



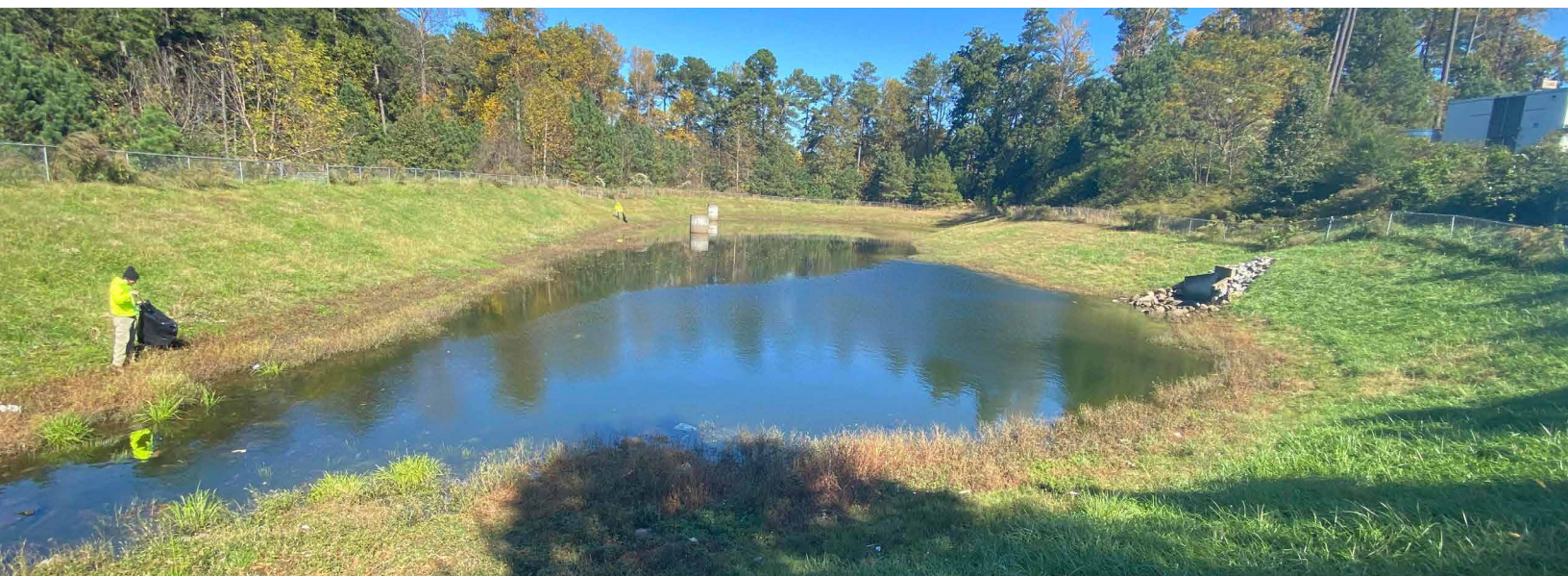
REPAIRING AN ABOVE GROUND STORMWATER FACILITY

OUR MISSION

Inspire change by preserving and protecting our most precious natural resource: water

When damage occurs to your aboveground SCM and/or surrounding devices, regulations require that you, the property owner, return the stormwater system back to the way it was designed. Otherwise, the stormwater system may fail the next annual inspection, or even worse, cause environmental harm. Repairs can range from minor erosion solutions to large-scale remediation projects.

AQUALIS
STORMWATER MANAGEMENT



Stormwater systems and SCM's, such as retention ponds, detention ponds, bio-retention basins, etc., are vital to protecting our creeks, streams, lakes, and oceans. Specially designed for a given site and with specific intended functionality, SCM's are the primary determinant for water quality. When a SCM fails or is not functioning properly, it and the stormwater system need immediate repair to ensure that it functions as originally designed. With annual inspections, regulators and local governing bodies are more strictly enforcing stormwater regulations that require these systems to perform as designed. If it is determined that a stormwater system is functioning improperly, a Notice of Violation, ("NOV") may be issued to the property owner. A NOV establishes a timeline and process for compliance with the regulation, and fines are issued if these requirements are not met in a timely manner (see "**Handling a Stormwater NOTICE OF VIOLATION**" whitepaper for more information on NOV's).

In addition to the regulatory consequences, a failed or impaired stormwater system can have serious negative impacts on the environment. A failed system can result in harm to the environment by contributing excessive nutrient and/or sediment loads beyond a property and creating downstream flooding and subsequent erosion/sedimentation.

This whitepaper will discuss typical failures and common deficiencies to above ground stormwater SCM's, what constitutes a "repair", and provide examples of various above ground repairs.

Stormwater System Failure

Failures to a stormwater system are usually the result of neglect, improper preventative maintenance, age, accident, or a defect. As noted in other whitepapers, a comprehensive stormwater management program involves several areas, especially routine annual inspections and regular stormwater maintenance. Both plans offer property owners an opportunity to prevent large-scale repairs by noticing and addressing small issues before they become larger problems. Routine inspection and maintenance of a stormwater facility is the **ONLY** way to monitor conditions and guarantee compliance. However, even the best-managed programs still sometimes encounter the need for repairs.

Common “failures” relative to aboveground stormwater facility include:

- Slope erosion, poor vegetative cover
- Excessive vegetative overgrowth
- Scour, blowout at the inlets of the basin
- Sediment accumulation in the basin bottom
- Clogged media in a filter or bioretention facility
- Compromised dams
- Pipe displacement, sink holes
- Pipe failure
- Outfall Device clogged, improper holding elevation
- Prevalence of invasive vegetation or algae





Repair

“Correcting deficiencies to ensure a functional and maintainable system”

Repairing stormwater systems can often be very expensive and time consuming. Soils, vegetation, rock, and structures must be moved using heavy equipment and labor. Stormwater systems are often located in tight working areas demanding a certain skillset for the contractor and equipment operators. It is important that repairs are completed by highly experienced professionals with stormwater repair experience.

Commonly, there are two general types of stormwater repairs, restorative repairs and rehabilitative repairs.

Restorative repair work consists of a variety of isolated or small-scale maintenance and work needed to address operational problems. Restoration can vary from treatment of invasive plants to erosion repair. Restorative repairs typically require licensing and extensive knowledge, and often require the use of small construction equipment.

Rehabilitative repair work consists of large-scale maintenance and major improvements needed to address failures within the stormwater management facilities. This work may require an engineering design with construction plans to be prepared for review and approval. This work may also require more specialized maintenance equipment, surveying, construction permits or assistance through private contractors and consultants.

Repairs are SCM-specific, so please review below typical Stormwater SCM's and common deficiencies for each.

Questions to consider around a potential repair are:

- Did an inspection determine repair activities to be needed?
- What is the extent/severity of the deficiency?
- Can a repair be avoided by implementation of a maintenance plan?
- What is the property owner's budget allocated for repairs?
- What options are available for restoring the system?



Bio-retention Cells

A system typically designed with beneficial plants and an engineered media to assist in pollutant removal by filtering solids suspended in the stormwater while promoting nutrient uptake; discharges are often controlled by an underdrain.

Common deficiencies warranting repair:

- Clogged and poorly draining media
- Dead or dying beneficial plants
- Invasive/nuisance vegetation present
- Blockage at inlets to bio-retention bed
- Damage to clean out pipes or underdrain
- High volumes of trash accumulation



Sand Filter

A system that facilitates the passage of stormwater through a sand media designed to assist in pollutant removal by filtering suspended solids, oils and debris.

Common deficiencies warranting repair:

- Clogged and poorly draining sand/media
- Blockage at inlets or outlets of sand filter



Constructed Wetland

A vegetated system designed with beneficial plants for increased nutrient removal and to hold a permanent volume of water with an additional storage capacity during and immediately following a rain event; discharges controlled by an engineered outlet device.

Common deficiencies warranting repair:

- Invasive/nuisance vegetative dominance
- Dead or dying beneficial plants
- Clogged or poorly draining structures; incorrect water levels
- High volume of mosquitoes
- High volumes of trash accumulation
- Beaver activity



Wet Detention Basin (Retention Pond)

A vegetated system designed to hold a permanent volume of water at all times with an additional storage capacity during and immediately following a rain event; discharges controlled by an engineered outlet device.

Common deficiencies warranting repair:

- Mowing needed
- Invasive/nuisance vegetative dominance
- Clogged or poorly draining structures; incorrect water levels
- Erosion and/or poor vegetative coverage
- High sediment volumes in forebay(s) or basin bottom
- High volumes of trash accumulation
- Animal burrows
- Beaver activity



Dry Detention Basin (Detention Pond)

A vegetated system designed to hold a temporary volume of water during and immediately following a rain event with discharges controlled by an engineered outlet device.

Common deficiencies warranting repair:

- Mowing needed
- Invasive/nuisance vegetative dominance
- Clogged or poorly draining structures; incorrect water levels
- Erosion and/or poor vegetative coverage
- High sediment volume in forebay(s) or basin bottom
- High volumes of trash accumulation
- Animal burrows
- Beaver activity



Grassed Swale

A vegetated channel designed to convey runoff while promoting infiltration.

Common deficiencies warranting repair:

- Mowing needed
- Invasive/nuisance vegetative dominance
- Incorrect water levels
- Erosion and/or poor vegetative coverage
- High volumes of trash accumulation



Permeable (Pervious) Pavement

A pervious product installed to allow infiltration and reduce runoff. Used to mimic pre-development hydraulic conditions.

Common deficiencies warranting repair:

- Limited infiltration due to clogging of pores
- Damage or settling of pavers



Infiltration Basin

A vegetated system designed with highly permeable soils that facilitates infiltration and groundwater recharge.

Common deficiencies warranting repair:

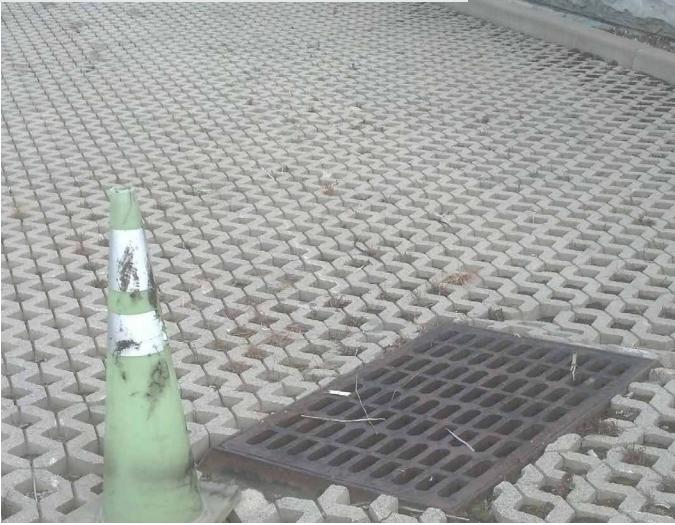
- Excessive overgrowth; large trees present
- Invasive/nuisance vegetative dominance
- Clogged & poorly draining soils at basin bottom; incorrect water levels
- Erosion and/or poor vegetative coverage
- High volumes of trash accumulation

Please refer to the below table for common repairs required within a BMP.

Best Management Practice (SCM)	Problem Example:	Solution Example:
Bioretention	“There is standing water present several days after a rain event.”	The media is most likely clogged and would require removal and replacement.
Sand Filters	“There is standing water present several days after a rain event.”	The top 3-5 inches of sediment and/or debris accumulation should be removed; if severe clogging of the sand has occurred, the material should be removed and replaced.
Constructed Wetlands	“My wetland is overrun with cattails and I have noticed a lot of mosquitoes in that area.”	Invasive plants can interfere and overtake the beneficial plants within a system; invasive plants provide the perfect habitat for mosquito breeding; selective treatment should be performed by a Licensed Applicator.
Wet/Dry Detention Basins	“There are multiple large areas of bare soil on the slopes of my pond that appear to be washing away.”	The cause of the erosion should be identified and the area(s) should be stabilized with the necessary method (riprap, seed, temporary or permanent erosion control matting).
Grassed Swale	“The pipe at the highest point of my swale is blocked and water is backing up.”	Sediment volumes should be assessed at the pipe and within the bottom of the channel, and excess sediment should be removed in order to reestablish design grades; all areas of exposed soil should be stabilized with the necessary erosion control method.
Permeable Pavement	“There is standing water at the waffle blocks in my parking lot.”	In time, permeable pavement becomes clogged; regular cleaning with a sweeping truck should be performed with a frequency based on the sediment inputs of the watershed.

Please review below examples of common above ground repairs.

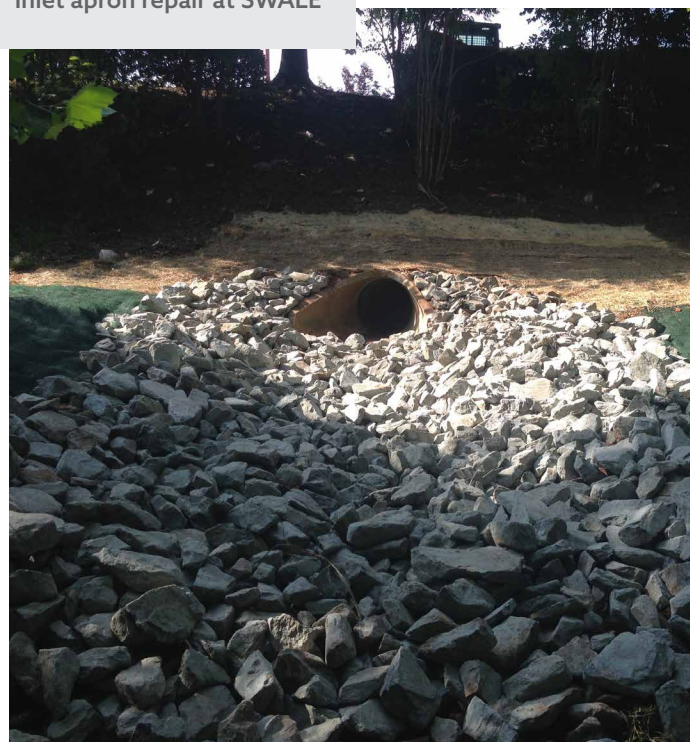
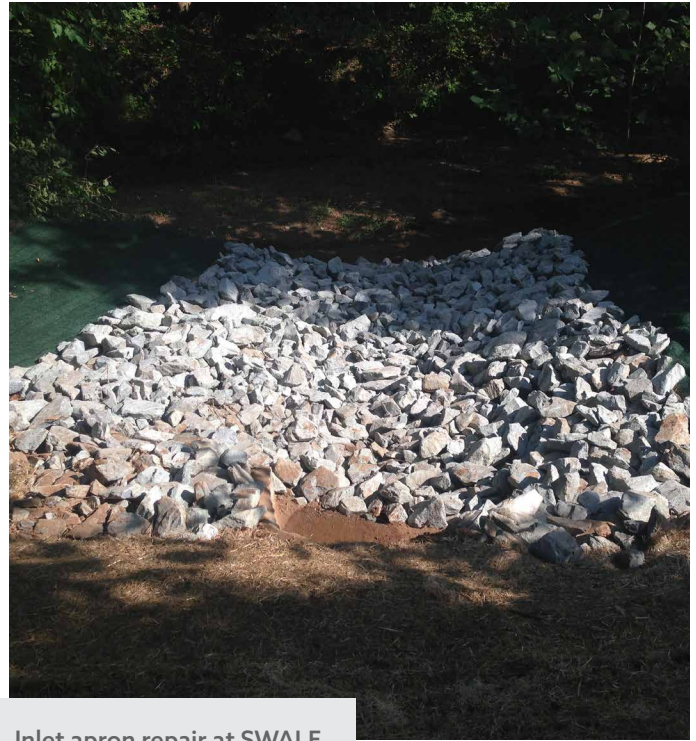
Sinking PERMEABLE PAVEMENT repair



Repair at riprap SWALE



Please review below examples of common above ground repairs.

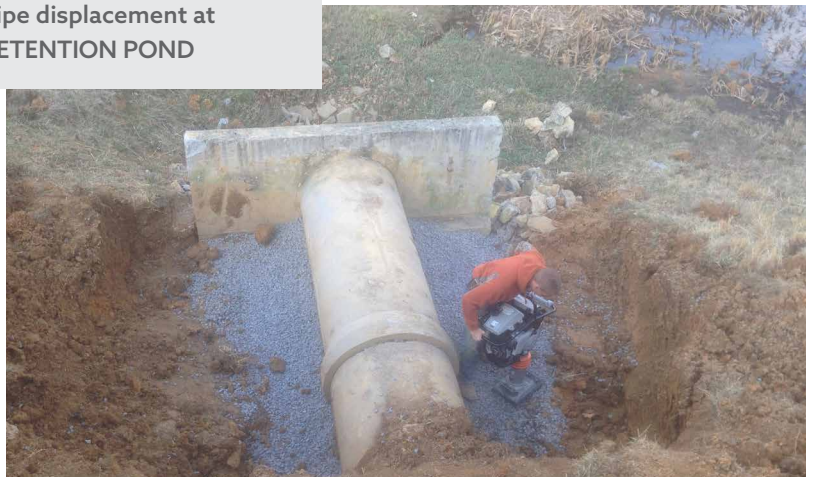


Inlet apron repair at SWALE

Please review below examples of common above ground repairs.



Pipe displacement at
RETENTION POND



Please review below examples of common above ground repairs.



Please review below examples of common above ground repairs.



Slope stabilization at
RETENTION POND



Please review below examples of common above ground repairs.



Cattail treatment and control at DETENTION BASIN



Please review below examples of common above ground repairs.



Sediment and Cattail removal at RETENTION POND



Please review below examples of common above ground repairs.



Sediment removal at bottom of DETENTION BASIN



Please review below examples of common above ground repairs.



Sediment removal and inlet apron install at DETENTION BASIN

Please review below examples of common above ground repairs.



Tree removal at
DETENTION BASIN



Stormwater systems are designed and implemented with the intent that regular inspections and proper maintenance activities will be performed. The frequency and size of stormwater facility repairs can be minimized by an inspection and maintenance plan customized to meet the needs of the system and performed by professionals knowledgeable about the practices that best promote the function of the system. However, even the best-managed system will require some level of repairs, and effective long-term planning builds a capacity to proactively manage restorative and/or rehabilitative repair work on the stormwater system.

We hope that this whitepaper has provided the reader with an understanding of repairs to above ground stormwater SCM's. We invite you to consider AQUALIS Stormwater Management for comprehensive stormwater program management. We are ready to answer any and all questions about how to get started. Please visit [Aqualisco.com](https://www.aqualisco.com) for more information.

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