Stormwater Management System

Operation & Maintenance Manual

Greenmont Commons
Dracut, Massachusetts

Prepared for

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Forward

This document is provided to meet the requirement of the Massachusetts Department of Environmental Protection (DEP) Massachusetts Stormwater Standards. Stormwater Report for an Operations and Maintenance Manual. It is the intent of this manual to provide a guide for the regular inspection and maintenance of the stormwater management system.

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SECTION 1 BACKGROUND

1.1 Introduction

When a site is developed, some of the landscape is changed from pervious surfaces to less pervious or impervious surfaces. These new surfaces have different drainage characteristics as compared to the existing conditions. Since the new areas are not as pervious, less rain and snowmelt can be absorbed into the ground. This results in less groundwater recharge. Water that runs over these new surfaces also moves more quickly to downstream areas. This can cause flooding if the amount of water reaching downstream areas is increased in volume, or if water accumulates in downstream areas more quickly, or both. Additionally, water that is moving faster is likely to cause erosion and siltation of downstream areas. The solution to these problems is to collect and manage stormwater runoff and to attenuate the volume and rate of discharge. By doing this runoff water can be recharged to the groundwater supply, sediments and other pollutants can be trapped, and downstream areas can be protected from increased runoff. Collection of stormwater can be accomplished by a system of swales, catch basins and subsurface drain pipes. Recharge can be accomplished by infiltration facilities, rain gardens, or dry wells. Suspended solids can be removed by various types of basins and channels, constructed wetlands, or filters. Attenuation can be accomplished by providing surface or subsurface storage of the stormwater and releasing the water at a controlled rate. These structural facilities are referred to as best management practices or BMP's.

For the Greenmont Commons project an open and closed drainage system was provided on the site. This was completed utilizing an underground detention system for stormwater flow attenuation, an alternative technology Vortechnics Hydrodynamic Separator and Constructed Stormwater Wetland for water quality volume. Upon the occurrence of larger storm systems, the closed drainage system will collect the stormwater through the use of catch basins and drainage manholes to direct the water to underground Pipe Detention System with an outlet to the Constructed Stormwater Wetlands.

1.2 Design Basis

Peak rate attenuation of the drainage system was designed on the basis of 2, 10, 25 and 100-yr. frequency storms in accordance with the USDA Natural Resources Conservation Service Technical Release 20. Stormwater management was further refined using smaller more frequent rainfall events in accordance with the Mass. DEP Stormwater Management Standards. Detailed calculations are available in the Stormwater Report as part of the Site Plan submission package.

1.3 Inspection & Maintenance Responsibility

Inspection & Maintenance of the drainage system will be the responsibility of the owner of the site.

SECTION 2 OPERATION

2.1 Background

Drainage systems are designed to operate with minimal outside intervention. Design calculations take into account the smaller more frequent storms as well as the less frequent but larger storms. A wide range of variables are considered with the final specification of pipes, swales, basins and other structures. It must be realized, however, that the design of a drainage system, which is based on engineering calculations and field experience, also includes some approximations and assumptions. This fact, together with local variations in topography, changes within the drainage area, and other factors, may affect the actual operation of the system. Therefore, field adjustments may need to be made in some cases to accommodate these variations.

2.2 Operation of BMP's

The following paragraphs describe the best management practices (BMP's) used in the drainage system for the Commercial Development project as shown on the Site Plan.

Catch Basins (CB)

Catch Basins are usually made of reinforce concrete and are wide enough inside for a person to enter and work. A sump is provided to collect sediments and an oil hood is provided to prevent floatable materials from escaping into the drainage system. A removable grate is provided. The function of catch basins includes:

- Collect stormwater and route it into the drainage system.
- Collect & store oil, debris and sediment.

Drainage Manholes (DMH)

Drainage manholes are usually made of reinforce concrete and are wide enough inside for a person to enter and work. An access cover and a ladder are provided. The function of manholes include:

- Inspecting and cleaning of drainage lines
- Provide a means for drain lines to change vertical or horizontal direction.

Vortechs Stormwater Quality System

Vortechs Stormwater Quality Systems are made of reinforce concrete. They are designed as a pre-treatment BMP to remove and isolate pollution from the stormwater system before it can enter an infiltration BMP. These chambers target hydrocarbons and total suspended solids (TSS) in stormwater runoff. They improve water quality by removing contaminants by the gravitational settling of the sediments and flotation of the hydrocarbons while preventing the re-suspension or

scour of previously captured pollutants A removable grate or cover is provided. The functions of the Vortechs Systems includes:

- Remove and isolate hydrocarbons from the stormwater system.
- Remove and isolate suspended solids from the stormwater system.

Underground Pipe Detention System

Subsurface storage chambers are structures that are installed under the surface that capture runoff and infiltrate it into the ground. They are typically constructed of plastic, concrete or metal in the configuration of tanks, pipes or arches and often utilize crushed stone for additional storage capacity and/or for structural support. The function of subsurface structures includes:

- Infiltration of stormwater into the ground to recharge the groundwater supply
- Provide storage of runoff to attenuate peak flows.

Rip Rap

Rip rap is heavy stone or other materials that prevent erosion at the end of drainage pipes or along channels. The function of rip rap includes:

- Reduce the velocity of flowing water
- Erosion protection
- Filtration of sediments

Level Spreader/Spillway

A level spreader is a basin constructed to trap sediment. The function of a spreader includes:

- Reduce velocity of entering water
- Allow additional sediment to fall out of slower moving water
- Protect downstream facilities that might otherwise be damaged by point source flow.

A level spreader/spillway is usually constructed of graded crushed stone.. The spillway is usually designed to safely pass the 100-yr rainfall event. The function of a spillway includes:

- Provide an escape for pended water that rises to the top level of a depression basis due to an extreme rainfall event, back to back large rainfall events, or clogged outlet facilities.

Bituminous & Cement Pavement

Bituminous & cement concrete pavement consists of performance grade asphalt or cement and fine grained aggregates and other additives The base materials are usually layers of graded stone that provide excellent structural and drainage characteristics Sometimes drain pipes are installed within the base material in order to drain off excess water. Bituminous &cement concrete pavement is usually installed in locations that receive constant vehicular traffic. The function of bituminous &cement concrete pavement includes:

- Provide a permanent walking or driving surface that is impermeable
- Collect stormwater and direct it to collection systems
- Protect underlying soils from erosion or damage caused by high traffic loads

SECTION 3 INSPECTION & MAINTENANCE

3.1 Background

Closed drainage systems in general are designed to be self-cleaning with only a limited amount of regular maintenance being required. So much emphasis is placed on the ability of the system to provide drainage control that it is not realized by most people that the design must also provide for this self-cleaning ability.

Infiltration basins are designed to manage rising and falling water levels. Sidewalls are sloped and landscaped to prevent erosion during rainstorms, or sloughing caused by a rapid drop in water level. Exit pipes and other control structures are provided with the same consideration for flushing, erosion control and maintenance as a closed drainage system.

Pre-treatment, treatment and infiltration facilities are designed to collect and store sediments and in some cases recharge stored water into the groundwater supply. As a result of their function these facilities require more frequent inspection and maintenance.

3.3 Inspection & Maintenance

The following paragraphs describe measures that must be taken on a frequent basis to insure the drainage system will continue to operate as it was designed. Additional maintenance may also be required after severe storms or prolonged rainfall. A log of inspections and repairs should be kept detailing their frequency and extent.

CAUTION. Entry of confined spaces such as manholes, catch basins, leaching basins, and drainage lines may be hazardous. Gases such as carbon monoxide may accumulate in these areas. Breathing these gases may cause temporary disorientation or permanent health problems. Accumulated water levels in sumps may be higher than expected. Flash rainstorms may result in rapidly rising water levels. Mud levels in sumps may be higher than expected. Manhole and catch basin covers are extremely heavy and awkward.

Only qualified and experience persons should enter confined spaces. Persons entering these systems must have proper equipment, including safety lines as required. Persons entering these systems must be assisted by at least one other qualified and experienced person at the surface.

Catch Basins

Inspection:	Inspect the basins once per year. Determine the level of silt & debris that has accumulated in the sumps by visual inspection. Inspect frames, covers and concrete for damage.
Maintenance:	Clean out the silt and debris by mechanical means. Dispose of the sediment & debris according to local regulations. Repair or replace any structural components that may be damaged

Drainage Manhole

Inspection:	Inspect the manhole once per year. Determine if debris is accumulating in the manhole by visual inspection. Inspect frames, covers and concrete for damage.
Maintenance:	If there is an accumulation of debris within the manhole clean out the debris by mechanical means. Dispose of the sediment according to local regulations. Repair or replace any structural components that may be damaged

Vortechs Stormwater Quality System

Inspection:	Inspect the Vortechs oil & grit chamber once per year, after a heavy rainfall, or if a hydrocarbon spill is suspected. Determine if sediment or oil is accumulating in the chamber by visual inspection. Inspect frames, covers and concrete for damage.
Maintenance:	If there is an accumulation of sediment or oil within the chamber follow the cleaning procedures as outlined by the manufacturer of the chamber. Dispose

	of the sediment or oil according to local regulations. Repair or replace any structural components that may be damaged.

Subsurface Pipe Detention System

Inspection:	Inspect the ADS Pipe subsurface storage system in the spring and fall and after heavy rainfall.
Maintenance:	Clean out the silt by mechanical means (clean-out ports are provided). Dispose of the sediment & debris according to local regulations. Repair or replace any structural components that may be damaged. Since additional pre-treatment is provided it is not expected that siltation will be a common occurrence. If siltation is observed carefully check the pre-treatment facilities for adequacy and/or signs of failure.

Culverts & Drainage Lines

Inspection:	Inspect the culverts and drain lines once per year. The drain lines must also be inspected from within the drain manholes. Determine if debris is accumulating in the lines by visual inspection.
Maintenance:	If there is an accumulation of debris within the pipe, clean the debris by high pressure flushing. Install haybales at the end of the drain lines to collect sediment. Dispose of the sediment according to local regulations.

Bituminous & Cement Pavement

Inspection:	Inspect the bituminous & cement concrete pavement for damage in the spring and fall. Monitor the system and to insure the system is draining properly. Determine if sediment has accumulated. Determine if any of the pavement has settled or heaved due to freeze-thaw conditions or flooding..
Maintenance:	Sanding and salting of pavers is allowed as required. If any sediment has accumulated remove it by mechanical means or by vacuuming. Sweep or vacuum the pavement quarterly. Vacuuming is the preferred method. Patch cracks that develop over time and reseal the surface to maintain a watertight impermeable surface.

Rip Rap

Inspection:	Inspect the stone rip rap in the spring and fall and after heavy rainfall
Maintenance:	Repair any damage by repositioning stones that are displaced. Add stones if required. If excessive or unusual damage is observed add a larger and heavier sized stone to increase the effectiveness. Weed the rip rap to prevent an excessive build-up of vegetation.

Level Spreader/Spillways

Inspection:	Inspect the emergency spillways in the spring and fall and after heavy rainfall
Maintenance:	Repair any damage by repositioning stones that are displaced. Add stones if required. If excessive or unusual damage is observed add a larger and heavier sized stone to increase the effectiveness. Weed the swale to prevent an excessive build-up of vegetation.

Inspection & Maintenance Schedule

	Inspection & Maintenance Frequency				
BMP's	Spring	Fall	Winter	Heavy Rainfall	Monthly [2.]
Sweeping & Vaccuuming	X	X			
Site Landscaping	X	X			X
Catch Basins	X	X			
Drainlines	X				
Vortechs Systems	X	X		X	
Pipe Systems[1.]	X				
Cultec Systems[1.]	X				
Outlets	X	X		X	
Level Spreader/Spillway	X	X		X	
Rip Rap	X	X		X	

[1.] Also confirm maximum 72 hr. drawdown during first year of operation
[2.] During the growing season

Inspection & Maintenance Budget

	Cost ($)					Yearly
Task	Spring	Summer	Fall	Winter	Occasional [1.]	Total ($)
Inspection & Documentation	1,000		1,000		1,000	3,000
Maintenance & Repair						
Vaccuuming	1,000		1,000		1,000	3,000
Cleaning & Flushing	500		500			1,000
Loam, Seed, Deco Stone	300		300			600
Mowing & Weeding	250	350	250			850
Structural					500	500
					Average Cost ($)	8,950

APPENDICES

NOTE: Make additional copies of the original logs found in the Appendix and maintain all logs for at least 3 years

Appendix A: Vortechnics Hydrodynamic Separator

Appendix B: Inspection Log

Project: Greenmont Commons, Dracut, MA

Inspection by:_____ Date:_____

BMP	Inspection Report	Maintenance Required
Deep Sump Hooded Catch Basin		
Vortechnics Hydrodynamic Separator Units		
Underground Pipe Detention Basin		
Constructed Stormwater Wetland		
Emergency Overflow Spillway		

Appendix C: Maintenance Log

Project: Greenmont Commons, Dracut, MA

Maintenance by:_____

BMP	Date	Maintenance Performed
Deep Sump Hooded Catch Basin		
Vortechnics Hydordynamic Separator Unis		
Underground Pipe Detention Basin		
Constructed Stormwater Wetlands		
Emergency Overflow Spillway		