?

Stormwater management facilities are designed to slow down, filter, or absorb (infiltrate) runoff after a rainfall. These can be landscape or structural practices, and are often referred to as Best Management Practices, or BMPs. In this guide, we are using the terms "facility" or "structure".

Stormwater management facilities include: filter strips, swales, ponds, created wetlands, rain gardens, drywells, porous pavement, manufactured facilities, etc. Piping, inlets and catch basins are important components that also need adequate maintenance to make sure they function properly. All of these stormwater management facilities serve a common purpose: controlling the quality and quantity of stormwater runoff from your site to safeguard our valuable waterways.

How Did the Association End Up Owning A Facility?

Your city or town recognized that more impervious surfaces (such as roofs and pavement) leads to more flooding and/or the degradation of water caused by stormwater-born pollution, and has adopted stormwater management as part of its ordinances. Each subdivision needs to bear the cost of treating the stormwater problems that it creates.

The developer of your subdivision designed stormwater systems to meet these ordinances, and thus received permission to build. The

stormwater facility was placed on land that is commonly owned by all landowners of the subdivision. In many cases, the homeowners' association was created primarily for the purpose of managing the commonly-owned land, and, of course, any associated facilities.

What's the big deal?

Wherever we live, work or relax, we are in a watershed, that is, an area that drains to a particular pond, stream, river or bay. Within each watershed, thousands of activities occur each day, each one adding a small amount of pollution to the landscape.

For example, when we drive, our vehicles usually leak small amounts of petroleum products or drop small particles of metal. Walking the dog may leave behind pathogens in the form of fecal matter. When we garden, we disturb soil, and may add fertilizers and pesticides.

The Problem With Stormwater Runoff

Then it rains! Stormwater quickly runs off impervious surfaces (such as roofs and paved areas) instead of soaking into the ground. During big storms, water can also run off from grassy areas, especially if they are on a steep slope or the soil has been compacted by heavy foot or vehicle traffic.

Conventional stormwater management directs runoff into drains and pipes that eventually discharge it into a river, stream or estuary. The problem with this is:

- Impervious areas generate large volumes of runoff quickly. The increased volume and speed of the runoff sometimes causes flooding and erosion, destroys natural habitat, and contributes to storm drain overflows.
- This runoff picks up a variety of pollutants including oil, pesticides, metals, chemicals, and sediment that harm water quality and fish habitat.
- During warm weather, runoff absorbs heat from impervious surfaces. This raises the temperature of the receiving water body, and harms fish and other aquatic life.
- Less water is absorbed into the ground. This reduces the flows in streams in the summertime and makes less water available to wells that supply our water.

Unless we do things differently, as Rhode Island grows and develops, these negative impacts will only increase.

A Better Way to Flow

Just as problems are created by thousands of small actions contributing little amounts of pollution, hundreds to thousands of actions are needed to reduce pollution in stormwater runoff. The State of Rhode Island, each municipality and community members are all actively pursuing a variety of measures to reduce stormwater impacts.



The Town of Narragansett installed an infiltration system under a parking lot to treat stormwater from a storm drain, before it enters Narrow River.

Your municipality has adopted a comprehensive Storm Water Management Program Plan. Here are some of the steps being taken:

- We continue to seek new ways to operate and maintain streets, drains, and facilities to remove potential pollutants more quickly.
- We have strengthened our ordinances to require low impact development and/or require onsite stormwater management for new construction and redevelopment on public and private property.
- We provide education and opportunities for individuals to become involved in reducing stormwater impacts and promoting watershed health, using partnerships with numerous other organizations.
- We work to preserve areas adjacent to rivers and streams. These areas filter out pollution, control erosion, and provide shade, food, and habitat for fish and wildlife. The measures we use to preserve these critical areas include restricting development, land use zoning requirements, land and easement

acquisition programs, and incentive, cost share and grant based programs.

- Statewide, millions of dollars are spent each year to help limit the environmental impact caused by impervious surfaces. There are projects: to restore streambanks, to construct facilities that manage the quality/quantity of runoff entering storm drain systems, and to build, retrofit, or enhance buildings, roads, parks, and drainage systems to improve conditions. Many of these projects are partnerships with private organizations or other public agencies.

Your facility is part of the solution ... but only if it's working!

Your homeowner's association is required to check your facility regularly to make sure it is functioning as intended. Routine inspection and maintenance can help keep your overall maintenance costs low by detecting problems early and avoiding large repair or replacement costs.



Whoa! This swale is so full of sediment and invasive plants it no longer treats stormwater runoff.

Who Should Do the Work?

Much of the work can be performed by you, Association members or volunteers. This includes routine inspections (described below), litter removal, mowing and removal of small deposits of sediment. One of the most important tasks that only residents can do is to educate themselves on ways to reduce the amount of runoff and pollutants leaving their property. Taking simple steps such as reducing the use

of fertilizers, picking up after the dog, or turning downspouts so they discharge on the lawn can make an amazing difference in the quantity and quality of water that the facility needs to control. (For other suggestions, see page 13.)

If the structure has steep side slopes, or significant sediment, or the vegetation has gotten out of hand, it may be time to consider employing a professional landscaping company to do the work. Their personnel will be trained and insured to deal with potentially dangerous sites. They may also identify more serious problems in the early stages, when it is more cost-effective to make repairs.

Remedial work such as replacement of pipes or repair of a slumped slope may require the services of a professional engineer. Inform your city or town if you feel your structure needs this kind of repair.

How Will Maintenance Be Paid For?

Your Homeowners' Association is responsible for the maintenance and upkeep of your structure, so you need to determine the best way to finance your maintenance needs. A facility maintenance fund is recommended for both capital maintenance procedures (such as facility replacement or sediment removal) and operating maintenance procedures (routine activities such as facility inspection, debris removal, and managing vegetation). This could be a portion of homeowner fees or a specific assessment.

While specific maintenance costs will, of course, depend on the characteristics of the facility, the site, and the area draining to the facility a general rule of thumb is that annual maintenance costs will be 5 to 10% of the facility's total capital cost. (Check with your municipal engineer for an estimate of the cost of your structure.) Again, routine, scheduled maintenance can help keep overall costs down by addressing problems before they require major attention.

A percentage of the money designated for non-routine maintenance costs (i.e. for sediment removal or vegetation replacement) should be saved each year based on the needed frequency. For example, if the facility is designed to need mechanical sediment removal every five years, 20% of the total cost should be set aside each year.

An additional 3 to 5% of the facility's capital cost should be saved each year for eventual facility replacement (based on the facility's life expectancy). Most of these facilities have a life expectancy of 25 to 50 years.

What do you need to do to Maintain Your Facility?

Follow the maintenance tasks and schedules specified in the operations and maintenance (O&M) plan for your facility. If you don't have a copy of your site's O&M plan, check with your municipal engineer or planner. If they don't have a copy on file, they can suggest who to contact to make a new plan.

The following section identifies general guidelines on what to look for and how to maintain your facility. It also notes non-routine maintenance that may require professional assistance.

Inspections

Inspecting your stormwater management facility allows you to detect problems early and to avoid long term problems. We recommend that you inspect your facility at least quarterly for the first two years, with the facility drawings and the O&M plan in hand, to help you understand how the facility is supposed to function. Inspect at least twice a year thereafter, or as noted in your O&M plan. Inspect inlets and outlets for blockage within 48 hours of major rainfall (more than one inch of rain over a 24-hour period).

Your Association should be able to check for:

- unexpected pooling of water;
- health of vegetation or growth of unwanted vegetation;
- obstructions of the inlet or outlet;
- excessive erosion or deposits of sediment;
- signs of dumping of pollutants (such as used motor oil, dog droppings or grass clippings);
- cracking or settling of the facility's structural components;
- wetness on the downstream side of a 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;
- stability of downstream channel conditions; and,
- signs of vandalism.

You may have a routine inspection log in your O&M Plan; if not, you can adapt the checklist on page 14 of this Guide for your use.

If your inspection finds problems which cannot be solved through routine maintenance, you should contact a professional Inspector to have a thorough evaluation done (check with your municipal engineer). Inspection of underground systems such as sand filtration

systems or infiltration trenches should also be left to professionals. A non-professional should never enter confined spaces meant for maintenance personnel. However, the facility owner can look for:

- o water remaining in the system longer than times designated in the design;
- o obvious signs of excessive sediment build up or debris around the facility; and,
- o signs of disturbance of manholes or damage to the structure.

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

Routine Maintenance

Be sure to check your facility's O&M Plan for specific recommendations on maintenance practices. A quick guide, by type of facility, is at the back of this document (see pages 15 - 17).

Here is an overview of the common routine maintenance needs of most facilities.

VEGETATION MANAGEMENT

Most stormwater management facilities rely on vegetation to filter sediment from stormwater before it reaches the structure and to prevent erosion of the banks and the bottom of the facility. Grass is the most common groundcover - although many facilities 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.

- o **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 spring, once during the summer and twice, again, in the fall.
- o **Pest and Weed Control.** Reduce the amount of pollutants reaching the facility by avoiding overfertilization and excess pesticide use. URI Cooperative Extension can provide additional information.
- o **Removing Small Sediment Deposits.** Because vegetation surrounding a facility 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, covered with top soil, seeded and mulched. Excess material should be taken off-site and can be used elsewhere as a mulch or soil supplement. If the soil becomes compacted, you will need a landscape company to aerate the soil.

- **Unwanted Vegetation.** Some vegetation is destructive to a BMP. Keeping dam and bottom areas free of trees and shrubs is critical because roots can destabilize the structure. Consistent mowing and monitoring will control any unwanted vegetation. Also be aware of invasive plant species such as *Phragmites*, purple loosestrife or autumn olive that may try to colonize. Contact URI Cooperative Extension for more information on invasive species.
- **“No Mow” Zones.** For wet ponds, a 25 foot 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. The buffer should only be mowed once a year (after mid-August).
- **Harmful activities:** Activities that have the potential to damage vegetation, or compact the soil, such as sports activities, should be avoided near the structure. This and/or inappropriate landscaping could take years off the life of your facility.
- **Inappropriate Landscaping:** Before altering vegetation in or around a facility, contact a professional.

EMBANKMENT AND OUTLET STABILIZATION

A stable embankment is important to ensure that erosion does not contribute to water quality problems and to prevent downstream flooding due to breaching. Maintaining a healthy vegetative cover and preventing the growth of trees and shrubs (deep-rooted 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. Control excessive animal burrowing, and fill existing burrows as soon as possible.

Outlet structures are particularly prone to undercutting, where the flow of water washes soil and small stones from around the outlet. If ignored, a small problem can easily result in the need to replace the entire structure. A professional engineer should be consulted if you observe: sink holes, cracking, wet areas around the outlet pipe, pipe displacement, or rusting of the pipe.

DEBRIS AND LITTER CONTROL

Regular removal of debris and litter will help in the following areas:

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

You will need to pay special attention to removing floating debris which can clog inlets and outlets. If trash or dumping is a problem, educating the local community can help.

MECHANICAL COMPONENTS

Mechanical components need to be functional at all times. Routine maintenance of valves, sluice gates, pumps, anti-vortex devices, fence gates, locks, and access hatches is best left to a professional.

INSECT CONTROL

Ponded water can be breeding grounds for mosquitoes and other insects. In a properly-functioning stormwater management facility, mosquitoes 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 facilities that have a permanent pool of water, this means removing floatable debris promptly. It may also be possible in larger wet ponds to maintain a stock of fish that feed on mosquito larvae.

A mosquito problem in dry ponds, infiltration trenches, or rain gardens is usually an early indication that there is a maintenance problem. In such cases, sediment needs to be removed, or the infiltration capacity of the facility needs to be increased by deep tilling or replacing the soil on the sides and bottom.

ACCESS MAINTENANCE

Most BMPs are designed so that heavy equipment can safely and easily reach the facility for non-routine maintenance. Keeping these access routes open is particularly important since one never knows when emergency access will be needed. Remove woody vegetation or other obstructions and maintain 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 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 (by surrounding neighbors or a landscape company) 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. This, again, may be an education project for the local community.

Non-Routine Maintenance

The non-routine maintenance needs of a facility, while infrequent, can be major undertakings and should always be performed by a professional. While tasks will vary by facility (see the quick guide starting on page 15 of this document), they typically include sediment/pollutant removal and replacement of BMP components.

SEDIMENT/POLLUTANT REMOVAL

The primary purpose of a stormwater management facility is to remove sediment and other pollutants (which are often attached to sediment) from stormwater. Therefore, sediment will naturally accumulate in a BMP and eventually need to be removed. Each type of facility has its own removal requirements. For instance, dry ponds should be cleared of sediment every ten years. For wet ponds, a minimum water depth of approximately 3 feet needs to be maintained. Your O&M Plan should have guidelines that will tell you when your facility needs cleaning.

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, de-watering and proper disposal of sediment. Your professional consultant should be able to guide you through the permit process.

Sediment and attached pollutants will need to be properly managed. Your O&M Plan may show an onsite area or a site adjacent to the facility (outside a floodplain) set aside for sediment de-watering and/or permanent disposal. If onsite disposal is not an option, transportation and landfill tipping fees can greatly increase sediment removal costs. And, the material needs to be tested to determine if it should be treated as a hazardous waste.

When sediment is stored on-site, it is important to protect it against erosion. Temporary stockpiles should be covered with a tarp, or, if they will remain for more than 30 days, seeded with annual rye. Permanent disposal sites need to be prepared as a seedbed and a permanent vegetated cover established.

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.

COMPONENTS REPLACEMENT/RETROFIT

While most facilities will last for a long time with proper maintenance, your association should plan long in advance for replacing these facilities. Eventually, like most infrastructure, facility components will need to be replaced. Failure to promptly address a weakened or failing component may jeopardize the safety of those living adjacent to or downstream of the facility.

Components of your structure may include:

- inflow and outflow devices;
- trash racks and anti-vortex devices;
- valves, orifices, and aerators;
- concrete structures (such as the casing for a sand filter);
- pumps and switches;
- specially-adapted plants
- earthworks such as embankments and side slopes; and
- stones that slow down water flow or protect banks (“riprap”).



Components of this facility include:
earthwork, inflow and outflow devices,
riprap, wetland plants and fencing.

An evaluation should be made to determine if current conditions have changed from those assumed during the initial design. Components or the entire structure sometimes need to be redesigned to meet unforeseen circumstances, for example, when a larger area contributes runoff to the facility. New technology may provide an alternative component, or it may be found that some simple changes will improve

the ability of the stormwater management system to remove pollutants.

Inspection and Maintenance Logs

Your Homeowners' Association needs to be able to demonstrate to the municipality and/or state permitting agency that you are following the maintenance tasks and schedules specified in the operations and management plan for your facility. This can be done by keeping a log of inspection and maintenance activities. In general, the logs should note inspection dates, the facility components inspected, and any maintenance or repairs made. It is also a good idea to track the rate of sediment accumulation and record any visual observations about the facility and its components.

Use the logs and checklists in your O&M plan. If none are available, adapt the checklist on page 14 of this Guide. Make sure to include dates and notes of maintenance/repair. If you have a maintenance contractor, keep copies of their reports in the Association files.

What Happens if the Association Doesn't Maintain the Facility?

If your Association does not maintain its facility, the municipality may step in and have either municipal staff or a contractor do the work. A bill will then be sent to the Association and, in some cases, a fine may be imposed.

Your municipality is required to obtain a permit from the Rhode Island Pollutant Discharge Elimination System (RIPDES) for the discharge of stormwater runoff. Part of this permit process includes ensuring the long-term operation and maintenance of many types of Best Management Practices. Thus, expect to be asked for documentation showing that you are following the plan that allowed your development to be built. Neglecting this responsibility only leads to diminished water quality, and reduces the ability of all of us to enjoy swimmable, fishable and drinkable waters.

Acknowledgements

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Environmental Services Section of the City of Portland, Oregon
Northern Virginia Planning District Commission

What Can You Do To Hold Down Facility Maintenance Costs?

Properly cared for, a stormwater management facility can work effectively for years without major maintenance costs. On the other hand, an abused or neglected system can be a continual financial drain.

Homeowners associations can minimize costs and potential liability 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 facility or a storm inlet. Leaves and grass clippings release bacteria, methane, and nutrients. They also clog structural components.
- ☒ Dispose of pet wastes in the storm system or on grassy areas near a facility. Animal wastes contain disease causing bacteria and release oxygen consuming materials.
- ☒ Wash dirty vehicles on streets or in driveways. Whatever comes off the car ends up in the storm drain system.
- ☒ Overfertilize the lawn. Whatever washes off the lawn or impervious areas, such as driveways or sidewalks, drains into the **facility** and shortens its life-span.
- ☒ Leave bare areas. 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, such as on a lawn.
- ✓ Put a pan underneath your car if it is leaking to catch the fluids until the leak 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 grass clippings off of paved surfaces and 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 groundcover 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.

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 where there shouldn't be?

Yes No N/A
Is there 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, 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 gardens, 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

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

WET AND DRY PONDS

ROUTINE MAINTENANCE

- ✓ Remove accumulated debris and litter, especially around inlet and outlet areas.
- ✓ Mow routinely, with heights preferably not less than 6 to 8 inches.
- ✓ Remove woody vegetation from all dam and embankment areas.
- ✓ Stabilize/revegetate side and bottom areas.
- ✓ Stabilize/revegetate contributing areas to reduce incoming sediments.
- ✓ Implement a pollution prevention program.

TIPS FOR WHEN NON-ROUTINE MAINTENANCE IS REQUIRED

Dry Ponds

- Standing water is visible in inappropriate areas after 48 hours.
- Insects and/or odor become problems.
- Wetland vegetation emerges (unless the facility is specifically designed with a marsh or wetland area).
- Visible damage to the embankment (such as sinkholes) or mechanical components.
- Low-flow channel is undermined, or choked with vegetation

Wet Ponds

- Visible signs of sediment accumulation.
- Insects and/or odor become problems.
- Algae blooms occur in the summer months or ponded areas become dominated by a single aquatic plant.
- Visible damage to the embankment or mechanical components.

NON-ROUTINE MAINTENANCE

- ✓ Dethatch grass to remove accumulated sediments (less than every 2 years).
- ✓ Aerate compacted areas to promote infiltration (less than every 2 to 3 years).
- ✓ Remove accumulated sediment/pollutants (2 to 10 years for dry ponds; 5 to 15 years for wet ponds).
- ✓ Replace structure components, reconstruct embankments and spillways (greater than 20 years if properly maintained).



A wet pond system in Narragansett

INFILTRATION TRENCH

ROUTINE MAINTENANCE

- ✓ Remove accumulated debris and litter from trench area.
- ✓ Mow routinely around trench with heights preferably not less than 6 to 8 inches.
- ✓ Remove woody vegetation and stabilize/revegetate side areas.
- ✓ Stabilize/revegetate contributing areas to reduce incoming sediments.
- ✓ Implement a pollution prevention program.

TIPS FOR WHEN NON-ROUTINE MAINTENANCE IS REQUIRED

- Standing water is visible after 48 hours.
- Visible damage to the embankment or mechanical components.
- Apparent sealing of the top of the filter.

NON-ROUTINE MAINTENANCE

- ✓ Dethatch and aerate compacted grass areas (less than every 2 to 3 years).
- ✓ Remove and replace first 6 to 12 inches of gravel and underlying filter fabric (as needed).
- ✓ Replace structure (approx. every 10 years).

GRASSED SWALE

ROUTINE MAINTENANCE

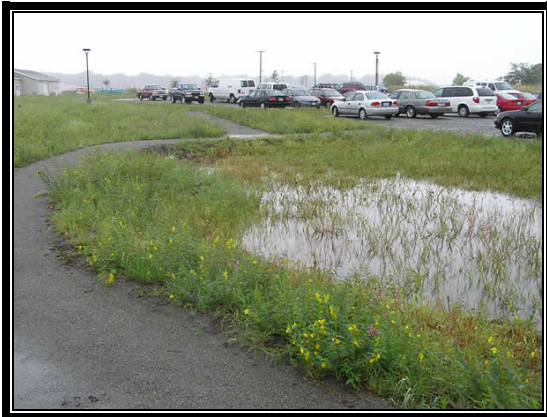
- ✓ Remove accumulated debris and litter.
- ✓ Mow routinely, with heights preferably not less than 6 to 8 inches.
- ✓ Remove woody vegetation and stabilize and revegetate side and bottom areas.
- ✓ Stabilize and revegetate contributing areas to reduce incoming sediments.
- ✓ Implement a pollution prevention program.

TIPS FOR WHEN NON-ROUTINE MAINTENANCE IS REQUIRED

- Standing water is visible after 48 hours.
- Insects and/or odor become problems.
- Wetland vegetation emerges.
- Visible erosion or undercutting of swale banks.

NON-ROUTINE MAINTENANCE

- ✓ Remove accumulated sediment/pollutants (as needed)



Stormwater swale at Save The Bay

SAND FILTER

ROUTINE MAINTENANCE

- ✓ Limit confined space entry to professional maintenance personnel.
- ✓ Maintain appropriate safety precautions (locks and fences) and signage.
- ✓ Remove debris from inlet area.
- ✓ Ensure that contributing areas are not sources of debris or vehicle fluids.
- ✓ Keep any electrical components, such as pumps, in proper working order.
- ✓ Employ safe electrical practices and turn power off before maintenance.
- ✓ Stabilize/revegetate contributing areas to reduce incoming sediments.
- ✓ Implement a pollution prevention program.

TIPS FOR WHEN NON-ROUTINE MAINTENANCE IS REQUIRED

- There is a back-up of water in the filter.
- There is visible damage to mechanical components or concrete shell.
- Sink holes develop or sand deposition occurs.

NON-ROUTINE MAINTENANCE

- ✓ Remove accumulated sediment/pollutants.
- ✓ Replace sand and filter.
- ✓ Replace filter components (greater than 20 years if properly maintained).

RAIN GARDEN

ROUTINE MAINTENANCE

- ✓ After or during each rainstorm, ensure that drainage paths are free from obstruction and that ponding dissipates.
- ✓ Stabilize erosion occurring at drainage paths.
- ✓ Remove accumulated debris.

Spring

- ✓ Prune deciduous trees and shrubs before leaves appear (usually early to mid-March).
- ✓ Prune flowering trees and shrubs after blossoming (usually early June).
- ✓ Divide ornamental grasses and perennials as soon as the soil becomes soft.

Summer

- ✓ During extended drought, water deeply in the morning every seven to ten days.
- ✓ Check trees and shrubs for signs of disease or insect pests. Plant diseases usually can be easily treated when detected early.
- ✓ Weed regularly, preferably by hand.

Fall

- ✓ Cut perennials back to the ground after the first frost and remove annuals.
- ✓ Plant new trees and shrubs as long as the soil temperature remains above 32 degrees.
- ✓ Mulch trees and shrubs to help condition the soil for spring and to protect roots.

Winter

- ✓ Cut back ornamental grasses and remove clippings.

TIPS FOR WHEN NON-ROUTINE MAINTENANCE IS REQUIRED

- Look for signs that plants are too wet (wilting, yellowing, ring spots on leaves, soft/rotting base).
- Standing water is consistently visible after one or two days. If water is not dissipating, the facility is not functioning properly. (Note that water will pond longer in winter and early spring.)
- Invasive species take hold in the planting areas.
- There is visible damage to berms or bottom areas

NON-ROUTINE MAINTENANCE

- ✓ If plants are dying, it may be necessary to choose plants more tolerant of drier/wetter conditions.
- ✓ Aerate soil profile to increase infiltration capacity (as needed).
- ✓ Remove accumulated sediment/pollutants (2 to 10 years or as needed).



Rain Garden