

CITY OF CHARLOTTE/MECKLENBURG COUNTY

POST CONSTRUCTION CONTROLS BEST MANAGEMENT PRACTICES MAINTENANCE HANDBOOK



2010

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1.0 OVERVIEW

The Post Construction Controls Regulations for the City of Charlotte, Mecklenburg County, Cornelius, Davidson, Huntersville, Matthews, Mint Hill and Pineville require that Best Management Practices (BMP) facilities be installed as part of meeting the each jurisdiction's NPDES Permit. Providing adequate maintenance is a key component for all BMP's to maximize performance and treatment of stormwater runoff as predicted and to extend the service life of the facility.

2.0 PURPOSE AND INTENT

The purpose of this manual is to provide general guidelines for maintenance procedures and practices for BMP facilities in the City of Charlotte, Mecklenburg County, and the surrounding towns. These guidelines are intended to be used in conjunction with good maintenance and construction practices and not to provide a step by step performance method.

Some of the general maintenance practices found in this manual can be performed by individuals who have general housekeeping skills in landscaping and yard maintenance which only requires basic hand tools and little experience. Other tasks discussed in this manual require experienced professionals that can operate heavy equipment, are knowledgeable of vegetation and landscape plants, and are highly trained in construction safety practices.

Never perform activities above your ability or experience. Always use appropriate safety devices when working around ponds and water.

3.0 BIORETENTION

Bioretention facilities have many components that need to be maintained and monitored to ensure that the overall performance is extended appropriately. It is important to remember that the structure has an amended soil foundation which performs as a filter media. At the bottom of the amended soil layer is a sub-drain to carry filtered runoff to a storm system. The upper layer of the amended soil is a 3 inch layer of hammered mulch with various plants or trees as specified in the original approved design plan.

General maintenance practices need to be performed on a regular basis to ensure that the facility is well manicured and to eliminate an accumulation of debris from clogging the mulch and soil layers. The following routine maintenance tasks are provided and should be carried out after every significant rainfall event or periodically as needed during dryer seasonal periods. Again, the main goal is to provide good housekeeping activities to keep the exposed part of the facility clean and performing adequately (figure 3.1).



Figure 3.1
Well-maintained Bioretention Facility

3.1 Routine Maintenance Activities

The following activities are to be performed on a routine basis (see Section 10 for recommended maintenance schedule) and after any significant rainfall event. Most of the activities listed below can be performed by non-professionals or landscape maintenance staff. Not performing the activities listed below may result in major problems identified on the annual report or failures which can become very costly to the owner to correct.

Always use good safety techniques when performing maintenance activities and never do any task above your level of competence.

- *Watering:* Plants and shrubs may require watering after initial planting periods (first 2 to 3 years) or during drought.
- *Erosion:* Inspect inlet and outlet areas of bioretention facility for erosion. Re-seed any bare spots or where natural soils are exposed around the bioretention perimeter immediately.
- *Nutrients and Pesticides:* Nutrients and pesticides should not be required. Consult with a professional if questionable conditions occur. The addition of these types of chemicals or products may have an adverse effect on the performance of the water treatment.
- *Trash and Debris:* Remove all trash and debris from forebay or main facility area. All debris should be removed immediately to avoid blockage of the soil media to infiltrate water and to keep outlet devices clear. All debris is to be disposed of appropriately. Plastics and aluminum can be recycled as a means to protect the environment. Periodic weeding may be needed to eliminate any grass or weeds from the bioretention area.
- *Leaves:* Remove any leaves that have accumulated in the cell area or near the facility. Leaves can block the soil media from infiltration and after rainfall runoff may be washed into the outlet structure which can cause flooding.
- *Outlet Structure:* Clear any debris or trash that is blocking the overflow weir (figure 3.2) and storm system. Clean off any protection device, such as wire fabric used to keep trash and debris from entering the outlet structure.



Figure 3.2
Overflow Weir

- *Plants:* Inspect plants that have been damaged or need irrigation. Dead or diseased plants are to be removed and replanted as soon as possible. If the entire facility shows signs of disease or widespread problems, then contact a professional to minimize damage and plant replacement.
- *Mowing:* Mow grass areas surrounding the facility to 3 to 6 inches in height. Replace any sod areas as needed to prevent any erosion.
- *Grass Clippings:* Remove any grass clippings around the perimeter of the facility after grass cutting practices. These clippings can clog the soil media, outlet structure devices or be washed into the storm system and into creeks.
- *RipRap:* Replace any riprap that has been moved from energy apron area. Should rip rap be displaced on a regular basis, then contact a professional for additional correction remedies.
- *Mulch:* The mulch layer should be refreshed periodically to maintain the 3 inch depth and completely replaced every 3 years. Replace the mulch layer immediately should the bioretention area be contaminated with heavy metals or any other pollutant that can significantly impact the operation of the bioretention facility.
- *Infiltration:* Observe for standing water in the bioretention cell that remains longer than 2 days. If standing water is observed in the bioretention area for more than 2 days following a rainfall event, then contact a professional or perform the following tasks if practical. The mulch layer can be raked away from the amended soil layer to inspect the condition of the underlying soil surface. Over a period of time the soil surface may become compacted or accumulate sediments which will hinder water from infiltrating past the soil surface. Should this inspection identify that the immediate surface of the amended soil structure is compacted or has a thin covered of hardened sediments, then removing the first inch or two of the soil and disposing of that waste appropriately will generally correct the problem. An additional measure that will improve the performance of the soil is to cultivate or till the top layer of the soil to encourage infiltration. Care should be taken to not damage any trees or shrubs if left in the bioretention area to perform this activity. The mulch layer can then be spread back of the soil structure to a 3 inch layer. It may be a good practice to replace the mulch layer during this type of maintenance.
- *Forebay:* The forebay area as shown in the photograph below (figure 3.3) has appropriate storage available to pre-treat runoff during a storm event. Should the forebay storage be taken up by

sedimentation (filled in), then contact a professional to have the forebay area cleaned, unless the sedimentation can be easily removed by hand and disposed of appropriately.



Figure 3.3
BMP Forebay

- *Maintenance Access:* Maintenance access areas are to be mowed and maintained regularly so as to provide unimpeded entry to the bioretention facility for inspection and maintenance activities. Any structural materials used for the construction of an access road are to be maintained in a good condition to allow for construction equipment during maintenance activities.

3.2 Major Maintenance Activities

The following maintenance activities are to be performed by professionals that require specific training or specialized equipment.

- *Forebay:* Excavation or vacuuming of the forebay (figure 3.4) is to be performed every 7 years or when the storage volume has been depleted by 50%. All debris is to be disposed of appropriately and not allowed to re-enter the storm system or be carried to a creek or stream. A bench mark is to be identified in the maintenance plan to identify the elevation of the original forebay bottom.

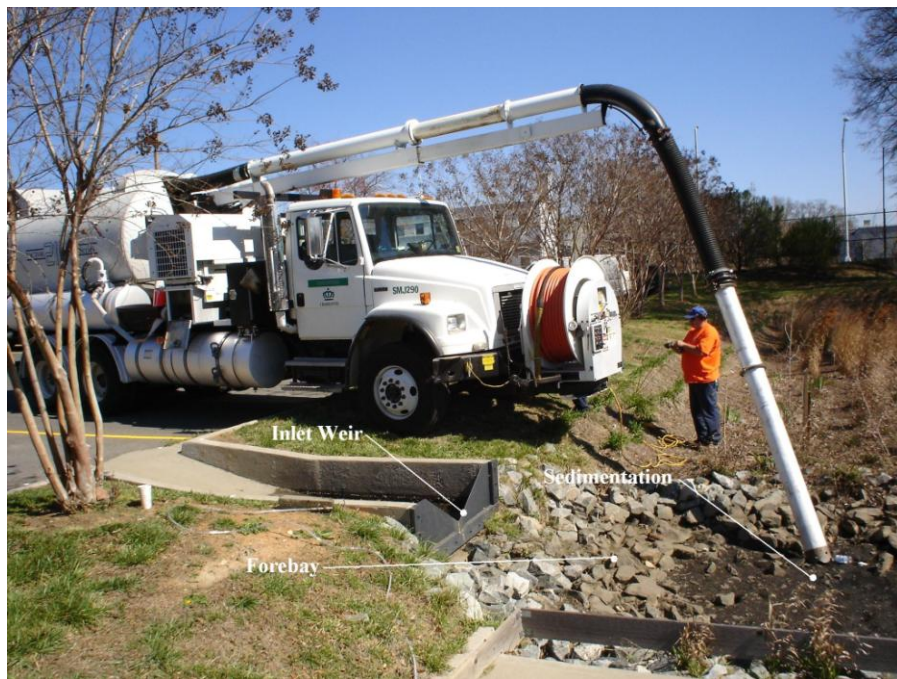


Figure 3.4
Forebay Vacuuming

- *RipRap*: Replace any rip rap that has been removed or in areas that the native soil is exposed.
- *Infiltration*: Bioretention facilities that no longer drain within 2 days of a rainfall event (figure 3.5) and the routine maintenance described above to treat the amended soil surface will not be the corrective action to resolve the problem, then replacement of the amended soil layer will be required. This activity will be performed as follows. Remove all plants and store in an appropriate area, remove the mulch surface layer, excavate all the amended soil taking care not to damage the under-drain system at the bottom of the facility. In some cases, cultivation of the bioretention facility bottom may be necessary to encourage infiltration into the natural soils. The amended soil to be replaced must meet all the original structural specifications as noted on the approved plans. A professional will certify that the soil content has satisfied that requirement and provide a report to the City prior to completing the activity.



Figure 3.5
Infiltration

- *Plants and Shrubs:* Any diseased or dead vegetation (figure 3.6) is to be treated or replaced immediately. All vegetation is to be re-established to the specifications described on the approved plan. If an on going problem continues with a specific species of plant, consult with a professional to determine the cause. All plants used in the bioretention area are to be well adaptive for this local area.



Figure 3.6
Bioretention Plantings

- *Maintenance Access:* Maintenance access roads may need to be scraped or gravel replaced due to settlement, erosion, or use. All maintenance roads are to remain in good condition throughout the life of the facility to allow for construction equipment during maintenance activities.

4.0 WETPOND



Figure 4.1
Wetpond

There are several major components of a wetpond (figure 4.1) and each contributes to the overall performance of the facility to treat stormwater runoff. Runoff is discharged into a forebay (similar to a sediment basin) which provides for settlement and pre-treatment of particulates prior to flowing into the main pond area for additional treatment. After stormwater leaves the forebay area, it travels through the berm or over a weir in the berm separating the forebay from the pond storage area. The main body of the pond consists of a permanent deep water body area surrounded by an aquatic shelf. The aquatic shelf is a shallow sloped earth bench in which aquatic plants have been planted for nutrient uptake. Most ponds are designed to temporarily store stormwater runoff for various storm events on top of the permanent pool elevation and are released over a specified period of time. The outlet structure, usually located at the downstream end of the pond, controls the discharge flow from the pond. The outlet discharge has an energy dissipater downstream to protect the discharge channel from erosive measures from the outlet discharge. Some ponds may also have an overflow weir designed in the embankment to release large flows safely downstream during intense storms and to help protect the berm from failure.

Maintenance activities for a wetpond facility are necessary to ensure longevity of the water quality treatment expected from this type of BMP. Inlets for the BMP are to be inspected and clear of debris to ensure bypass is not a concern. Erosion within the drainage area contributing to a BMP has to be addressed to eliminate premature loss of storage within the forebay or main pond area. All outlet structures are to be kept clear of debris so the design discharge rates are not exceeded and water quality treatment is provided.

4.1 Routine Maintenance Activities

The following activities are to be performed on a routine basis (see Section 10 for recommended maintenance schedule) and after any significant rainfall event. Most of the activities listed below can be performed by non-professionals or landscape maintenance staff. Not performing the activities listed below may result in major problems identified on the annual report or failures which can become very costly to the owner to correct.

Always use good safety techniques when performing maintenance activities and never do any task above your level of competence. Care should always be taken when performing tasks around the BMP pond areas. Never wade or work near the water edge without someone else being around and always use appropriate safety equipment, such as personal safety devices (PSD).

- *Watering*: Plants and shrubs may require watering after initial planting periods (first 2 to 3 years) or during drought.
- *Erosion*: Inspect inlet and outlet areas of the wetpond facility for erosion. Re-seed any bare spots or where natural soils are exposed around the facility perimeter or embankments immediately.
- *Nutrients and Pesticides*: Nutrients and pesticides should not be required. Consult with a professional if questionable conditions occur. The addition of these types of chemicals or products may have an adverse effect on the performance of the water treatment.
- *Trash and Debris*: Remove all trash and debris from forebay or main facility area. All debris should be removed immediately to avoid obstructions within the flow area of the facility and to keep outlet devices clear. All debris is to be disposed of appropriately. Plastics and aluminum can be recycled as a means to protect the environment. Periodic weeding may be needed to eliminate any grass or weeds from the facility area. Some trash and debris can be removed using a net made on the end of a handle. In some cases, a small water craft may be necessary to retrieve trash within the pond area. However, never use a water craft alone and always use appropriate safety equipment such as personal safety devices.
- *Leaves*: Remove any leaves that have accumulated in or near the facility area. Leaves can accumulate on or around vegetation and impact plant life. They also need to be removed after rainfall runoff to avoid being washed into the outlet structure which can cause flooding.
- *Outlet Structure*: Clear any debris or trash that is blocking the overflow weir and storm system. Clean off any protection device, such as wire fabric used to keep trash and debris from entering the outlet structure. Make sure that all outlet openings, such as an orifice or weir are kept clear of debris. Drain valves should be opened several times a year for a short time to ensure that they are not blocked.
- *Plants*: Inspect plants that have been damaged or need irrigation. Dead or diseased plants are to be removed and replanted as soon as possible. If the entire facility shows signs of disease or widespread problems, then contact a professional to minimize damage and plant replacement.
- *Mowing*: Grass areas surrounding the facility are to be mowed annual to prevent trees and unwanted undergrowth to become established. BMPs that are located near residential structures and require being aesthetically pleasing may be mowed to a minimum of 3 inch height.
- *Grass Clippings*: Remove any grass clippings around the perimeter of the facility after grass cutting practices. These clippings can contaminate the pond, clog outlet devices, or be washed into the storm system and into creeks.
- *RipRap*: Replace any riprap that has been moved from energy apron area. Should rip rap be displaced on a regular basis, then contact a professional for additional correction remedies.
- *Forebay*: The forebay area as shown in the photograph below (figure 4.2) has appropriate storage available to pre-treat runoff during a storm event. Should the forebay storage be taken up by sedimentation (filled in), then contact a professional to have the forebay area cleaned, unless the sedimentation can be easily removed by hand and disposed of appropriately.



Figure 4.2
BMP Forebay

- *Maintenance Access:* Maintenance access areas are to be mowed and maintained regularly so as to provide unimpeded entry to the BMP facility for inspection and maintenance activities. Any structural materials used for the construction of an access road (figure 4.3) are to be maintained in a good condition to allow for construction equipment during maintenance activities.



Figure 4.3
Maintenance Access Road

4.2 Major Maintenance Activities

The following maintenance activities are to be performed by professionals that have specific training or specialized equipment.

- *Forebay*: Excavation or vacuuming of the forebay (Figure 4.4, 4.5) is to be performed every 7 years or when the storage volume has been depleted by 50%. All debris is to be disposed of appropriately and not allowed to re-enter the storm system or be carried to a creek or stream. A bench mark is shown on the maintenance plan to identify the elevation of the original forebay bottom. The forebay area (figure 4.4) is most likely the primary feature in a wetpond to require periodic maintenance to ensure that adequate storage is available to pre-treat runoff (deposit sediments) prior to flowing into the main pond area. The forebay will need to be drained or pumped dry (see Charlotte Land Development Standards Manual for the Dewatering Standard) in such a manner as to not allow untreated water to be discharged downstream of the facility during maintenance practices. The forebay will need to be excavated (figure 4.4) to the original size based on the approved engineering plans of record and stabilized after the area has been restored. All outfall energy dissipaters will need to be reconstructed to the original size if disturbed during the maintenance of the forebay. Any plantings that are disturbed will need to be replaced as per the original approved planting plan.



Figure 4.4
Sedimentation in Forebay



Figure 4.5
Excavating Forebay

- *Earthen Berm (Riprap Lined)*: The berm between the forebay and the main body of the pond may need to be repaired to make sure that any eroded areas are backfilled, compacted and stabilized. This berm is generally constructed of good structural material and lined on the surface with riprap to guard against erosion and breach failure. Any areas of the berm that are showing signs of settlement, undermining, or are eroding shall be backfilled, compacted, lined and stabilized immediately.
- *Dewatering*: Should the main pond need to be accessed for maintenance, the permanent pool of water will need to be lowered or completely drained (figure 4.6) as necessary to complete the required maintenance activity.



Figure 4.6
Outlet Structure

The permanent pool of water stored in the main pond area can be drained by opening the maintenance valve (see figure 4.7) on the outlet structure until an adequate amount of water is being released such that the pond drains over a minimum of 2 days. This practice is necessary so disturbance to the downstream channels is minimized. Should the discharge flow appear to be unclear after the initial flow has been released, then an alternative operation (filtering) must be implemented so as to not pollute the downstream channel. A suitable practice to perform this task can be found and followed as referenced in the Charlotte Land Development Standards Manual - Dewatering Standard.

After the pond has been drained successfully, then any necessary cleaning of the outlet structure and maintenance valve is to be performed prior to sustaining the permanent pool of water in the pond.

- **Main Pond Maintenance:** After draining the main pond permanent pool of water, the aquatic shelf, as well as, the permanent pool storage area can be accessed to perform necessary maintenance activities. To address sedimentation accumulation (well stabilized drainage areas may need excavation between 10 and 15 years) in the main pond which has filled the original storage volume in the main pond is to be excavated (figure 4.8) until the original design storage volume per the approved plans has been achieved. All waste material is to be dried appropriately and removed to a suitable area. Any contaminated soil is to be hauled to an appropriate landfill for disposal. Care is to be exercised to ensure

that this maintenance operation prevents any waste from being discharged downstream of the site. All adequate erosion control materials and devices are to be used to prevent sedimentation from leaving the site during maintenance activities.

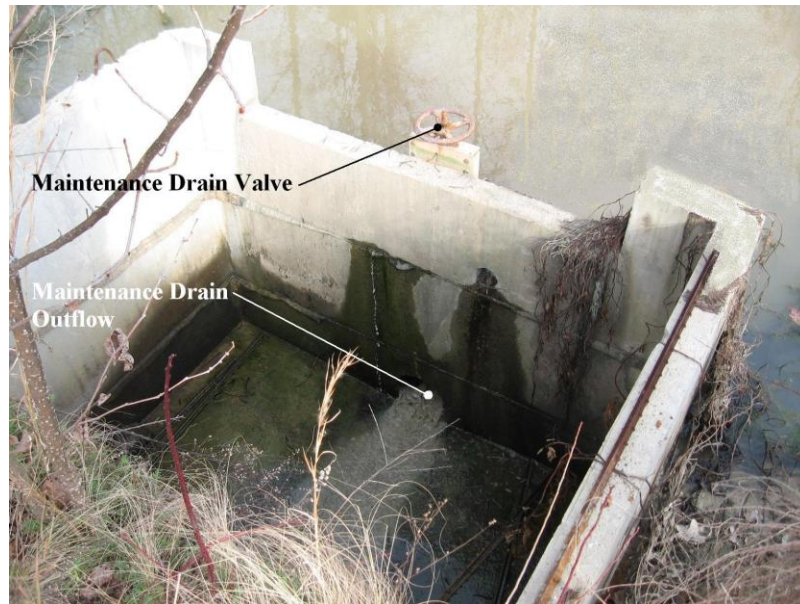


Figure 4.7
Outlet Structure

After sedimentation has been removed and all grading complete making sure that all pond characteristics have been reconstructed per the original design, including slopes, aquatic shelf, energy dissipaters, berms, etc. the pond area can be stabilized, aquatic plants replanted (per the original plan) and the pond drain valve closed to begin filling pond to permanent pool elevation.



Figure 4.8
Wetpond Excavation

- *RipRap*: Replace any rip rap that has been removed or in areas that the native soil is exposed.

- *Plants and Shrubs:* Any diseased or dead vegetation is to be treated or replaced immediately. All vegetation is to be re-established to the specifications described on the approved plan. If an on going problem continues with a specific species of plant, consult with a professional to determine the cause. All plants used in the BMP area are to be well adaptive for this local area.
- *Invasive Plants:* All invasive plants (figure 4.9) are to be removed from the main pond when 30 percent of the surface area of the pond is covered. The procedure for removing the invasive plants is similar to the main pond maintenance procedure. Care should be taken to not disturb wetland plants on the aquatic shelf in the main pond area that are not impacted by the invasive species.



Figure 4.9
Invasive Plants

All vegetation in the BMP is to be replanted per the original planting plan. The site is to be revisited periodically to ensure that the plants have been successfully established.

- *Maintenance Access:* Maintenance access roads may need to be scraped or gravel replaced due to settlement, erosion, or use. All maintenance roads are to remain in good condition throughout the life of the facility to allow for construction equipment during maintenance activities.
- *Embankment:* The embankment of the pond is to be free of any settlement; eroded areas are to be backfilled and compacted appropriately and all exposed native soil areas are to be stabilized immediately (figure 4.10).



Figure 4.10
Embankment Erosion

- *Aquatic Shelf*: Maintenance of the aquatic shelf (figures 4.11, 4.12) should be performed at such a time when sedimentation has accumulated or inundated the plants to an extent that the life of the plants are impacted. All plants are to be removed and disposed of in an appropriate landfill unless a qualified professional has determined that the plants can be removed and replanted successfully (figure 4.9). The aquatic shelf is to be re-graded to the design depth and dimensions as noted on the original approved plans or as specified in the BMP Design Manual. It is very important to make sure that all of the sloped areas leading to the aquatic shelf are stabilized prior to planting of any vegetation. Adequate protection from animals and water fowl are to be used as necessary to ensure aquatic plants are established successfully after re-construction of the aquatic shelf.

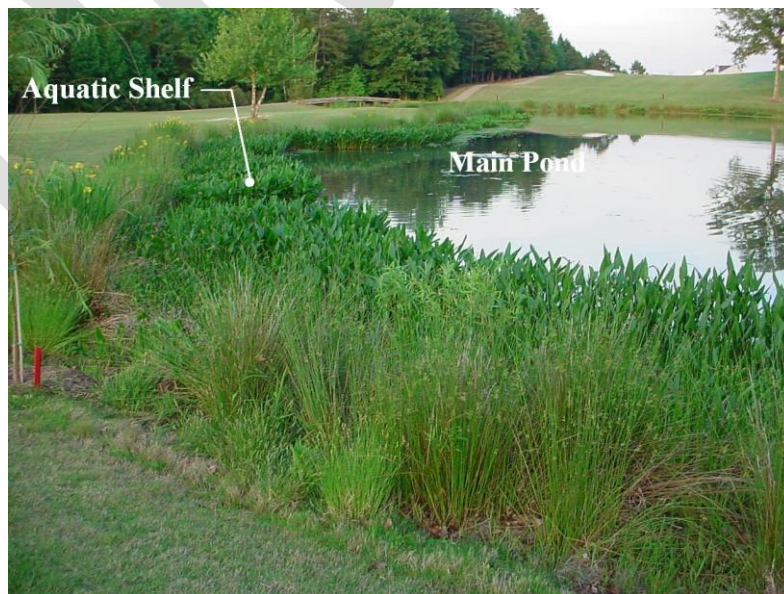


Figure 4.11

Well Established Aquatic Shelf



Figure 4.12
Dead Plants on Aquatic Shelf

- *Main Pond Slopes:* All slope areas leading to the main pond are to be no greater than a 3:1 slope horizontal to vertical. All slopes are to be repaired and stabilized should any native soils be exposed. Erosion from unstable slopes (figure 4.13) will promote premature sediment accumulation in the forebay or pond and require early maintenance to be performed and can be very costly for the owner.



Figure 4.13
Slope Erosion

- *Outlet Structure:* The outlet structure (figure 4.14) may need cleaning of debris routinely. Any debris that covers the discharge openings can interrupt the performance of the pond and can impact downstream channel stability.

Draining the pond should not be necessary to perform routine maintenance of the outlet structure. However, if a situation should occur then follow the procedure above for dewatering the pond. Any leaks or cracks in the outlet structure that are visible are to be repaired immediately. A cleaning rod may be needed to pass through any low level orifice to ensure that debris has been cleared from the opening. All strainers that are part of the original design are to be raked clean and open.



Figure 4.14
Outlet Structure

- *Maintenance Valve:* The maintenance valve is to be checked during each maintenance operation of the pond to ensure that it opens and closes properly. Any malfunction of the drain valve is to be repaired immediately. This procedure should be performed at least twice a year during routine maintenance inspections.

5.0 WETLAND



Figure 5.1
Wetland

There are several major components of a wetland (figure 5.1) and each contributes to the overall performance of the facility to treat stormwater runoff. Runoff is discharged into a forebay (similar to a sediment basin) which provides for settlement and pre-treatment of particulates prior to flowing into the main pond area for additional treatment. After stormwater leaves the forebay area, it travels through the berm or over a weir in the berm separating the forebay from the pond storage area. The main body of the pond consists of several different wetland plant zones (shallow and deep) with main channels running between. The wetland plant zones have been planted for nutrient uptake. Most ponds are designed to temporarily store stormwater runoff for various storm events on top of the permanent pool elevation and are released over a specified period of time. The outlet structure, usually located at the downstream end of the pond, controls the discharge flow from the pond. The outlet discharge has an energy dissipater downstream to protect the discharge channel from erosive measures from the outlet discharge. Some ponds may also have an overflow weir designed in the embankment to release large flows safely downstream during intense storms and to help protect the berm from failure.

Maintenance activities for a wetland facility are necessary to ensure longevity of the water quality treatment expected from this type of BMP. Inlets for the BMP are to be inspected and clear of debris to ensure bypass is not a concern. Erosion within the drainage area contributing to a BMP has to be addressed to eliminate premature loss of storage within the forebay or main pond area. All outlet structures are to be kept clear of debris so the design discharge rates are not exceeded and water quality treatment is provided.

5.1 Routine Maintenance Activities

The following activities are to be performed on a routine basis (see Section 10 for recommended maintenance schedule) and after any significant rainfall event. Most of the activities listed below can be performed by non-professionals or landscape maintenance staff. Not performing the activities listed below may result in major problems identified on the annual report or failures which can become very costly to the owner to correct.

Always use good safety techniques when performing maintenance activities and never do any task above your level of competence. Care should always be taken when performing tasks around the BMP pond areas. Never wade or work near the water edge without someone else being around and always use appropriate safety equipment, such as personal safety devices (PSD).

- *Watering:* Plants and shrubs may require watering after initial planting periods (first 2 to 3 years) or during drought.
- *Erosion:* Inspect inlet and outlet areas of the wetpond facility for erosion. Re-seed any bare spots or where natural soils are exposed around the facility perimeter or embankments immediately.
- *Nutrients and Pesticides:* Nutrients and pesticides should not be required. Consult with a professional if questionable conditions occur. The addition of these types of chemicals or products may have an adverse effect on the performance of the water treatment.
- *Trash and Debris:* Remove all trash and debris from forebay or main facility area. All debris should be removed immediately to avoid obstructions within the flow area of the facility and to keep outlet devices clear. All debris is to be disposed of appropriately. Plastics and aluminum can be recycled as a means to protect the environment. Periodic weeding may be needed to eliminate any grass or weeds from the facility area. Some trash and debris can be removed using a net made on the end of a handle. In some cases, a small water craft may be necessary to retrieve trash within the pond area. However, never use a water craft alone and always use appropriate safety equipment such as personal safety devices.
- *Leaves:* Remove any leaves that have accumulated in or near the facility area. Leaves can accumulate on or around vegetation and impact plant life. They also need to be removed after rainfall runoff to avoid being washed into the outlet structure which can cause flooding.

- *Outlet Structure:* Clear any debris or trash that is blocking the overflow weir and storm system. Clean off any protection device, such as wire fabric used to keep trash and debris from entering the outlet structure. Make sure that all outlet openings, such as an orifice or weir are kept clear of debris. Drain valves should be opened several times a year for a short time to ensure that they are not blocked.
- *Plants:* Inspect plants that have been damaged or need irrigation. Dead or diseased plants are to be removed and replanted as soon as possible. If the entire facility shows signs of disease or widespread problems, then contact a professional to minimize damage and plant replacement.
- *Mowing:* Grass areas surrounding the facility are to be mowed annual to prevent trees and unwanted undergrowth to become established. BMPs that are located near residential structures and require being aesthetically pleasing may be mowed to a minimum of 3 inch height.
- *Grass Clippings:* Remove any grass clippings around the perimeter of the facility after grass cutting practices. These clippings can contaminate the pond, clog outlet devices, or be washed into the storm system and into creeks.
- *RipRap:* Replace any riprap that has been moved from energy apron area. Should rip rap be displaced on a regular basis, then contact a professional for additional correction remedies.
- *Forebay:* The forebay area as shown in the photograph below has appropriate storage available to pre-treat runoff during a storm event. Should the forebay storage be taken up by sedimentation (filled in), then contact a professional to have the forebay area cleaned, unless the sedimentation can be easily removed by hand and disposed of appropriately.



Figure 5.2
Forebay

- *Maintenance Access:* Maintenance access areas are to be mowed and maintained regularly so as to provide unimpeded entry to the BMP facility for inspection and maintenance activities. Any structural materials used for the construction of an access road (figure 5.3) are to be maintained in a good condition to allow for construction equipment during maintenance activities.



Figure 5.3
Maintenance Access Road

5.2 Major Maintenance Activities

The following maintenance activities are to be performed by professionals that have specific training or specialized equipment.

- *Forebay:* Excavation or vacuuming of the forebay (as shown in the photograph below) is to be performed every 7 years or when the storage volume has been depleted by 50%. All debris is to be disposed of appropriately and not allowed to re-enter the storm system or be carried to a creek or stream. A bench mark is shown on the maintenance plan to identify the elevation of the original forebay bottom. The forebay area (figures 5.2,5.4,5.5) is most likely the primary feature in a wetpond to require periodic maintenance to ensure that adequate storage is available to pre-treat runoff (deposit sediments) prior to flowing into the main pond area. The forebay will need to be drained or pumped dry (see Charlotte Land Development Standards Manual for the Dewatering Standard) in such a manner as to not allow untreated water to be discharged downstream of the facility during maintenance practices. The forebay will need to be excavated (figure 5.4) to the original size based on the approved engineering plans of record and stabilized after the area has been restored. All outfall energy dissipaters will need to be reconstructed to the original size if disturbed during the maintenance of the forebay. Any plantings that are disturbed will need to be replaced as per the original approved planting plan.



Figure 5.4
Sedimentation in Forebay



Figure 5.5
Excavating Forebay

- *Earthen Berm (Riprap Lined)*: The berm between the forebay and the main body of the pond may need to be repaired to make sure that any eroded areas are backfilled, compacted and stabilized. This berm is generally constructed of good structural material and lined on the surface with riprap to guard against erosion and breach failure. Any areas of the berm that are showing signs of settlement, undermining, or are eroding shall be backfilled, compacted, lined and stabilized immediately.
- *Dewatering*: Should the main pond need to be accessed for maintenance, the permanent pool of water will need to be lowered or completely drained (figure 5.6) as necessary to complete the required maintenance activity.



Figure 5.6
Draining Pond with Maintenance Valve

The permanent pool of water stored in the main pond area can be drained by opening the maintenance valve (figure 5.6) on the outlet structure until an adequate amount of water is being released such that the pond drains over a minimum of 2 days. This practice is necessary so disturbance to the downstream channels is minimized. Should the discharge flow appear to be unclear after the initial flow has been released, then an alternative operation (filtering) must be implemented so as to not pollute the downstream channel. A suitable practice to perform this task can be found and followed as referenced in the Charlotte Land Development Standards Manual - Dewatering Standard.

After the pond has been drained successfully, then any necessary cleaning of the outlet structure and maintenance valve is to be performed prior to sustaining the permanent pool of water in the pond.

- *Main Pond Maintenance:* After draining the main pond permanent pool of water, the aquatic shelf, as well as, the permanent pool storage area can be accessed to perform necessary maintenance activities. To address sedimentation accumulation (well stabilized drainage areas may need excavation between 10 and 15 years) in the main pond which has filled the original storage volume in the main pond is to be excavated (figure 5.7) until the original design storage volume per the approved plans has been achieved. All waste material is to be dried appropriately and removed to a suitable area. Any contaminated soil is to be hauled to an appropriate landfill for disposal. Care is to be exercised to ensure that this maintenance operation prevents any waste from being discharged downstream of the site. All adequate erosion control materials and devices are to be used to prevent sedimentation from leaving the site during maintenance activities.

After sedimentation has been removed and all grading complete making sure that all pond characteristics have been reconstructed per the original design, including slopes, wetland plant zones to the actual size and elevations, energy dissipaters, berms, etc. the pond area can be stabilized, aquatic plants replanted (per the original plan) and the pond drain valve closed to begin filling pond to permanent pool elevation.

- *RipRap:* Replace any rip rap that has been removed or in areas that the native soil is exposed.
- *Plants and Shrubs:* Any diseased or dead vegetation is to be treated or replaced immediately. All vegetation is to be re-established to the specifications described on the approved plan. If an on going

problem continues with a specific species of plant, consult with a professional to determine the cause. All plants used in the BMP area are to be well adaptive for this local area.

- *Invasive Plants:* All invasive plants (figure 5.8) are to be removed from the main pond when 30 percent of the surface area of the pond is covered. The procedure for removing the invasive plants is similar to the main pond maintenance procedure. Care should be taken to not disturb wetland plants on the aquatic shelf in the main pond area that are not impacted by the invasive species.



Figure 5.8
Invasive Plants

All vegetation in the BMP is to be replanted per the original planting plan. The site is to be revisited periodically to ensure that the plants have been successfully established.

- *Maintenance Access:* Maintenance access roads may need to be scraped or gravel replaced due to settlement, erosion, or use. All maintenance roads are to remain in good condition throughout the life of the facility to allow for construction equipment during maintenance activities.
- *Embankment:* The embankment of the pond is to be free of any settlement; eroded areas are to be backfilled and compacted appropriately and all exposed native soil areas are to be stabilized immediately.



Figure 5.9
Embankment Erosion

- *Main Pond Slopes:* All slope areas leading to the main pond are to be no greater than a 3:1 slope horizontal to vertical. All slopes are to be repaired and stabilized should any native soils be exposed. Erosion from unstable slopes (figure 5.9) will promote premature sediment accumulation in the forebay or pond and require early maintenance to be performed and can be very costly for the owner.
- *Outlet Structure:* The outlet structure may need cleaning of debris routinely. Any debris that covers the discharge openings can interrupt the performance of the pond and can impact downstream channel stability.

Draining the pond should not be necessary to perform routine maintenance of the outlet structure. However, if a situation should occur then follow the procedure above for dewatering the pond. Any leaks or cracks in the outlet structure that are visible are to be repaired immediately. A cleaning rod may be needed to pass through any low level orifice to ensure that debris has been cleared from the opening. All strainers that are part of the original design are to be raked clean and open.



Figure 5.10
Outlet Structure

- *Maintenance Valve:* The maintenance valve (figure 5.10) is to be checked during each maintenance operation of the pond to ensure that it opens and closes properly. Any malfunction of the drain valve is to be repaired immediately. This procedure should be performed at least twice a year during routine maintenance inspections.

6.0 ENHANCED GRASS SWALE / INFILTRATION TRENCH

Enhanced grass swales and infiltration trenches are both reasonably flat channels with improved material constructed along the travel path of the storm runoff to enhance or encourage infiltration characteristics. Maintenance for these BMPs consists of grooming of vegetation and sedimentation removal.



Figure 6.1
Grass Swale

6.1 Routine Maintenance Activities

The following activities are to be performed on a routine basis (see Section 10 for recommended maintenance schedule) and after any significant rainfall event. Most of the activities listed below can be performed by non-professionals or landscape maintenance staff. Not performing the activities listed below may result in major problems identified on the annual report or failures which can become very costly to the owner to correct.

- *Watering:* Watering may be required after initial planting periods or during drought to maintain a good vegetation cover.
- *Grass:* Mowing will be dictated by the location of the BMP. In areas of develop that require aesthetically pleasing characteristics, mowing will probably follow normal landscape practices as the development site. Grass should be mowed to a 3 inch to 6 inch height. In more remote areas mowing can be achieved less regularly.
- *Grass Clippings:* Grass clippings should be removed if possible so as to not impede infiltration in to the subsoil material.
- *Trash:* Trash is to be removed routinely during normal maintenance practices. Trash left uncollected can block check dams and cause water to over flow channel slopes during heavy rains.
- *Check Dams:* All check dams are to be cleared of debris and any displaced riprap to be restored during routine maintenance practices.

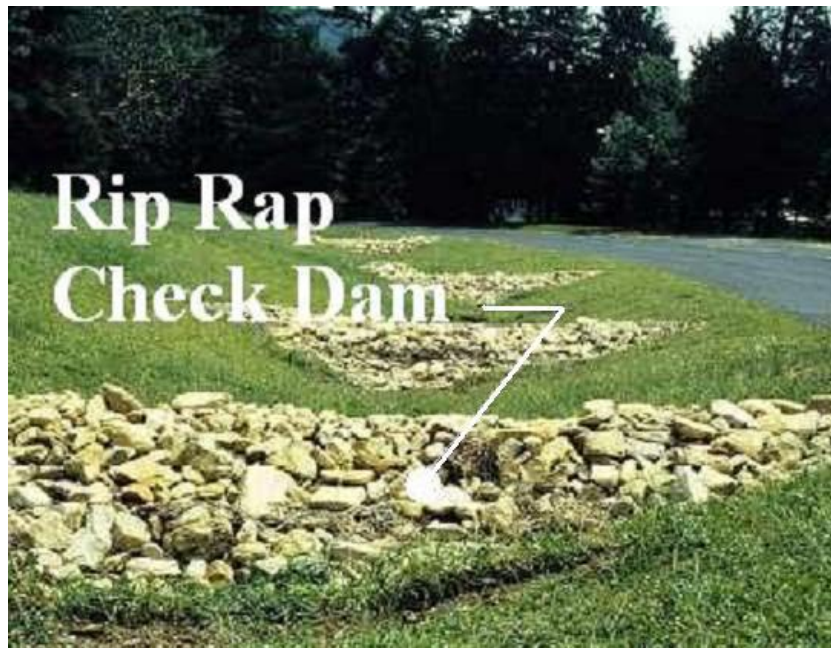


Figure 6.2
Grass Swale with Check Dams

- *Sedimentation:* Sedimentation is to be removed as needed where accumulation occurs. Removal of incidental accumulation will reduce major removal in the future. All sedimentation that is removed should be disposed of in an area so as to not re-enter the swale or allowed to go to creeks or streams.
- *Aeration:* Seasonal aeration is encouraged to improve infiltration characteristics of the channel bottom that mowing practices compact. Several passes with a common lawn aerator is sufficient to make this improvement. This operation can be performed in the fall and spring seasons.

6.2 Major Maintenance Activities

The following maintenance activities are to be performed by professionals that have specific training or specialized equipment.

- *Sedimentation:* Heavy sedimentation is to be removed when infiltration has been reduced so as the water stands in the channel for more than 2 days. This can be accomplished by scraping the first inch or two of cover, including grass until a clean portion of the subsoil layer is reached. If necessary, restore the subsoil removed with new amended soil as shown of the approved plan. Cultivation of the subsoil is recommended prior to re-establishing the vegetation to enhance infiltration characteristics and to address compaction created by construction equipment. Watering may be required after initial planting periods or during drought to maintain a good vegetation cover.
- *Removal of subsoil:* If subsoil layer is contaminated or is filled with sedimentation, the entire subsoil layer is to be removed and replaced. Care is recommended when excavating near the bottom of the trench so as to not damage any sub-drain pipe. The subsoil layer is to be replaced with the same material and consistency as shown on the approved plan.
- *Sub-drain maintenance:* Sub-drain pipe located in the bottom of the trench are to be inspected and cleaned annually and more often if signs of reduced infiltration are observed. Removal of the sub-drain cleanout cap provides access to the sub-drain pipe. Cleaning rods or devices are usually adequate to break up any clogged pipes due to accumulation of debris and dirt. A high pressure nozzle can be pushed through the cleanout pipe to flush any loss trash and remaining dirt out of the system.

- *Check dams:* Check dams that are blocked should be removed and reconstructed to original elevation and size. Care should be taken to replace riprap stone with the same size stone as original design.
- *Grass:* Any exposed areas are to be re-established to reduce damage to the subsoil or create erosion immediately.
- *Nutrients and Pesticides:* Nutrients and pesticides should not be required. Consult with a professional if questionable conditions occur. The addition of these types of chemicals or products may have an adverse effect on the performance of the water treatment.

7.0 FILTER STRIP

Filter strips are improved natural areas that encourage infiltration of rainfall runoff. They typically are constructed on fairly flat slopes, covered in with loose soils and vegetation. Some localized ponding can be expected for short periods of time. Limiting equipment and activity from these areas is important towards the functionality of this type of BMP.



Figure 7.0
Filter Strip

7.1 Routine Maintenance Activities

The following activities are to be performed on a routine basis (see Section 10 for recommended maintenance schedule) and after any significant rainfall event. Most of the activities listed below can be performed by non-professionals or landscape maintenance staff. Not performing the activities listed below may result in major problems identified on the annual report or failures which can become very costly to the owner to correct.

- *Watering:* Watering may be required after initial planting periods or during drought to maintain a good vegetation cover.
- Reseed filter strip to maintain a dense growth of vegetation.
- Repair erosion immediately to ensure that runoff disperses and flows across area to achieve maximum infiltration.
- Mow grass areas at least two to three times a year with 3 inch minimum height.
- Clean debris and litter as needed.

- If an outlet structure is provided, make sure that openings are clear of debris and trash after rainfall runoff events.



Figure 7.1
Filter Strip Inlet

- Aeration of the filter strip can be done in the fall and spring to encourage infiltration and to address compaction from use or mowing practices.
- Remove grass clippings after any harvesting or mowing activities.



Figure 7.3
Wooded Filter Strip

8.0 EXTENDED DRY DETENTION

Extended dry detention basins are impoundments constructed so as to create storage area available to detain rainfall runoff for a specified period of time for different storm events. After the stored runoff has been released the basin returns to a dry state. The storage level in this type of BMP is control or determined by an outlet structure which has one of more openings to release stored runoff as it enters the facility. Maintenance for this type of BMP usually consist of mowing the storage area periodically, cleaning the outlet device and making sure the embankment is safety and structurally sound. Some of these BMPs may have a forebay to initially treat the runoff prior to dispersing into the main storage area. The forebay may need periodic excavation to remove sedimentation every 7 years. As seen in figure 8.1 dry detention ponds temporarily store water for several days to control discharge downstream. Forebay area is clean and has ample storage to pre-treat runoff adequately.

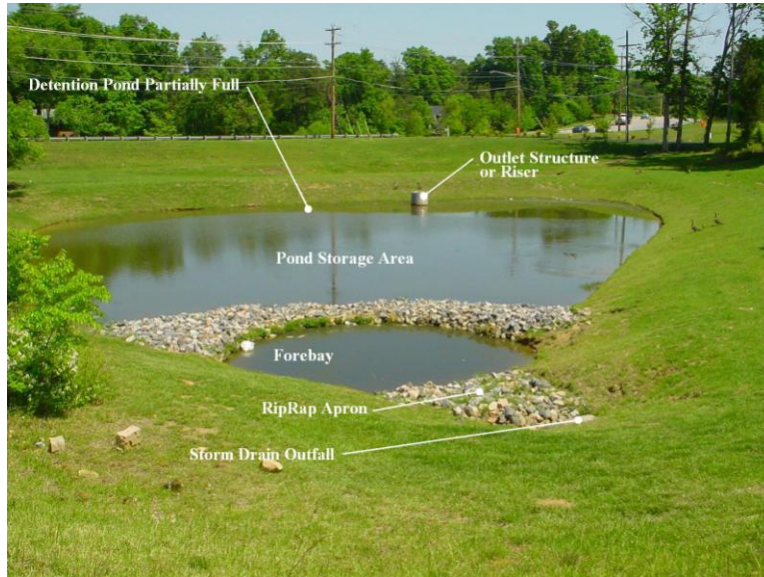


Figure 8.1
Partially Full Dry Detention Basin

8.1 Routine Maintenance Activities

The following activities are to be performed on a routine basis (see Section 10 for recommended maintenance schedule) and after any significant rainfall event. Most of the activities listed below can be performed by non-professionals or landscape maintenance staff. Not performing the activities listed below may result in major problems identified on the annual report or failures which can become very costly to the owner to correct.

Always use good safety techniques when performing maintenance activities and never do any task above your level of competence. Care should always be taken when performing tasks around the BMP pond areas. Never wade or work near the water edge without someone else being around and always use appropriate safety equipment, such as personal safety devices (PSD).

- *Forebay:* The forebay area as shown in the photograph above (figure 8.1) has appropriate storage available to pre-treat runoff during a storm event. Should the forebay storage be taken up by sedimentation (filled in), then contact a professional to have the forebay area cleaned, unless the sedimentation can be easily removed by hand and disposed of appropriately.
- *Storage Area:* The storage area should be mowed periodically to prevent undergrowth and trees to establish. It is suggested to keep the storage area maintained to a maximum of 6 inch grass height. This will minimize loss of storage area due to undergrowth and grass between maintenance periods. Some dry detention ponds are used for other amenities or use and may need additional maintenance based on that need.
- *Mowing:* Grass areas surrounding the facility are to be mowed annual to prevent trees and unwanted undergrowth to become established. BMPs that are located near residential structures and require being more aesthetically pleasing (figure 8.2) may be mowed to a minimum of 3 inch height.



Figure 8.2
Well Maintained Detention Basin

- *Grass Clippings:* Remove any grass clippings around the perimeter of the facility after grass cutting practices. These clippings can clog outlet devices or be washed into the storm system and into creeks.
- *RipRap:* Replace any riprap that has been moved from energy apron area. Should rip rap be displaced on a regular basis, then contact a professional for additional correction remedies.
- *Outlet Structure:* Clear any debris or trash that is blocking the overflow weir and storm system. Clean off any protection device, such as wire fabric used to keep trash and debris from entering the outlet structure. Make sure that all outlet openings, such as an orifice or weir are kept clear of debris. Drain valves should be opened several times a year for a short time to ensure that they are not blocked. Repair in cracks or failures in the outlet structure immediately.
- *Maintenance Access:* Maintenance access roads may need to be scraped or gravel replaced due to settlement, erosion, or use. All maintenance roads are to remain in good condition throughout the life of the facility to allow for construction equipment during maintenance activities.
- *Embankment:* The embankment of the storage area is to be free of any settlement; eroded areas are to be backfilled and compacted appropriately and all exposed native soil areas are to be stabilized immediately.
- *Emergency Weir:* The emergency weir for dry detention is usually a separate device constructed of concrete. Make sure all debris is clear from this structure after a significant rainfall event to eliminate flooding. Repair any undermining of the weir or erosion around the perimeter area. All earthen areas of the weir are to be stable and grass established. Repair any deficiencies with the weir such as cracks or depressions.

8.2 Major Maintenance Activities

The following maintenance activities are to be performed by professionals that have specific training or specialized equipment.

- *Sedimentation:* Dry detention storage areas that have sedimentation accumulation or over growth as shown in figure 8.3 need to be cleaned and original storage returned. Sedimentation accumulation may need to be excavated and removed by a backhoe or loader on an as needed basis. Detention basins that have reduced storage from lack of maintenance may cause flooding downstream of the facility.

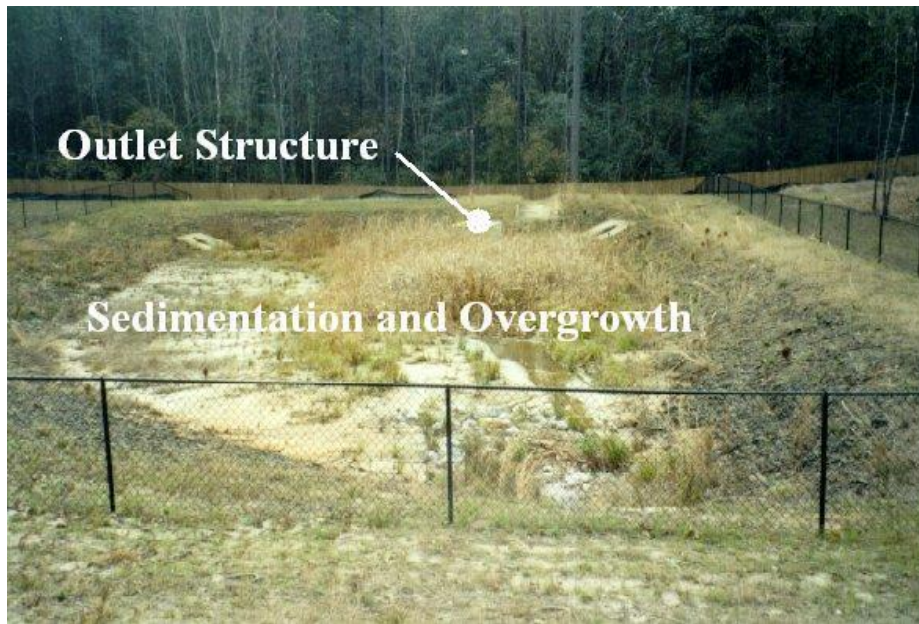


Figure 8.3
Over Grown Dry Detention

- *Emergency Weir:* Emergency weirs constructed of concrete are to remain in good condition throughout the life of the structure. Any broken or cracked sections of the weir are to be repaired immediately. Any under cut or erosion around the weir structure are to be repaired and stabilized immediately.
- *Outlet Structure:* Outlet structures repairs are to be performed immediately. Cracks are to be repaired immediately to eliminate any catastrophic failures during heavy rain storms. Any settlement around the base of the structure is to be repaired immediately to eliminate any failure of the structure.
- *Embankment:* Embankment failure is to be repaired immediately by backfilling and compacting the eroded area. After successfully repair the failure, stabilize with grass to prevent reoccurrence of erosion.

10.0 SAND FILTER

Sand filters are BMPs usually constructed of concrete or pipe which incorporate a sand media layer acting as a filter are require routine cleaning usually done by specialized equipment.

10.1 Routine Maintenance Activities

The following activities are to be performed on a routine basis (see Section 10 for recommended maintenance schedule) and after any significant rainfall event. Most of the activities listed below can be performed by non-professionals or landscape maintenance staff. Not performing the activities listed below may result in major problems identified on the annual report or failures which can become very costly to the owner to correct. Routine maintenance activities associated with a sand filter consist of removing debris and silt from discharge openings and grates. Do not enter any closed sand filter device. This procedure is to be only performed by trained staff with specialized equipment.

10.2 Major Maintenance Activities

The following maintenance activities are to be performed by professionals that have specific training or specialized equipment.

- *Forebay:* Sand filter forebay is a chamber to collect floatable, trash, sedimentation and any other debris captured. Cleaning the forebay may be accomplished by hand work but most likely will be done by a vacuum truck. The structure may need to be dewatered prior to any cleaning operation. This can be done by opening the drain valve or vacuuming the water with a vacuum truck.
- *Sedimentation Chamber:* the sedimentation chamber located downstream of the forebay can be cleaned periodically by removing the first layer of build up and restoring the sand filter media. Should the sand media become contaminated, the entire sand media layer is to be replaced. This task can be done by vacuuming the sand media out of the structure.

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10. Routine Maintenance Tasks and Schedule

Wet Pond Maintenance Tasks and Schedule	
TASK	SCHEDULE
Forebay inspection and cleanout	Monthly inspection. Remove sediment every 7 years or whenever the sediment volume exceeds 50% of storage volume
Volume measurement	Yearly – Dredging needed every 20 years or when 25% of permanent pool volume has been lost
Bank mowing and inspection / stabilization of eroded areas	Monthly
Outlet / inlet inspection and cleanout	Monthly
Unwanted vegetation and trash removal	Monthly
Visual inspection of water quality	Monthly
Inspect / exercise all mechanical devices, valves, etc	Yearly
Inspect for structural damage, leaks, etc	Yearly
Rodent management	As needed
Security	As needed

Dry Pond Maintenance Tasks and Schedule	
TASK	SCHEDULE
Forebay inspection and cleanout	Monthly inspection. Remove sediment every 7 years or when sediment volume exceeds 50% of storage volume
Bank mowing and inspection / stabilization of eroded areas	Monthly
Outlet / inlet inspection and cleanout	Monthly
Unwanted vegetation and trash removal	Monthly
Inspect for structural damage, leaks, etc	Yearly
Inspect / exercise all mechanical devices, valves, etc	Yearly
Evaluate sediment level (remove as needed)	Yearly
Security	As needed

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Wetland Maintenance Tasks and Schedule	
TASK	SCHEDULE
Forebay cleanout	Monthly inspection. Remove sediment every 7 years or when sediment volume exceeds 50% of storage volume
Invasive species control / vegetation management and replanting to maintain design densities	Semi-Annual
Bank mowing and stabilization of eroded areas	Monthly
Outlet / inlet inspection and cleanout	Monthly
Trash removal	Monthly
Inspect for structural damage, leaks, etc	Yearly
Visual inspection of water quality	Monthly
Rodent and mosquito management	As needed
Evaluate sediment level (remove at 20 yrs. or when plants are being impacted)	Yearly
Security	As needed

Bioretention Maintenance Tasks and Schedule	
TASK	SCHEDULE
Sedimentation prevention	Monthly inspection and watch on surrounding drainage areas such as out parcels and parking lots
Drop box clean off	Monthly
Perimeter mowing	Monthly (maintain 2 – 6 inch height)
Inspect for proper drawdown / clogging	Monthly
Stabilization of eroded areas	Monthly
Trash removal	Monthly
Pruning	Yearly
Mulch renewal	Yearly
Mulch replacement	Every 3 years
Inspect plants, replace as necessary	Monthly
Test P Index of soil media and replace if over 50 ppm	Every 2 years
Replace pea gravel diaphragm	As needed
Remove sediment	As needed
Perimeter mowing	Monthly

Sand Filter Maintenance Tasks and Schedule	
TASK	SCHEDULE
Street sweep parking lot	Quarterly
Trash removal	Monthly
Inspect outlet for obstructions	Monthly
Inspect for clogging	Monthly
Inspect inlet grates	Monthly
Skim sand media	Yearly
Pump oil and grit from sedimentation chamber	Yearly or at 50% full
Replace sand media	As needed (expect 3 years)

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Infiltration Trench Maintenance Tasks and Schedule

TASK	SCHEDULE
Maintain stone or mulch top surface	Yearly
Clean forebay if present	Yearly or at 50% full
Trash removal	Monthly
Remove unwanted vegetation	Monthly
Check observation wells following precipitation events to ensure proper infiltration	Monthly

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Grassed Channels / Enhanced Swales Maintenance Tasks and Schedule

TASK	SCHEDULE
Mowing	Weekly – Monthly (as needed to retain 2-6 inch height)
Inspect condition of dispersion devices and check dams	Yearly
Trash removal	Weekly – Monthly (prior to mowing)
Reseed	Yearly
Stabilization of eroded areas	Monthly
Removal of sediment	Yearly
Inspect for clogging (enhanced swale)	Monthly
Inspect pea gravel diaphragm and replace / repair as necessary	Monthly

Filter Strip with Flow Dispersion Maintenance and Schedule

TASK	SCHEDULE
Mowing of grass	Weekly – Monthly (as needed to retain 2-6 inch height)
Stabilization of eroded areas throughout the filter strip and below the flow dispersion device.	Monthly
Inspect gravel diaphragm (if present) and remove sediment	Yearly
Check outlet pipes on berms (if present) for clogging	Monthly
Remove debris / unwanted vegetation from behind lip of level spreader (if present)	Monthly
Repair flow dispersion device to prevent formation of channels in filter strip	Monthly as needed
Reseeding of grass	Yearly

Charlotte-Mecklenburg BMP Maintenance and Inspection Check List

Mecklenburg County BMP Maintenance and Inspection Check List Grassed Channels / Swales

[Note: a separate form must be used for each BMP]

Project Name: _____
 Project Address: _____
 Owner's Name: _____
 Owner's Address: _____
 Recorded Book and Page Number of the Lot: _____
 BMP Name and Location: _____
 Inspection Date: _____
 Inspector: _____
 Inspector Address/Phone Number: _____
 Date Last Inspected: _____

Type of Inspection: Visual

Maintenance Item	Satisfactory	Unsatisfactory	Inspection Frequency	Comments/Actions Required
1. Debris Cleanout				
Clear of trash and debris			W-M	
2. Vegetation Management				
Grass height (maintain 2-6 inch height)			W-M	
Unwanted vegetation present			M	
Ground cover well established (yearly reseeding needed)			Q	
3. Erosion				
Evidence of soil erosion in swale or contributing areas			M	
4. Dewatering				
Evidence of standing water			M	
5. Sedimentation				
Sediment accumulation			Y	
6. Energy dispersion / check dams				
Condition of dispersion devices			Y	
Condition of check dams			Y	
Inspect pea gravel diaphragm and replace / repair as necessary			M	
7. Miscellaneous				

W=Weekly, M=Monthly, Q=Quarterly, Y=Yearly (revision 6/07)

If applicable: Attach to this form documentation of BMP maintenance escrow account activity. This may be provided in the form of a bank statement which includes the current balance, as well as deposits and withdraws for the previous 12 months.

Maintenance Actions Taken: [If any of the above items were marked “U” for unsatisfactory, explain the actions taken and time table for correction. Attach additional pages as necessary.]

Additional Comments:

I do hereby certify that I conducted an inspection of the BMP described herein. I further certify that at the time of my inspection said BMP was performing properly and was in compliance with the terms and conditions of the approved maintenance agreement required by the Post-Construction Storm Water Ordinance.

Certification:

Inspectors Signature

Date

(seal)

[Note: The Post-Construction Storm Water Ordinance requires that inspections be conducted of all BMPs beginning within one (1) year from the date of as-built certification and each year thereafter and that these inspections be completed by a North Carolina Professional Engineer or Landscape Architect. All inspections must be documented and submitted using this form. The inspection form must be

signed and sealed by the inspector and mailed to the Storm Water Administrator at the following address: LUESA, Water Quality Program, 700 North Tryon Street, Charlotte, NC 28202.]

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Mecklenburg County BMP Maintenance and Inspection Check List Wet Pond

[Note: a separate form must be used for each BMP]

Project Name: _____
 Project Address: _____
 Owner's Name: _____
 Owner's Address: _____
 Recorded Book and Page Number of the Lot: _____
 BMP Name and Location: _____
 Inspection Date: _____
 Inspector: _____
 Inspector Address/Phone Number: _____
 Date Last Inspected: _____

Maintenance Item	Satisfactory	Unsatisfactory	Inspection Frequency	Comments/Actions Required
1. Debris Cleanout				
Clear of trash and debris	<input type="checkbox"/>	<input type="checkbox"/>	M	
2. Vegetation Management				
Banks / surrounding areas mowed	<input type="checkbox"/>	<input type="checkbox"/>	M	
Unwanted vegetation present	<input type="checkbox"/>	<input type="checkbox"/>	M	
Condition of wetland plants	<input type="checkbox"/>	<input type="checkbox"/>	M	
3. Erosion				
Evidence of soil erosion on banks or contributing drainage areas and outlet	<input type="checkbox"/>	<input type="checkbox"/>	M	
4. Sedimentation				
Forebay sediment inspection (cleanout every 7 years or when 50% full)	<input type="checkbox"/>	<input type="checkbox"/>	M	
Pond volume measurement (dredge every 20 years or when 25% of permanent pool volume lost)	<input type="checkbox"/>	<input type="checkbox"/>	Y	
5. Energy dissipators				
Condition of dissipater at inlets	<input type="checkbox"/>	<input type="checkbox"/>	Y	
Condition of dissipater at outfall	<input type="checkbox"/>	<input type="checkbox"/>	Y	
6. Inlet				
Condition of pipe and / or swale (cracks, leaks, sedimentation, woody vegetation)	<input type="checkbox"/>	<input type="checkbox"/>	M	
7. Outlet				
Condition of orifice (drawdown device)	<input type="checkbox"/>	<input type="checkbox"/>	M	
Condition of riser outlet and trash rack	<input type="checkbox"/>	<input type="checkbox"/>	M	
8. Emergency spillway and dam				
Condition of spillway	<input type="checkbox"/>	<input type="checkbox"/>	Y	

Condition of dam (ie. leaks, holes, woody vegetation)			Y	
9. Mechanical devices				
Inspection of all valves, etc. (should be exercised yearly)			Y	
10. Visual Inspection				
Appearance of water (ie. sheen, muddy, oily, clear, algae, etc)			M	
Mosquito larvae			M	
11. Forebay embankment				
Condition of forebay embankment (breached?)			M	
12. Water elevation				
Is pond at normal pool elevation?			M	
13. Miscellaneous				

W=Weekly, M=Monthly, Q=Quarterly, Y=Yearly (revision 6/07)

If applicable: Attach to this form documentation of BMP maintenance escrow account activity. This may be provided in the form of a bank statement which includes the current balance, as well as deposits and withdraws for the previous 12 months.

Maintenance Actions Taken: [If any of the above items were marked “U” for unsatisfactory, explain the actions taken and time table for correction. Attach additional pages as necessary.]

Additional Comments:

I do hereby certify that I conducted an inspection of the BMP described herein. I further certify that at the time of my inspection said BMP was performing properly and was in compliance with the terms and conditions of the approved maintenance agreement required by the Post-Construction Storm Water Ordinance.

Certification:

Inspectors Signature

Date

(seal)

[Note: The Post-Construction Storm Water Ordinance requires that inspections be conducted of all BMPs beginning within one (1) year from the date of as-built certification and each year thereafter and that these inspections be completed by a North Carolina Professional Engineer or Landscape Architect. All inspections must be documented and submitted using this form. The inspection form must be signed and sealed by the inspector and mailed to the Storm Water Administrator at the following address: LUESA, Water Quality Program, 700 North Tryon Street, Charlotte, NC 28202.]

Mecklenburg County BMP Maintenance and Inspection Check List Wetland

[Note: a separate form must be used for each BMP]

Project Name: _____
 Project Address: _____
 Owner's Name: _____
 Owner's Address: _____
 Recorded Book and Page Number of the Lot: _____
 BMP Name and Location: _____
 Inspection Date: _____
 Inspector: _____
 Inspector Address/Phone Number: _____
 Date Last Inspected: _____

Maintenance Item	Satisfactory	Unsatisfactory	Inspection Frequency	Comments/Actions Required
1. Debris Cleanout				
Clear of trash and debris			M	
2. Vegetation Management				
Banks / surrounding areas mowed			M	
Unwanted vegetation present (replant semi-annually to maintain design densities)			M	
Condition of wetland plants			M	
3. Erosion				
Evidence of soil erosion on banks or contributing drainage areas and outlet			M	
4. Sedimentation				
Forebay sediment inspection (cleanout every 7 years or when 50% full)			M	
Sedimentation level in wetland (cleanout every 20 years or when plants are being impacted)			Y	
5. Energy dissipators				
Condition of dissipater at inlets			Y	
Condition of dissipater at outfall			Y	
6. Inlet				
Condition of pipe and / or swale (cracks, leaks, sedimentation, woody vegetation)			M	
7. Outlet				
Condition of orifice (drawdown device)			M	
Condition of outlet			M	
8. Mechanical devices				

Inspection of all valves, etc. (should be exercised yearly)			Y	
9. Visual water inspection				
Appearance of water (ie. sheen, muddy, oily, clear, algae, etc)			M	
Water level maintained at permanent pool			Y	
Mosquito larvae			M	
10. Dam / Embankment				
Seepage through embankment			Y	
Woody vegetation on embankment			Y	
11. Miscellaneous				

W=Weekly, M=Monthly, Q=Quarterly, Y=Yearly (revision 6/07)

If applicable: Attach to this form documentation of BMP maintenance escrow account activity. This may be provided in the form of a bank statement which includes the current balance, as well as deposits and withdraws for the previous 12 months.

Maintenance Actions Taken: [If any of the above items were marked “U” for unsatisfactory, explain the actions taken and time table for correction. Attach additional pages as necessary.]

Additional Comments:

I do hereby certify that I conducted an inspection of the BMP described herein. I further certify that at the time of my inspection said BMP was performing properly and was in compliance with the terms and conditions of the approved maintenance agreement required by the Post-Construction Storm Water Ordinance.

Certification:

Inspectors Signature

Date

(seal)

[Note: The Post-Construction Storm Water Ordinance requires that inspections be conducted of all BMPs beginning within one (1) year from the date of as-built certification and each year thereafter and that these inspections be completed by a North Carolina Professional Engineer or Landscape Architect. All inspections must be documented and submitted using this form. The inspection form must be signed and sealed by the inspector and mailed to the Storm Water Administrator at the following address: LUESA, Water Quality Program, 700 North Tryon Street, Charlotte, NC 28202.]

Mecklenburg County BMP Maintenance and Inspection Check List Bioretention

[Note: a separate form must be used for each BMP]

Project Name: _____
 Project Address: _____
 Owner's Name: _____
 Owner's Address: _____
 Recorded Book and Page Number of the Lot: _____
 BMP Name and Location: _____
 Inspection Date: _____
 Inspector: _____
 Inspector Address/Phone Number: _____
 Date Last Inspected: _____

Maintenance Item	Satisfactory	Unsatisfactory	Inspection Frequency	Comments/Actions Required
1. Debris Cleanout				
Clear of trash and debris			M	
2. Vegetation Management				
Banks / surrounding areas mowed			M	
Unwanted vegetation present			M	
Condition of plants			M	
Condition of mulch - Must be double hammered hardwood, 3 inches deep (replace at least every 3 years and renew yearly)			M	
3. Erosion				
Evidence of soil erosion on banks or contributing areas			M	
4. Sedimentation				
Forebay (if present) sediment inspection (cleanout when 50% full)			M	
Evidence of sediment in bioretention cell			M	
5. Energy dissipators				
Condition of dissipater at inlets			Y	
Condition of dissipater at outfall			Y	
Inspect pea gravel diaphragm (replace as needed)			M	
6. Inlet				
Condition of pipe of swale (cracks, leaks, sedimentation, woody vegetation)			M	
7. Outlet				
Condition of outlet / drop box			M	

8. Dewatering (drawdown must be between 48 hours and 120 hours)				
Evidence of standing water			M	
9. Overall functionality				
Evidence of bypass			M	
P Index test results for soil media (indicate test results and date last tested)			Y2	
10. Miscellaneous				

W=Weekly, M=Monthly, Q=Quarterly, Y=Yearly, Y2=every 2 yrs. (revision 6/07)

If applicable: Attach to this form documentation of BMP maintenance escrow account activity. This may be provided in the form of a bank statement which includes the current balance, as well as deposits and withdraws for the previous 12 months.

Maintenance Actions Taken: [If any of the above items were marked “U” for unsatisfactory, explain the actions taken and time table for correction. Attach additional pages as necessary.]

Additional Comments:

I do hereby certify that I conducted an inspection of the BMP described herein. I further certify that at the time of my inspection said BMP was performing properly and was in compliance with the terms and conditions of the approved maintenance agreement required by the Post-Construction Storm Water Ordinance.

Certification:

Inspectors Signature

Date

(seal)

[Note: The Post-Construction Storm Water Ordinance requires that inspections be conducted of all BMPs beginning within one (1) year from the date of as-built certification and each year thereafter and that these inspections be completed by a North Carolina Professional Engineer or Landscape Architect. All inspections must be documented and submitted using this form. The inspection form must be signed and sealed by the inspector and mailed to the Storm Water Administrator at the following address: LUESA, Water Quality Program, 700 North Tryon Street, Charlotte, NC 28202.]

Mecklenburg County BMP Maintenance and Inspection Check List Dry Pond

[Note: a separate form must be used for each BMP]

Project Name: _____
 Project Address: _____
 Owner's Name: _____
 Owner's Address: _____
 Recorded Book and Page Number of the Lot: _____
 BMP Name and Location: _____
 Inspection Date: _____
 Inspector: _____
 Inspector Address/Phone Number: _____
 Date Last Inspected: _____

Maintenance Item	Satisfactory	Unsatisfactory	Inspection Frequency	Comments/Actions Required
1. Debris Cleanout				
Clear of trash and debris			M	
2. Vegetation Management				
Banks / surrounding areas mowed			M	
Unwanted vegetation present			M	
3. Erosion				
Evidence of soil erosion on banks, contributing drainage areas or bottom of pond			M	
4. Sedimentation				
Forebay (if present) sediment inspection (cleanout every 7 years or when 50% full)			M	
Sediment level in pond			Y	
5. Energy dissipators				
Condition of dissipater at inlets			Y	
Condition of dissipater at outfall			Y	
6. Outlet / Inlet				
Condition of orifice (drawdown device) / trash rack			M	
Condition of outlet			M	
Condition of inlet			M	
7. Mechanical devices				
Inspection of all valves, etc. (exercise yearly)			Y	
8. Dewatering				
Evidence of standing water			M	
9. Structural Integrity				
Evidence of structural damage (leaks, cracks,			Y	

etc)				
10. Emergency Spillway & Dam				
Condition of spillway			Y	
Condition of dam			Y	
11. Miscellaneous				

W=Weekly, M=Monthly, Q=Quarterly, Y=Yearly (revision 6/07)

If applicable: Attach to this form documentation of BMP maintenance escrow account activity. This may be provided in the form of a bank statement which includes the current balance, as well as deposits and withdraws for the previous 12 months.

Maintenance Actions Taken: [If any of the above items were marked "U" for unsatisfactory, explain the actions taken and time table for correction. Attach additional pages as necessary.]

Additional Comments:

I do hereby certify that I conducted an inspection of the BMP described herein. I further certify that at the time of my inspection said BMP was performing properly and was in compliance with the terms and conditions of the approved maintenance agreement required by the Post-Construction Storm Water Ordinance.

Certification:

Inspectors Signature

Date

(seal)

[Note: The Post-Construction Storm Water Ordinance requires that inspections be conducted of all BMPs beginning within one (1) year from the date of as-built certification and each year thereafter and that these inspections be completed by a North Carolina Professional Engineer or Landscape Architect. All inspections must be documented and submitted using this form. The inspection form must be signed and sealed by the inspector and mailed to the Storm Water Administrator at the following address: LUESA, Water Quality Program, 700 North Tryon Street, Charlotte, NC 28202.]

Mecklenburg County BMP Maintenance and Inspection Check List Sand Filter

[Note: a separate form must be used for each BMP]

Project Name: _____
 Project Address: _____
 Owner's Name: _____
 Owner's Address: _____
 Recorded Book and Page Number of the Lot: _____
 BMP Name and Location: _____
 Inspection Date: _____
 Inspector: _____
 Inspector Address/Phone Number: _____
 Date Last Inspected: _____

Maintenance Item	Satisfactory	Unsatisfactory	Inspection Frequency	Comments/Actions Required
1. Debris Cleanout				
Clear of trash and debris			M	
2. Street Sweeping				
Parking lot street sweeping			Q	
3. Erosion				
Evidence of soil erosion around contributing areas			M	
4. Sedimentation chamber				
Sediment level in chamber (pump yearly or when 50% full)			M	
5. Sand media				
Condition of media (skim annually, replace as necessary)			M	
6. Outlet / Inlet				
Condition of outlet			M	
Condition of inlets and grates			M	
7. Mechanical devices				
Inspection of all valves, etc.			Y	
8. Dewatering				
Evidence of filter clogging			M	
9. Structural Integrity				
Evidence of structural damage (leaks, cracks, etc)			Y	
10. Overall functionality				
Evidence of odors			M	
Evidence of bypass			M	

11. Miscellaneous

W=Weekly, M=Monthly, Q=Quarterly, Y=Yearly (revision 6/07)

If applicable: Attach to this form documentation of BMP maintenance escrow account activity. This may be provided in the form of a bank statement which includes the current balance, as well as deposits and withdraws for the previous 12 months.

Maintenance Actions Taken: [If any of the above items were marked “U” for unsatisfactory, explain the actions taken and time table for correction. Attach additional pages as necessary.]

Additional Comments:

I do hereby certify that I conducted an inspection of the BMP described herein. I further certify that at the time of my inspection said BMP was performing properly and was in compliance with the terms and conditions of the approved maintenance agreement required by the Post-Construction Storm Water Ordinance.

Certification:

Inspectors Signature

Date

(seal)

[Note: The Post-Construction Storm Water Ordinance requires that inspections be conducted of all BMPs beginning within one (1) year from the date of as-built certification and each year thereafter and that these inspections be completed by a North Carolina Professional Engineer or Landscape Architect. All inspections must be documented and submitted using this form. The inspection form must be signed and sealed by the inspector and mailed to the Storm Water Administrator at the following address: LUESA, Water Quality Program, 700 North Tryon Street, Charlotte, NC 28202.]

Mecklenburg County BMP Maintenance and Inspection Check List Infiltration Trench

[Note: a separate form must be used for each BMP]

Project Name: _____
 Project Address: _____
 Owner's Name: _____
 Owner's Address: _____
 Recorded Book and Page Number of the Lot: _____
 BMP Name and Location: _____
 Inspection Date: _____
 Inspector: _____
 Inspector Address/Phone Number: _____
 Date Last Inspected: _____

Maintenance Item	Satisfactory	Unsatisfactory	Inspection Frequency	Comments/Actions Required
1. Debris Cleanout				
Clear of trash and debris	<input type="checkbox"/>	<input type="checkbox"/>	M	
2. Vegetation Management				
Banks / surrounding areas mowed	<input type="checkbox"/>	<input type="checkbox"/>	M	
Unwanted vegetation present	<input type="checkbox"/>	<input type="checkbox"/>	M	
3. Erosion				
Evidence of soil erosion around contributing areas	<input type="checkbox"/>	<input type="checkbox"/>	M	
4. Sedimentation				
Forebay sediment inspection (cleanout yearly or when 50% full)	<input type="checkbox"/>	<input type="checkbox"/>	M	
Evidence of sediment in trench	<input type="checkbox"/>	<input type="checkbox"/>	M	
5. Energy dissipators				
Condition of dissipater at inlets	<input type="checkbox"/>	<input type="checkbox"/>	Y	
Condition of dissipater at outfall	<input type="checkbox"/>	<input type="checkbox"/>	Y	
6. Surface aggregate				
Condition of stone or mulch	<input type="checkbox"/>	<input type="checkbox"/>	Y	
7. Dewatering				
Evidence of standing water	<input type="checkbox"/>	<input type="checkbox"/>	M	
Check water level in observation well	<input type="checkbox"/>	<input type="checkbox"/>	M	
8. Overflow spillway				
Condition of spillway	<input type="checkbox"/>	<input type="checkbox"/>	Y	
9. Overall functionality				
Evidence of bypass	<input type="checkbox"/>	<input type="checkbox"/>	M	

10. Miscellaneous

W=Weekly, M=Monthly, Q=Quarterly, Y=Yearly (revision 6/07)

If applicable: Attach to this form documentation of BMP maintenance escrow account activity. This may be provided in the form of a bank statement which includes the current balance, as well as deposits and withdraws for the previous 12 months.

Maintenance Actions Taken: [If any of the above items were marked “U” for unsatisfactory, explain the actions taken and time table for correction. Attach additional pages as necessary.]

Additional Comments:

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Certification:

Inspectors Signature

Date

(seal)

[Note: The Post-Construction Storm Water Ordinance requires that inspections be conducted of all BMPs beginning within one (1) year from the date of as-built certification and each year thereafter and that these inspections be completed by a North Carolina Professional Engineer or Landscape Architect. All inspections must be documented and submitted using this form. The inspection form must be signed and sealed by the inspector and mailed to the Storm Water Administrator at the following address: LUESA, Water Quality Program, 700 North Tryon Street, Charlotte, NC 28202.]

Mecklenburg County BMP Maintenance and Inspection Check List Filter Strips with Flow Dispersion

[Note: a separate form must be used for each BMP]

Project Name: _____
 Project Address: _____
 Owner's Name: _____
 Owner's Address: _____
 Recorded Book and Page Number of the Lot: _____
 BMP Name and Location: _____
 Inspection Date: _____
 Inspector: _____
 Inspector Address/Phone Number: _____
 Date Last Inspected: _____

Maintenance Item	Satisfactory	Unsatisfactory	Inspection Frequency	Comments/Actions Required
1. Debris Cleanout				
Clear of trash and debris	<input type="checkbox"/>	<input type="checkbox"/>	W-M	
2. Vegetation Management				
Grass height (maintain 2-6 inch height)	<input type="checkbox"/>	<input type="checkbox"/>	W-M	
Unwanted vegetation present	<input type="checkbox"/>	<input type="checkbox"/>	M	
Ground cover well established (yearly reseeding needed)	<input type="checkbox"/>	<input type="checkbox"/>	Y	
3. Erosion				
Evidence of soil erosion in filter strip and below dispersion device	<input type="checkbox"/>	<input type="checkbox"/>	M	
4. Drainage				
Evidence of standing water	<input type="checkbox"/>	<input type="checkbox"/>	M	
Evidence of bypass	<input type="checkbox"/>	<input type="checkbox"/>	M	
Check outlet pipes for clogging	<input type="checkbox"/>	<input type="checkbox"/>	M	
5. Sedimentation				
Sediment accumulation	<input type="checkbox"/>	<input type="checkbox"/>	Y	
Sediment in gravel diaphragm (if present)	<input type="checkbox"/>	<input type="checkbox"/>	Y	
6. Energy dispersion / check dams				
Condition / functionality of dispersion devices	<input type="checkbox"/>	<input type="checkbox"/>	M	
Debris on dispersion devices	<input type="checkbox"/>	<input type="checkbox"/>	M	
Condition of check dams	<input type="checkbox"/>	<input type="checkbox"/>	M	
Inspect pea gravel diaphragm (replace as needed)	<input type="checkbox"/>	<input type="checkbox"/>	M	

7. Miscellaneous

W=Weekly, M=Monthly, Q=Quarterly, Y=Yearly (revision 6/07)

If applicable: Attach to this form documentation of BMP maintenance escrow account activity. This may be provided in the form of a bank statement which includes the current balance, as well as deposits and withdraws for the previous 12 months.

Maintenance Actions Taken: [If any of the above items were marked “U” for unsatisfactory, explain the actions taken and time table for correction. Attach additional pages as necessary.]

Additional Comments:

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Certification:

Inspectors Signature

Date

(seal)

[Note: The Post-Construction Storm Water Ordinance requires that inspections be conducted of all BMPs beginning within one (1) year from the date of as-built certification and each year thereafter and that these inspections be completed by a North Carolina Professional Engineer or Landscape Architect. All inspections must be documented and submitted using this form. The inspection form must be signed and sealed by the inspector and mailed to the Storm Water Administrator at the following address: LUESA, Water Quality Program, 700 North Tryon Street, Charlotte, NC 28202.]

DEFINITIONS