Hamilton County MS4 Water Quality Program

STORMWATER BEST MANAGEMENT PRACTICES MANUAL – MAINTANANCE OF DENTENTION DEVICES

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City of Chattanooga

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1. Purpose, Applicability, and Scope

This Best Management Practices (BMP) Detention Device Maintenance Manual is the support document for the stormwater management program. Like the initial manual "Stormwater Best Management Practices" this document has been created to allow changes as new information and techniques are developed for the management of stormwater. This manual has intentional been developed in a non-technical format because its users are expected to be people who own stormwater detention devices that have been constructed on their property but who are not likely to be familiar with the technical engineering terms often applied to the structures. The Hamilton County Water Quality Program (HCWQP) appreciates the City of Chattanooga's willingness to share its knowledge in this manual.

2. Why Stormwater Detention is Important

One of the great challenges facing humanity in the 21st Century is maintaining clean drinking water despite growing human populations and land development. Because the water we drink originates from stormwater, it is important that we keep it as clean as possible from the very beginning. Stormwater flowing over parking lots, streets, industrial sites, or agricultural fields may pick up grease and oil leaked from automobiles, chemicals that have spilled, fertilizers from fields and lawns, or pesticides used to control insects. All of these are considered to be contaminants, substances that can pollute our waters and result in human health problems.

Scientific studies have shown that well-constructed and maintained stormwater detention devices can reduce not only silt and other sediments from entering our streams, but harmful contaminants like metals, petroleum products, and nutrients as well. Nutrients are organic substances that deplete oxygen levels in waters because they stimulate biological activities that include the growth of harmful bacteria.

In addition, stormwater detention is important in flood prevention. Detention devices are generally associated with surfaces like paved parking lots or roofs of buildings which cause stormwater to run off of their surfaces rather than penetrating into the ground. Water held in detention devices allows it to enter storm sewers or drainage ditches at a slower rate so that streams and, rivers do not receive the runoff in such short periods of time that they overflow their banks.

Poorly maintained stormwater detention devices also may become breeding grounds for mosquitoes, which can be serious threats to human health. The relatively new West Nile Virus is spread from birds to humans by mosquitoes. It is important that mosquito breeding grounds in detention devices be eradicated by keeping the devices clean and free of shallow water.

3. Good Housekeeping Saves Time and Money

One of the best ways to save cleanup time and expense is to keep the surfaces that stormwater flows over clean. Trash collection should be conducted often in areas such as parking lots, ditches, and roadsides where it is often discarded. Larger commercial parking lots should employ a cleaning company to remove debris before it enters storm drains. Smaller parking lots should be swept regularly to prevent dirt buildup, which enters the stormwater system as silt if not removed. Oil and other leaking automobile fluids can be absorbed from parking lots with kitty litter, which is often cheaper than commercially available oil absorbents. Just spread the kitty litter over the oil stains, allow it to set for a few hours, then sweep it up and place it in a plastic bag in the garbage can or dumpster. For commercial automotive shops and other facilities where larger quantities of oil grease are likely to spill, booms should be placed between the paved surfaces and the point where stormwater exits the property or enters a storm drain. The booms can be discarded periodically and replaced with fresh ones to assure that the oil and grease does not enter the stormwater.

Erosion control in ditches or other conveyances that lead to stormwater detention devices is also important.

Maintaining well-groomed grassy slopes along ditches will prevent silt from entering stormwater and clogging filters in detention devices. Where erosion control is difficult, rock check dams can be placed within the ditches to collect the silt. It is much easier and less expensive removing silt from check dams than from detention devices.

4. Which Device Do I Have?

1. **Infiltration Basins** have earthen bottoms with soils that allow stormwater to penetrate. They may have pre-treatment devices, standpipes (pipes that drain excess water), and emergency spillways.
2. **Dry Detention Ponds** have grassy bottoms and may have pre-treatment devices, standpipes, and emergency spillways.
3. **Wet Detention Ponds** have water in them all the time. They may also have pre-treatment devices, standpipes, and emergency spillways.
4. **Constructed Wetlands** have vegetation that removes materials from the water, which may stand in the wetland basin for long periods of time. They may also have pre-treatment devices, standpipes, and emergency spillways.
5. **Biofilters** are usually grassy swales (small basins). They are smaller and generally shallower than dry detention ponds. They may have standpipes.
6. **Media Filters** are usually sand and gravel devices that filter materials from the water as the water moves through the media. They may also be oil booms or other structures that contain natural or artificial filtration materials. Media filters may be used in conjunction with other detention structures.
7. **Oil Skimmers** are box-like structures that separate oil from water by allowing water to be siphoned off from a level below the oil, which floats. They are often used as pre-treatment devices for other detention structures.

Refer to your original drawings, project engineer or call the Hamilton County Water Quality program office (423.209.7851) if you cannot determine which device you have.

1.0 Dry Detention Ponds

Description

- Basins that allow stormwater to accumulate and release at a slower rate.
- Only hold water following rainfall events.
- Release water slowly through a bottom outlet.
- May have media filters (e.g. sand filters) that trap materials that include sediments, nutrients, toxic materials, floatable materials, oxygen-demanding substances, and oil and grease.
    - May have oil skimmers.
    - May have French drains to assure total discharge of water from bottom of pond.

Maintenance

1. Monitor water levels after storm events.
    - Remove trash.
    - Check water levels. If stormwater remains beyond four days, the bottom outlet may be clogged and should be cleaned after the water is no longer present. It is important to prevent water from standing in dry detention ponds because they may become breeding grounds for mosquitoes.
    - A wire mesh basket installed around the bottom outlet is a good way to prevent clogging of the outlet itself.

Note: If water is detained longer than 4 days you can call the Hamilton County Water Quality Program at (423)209.7851 or an engineering consultant for guidance.

2. Inspect and maintain pre-treatment devices.
   - Clean out sediments and trash that collect in grates, forebays, or other pre-treatment devices.
   - Keep areas along channels that carry stormwater clean and stop erosion by planting grass along drainage ways.

3. Maintain the bottoms of dry detention ponds.
   - Plant and maintain grass to prevent erosion of the bottom soils.
   - Remove trees that begin to grow in the pond.
   - Remove accumulations of sediments and other debris every three years or as needed to keep the bottom clean and water from ponding.

Removal of accumulated sediment from a detention basin can be performed by a small work crew with shovels and wheelbarrows or by small excavation equipment. Removal of the top foot or so of soil is generally necessary every five to 10 years. If only dense clay remains after soil removal, it may be necessary to replace the removed sediments with clean topsoil, which should be seeded. Soil removal should be performed during drier summer periods to allow time for the grass to become reestablished in the bottom of the basin.

Some materials that accumulate in the bottoms of dry detention ponds may require special handling. If you have any questions regarding how disposal of the material must be conducted, contact the Tennessee Department of Environment and Conservation – Division of Solid Waste at (423) 634-5745.

Maintenance Costs Estimates

- Maintaining pre-treatment grates, forebays, and catch basins by removing debris and sediments - $8.00 per hour ($20.00/month).

- Removal of accumulated debris from a detention basin can be performed by a small work crew with shovels and wheelbarrows or by small excavation equipment. Assuming that one foot of soil (or less) is removed from the basin and the basin is less than 2,000 square feet in size, the cost for soil removal may range from $250 to $750.

Troubleshooting

1. Water remains in pond four days after rainfall
   Standpipe may be clogged
   A. Remove trash from standpipe trash rack
   B. Check outflow to be sure water is running through the pipe

2. Mosquito or gnat infestations
   Habitats for mosquito and gnats exist in pond
   A. Remove debris from pond to eliminate habitat for breeding
   B. Use a bacterial larvicide to control mosquitoes in pre-treatment devices
   C. Follow steps in #1 above if water is retained 72 hours after rainfall
   D. Install bat houses or purple martin houses

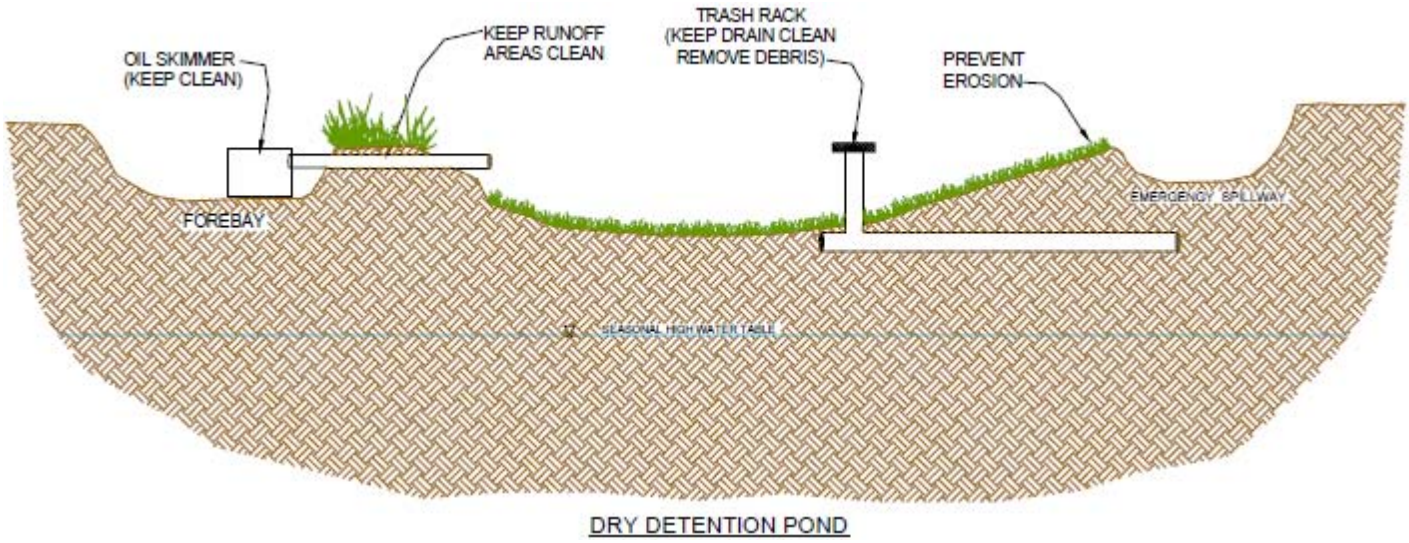
Additional Troubleshooting

If water stands in pond longer that four days after outfall pipe is cleaned, you may need to:

- Call engineering consultant
- Add French drain

- Regrade bottom
- Remove accumulated sediment

Typical Dry Detention Pond



DRY DETENTION POND

INSPECTION CHECKLIST
DRY DETENTION PONDS

Chattanooga and Hamilton County, Tennessee MS4s

Inspection Date: _____

Facility Owner: _____

Facility Address: _____

_____

Facility Tax ID #:_____

Items Inspected	Maintenance Needed (Yes/No)	Corrected (Date)
Weekly or After Rainfall		
1. Spillway clean?		
2. Standpipe clean?		
3. Silt or trash buildup?		
4. Water standing longer than 4 days?		
5. Pipes clean and open? Trash buildup?		
Monthly		
1. Trees on dam?		
2. Erosion on dam?		
3. Animal burrows?		
4. Leaks in dam?		
5. Unwanted plants?		
Pre-Treatment Devices Check Weekly or After Rainfall		
1. Debris or silt buildup?		
2. Grass need mowing?		
3. Erosion upstream?		
4. Oil/Grease buildup?		
5. Oil skimmer trash removed?		

2.0 Wet Detention Ponds

Description

- Ponds that hold water year round and allow stormwater to be stored in the pond's freeboard space and be slowly discharged over time.
- Water does not percolate through the soil.
- Generally have standpipes and/or emergency spillways to allow overflow to exit the pond without damaging the pond dams.
- Stormwater often flows through pre-treatment devices, like forebays, prior to entering the wet detention ponds. May have oil skimmers.
- Wet detention pond margins often provide habitats for wildlife and aquatic plants.

Maintenance

1. Keep "pretreatment devices" and inflows free of debris and don't let sediments collect in them. Remove trash or sediments from these devices monthly during wet periods.

2. Inspect wet detention ponds at least every year as well as after every major rainfall event.
   - Remove any debris that threatens to clog standpipes or spillways.

3. Check pond dams at least once each year.
   - Maintain grass on dam to prevent erosion.
   - Correct erosion problems before they become serious.
   - Remove trees that begin to grow on dams while they are small. If allowed to get big, they can cause dam failure.

4. Keep area around ponds clean.
   - Keep grass mowed and free of leaves, twigs, and other debris.

- Remove debris from ditches that channel stormwater into ponds.

Maintenance Cost Estimates

1. Preventative Measures
   - Cleanup in areas around pond - $20.00/month.
   - Mowing grass around pond - $40 per half acre.
   - Removing small trees from dam* - $20 per hour. After initial removal, mowing will keep trees from growing on dam.

The cost of removal of trees from the dam depends on how serious the situation becomes. If trees are removed as they appear, the cost should be minimal and requires no skilled labor. Maintaining grass to prevent erosion of the dam surfaces will also prevent the sometimes high costs of repairing leaks in the dams.

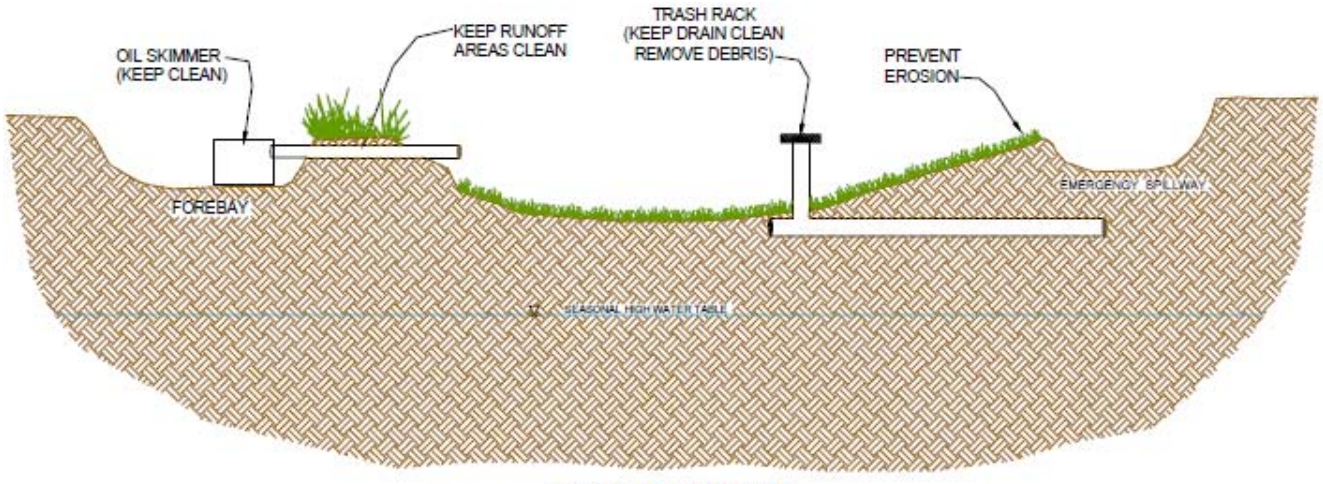
Mosquito Control

- Shallow areas of ponds can be breeding areas for mosquitoes.
- Prevent debris and soil from washing into the pond to create mosquito breeding habitat.
- Use bacterial larvicides available from home improvement stores in pre-treatment devices.
- Stock fish to eat mosquito larvae. Sunfish and mosquito fish are best.
- Install aerator (fountain) to reduce stagnation and decrease mosquito population.
- Install bat houses or purple martin houses to encourage these insect-eating animals.

Troubleshooting

1. Not enough storage space (freeboard) for rainfall (pond too full)
   Standpipe may be clogged
   A. Check trash rack and remove trash
   B. Check pond outlet to assure water is running through pipe

2. Mosquito or gnat infestations
   Habitats for mosquito and gnats exist in pond
   A. Remove debris from pond to eliminate habitat for breeding
   B. Use bacterial larvicide to control mosquitoes in pre-treatment devices
   C. Stock mosquito fish for control
   D. Place bat houses or purple martin houses near pond to encourage biological control



DRY DETENTION POND

INSPECTION CHECKLIST
WET DETENTION PONDS

Chattanooga and Hamilton County, Tennessee MS4s

Inspection Date: _____

Facility Owner: _____

Facility Address: _____

_____

Facility Tax ID #:_____

Items Inspected	Maintenance Needed (Yes/No)	Corrected (Date)
Weekly or After Rainfall		
1. Spillway clean?		
2. Standpipe clean?		
3. Silt or trash buildup?		
4. Pipes clean and open? Trash buildup?		
Monthly		
1. Trees on dam?		
2. Erosion on dam?		
3. Animal burrows?		
4. Leaks in dam?		
5. Unwanted plants?		
Pre-Treatment Devices Check Weekly or After Rainfall		
1. Debris or silt buildup?		
2. Grass need mowing?		
3. Erosion upstream?		
4. Oil/Grease buildup?		
5. Oil skimmer trash removed?		

3.0 Infiltration Basins

Description

- Simple excavated basins that allow stormwater to percolate through filtering media in the bottom of the basin rather than flow into storm sewers or streams.
- May have standpipes and emergency spillways.
- Filtering media is loose to allow the water to pass through slowly.
- Contaminants are filtered from the stormwater as it passes through the soil.
- Floatable materials and sediments are also trapped in the basins.
- Debris that collects in the bottom of the basins and clogs soils must be removed periodically to allow for maximum infiltration.

The State of Tennessee Division of Water Supply may consider some infiltration basins Class V injection wells. In these cases, a special discharge permit will be required. Please contact the Division of Water Supply at (615) 532-0191 to determine if your facility will be regulated by Water Supply.

Maintenance

1. Keep “pretreatment devices” and inflows free of debris. Remove trash and sediment from grates monthly and after major storms.

2. Maintain area surrounding infiltration basin.
   - Keep grass mowed and free of debris
   - Patch (reseed) wash areas to prevent soil from entering stormwater
   - Fertilize grass lightly – excess fertilizer is a pollutant

3. Maintain bottom of infiltration basin annually – Take action if stormwater remains in pond for more than 4

days after rainfall.
- Loosen media (during drier summer periods) to allow water to soak into the ground
- Remove accumulated sediment
- Remove weeds and grass from the infiltration basin
- If there is any question about whether or not removed media might require special handling for disposal, contact the Tennessee Department of Environment and Conservation – Division of Solid Waste at (423)-634-5745

Maintenance Cost Estimates

1. Preventative Measures
   - Cleaning grates and other pre-treatment devices $20 per month
   - Mowing/landscaping - $10 - $15 per hour

2. Maintenance
   - Tilling (@$10 per hour) $40-$80 (larger infiltration basins may be higher)
   - Removal of sediment from infiltration basin - $250 - $750 (average size pond)
   - Replacement topsoil and labor - $750 - $1,000 (average size infiltration basin)

Preventative measures are important in decreasing costs of maintaining infiltration basins. Maintaining pre-treatment grates and catch basins by removing debris and sediment from them requires only a few minutes each month and can save a lot of money.

Removal of accumulated sediment from an infiltration basin can be performed by a small work crew with shovels and wheelbarrows or by small excavation equipment. Assuming that one foot of soil is removed from the basin and the basin is less than 2,000 square feet in size, the cost for soil removal would be expected to range from $250 to $750. Cost of replacement of clean media in an infiltration basin depends on the size of the basin, type of media, and method of distributing it.

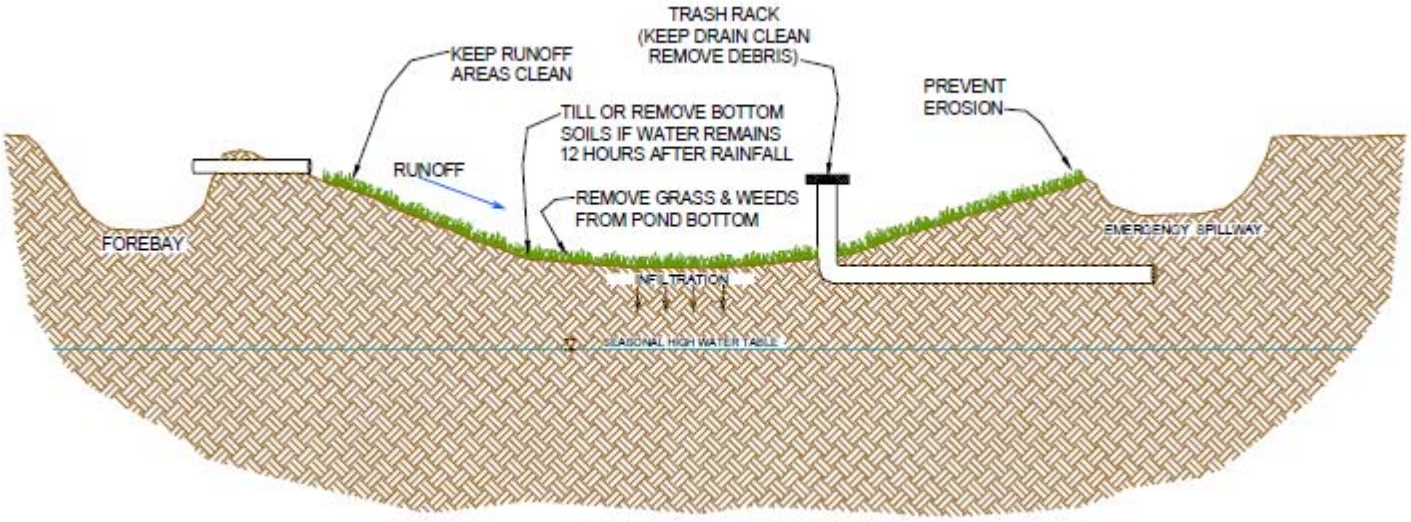
Mosquito Control

- Water standing in ponds can be breeding areas for mosquitoes.
- Prevent debris and soil from washing into the pond to create mosquito breeding habitat.
- Use bacterial larvicides available from home improvement stores in pre-treatment devices.
- Keep water from remaining in pond more than 3 days by using maintenance practices above.

Troubleshooting

1. Water remains in infiltration basin three days hours after rainfall
   Surface soils in infiltration basin may be clogged
   A. Till surface soils/remove debris
   B. Remove grass or weeds growing in pond bottom
   C. Remove 6 inches to 1 foot of surface soils if tilling does not shorten water detention to less than 72 hours

2. Mosquito or gnat infestations
   Habitats for mosquito and gnats exist in infiltration basin
   A. Remove debris from pond to eliminate habitat for breeding
   B. Use bacterial larvicide to control mosquitoes in pre-treatment devices
   C. Follow steps in #1 above if water is retained 4 days after rainfall



INFILTRATION BASIN

INSPECTION CHECKLIST
INFILTRATION BASINS
Chattanooga and Hamilton County, Tennessee MS4s

Inspection Date: _____

Facility Owner: _____

Facility Address: _____

_____

Facility Tax ID #:_____

Items Inspected	Maintenance Needed (Yes/No)	Corrected (Date)
Weekly or After Rainfall		
1. Spillway clean?		
2. Standpipe clean?		
3. Silt or trash buildup?		
4. Pipes clean and open? Trash buildup?		
5. Water standing longer than 4 days – tilling needed?		
Monthly		
1. Trees on dam?		
2. Erosion on dam?		
3. Animal burrows?		
4. Leaks in dam?		
5. Unwanted plants?		
Pre-Treatment Devices Check Weekly or After Rainfall		
1. Debris or silt buildup?		
2. Grass need mowing?		
3. Erosion upstream?		
4. Oil/Grease buildup?		
5. Oil skimmer trash removed?		

4.0 Constructed Wetlands

Description

- Specifically constructed to be a wetland with plants acting as filters to remove pollutants.
- Excavated basins that have large portions covered by plants that require moist soils.
- May or may not have standpipes and/or emergency spillways.
- May have pre-treatment devices like oil skimmers and/or forebays.
- Effect means of pollutant removal.

Maintenance

1. Keep pre-treatment devices and inflows free of debris. Remove trash and sediment from grates monthly or after major storms.
2. Forebays (pretreatment devices) should be cleaned out twice a year.
3. May need to remove excessive growth periodically
4. May need to mow aquatic vegetation during dry periods on occasion.
5. Maintain surrounding areas:

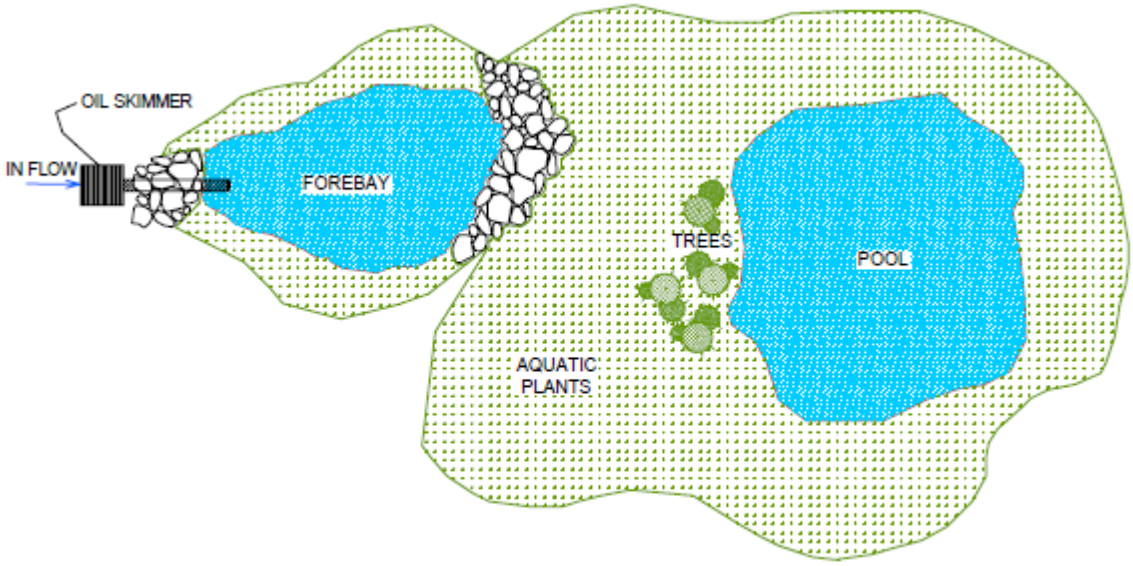
- Keep grass mowed and free of debris.
- Prevent erosion.
- Fertilize grass only lightly. Excess fertilizer is a pollutant.
- Inspect at least every year as well as after every major rainfall event.
- Remove debris that threatens to clog standpipes or emergency spillways.

Maintenance Cost Estimate

Maintaining pre-treatment grates and forebays by removing trash and silt from them requires only a few minutes each month and the cost for unskilled labor at a rate of $8.00 per hour should result in a monthly fee of less than $20.00.

Mosquito Control

- If a pool of water can be maintained within the wetland, mosquito fish (Gambusia) can be introduced to control these and other pests.
- Purple martin houses can be installed near a constructed wetland in attempt to control the mosquitoes.
- Bat houses and purple martin houses will attract bats and purple martins that feed on mosquitoes.
- Biological mosquito larvicides, available from hardware stores or home improvement stores can be used in pretreatment devices or forebays.



CONSTRUCTED WETLAND

INSPECTION CHECKLIST
Constructed Wetlands
Chattanooga and Hamilton County, Tennessee MS4s

Inspection Date: _____

Facility Owner: _____

Facility Address: _____

_____

Facility Tax ID #:_____

Items Inspected	Maintenance Needed (Yes/No)	Corrected (Date)
Monthly		
1. Trees on dam?		
2. Erosion on dam?		
3. Animal burrows?		
4. Leaks in dam?		
5. Unwanted plants?		
6. Standpipe clean?		
7. Silt or debris buildup?		
8. Unwanted plants?		
Pre-Treatment Devices Check Weekly or After Rainfall		
1. Debris or silt buildup?		
2. Grass need mowing?		
3. Erosion upstream?		
4. Oil/Grease buildup?		
5. Oil skimmer clean? Trash removed?		

5.0 Biofilters

Description

- Grassy channels (called swales because they are wider than most drainage ditches) or strips of vegetation through which stormwater passes before entering storm sewers or drainage ditches.
- Trap materials that include sediments, nutrients, toxic materials, floatable trash, oxygen-demanding substances, and oil and grease. This reduces the amount of these substances that enter streams.

Maintenance

1. Monitor grassed areas.
   - Check biofilters at least every two weeks and after major storm events.
   - Remove trash and sediments that may cover the grass often so that they won't build up and to discourage mosquito populations.
   - Mow grass when it reaches a length of 8 inches. Clippings should be bagged and removed rather than mulched so that they aren't washed downstream.
   - Sediment can be removed by hand using a shovel or rake, or from larger areas by excavation.
   - Debris such as leaves and twigs should be removed by raking.
   - Eroded areas that become bare should be reseeded in a manner that will not allow the seeds to wash away. This can be accomplished by applying hay straw with the seeds.

Maintenance Cost Estimate

Maintenance of smaller biofilters can be performed by a small landscaping team using a hand mower and rakes. To maintain grass at a height of no more than 8 inches, mowing may be required every 10 days to two weeks

during summer. Generally, this is included within normal landscaping activities and is included with that cost, which will be determined by the size of the area maintained.

Mosquito Control

Stormwater generally passes through biofilters shortly after rainfall events. If stormwater is retained within biofilters, mosquitoes may be able to breed in them.

- Follow good management practices as outlined above.
- Prevent debris and soil from washing into the biofilter.
- Mow grassy areas regularly and prevent weed infestations.
- Maintain clean inflow areas and remove soil and debris accumulations in the biofilter margins.

Troubleshooting

1. Water stands in biofilter three days after rainfall
   Drainpipe may be clogged or blocked
   A. Check drainpipe for trash buildup and remove
   B. Mow grass

2. Mosquito or gnat infestations
   Habitats for mosquito and gnats exist in basin
   A. Remove debris from biofilter to eliminate habitat for breeding

BIO-FILTER

INSPECTION CHECKLIST
BIOFILTERS
Chattanooga and Hamilton County, Tennessee MS4s

Inspection Date: _____

Facility Owner: _____

Facility Address: _____

_____

Facility Tax ID #:_____

Items Inspected	Maintenance Needed (Yes/No)	Corrected (Date)
Weekly or After Rainfall		
1. Trash buildup in basin?		
2. Grass too tall?		
3. Pipes clean and open? Trash buildup?		
4. Oil/Grease buildup?		
5. Oil skimmer clean? Trash removed?		
Pre-Treatment Devices Check Weekly or After Rainfall		
1. Debris or silt buildup?		
2. Grass need mowing?		
3. Erosion upstream?		
4. Oil/Grease buildup?		
5. Oil skimmer clean? Trash removed?		

6.0 Media Filter

Description

- Used in conjunction with detention facilities to treat stormwater before it is discharged from the site.
- Use sand or synthetic materials to filter substances from stormwater.
- Employ settling basins to catch stormwater prior to it entering the filtering media so that sediments settle out.
- Become dry between rainfall periods.
- Trap materials that include sediments, nutrients, toxic materials, floatable materials, oxygen-demanding substances, and oil and grease.

Maintenance

- Examine media filters for clogging at least every two weeks.
- When a sand filter becomes clogged to the point that stormwater runs off rather than filtering through it, the sand must be replaced.
- Remove trash and silt that collects on the surface of media filters and in the associated catch basins as necessary or after heavy rainfall periods.

Maintenance Cost Estimate

Basic maintenance of a media filter can be performed by a small work crew or even a single person using a shovel or rake to remove debris or sediments that collects in the catch basin or on the surface of the filter. The cost of replacing the media depends on the
type of filtration media. Sand is rather inexpensive; some filtration media is more expensive. Disposable

artificial media may range from $100 to more than $1,000 depending on size of filters and materials used. Filter media may have special disposal requirements.

Mosquito Control

Stormwater generally passes through media filters shortly after rainfall events. If stormwater is retained within media filters, mosquitoes may be able to breed in them.

- Follow good management practices as outlined above.
- Prevent debris, sediments, and other materials from accumulating in filter.
- Mow grassy areas regularly and prevent weed infestations.
- Maintain clean inflow areas and remove soil and debris accumulations in the biofilter margins.

Troubleshooting

1. Water stands in media filter three days after rainfall
    Drainpipe may be clogged or blocked
    A. Check drainpipe for trash buildup and remove
    B. Mow grass
    C. Change media if clogged

2. Mosquito or gnat infestations
    Habitats for mosquito and gnats exist in basin
    A. Remove debris from media filter to eliminate habitat for breeding

MEDIA FILTRATION

INSPECTION CHECKLIST
MEDIA FILTERS
Chattanooga and Hamilton County, Tennessee MS4s

Inspection Date: _____

Facility Owner: _____

Facility Address: _____

_____

Facility Tax ID #:_____

Items Inspected	Maintenance Needed (Yes/No)	Corrected (Date)
Check Weekly		
1. Filter clogged?		
2. Debris buildup?		
3. Trash buildup?		
4. Oil/Grease Buildup?		
5. Oil skimmer free of trash and absorbent material replaced?		

7.0 Oil Skimmers

Description

- Often used as part of an overall stormwater facility to remove petroleum and sediments from stormwater before entering detention facility.
- Collect petroleum (oil) compounds and grease.
- Box-like structures with inlet and outlet pipes.
- Oil booms and other simple disposable filters can be used to collect petroleum and reduce maintenance costs.

Maintenance

Oil skimmers are perhaps best maintained by professionals who can remove and possibly recycle the petroleum products filtered. However, oil skimmers should be checked and trash removed weekly. Without sound maintenance, oil skimmers can become mosquito havens.

- Check weekly and remove trash as necessary.
- Have oil/water separators cleaned regularly and oil, grease, and floating debris removed. Installation of booms or other absorbent devices at oil skimmer intakes may lengthen the time between cleanings.
- Remove petroleum products by pumping and have the materials placed in drums to be picked up by companies that specialize in waste recycling and disposal.
- When oil booms or other pre-filters become saturated, remove them.

1. Practice good housekeeping.

- Inspect parking lots at least weekly (more often if they have heavy traffic).
- Sweep parking lots at least weekly to remove dirt and debris.
- Identify oil and grease spills from automobiles and use kitty litter to soak up the spills and then sweep up the kitty litter, place it in a plastic bag, and place the bag in a dumpster (see introduction to this maintenance manual).

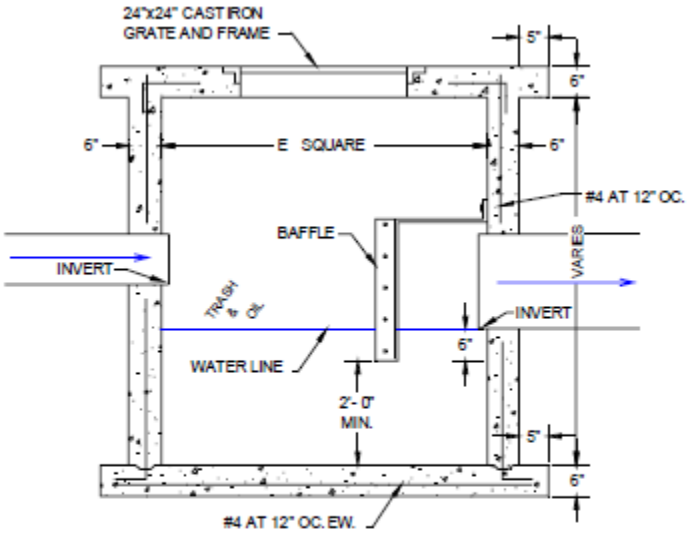
Maintenance Costs Estimate

Maintenance costs for oil skimmers vary widely depending on the size of the device and the amount of sludge and liquid accumulation. There is also a laboratory analysis requirement for the sludge that remains in the bottom of the filter after the liquid has been removed.

- Laboratory analysis for sludge - $100 to $200 per sample
- Liquid disposal - 40 to 50 cents per gallon.
- Drums of material removed from the separator - $200 to $250 each for disposal.
- Servicing a unit to clean condition – Several thousand dollars.

Mosquito Control

- Use biological mosquito larvicides in standing water.
- Remove trash from inside skimmers to eliminate breeding habitat.



OIL SKIMMER/GRIT COLLECTOR STRUCTURE

Mosquito Control

Because stormwater detention structures do what their name implies – detain water – they can become breeding grounds for mosquitoes. Some species of mosquitoes transmit diseases such as West Nile virus and encephalitis to humans. In some cases these diseases can be life threatening. It is, therefore, important to include mosquito control among our management practices for these devices.

Some mosquitoes can breed in a very small amount of water. Bird baths, discarded cans, and other small containers may harbor immature mosquito larvae. Eggs laid by mosquitoes hatch into larvae, which mature into adults in very short periods. Management practices for controlling mosquitoes in stormwater detention devices are primarily aimed at eliminating shallow, standing water, debris that might act to prevent stormwater from draining from devices, and employing larvicide to kill mosquito larvae in smaller devices or pretreatment devices.

Specific mosquito control steps will be discussed in each of the sections that follow. Good maintenance of the stormwater devices will generally also result in good mosquito control.