Stormwater Management
Operation and Maintenance Guide

Milford Town Park Stormwater Retrofits
Milford, Massachusetts

Prepared for:

TOWN OF MILFORD
52 MAIN STREET
MILFORD, MA 01757

Prepared by:

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Unit 1 • Sandwich, MA 02563
508-833-6600 • horsleywitten.com

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Operations & Maintenance Plan
Stormwater Retrofits
Milford Town Park

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1.0 INTRODUCTION

This document provides a general description of the stormwater retrofits installed at Town Park and provides the operation and maintenance (O&M) requirements for these structures. The stormwater management system for the Park utilizes green infrastructure (GI) practices which consist of bioretention (a.k.a. rain garden) systems. In addition, the stormwater management improvements include a subsurface infiltration system.

2.0 RESPONSIBLE PARTIES

The responsible parties are required to inspect and maintain all measures as outlined in this maintenance Guide throughout the year. Site maintenance is divided into three categories as outlined below.

1. Stormwater Infrastructure
    - Structural Components
    - Structural Maintenance Schedule
    - Planting Maintenance Schedule
    - Landscape Maintenance Schedule
    - Weed Guide

2. General Site Maintenance
    - Trash & Debris
    - Pet Waste
    - Pavement Sweeping
    - Contributing Drainage Areas

3. Long-Term Pollution Prevention Measures

For structures (catch basins, manholes, pipes, overflow structures, etc.) and the subsurface infiltration system:

Representative:	Scott Crisafulli
Title:	Highway Surveyor Milford Highway Office 30 Front Street Milford MA 01757
Email:	SCrisafulli@townofmilford.com
Phone:	508-473-1274

For the rain gardens:

Representative:	James Asam
Title:	Parks and Recreation Administrator Milford Highway Office (Upper Level) 30 Front Street Milford MA 01757
Email:	jasam@townofmilford.com
Phone:	774-462-3311

3.0 GREEN STORMWATER INFRASTRUCTURE

3.1 How Does Green Infrastructure Work?

Green Stormwater Infrastructure (GSI) is a nature-based approach to stormwater treatment and management. These stormwater practices or "treatment areas" are designed to mimic nature and use the natural filtration properties of soil and plants to remove pollutants from stormwater runoff prior to discharging to the Town-owned municipal drainage system.

GSI relies on the following basic steps to function properly. Structural components of the practices facilitate the functioning of the steps. If one of these steps, or components, does not work properly, the entire system can be compromised and the GSI practice itself could be contributing to maintenance problems. This can lead to a landscape nuisances, more frequent maintenance and costly repairs/improvement.

1. ***Collect*** (Inlets)
2. ***Move Water*** (Conveyance) if needed, can come after capturing sediment
3. ***Capture Sediment*** (Pretreatment)
4. ***Treat and Manage*** (Filter, Infiltrate or Store)
5. ***Overflow*** (Structures and Spillways)

3.2 What is required for Maintenance?

As these are nature-based systems that often rely on plant upkeep, the maintenance for GSI typically falls under landscape and general site maintenance services. Proper operation and maintenance (O&M) as outlined in this Guide are vital to its long-term viability. Regularly scheduled maintenance can prevent system failures due to sediment build-up, damage, or deterioration. The maintenance requirements, outlined in this Guide, are critical to ensure proper treatment, maintain storage capacity and preserve the visual integrity.

General maintenance includes the following:

1. Removing sediment from the pretreatment practices used to capture sediment.
2. Maintaining the proper drainage function and pollutant removal capacity of the systems.

3. Maintaining healthy native trees, plants, and vegetative cover as well as the removal of unwanted weeds.

It is recommended that all practices be maintained regularly as part of the routine landscape maintenance or at a minimum four times per year and after major rain events.

- Early Spring: during spring cleanup
- Summer: during lawn mowing and other routine park maintenance
- Early Fall: when leaves begin to fall.
- Late Fall/Early Winter: after all the leaves have fallen during leaf removal.
- After major storm events: 2" of rain or greater.

3.3 Practice Types

There are two types of practices on the site: underground infiltration chambers and bioretention areas.

Underground infiltration chambers are designed to store and infiltrate the stormwater. The chamber system proposed at this site will divert runoff from the adjacent neighborhoods that currently flows through the existing pipe network. Once diverted, the chambers will remove Total Suspended Solids (TSS) and infiltrate 75% of the Water Quality Volume (1-inch) storm. Larger storms will bypass the chamber system.

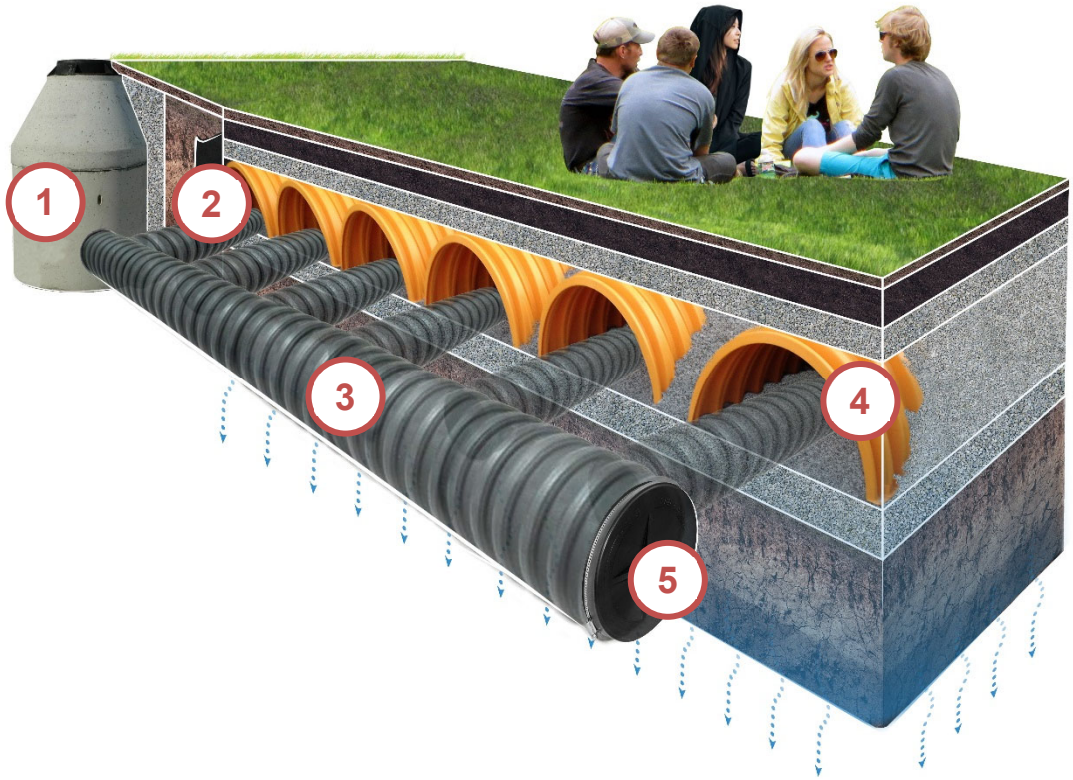
Bioretention areas are a type of GSI that has a proven track record of better pollutant removal capabilities than more conventional drainage systems. Bioretention areas use a designed soil media and vegetation to remove nitrogen and bacteria and reduce stormwater runoff. The two bioretention areas on site will capture and treat runoff from within the park. One of the bioretention areas will also infiltrate runoff.

The maintenance for the bioretention areas is divided into two categories:

a. The **Structural Components** that make up the basic steps of a functioning system

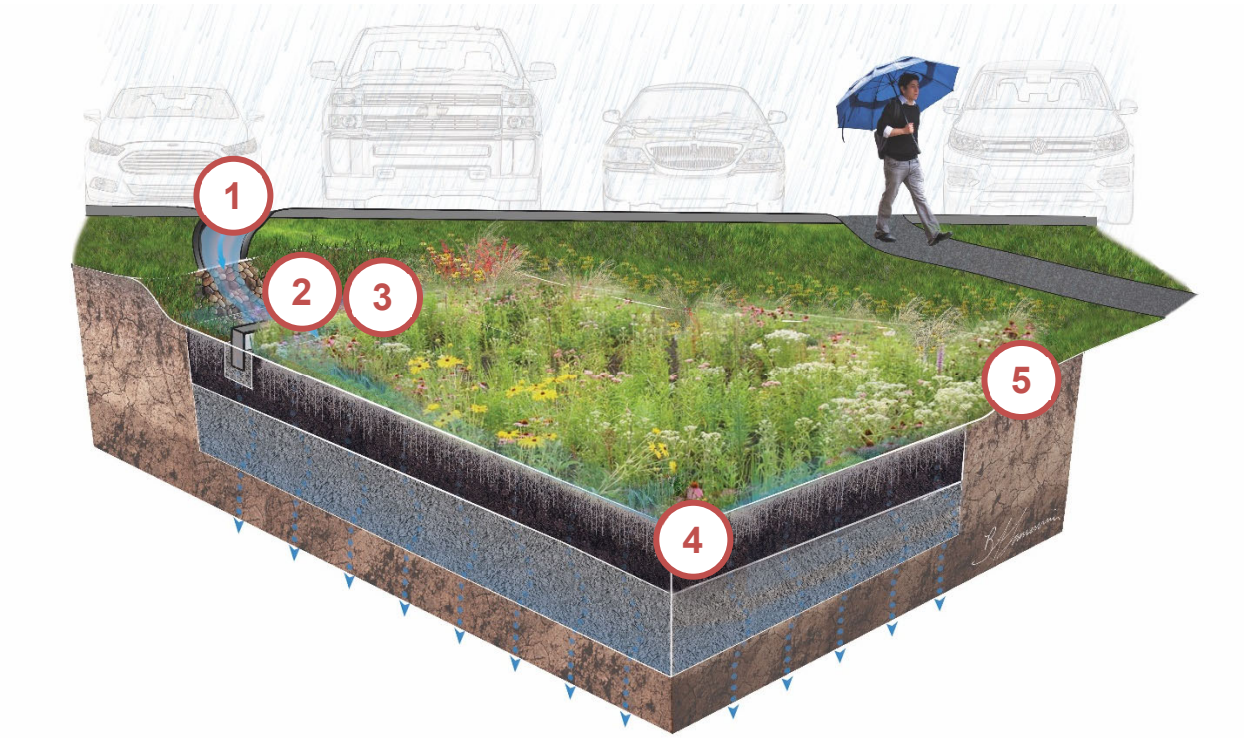
b. **Plantings**, the landscape and filtration element

The following sections describes the general function and maintenance of each practice.



3.4 Structural Components

1. ***Collect***: Stormwater runoff is diverted from the existing drainage system.
2. ***Capture Sediment***: Sand and debris settle out within the separator row, the first row of chambers wrapped in filter fabric.
3. ***Move Water:*** Stormwater is directed through the chamber system via a closed, external pipe/manifold system.
4. ***Treat and Manage***: Stormwater is stored in the chambers and infiltrates into the subsurface soils.
5. ***Overflow:*** Runoff from larger storms will overflow the manifold and return to the existing system, or bypass the system at the upstream diversion manhole.



3.5 Structural Components

1. ***Collect***: Stormwater runoff is directed to broad dip inlets(s) where stormwater enters the system.

2. ***Capture Sediment***: Sand and debris settle out within the sediment forebay.

3. ***Move Water:*** Stormwater exits the forebay flowing over a stone check dam to enter the Bioretention Area and Vegetated Swale. The Swale both treats the stormwater and conveys it slowly downhill.

4. ***Treat and Manage***: Plants in the vegetated swale help to slow the water down and treat water that filters through the soil and plant roots. Bioretention media and vegetation remove nitrogen and bacteria, and allow stormwater to infiltrate into the soil.

5. ***Overflow***: Level Spreader/Overflow Spillway: Runoff from larger storms will flow over the level spreader to the overflow spillway.

STRUCTURAL COMPONENTS MAINTENANCE SCHEDULE

As required by the MS4 General Permit, a site inspection of the underground chambers and bioretention components shall be conducted at least once a year, ideally in the Spring. It is recommended the systems also have an inspection conducted during Fall and after first major storm event

See the calendar below and the Inspection Report in **Appendix B** for more information. The manufacturer's recommendations for maintenance are included in **Appendix C**.

Infiltration System General Maintenance Schedule												
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Task	**Frequency & Time of the Year**											
Site Inspection				**X**							x	
Debris & Trash Removal				**X**							x	
Sediment Removal				x	x	x	x	x	x	x	x	

The majority of the bioretention maintenance falls under planting maintenance. See Plantings and the corresponding calendar to combine maintenance efforts. Debris and trash should be removed monthly and sediment removal should occur during the site inspections and, as needed, during the monthly debris and trash inspections. See the calendar below and the Inspection Report in **Appendix A** for more information.

Bioretention General Maintenance Schedule												
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Task	**Frequency & Time of the Year**											
Site Inspection				**X**							x	
Debris & Trash Removal				**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	
Sediment Removal				x	x	x	x	x	x	x	x	

should **also** be completed after major storm events

X required inspection

x as needed

- When removing trash and debris during monthly inspections look for:
    - If sediment is > 3” in sediment forebay. Ensure sediment does not cause blockage of inlet weir. If it does, remove sediment.
    - If standing water does not drain after 48 hours. See Inspection Report for action items.

- After rain event look for:
    - If standing water does not drain after 48 hours. See Inspection Report for action items.

3.6 Plantings

The planting design for the bioretention area consists of two landscape maintenance areas:

- Mowed areas
- No mow areas
- Buffer Restoration areas.

PLANTINGS: MOWED AREAS MAINTENANCE

There is an area of the site that is allowed to be maintained as mowed lawn as necessary. Landscape maintenance of mowed lawn areas includes the following:

Seeding

Loam/reseed bare spots with the specified seed mix as shown on the Planting Plans.

Mowing/Weed Whacking

Do NOT cut area lower than 4". Depending on height of grasses and the time of year, grass cuttings/stalks may need to be raked and removed from site to prevent the clippings from entering the bioretention areas.

Watering

Allowing the lawn areas to "brown" is desired. Water only during drought conditions or during reseeding establishment period.

Fertilizing

No fertilizer shall be used.

Weeding

Weeding should be limited to invasive and weedy species (see Section 3.6 Weed Identification below and the Weed Guide at https://web.uri.edu/riss/files/In-the-Weeds.pdf). Non-chemical methods (hand pulling and hoeing) are required; chemical herbicides should be avoided. Properly remove and dispose of all invasive species off site as to prevent colonization elsewhere, this includes disposal on land beyond the project area.

Monitoring

During the establishment period, walk the mow areas monthly during the first year without the intent to mow, but to look for invasive species, bare spots and identify potential pest or disease problems. Properly remove and dispose all invasive species as to prevent colonization elsewhere, this includes disposal on land beyond the project area.

Debris & Trash

Remove and properly dispose litter from all low mow areas prior to mowing.

PLANTINGS: NO MOW AREA MAINTENANCE (BIORETENTION)

By design, plants in bioretention areas are meant to flourish throughout the growing season leaving dry standing stalks during the dormant months. Plants do not require fertilizers and/or watering. This area is designated as No Mow - frequent mowing would eliminate selected meadow species, may promote the growth of undesirable plants, and require additional maintenance and watering. It is recommended this area be cut back no more than one time per year. Remove and replace vegetation as necessary, using the appropriate species as shown on the Planting Plan. The best time to plant is in early to mid-fall or early to mid-spring.

Specific maintenance activities of the bioretention no mow area include the following:

Seeding

Loam and reseed bare spots with the specified seed mix as shown on the Planting Plan.

Cutting Back

Recommend cutting with shears a maximum of once a year in early spring. Allow areas to grow up to 12”-36” as to maintain a meadow appearance. Do NOT cut area lower than 6” – maintain sporadic wooden stakes on site at 6” height to provide visual cues during cutting. Depending on height of grasses and the time of year, grass cuttings/stalks may need to be raked and removed from site so as not to clog the bioretention. Use a leaf blower as needed to assist in clean-up.

Pruning

Prune trees and shrubs to remove deadwood and low hanging branches.

Watering

Water only during drought conditions or during reseeding establishment period.

Fertilizing

No fertilizer shall be used.

Weeding

Weeding should be limited to invasive and weedy species (see section 3.6 Weed Identification below and the Weed Guide at https://web.uri.edu/riss/files/In-the-Weeds.pdf). Non-chemical methods (hand pulling and hoeing) are required; chemical herbicides should be avoided. Properly remove and dispose off site all invasive species as to prevent colonization elsewhere; this includes disposal on land beyond the project area.

Monitoring

During the establishment period, walk the low to no “mow” areas monthly without the intent to cut, but to look for invasive species, bare spots and identify potential pest or disease problems.

Debris & Trash

Remove and properly dispose litter from all areas prior to cutting.

PLANTINGS: REPLACEMENTS

The plants that thrive in bioretention areas are typically quite drought tolerant due to the filter profile having a top layer of planting soil and sandy soil media below. They need to be able to withstand periods of inundation after storm events, however; when it doesn't rain, there will be less water held naturally in the sand than in other soil types for the plants to use.

Specifying plants native to the area increases the ecosystem benefits by helping to support native wildlife like pollinators.

If replacements are needed, use the planting plan as a guide. However, if all plants of a certain species have not done well in the bioretention area, do not replace with that same species. Rather, replant with one or more of the other species that has thrived under the bioretention area conditions or have a plant professional choose a different species based on current photos of the site and the following site-specific considerations.

Plants for this bioretention area should be:

- Preferably native
- Drought tolerant
- Tolerant of inundation for 24 hours
- Size constraints:
    - taller perennials at the bottom of the bioretention
    - shorter perennials on the side slopes
- Sun, wind, and salt tolerant
- A mix of different types of plants that will create a resilient plant community: cold & warm season grasses, perennials, groundcovers in all areas.

PLANTINGS: MAINTENANCE SCHEDULE

By design, plants in the bioretention areas are meant to help filter the stormwater as it passes through and flourish throughout the growing season. The plants do not require fertilizers or mulch, and, after establishment, only need water during periods of drought. Remove and replace vegetation as necessary, using the appropriate species as discussed in the no-mow bioretention area maintenance page above. Weeding should occur quarterly during the growing season as well as monitoring for invasive species. An annual spring or fall "clean up" includes cutting last season's growth of the perennials and pruning as needed. See the calendar below, and the Weed Identification and the Weed Identification Guide at https://web.uri.edu/riss/files/In-the-Weeds.pdf for more information.

Bioretention Landscape Maintenance Schedule												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Task	**Frequency & Time of the Year**											
Pruning				**X**								
Cutting				**X**								
Mowing				x	x	x	x	x	x	x	x	
Weeding				**X**		**X**		**X**		**X**		
Monitoring				**X**		**X**		**X**		**X**		
Watering						x	x	x	x			
Seeding				x	x			x	x			
Plant Thinning				x	x			x	x			
Plant Replacement				x	x			x	x			

Low Mow Areas
No Mow Areas (Bioretention)
All areas

X required
x as needed

3.7 Weed Identification

Yellow Toadflax *(Linaris vulgaris)*

Redroot Pigweed- (*Amaranthus retroflexus)*

Smartweed *(Polygonum lapathifolium)*

Dandelion *(Taraxacum officinale)*

Fireweed *(Erechtites hieraciifolius)*

Spotted Spurge (Euphorbia maculata)

Crabgrass *(Digitaria ischaemum)*

Crabgrass with seedheads

Ragweed (*Ambrosia artemisiifolia*)

Japanese Knotweed (Polygonum cuspidatum)

Asian Bittersweet *(Celastrus orbiculatus)*

Green Foxtail *(Setaria viridis)*

Norway Maple Tree Seedling *(Acer platanoides)*

Catalpa Tree Seedling (Catalpa speciosa)

Purple Loosetrife (*Lythrum salicaria*)

Field Bindweed (*Convolvulus arvensis*)

Black Swallow-wort (*Cynanchum louiseae*)

4.0 LONG-TERM POLLUTION PREVENTION MEASURES

Long-term pollution prevention measures implemented at the site reduce pollutants in stormwater discharges. The following precautions will be employed on an on-going basis.

Spill Prevention & Control Measures

To minimize the risk of spills or other accidental exposure of materials and substances to stormwater runoff, the following material management is to be used when working on site.

- Any materials stored on-site will be stored in a neat, orderly manner in their appropriate containers.
- Products will be kept in their original containers with the original manufacturer's label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Manufacturers' recommendations for proper use and disposal will be followed.
- The contractor's supervisor will be issued this Guide to ensure proper use and disposal of materials.

Materials or substances listed below may be present on-site for maintenance and care should be taken to avoid spills:

  - Petroleum Based Products

The following product-specific measures will be followed on-site:

- *Petroleum Products* - All on-site vehicles will be monitored for leaks and receive preventative maintenance to reduce the chance of leakage.
- *Grass Clipping, Leaf Litter and Plant Debris* – are to be removed from the property and not disposed on site.

BIORETENTION AREA INSPECTION REPORT

Location:

Date:

Inspector:

Maintenance Item	Description	Maintenance (Y/N)
1. Collection Inlets: Catch Basins (Site 1)		
Surface Debris Cleaning	Remove all trash, leaf litter and inlet clogging.	
Catch Basins	Check for clogging and sediment accumulation that impacts inflow. If sediment/debris accumulation, remove sediment.	
Actions to be taken:		
2. Capture Sediment Rip Rap Outfall (Site 1)		
Debris Cleanout	Remove trash and debris from the surface.	
Side Slopes	Signs of erosion gullies, animal burrowing, overtopping or slumping are observed. Repair as necessary.	
Sediment/Organic Debris Removal	Remove sediment accumulation and properly dispose of (critical when accumulation is greater than or equal to 3 inches.)*	
Actions to be taken:		
3. & 4. Move and Treat: Bioretention Areas		
Debris Cleanout	Remove trash and debris from the surface.	
Side Slopes	Signs of erosion gullies, animal burrowing, overtopping or slumping are observed. Repair as necessary.	
Sediment/Organic Debris Removal	Remove sediment accumulation and properly dispose when accumulation is greater than or equal to 3 inches.*	
Vegetation Maintenance Replacement	Prune and thin plants as necessary. Cut back and remove dead stalks. Remove dead or diseased plants and replace. Remove invasive species.	
Water Draining properly	If standing water is observed for more than 48 hours after a storm event, rototill or aerate the bottom 6 inches to breakup any hard-packed sediment.* If standing water does not drain after tilling, replace the soil media.	
Actions to be taken:		

Maintenance Item	Description	Maintenance (Y/N)
5. Overflow Structures		
Bioretention Berms	Check for settling, gullying, erosion damage, & clogging. Repair as necessary and return to design grades.	
Drain Basin	Schedule cleaning. Check for leaf litter, debris, and clogging.	
Actions to be taken:		
General Site Maintenance		
Debris Removal	Remove trash from perimeter areas.	
Pet Waste Removal	Remove any pet waste from perimeter areas.	
Snow Removal	Ensure snow piles do no block inlet structures and are not placed in the green stormwater infrastructure.	
Actions to be taken:		

*Sediment shall be disposed of offsite in a pre-approved location.

UNDERGROUND CHAMBERS INSPECTION REPORT

Location:

Date:

Inspector:

Maintenance Item	Description	Maintenance (Y/N)
1. Collect: Existing Catch Basins & Diversion Strucutre		
Surface Debris Cleaning	Remove all trash, leaf litter and inlet clogging.	
Catch Basins	Check for clogging and sediment accumulation that impacts inflow. If sediment/debris accumulation, remove sediment.	
Actions to be taken:		
2. Capture Sediment: Separator Row		
Debris Cleanout	Remove trash and debris.	
Sediment/Organic Debris Removal	Remove sediment accumulation and properly dispose of (critical when accumulation is greater than or equal to 3 inches.)*	
Actions to be taken:		
3. Move: Manifold		
Debris Cleanout	Remove trash and debris.	
Actions to be taken:		
4. Treat and Manage: Chambers		
Debris Cleanout	Remove trash and debris.	
Filter Fabric	Check for signs of wear, rips, or other damage.	
Sediment/Organic Debris Removal	Remove sediment accumulation and properly dispose when accumulation is greater than or equal to 3 inches.*	

Maintenance Item	Description	Maintenance (Y/N)
Water Draining properly	If standing water is observed for more than 48 hours after a storm event, rototill or aerate the bottom 6 inches to breakup any hard-packed sediment.* If standing water does not drain after tilling, replace the soil media.	
Actions to be taken:		
5. Overflow Structures		
Structures	Schedule cleaning. Check for leaf litter, debris, and clogging.	
Actions to be taken:		
General Site Maintenance		
Debris Removal	Remove trash from perimeter areas.	
Pet Waste Removal	Remove any pet waste from perimeter areas.	
Actions to be taken:		

*Sediment shall be disposed of offsite in a pre-approved location.

Contech® CMP Detention Inspection and Maintenance Guide

Underground stormwater detention and infiltration systems must be inspected and maintained at regular intervals for purposes of performance and longevity.

Inspection

Inspection is the key to effective maintenance of CMP detention systems and is easily performed. Contech recommends ongoing, annual inspections. Sites with high trash load or small outlet control orifices may need more frequent inspections. The rate at which the system collects pollutants will depend more on-site specific activities rather than the size or configuration of the system.

Inspections should be performed more often in equipment washdown areas, in climates where sanding and/or salting operations take place, and in other various instances in which one would expect higher accumulations of sediment or abrasive/corrosive conditions. A record of each inspection is to be maintained for the life of the system.

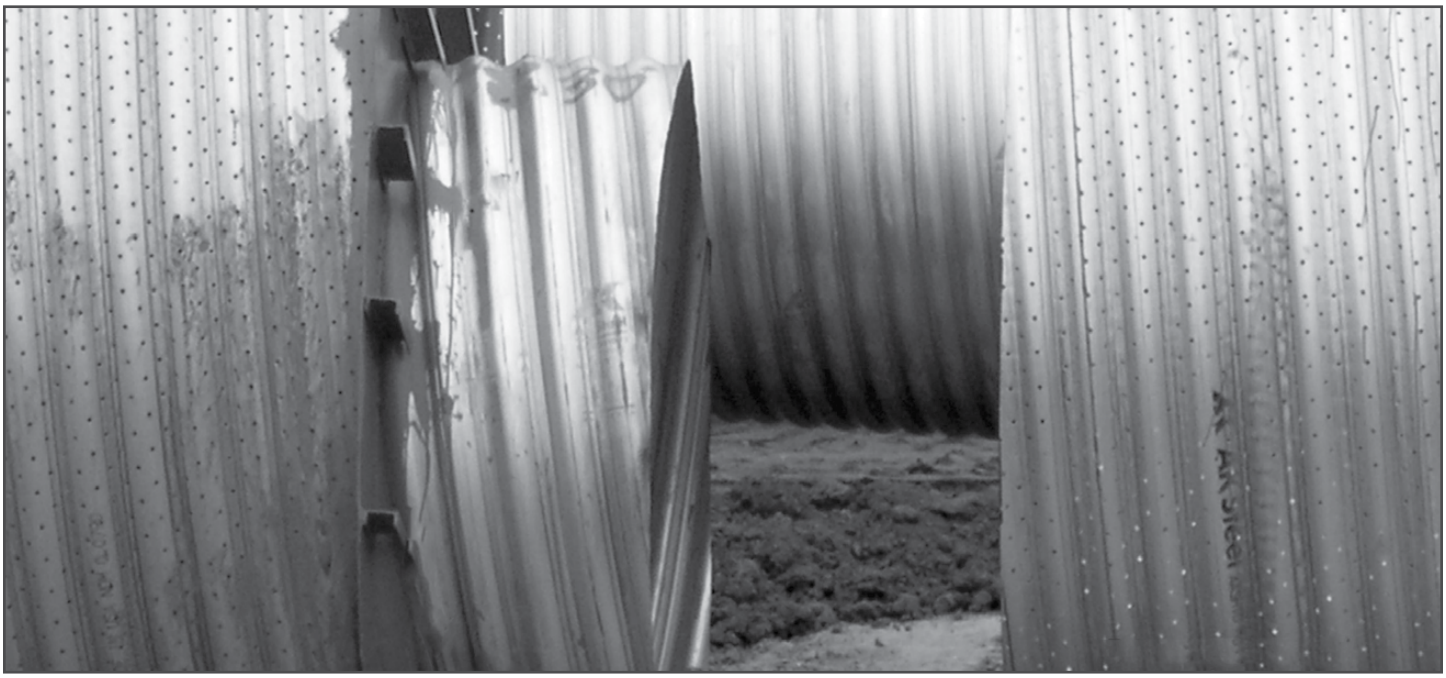
Maintenance

CMP detention systems should be cleaned when an inspection reveals accumulated sediment or trash is clogging the discharge orifice. Accumulated sediment and trash can typically be evacuated through the manhole over the outlet orifice. If maintenance is not performed as recommended, sediment and trash may accumulate in front of the outlet orifice. Manhole covers should be securely seated following cleaning activities. Contech suggests that all systems be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Should it be necessary to get inside the system to perform maintenance activities, all appropriate precautions regarding confined space entry and OSHA regulations should be followed.

Annual inspections are best practice for all underground systems. During this inspection if evidence of salting/de-icing agents is observed within the system, it is best practice for the system to be rinsed, including above the spring line soon after the spring thaw as part of the maintenance program for the system.

Maintaining an underground detention or infiltration system is easiest when there is no flow entering the system. For this reason, it is a good idea to schedule the cleanout during dry weather.

The foregoing inspection and maintenance efforts help ensure underground pipe systems used for stormwater storage continue to function as intended by identifying recommended regular inspection and maintenance practices. Inspection and maintenance related to the structural integrity of the pipe or the soundness of pipe joint connections is beyond the scope of this guide.



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