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WET RETENTION POND OPERATION & MAINTENANCE AGREEMENT

Harris Creek Farms

Rolesville, North Carolina



30 May 2025

QUANTECH ENGINEERING, LLP

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Wet Retention Pond Operation and Maintenance Agreement

I. GENERAL INFORMATION

I will keep a maintenance record on this SCM. This maintenance record will be kept in a log in a known set location. Any deficient SCM elements noted in the inspection will be corrected, repaired or replaced immediately. These deficiencies can affect the integrity of structures, safety of the public, and the removal efficiency of the SCM.

Important maintenance procedures:

- The drainage area will be carefully managed to reduce the sediment load to the detention pond.
- The inlet pipe(s), dissipator(s), and control box will be clear of trash and debris.
- If the pond must be drained for an emergency or to perform maintenance, use appropriate control measures to ensure the flushing of sediment through the emergency drain will be minimized as much as possible.
- Any and all erosion will be repaired as soon as possible.
- Grass should be maintained around 4-6 inches in height.
- If replanting the vegetated shelf and perimeter (or during the initial planting) of the basin, these areas should be watered twice weekly if needed until the plants become established (commonly six weeks)
- No portion of the wet pond should be fertilized after the initial fertilization that is required to establish the plants on the vegetated shelf.
- At least once annually, a dam safety expert will inspect the embankment and any problems that are found will need to be repaired immediately
- When measuring the depth of the sediment, use a device that will give an accurate depth reading and not readily penetrate the accumulated sediment.

The detention pond is located in the rear of Lots 4 & 5 and will be inspected **quarterly and within 24 hours after every storm event greater than 1.0 inches**. Records of operation and maintenance will be kept in a known set location and will be available upon request. Inspection activities shall be performed as follows in this manual. Any problems that are found shall be repaired immediately.

II. DESCRIPTION OF DEVICE

- SCM-1
 - i. Overall Dimensions 90' x 220' at ponding elevation
 - 1. Forebay roughly 15% of basin
 - 2. Inlet pipe with dissipator 20' long and class B stone,
 - ii. Dam
 - 1. Width a minimum of 14 wide
 - 2. Top of dam a minimum 5.30' above Ponding elevation (roughly at elevation 237.30')
 - 3. Fore-slope no steeper than 3:1
 - 4. Backslope no steeper than 2:1
 - 5. Weir is 40' flat a minimum of 3.80' above the ponding elevation and a minimum of 0.55' below the top of dam (roughly at elevation 236.75')
 - iii. Riser Structure
 - 1. 5' x 5' concrete riser with trash rack on top
 - 2. Top of riser is a minimum of 3.80' above ponding elevation (roughly at elevation 235.80')
 - 3. Orifice 3.5" at ponding elevation (roughly at elevation 232.00')
 - 4. Bottom with gate valve at bottom of pond floor roughly at elevation 356.70'
 - iv. 30" RCP outlet with FES and 10' long dissipator of Class A stone

- SCM-2
 - i. Overall Dimensions 60' x 190' at ponding elevation
 - 1. Forebay roughly 15% of basin
 - 2. Inlet pipe with dissipator 6' long and class B stone,
 - ii. Dam
 - 1. Width a minimum of 10 wide
 - 2. Top of dam a minimum 3.20' above Ponding elevation (roughly at elevation 240.20')
 - 3. Fore-slope no steeper than 3:1
 - 4. Backslope no steeper than 2:1
 - 5. Weir is 40' flat a minimum of 2.50' above the ponding elevation and a minimum of 1' below the top of dam (roughly at elevation 239.50')
 - iii. Riser Structure
 - 1. 5' x 5' concrete riser with trash rack on top
 - 2. Top of riser is a minimum of 1.75' above ponding elevation & roughly 7.25' tall (roughly at elevation 238.75')
 - 3. Orifice 2" at ponding elevation (roughly at elevation 237.00')
 - 4. Bottom with gate valve at bottom of pond floor roughly at elevation 231.70'
 - iv. 30" RCP outlet with FES and 10' long dissipator of Class B stone

III. OPERATION

A wet pond shall be designed to capture the design storm and release it slowly over a period of two to five days via a properly design outlet structure. The first outlet in the structure is designed to be above the bottom of the pond, thus creating a permanent pool of water. Stormwater shall have an adequate flow path to bring about removal of TSS through dilution and settling. The pond shall be designed in a manner that protects the device, the areas around the device and the receiving stream from erosion. The pond also must be maintained properly to prevent the resuspension of captured sediments.

IV. INSPECTION AND MAINTENANCE OF SCM

A. Trash Control

It is important to control the potential risk of system blockage due to the presence of trash such as cardboard, bottle, trash bags, etc. in the piping and outlet structure. Due to the nature of the flow-control structure, trash or other items could possibly become trapped in the structure and cause partial or complete blockage. Site maintenance should include routine and effective trash collection and control measures.

B. Sediment

Sedimentation from areas tributary to the site will result in reduction of the storage volume and water dissipation/filtration. Sediment deposited in the system will require removal. The frequency of the sediment removal can be reduced by ensuring that the site areas around the building are stabilized with a vegetative ground cover such that it restrains erosion. This requires periodic applications treatments necessary to promote a stable groundcover and minimize sedimentation, do not fertilize unless absolutely necessary. When the sediment level at any point along the device exceeds 6 inches in depth or it reduces the depth to 75% of the original design depth, the sediment must be removed and the original volume restored. General, the removal process should be carried out by methods that do not simply wash the sediment downstream. If scouring and flushing is used, filtering or trapping devices should be installed immediately downstream or below the piping (if applicable) to capture sediment for removal. It is very important to remove sedimentation prior to any large accumulation, as the degree

of removal difficulty, and the likelihood of downstream impacts increase significantly with increased sediment depth and volume.

C. Bare Spots

Check for areas that show no signs of vegetative or permanent cover (grass, matting, rip rap, etc.) in an area greater than 1 square foot. After area is stabilized, inspections should be made quarterly, SCM should be maintained to keep grass cover dense and vigorous. Maintenance should include periodic mowing, occasional spot reseeding, and weed control; swale grasses should never be mowed close to the ground. Grass heights in the 4 to 6 inch range are recommended and should never exceed 8 inches.

D. Erosion, & Cavities

Check the entire area and pay special attention to Dams and Embankment for areas that have been wearing away by the action of water, ice, wind etc. Eroded areas are more than likely associated with bare spots though cavities which are a hollow space or a pit may have high and thick vegetative or permanent cover concealing itself. A thorough walk around is required to find these. Check for bare areas, depression, cavity, rodent burrows. If these items are found at an early stage and repaired in a timely manner, it will maintain a lower cost of the repairs; left unattended and the degree of repair difficulty and the likelihood of downstream impacts increase significantly with increased erosive depth and volume.

E. Rodent Control

Generally in this urban environment, rodents are not a problem. Rodents such as groundhogs, muskrats, and moles are attracted to moist. Wet areas and can be quite dangerous to structural integrity and proper performance of the earthwork and drainage. Groundhogs and muskrats thrive on burrowing into the manmade earthwork, which become pathways for seepage. In the event that burrows are detected within the constructed wetland area, the rodents should be dealt with by removal.

F. Short circuiting

This occurs when inflow Storm water flows directly out of the SCM with little or no dispersion and results in the direct transport of upstream pollutant loads to the downstream receiving water body, by passing the pollutant removal process as designed by the engineer.

G. Forebay

Forebays are required on all inlets to a wet pond to collect sediment for easier removal and to dissipate the flow energy prior to the stormwater entering the main part of the wet pond. The forebay should be configured for energy dissipation to avoid re-suspension of sediment previously captured in the forebay. The volume for the forebay shall be 15 to 20% of the main pool volume; The forebay entrance shall be deeper than the forebay exit; The water flowing over or through the structure that separates the forebay from the main pool shall flow at a nonerosive velocity.

H. Vegetated Shelf

The main pool shall be equipped with a vegetative shelf around its perimeter. The minimum width of the vegetated shelf shall be six feet and the slope shall be no steeper than 6:1 (horizontal to vertical). The vegetated shelf may be completely submerged with the permanent pool perimeter as its outer boundary, completely above the permanent pool with the permanent pool perimeter as its inner boundary, or partially submerged at permanent pool. A vegetated shelf is not required around the perimeter of the forebay, although the designer may provide one if it suits the project. The vegetated shelf shall be planted with a minimum of three diverse species of herbaceous, native vegetation at a minimum density of 50 plants per 200 square feet of shelf area.

I. Vegetation

The dam structure, including front and back embankment slopes, of the pond shall be vegetated with non-clumping turf grass. Weeping love grass is not allowed because it does not provide long-term slope stabilization. Trees and woody shrubs shall not be planted on the dam or embankment slopes and any volunteers should be removed as part of regular maintenance activities. However, trees and shrubs may be planted outside of the embankment slopes and can serve to shade the wet pond, along its south, east, and west sides. Shading reduces heating of the water and helps to reduce algal blooms and the potential for anaerobic conditions.

J. Fountains (if applicable)

Fountains are optional, decorative wet pond amenities. The fountain should draw water from fewer than two feet below the permanent pool to avoid resuspending solids. Separated units (where the nozzle, pump and intake are connected by tubing) should be used only if they draw water from the surface in the deepest part of the pond. The falling water from the fountain should be centered in the pond, away from the shoreline. Fountain will not resuspend sediment or cause erosion in the pond.

K. Cracks, Scaling, and Spalling (for concrete structures)

Cracks – the entire structure shall be inspected for cracks. Short, isolated cracks are usually not significant, but larger cracks (wider than $\frac{1}{4}$ ") and well-defined cracks indicate a serious problem. There are two types of cracks for slabs/floors and ceilings: Traverse and longitudinal, and two types of cracks for walls and support structures: Vertical and horizontal.

TRAVERSE cracks appear crossing the embankment/waterflow. These cracks provide avenues for seepage and piping could develop.

LONGITUDINAL cracks run parallel to the embankment/waterflow and may signal the early stages of a slide. In recently built structures, these cracks may be indicative of poor compaction or poor foundation preparation resulting in consolidation after construction.

VERTICAL cracks are usually caused by the settling over time, if a crack is wider than $\frac{1}{8}$ of an inch, or if it's located closer to a corner, it could be a sign of a more serious issue and you should have a professional inspect it.

HORIZONTAL cracks are usually caused by foundation movement or by hydrostatic pressure and can be a sign of serious issues, you should have a professional inspect it.

Scaling – occurs when the surface of concrete begins to flake off. This weakens the structure and may assist in cracking. These scaling should not be no more than $\frac{1}{4}$ " in depth. One method to identify this issue is to use spray paint to paint entire area to see if additional scaling occurs, if more scaling occurs, it will be evident due to the lack of paint in the new area, if scaling continues periodically, contact structure or civil engineer for consultation in regards to this matter.

Spalling – is evident when pieces of concrete fall from the main pipe and can be caused by Settlement. It is defined as the breaking, chipping, or fraying of concrete slabs that leave an uneven surface or edge, most often at joints or cracks.

L. Settlement (If embankments or fill are part of the system)

Occurs both during construction and after the embankment has been completed and places in service. To a certain degree this is normal and should be expected. It is usually the most pronounced at the location of the maximum foundation depth or embankment height. Excessive settlement will reduce the free board (difference in

elevation between the water surface and the top of the dam). Any area of excessive settlement should be restored to original elevation and condition to reduce the risk of overtopping. A relatively large amount of settlement (more than 6") within a small area could indicate serious problems in the foundation or perhaps the lower part of the embankment. Settlement accompanied by cracking often precedes failure.

M. Conduits

Inspect thoroughly once a year, Conduits should be visually inspected at the joints. Pipes should be inspected for proper alignment (sagging), elongation and displacement at joints, cracks, leaks, surface water, surface wear, loss of protective coating, corrosion and blocking. Problems with pipes most often occurs at joints and special attention should be given to them during inspection. Joints should be checked for gaps caused by elongation or settlement and loss of joint filler material. Open joints can permit erosion of the embankment material and possibly the piping of soil material through the joints eventually creating a cavity or erosion. Catch basin should be checked for signs that water is seeping along the exterior surface of the pipe where it enters the catch basin. A depression in the soil surface over the pipe may be signs that soil is being removed from around the pipe.

N. Rip-Rap

Inspect thoroughly once a year, and after every significant rainfall event of 1" or more. Check for displacement of the rip rap; compare the dimension of the dissipator, spillway, liner, dam, etc. with the plans to ensure that the proper dimensions are in place. One common occurrence is rip rap sliding downhill with the flow, and will need to be repositioned/replaced, check the toe of the slope for any rip rap that was displaced and for geo-technical fabric being exposed will show that displacement has occurred. One technique is resolve this issue it to install chicken wire fence (just high enough to barely show above the rip rap) with steel fence post no more than 3' apart. Depending on the slope, this may be inevitable and/or more rows of fencing may need to be added. Another method would be to wrap the rip rap in a wire frame (very similar to a gabion basket) before placing. Walking on the rip rap will help determine if any cavities exists under the geo-technical fabric by the bouncing of the surface as you step on the area. Stepping on the rip rap could be hazardous, tripping over rip rap due to rocks shifting, poor footing, etc. is a common occurrence.

V. SUGGESTED INSPECTION SCHEDULE

A. Monthly

- i. Mow to a height of 4"-6" grass height should never exceed 8". Remove clippings, leaves, and other debris.
- ii. Check for any potential blockage
- iii. Remove all trash and debris in and around SCM

B. Quarterly

- i. Inspect all structures
- ii. Look for bare spots, erosion, and cavities
- iii. Inspect all conduits / pipes

C. Annually

- i. SCM certified by Licensed Engineer and submit a report with form 501 to City of Raleigh

VI. RECORD KEEPING

A. Operation of an detention pond system should indicate recording of the following:

- i. Annual Inspection Reports – a collection of written inspection report should be kept on file on the last Sheet of this manual. Inspection will be conducted annually. Copies should be provided to the City of Raleigh Inspections Department.

- ii. Observations – all observations should be recorded. Where periodic inspections are performed following significant rainfall events, these inspections should be logged into the Periodic Inspection, Operation and Maintenance Form on the last Sheet of this manual.
- iii. Maintenance – written records of maintenance and/or repairs should be recorded on the Periodic Inspection, Operations and Maintenance Form on the last sheet of this manual.
- iv. Other Operation Procedures – the owner should maintain a complete and up-to-date set of plans (as-built drawings) and all changes made to the system over time should be recorded on the as-built.

VII. Estimated Financial Cost

A. Estimated Construction Cost

- i. Structure = \$ 2,850
- ii. Construct and grade = \$ 5,000
- iii. Plantings & seed = \$ 3,000
- Total estimated construction cost = \$10,850

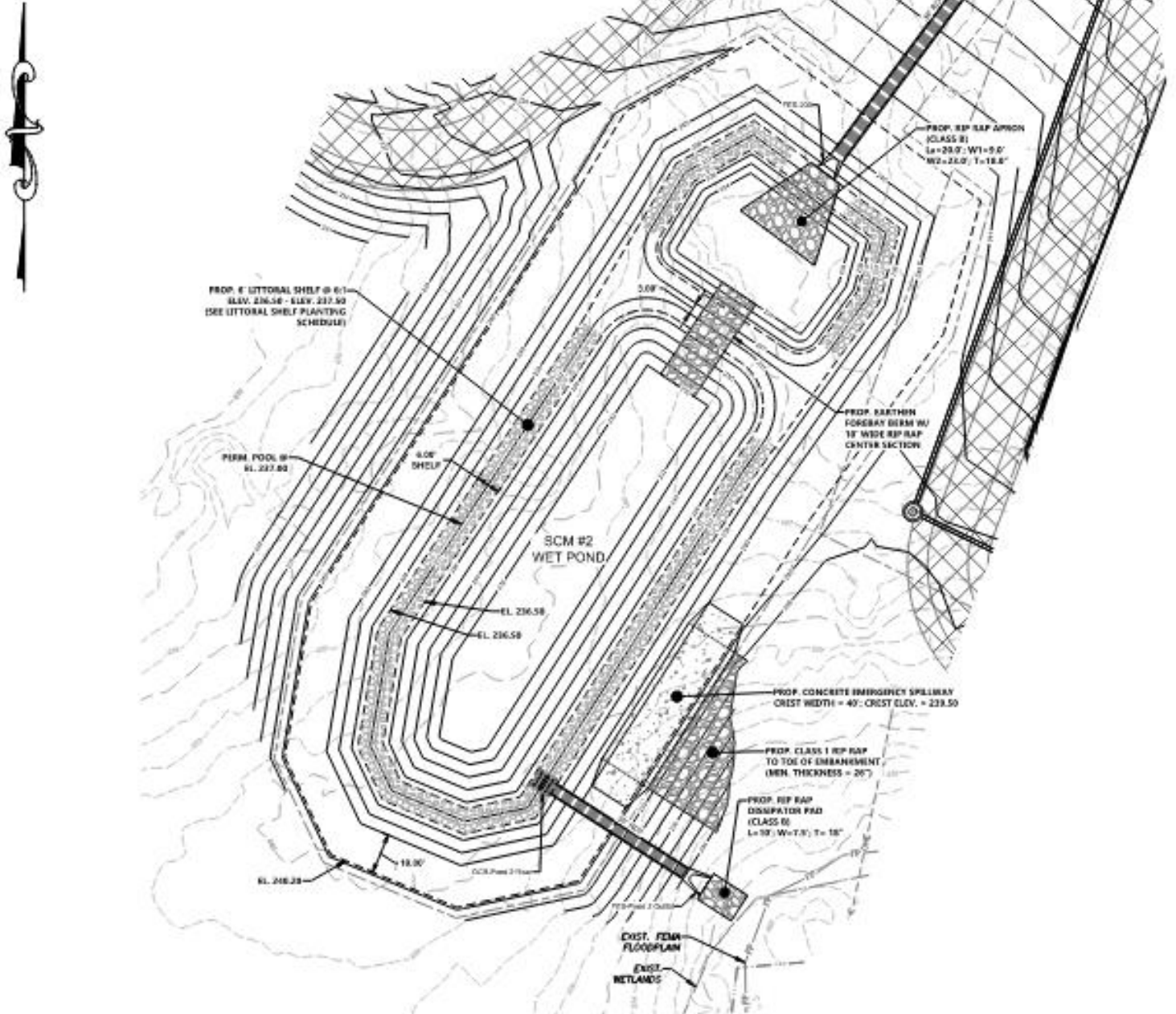
B. Estimate Maintenance Cost

- i. Annual inspection = \$500.00
- ii. Routine lawn management = \$600.00

C. Required annual contribution

\$ 5,850/30 years (\$ 195) + \$ 1,100 = \$ 1,395 annual cost

B. SCM 2



IX. Maintenance

SCM element:	Potential problem:	How I will remediate the problem:
Entire SCM	Trash/debris is present.	Remove the trash/debris.
Adjacent pavement (if applicable)	Sediment is present on the pavement surface.	Sweep or vacuum the sediment as soon as possible.
Perimeter of the Wet Retention basin	Areas of bare soil and / or erosive gullies have formed.	Re-grade the soil if necessary to remove the gully, and then plant a ground cover and water until it is established. Provide lime and one-time fertilizer application.
Inlet device: pipe or swale	The pipe is clogged (if applicable).	Unclog the pipe. Dispose of the sediment off-site.
	The pipe is cracked or otherwise damaged (if applicable).	Replace the pipe.
	Erosion is occurring in the swale (if applicable).	Regrade the swale if necessary to smooth it over and provide erosion control devices such as reinforced turf matting or riprap to avoid future problems with erosion.
Embankment	Shrubs or trees have started to grow on the embankment	Remove shrubs or trees immediately.
	Grass cover is unhealthy or eroding.	Restore the health of the grass cover – consult a professional if necessary.
	Signs of seepage on the downstream face.	Consult a professional.
	Evidence of muskrat or beaver activity is present.	Use traps to remove muskrats and consult a professional to remove beavers
	An annual inspection by an appropriate professional show that the embankment needs repair.	Make all needed repairs.
	A tree has started to grow on the embankment.	Consult a dam safety specialist to remove the tree.
Main treatment area and forebay / pretreatment area	Sediment has accumulated and reduced the depth to 75% of the original design depth.	Search for the source of the sediment and remedy the problem if possible. Remove the sediment and dispose of it in a location where it will not cause impacts to streams or the SCM. Re-vegetate disturbed areas immediately with sod (preferred) or seed protected with securely staked erosion mat.
	Erosion has occurred or riprap is displaced.	Provide additional erosion protection such as reinforced turf matting or riprap if needed to prevent future erosion problems.
	Weeds and noxious plants are growing in the main treatment area	Remove the weeds and noxious plants, preferably by hand. If pesticides are used, wipe them on the plants (do not spray).
	Water is more than 6" above the permanent pool for more than 5 days after a storm event	Check outlet structure for clogging. If it is a design issue, consult an appropriate professional.
	Algal growth covers over 50% of the area.	Consult a professional to remove and control the algal growth.

	Cattails, phragmites or other invasive plants cover 50% of the basin surface.	Remove the plants by wiping them with pesticide (do not spray).
Receiving water	Erosion or other signs of damage have occurred at the outlet.	Repair the damage and improve the flow dissipation structure.
	Discharges from the wet pond are causing erosion or sedimentation in the receiving water.	Contact the NC Division of Water Quality 401 Oversight Unit at 919-733-1786.
Weir	Weir wall is damage or not level	Repair weir wall if damage or level with concrete mix if not level.
Flow diversion structure and / or outlet device (if any are applicable)	The structure is clogged.	Unclog the conveyance and dispose of any sediment offsite.
	The structure is damaged.	Make any necessary repairs or replace if damage is too large for repair.
	Sediment has accumulated in the structure to a depth of greater than four inches.	Search for the source of the sediment and remedy the problem if possible. Remove the sediment and stabilize or dispose of it in a location where it will not cause impacts to streams or the SCM.
	seepage, cracks, spalling, or settlements	A geotechnical or civil engineer should be consulted regarding the origin of these problems and for the assessment of the appropriate solutions for correcting them. If the professional is not immediately able to inspect the dam, then the bottom drain should be opened and the water level lowered to remove the risk of failure until a professional can observe these problems
Rip Rap	Displacement	Reposition/replace rip rap to size and dimension as per the plans.
	Sediment fills 25% in height of rip rap device (liner, dissipator, spillway, etc.)	Search for the source of the sediment and remedy the problem if possible. Remove rip rap from sediment area, remove the sediment and stabilize or dispose of it in a location where it will not cause impacts to streams or the SCM, replace rip rap to the dimension of the plans.
	In-adequate rip rap.	Re-freshen rip rap with like stone and size.
Floating Wetland island (if applicable)	Weeds or volunteer trees are growing on the mat.	Remove the weeds or trees.
	The anchor cable is damaged, disconnected or missing.	Restore the anchor cable to its design state.
SCM element:	Potential problem:	How I will remediate the problem:

I acknowledge and agree by my signature below that I am responsible for the performance of the maintenance procedures listed above. I agree to notify DWQ of any problems with the system or prior to any changes to the system or responsible party.

Project name: _____

SCM drainage area number: _____

Print name: _____

Title: _____

Address: _____

Phone: _____

Signature: _____

Date: _____

Note: The legally responsible party should not be a homeowners association unless more than 50% of the lots have been sold and a resident of the subdivision has been named the president.

I, _____, a Notary Public for the State of _____,
County of _____, do hereby certify that _____
personally appeared before me this _____ day of _____, _____, and acknowledge the due
execution of the forgoing sand filter maintenance requirements. Witness my hand and official seal,

SEAL

My commission expires _____

