



## Operation & Maintenance Plan



### Hillside Commons

Located in South Kingstown, Rhode Island

Applicant: Scot V. Hallberg

10-17-2018

---

---

## Table of Contents

Operation & Maintenance Plan Overview.....	2
Stormwater System Owner / Party Responsible for O&M.....	3
Public Safety.....	4
Stormwater System Plan.....	5
Inspections & Maintenance.....	6
Estimated Inspections & Maintenance Budget.....	9
Appendix A – Inspection Schedule & Maintenance Checklists.....	10
Appendix B – RIDEM Sample Stormwater Facility Maintenance Agreement.....	16

---

## Operation & Maintenance Plan Overview

An essential component of a successful Stormwater System (SS) is the ongoing Operation and Maintenance (O&M) of the various components of the stormwater drainage, control, and conveyance systems. These components include swales, pipes, catch basins, and treatment/ control devices are commonly referred to as Best Management Practices (BMPs). Failure to provide effective maintenance can reduce the hydraulic capacity and the pollutant removal efficiency of stormwater practices.

Many people expect that stormwater facilities will continue to function correctly forever. However, it is inevitable that deterioration of the stormwater system will occur once it becomes operational. The question is not whether stormwater system maintenance is necessary but how often.

This plan has been developed to proactively address operations and maintenance to minimize potential problems and maximize potential stormwater runoff treatment and management. Ongoing inspections and maintenance will extend the service life of the Best Management Practices.

This plan addresses;

1. Stormwater management system(s) owners;
2. The party or parties responsible for operation and maintenance, including how future property owners will be notified of the presence of the stormwater management system and the requirement for proper operation and maintenance;
3. A description and delineation of public safety features;
4. The routine (scheduled) and non-routine (corrective) maintenance tasks for each BMP to be undertaken after construction is complete and a schedule for implementing those tasks;
5. A plan that is drawn to scale and shows the location of all stormwater BMPs in each treatment train along with the discharge point;
6. An estimated operation and maintenance budget; and
7. Funding source for operation and maintenance activities and equipment.

A major contributor to unmaintained stormwater facilities is a lack of clear ownership and responsibility definition. In order for an inspection and maintenance program to be effective, the roles for each responsibility must be clearly defined prior to construction of a system. This can be accomplished with a maintenance agreement between the site owners and the responsible authority.

This report is suitable for recording as an attachment to a maintenance agreement between the site owner and the responsible authority. A copy of a sample agreement prepared by RIDEM is attached to this report as Appendix B.

---

## Stormwater System Owner / Party Responsible for O&M

Stormwater BMPs are maintained during construction by the site contractor as identified in the Soil Erosion and Sediment Control Plan (SESC) for the site. A copy of the SESC is required to be kept on site during construction. The SESC requires maintenance and inspection of the BMPs during the construction phase of project and requires a log be kept of these activities. Once construction is complete and the contractor's warranty period is elapsed, the contractor must obtain the signature of the stormwater system's owner releasing the contractor from his maintenance and inspection responsibilities. A copy of this release of contractor's responsibility shall be attached to this document.

The Owners Association will be owner of the stormwater system. Upon completion of construction, and creation of the Owners Association, their legal name along with mailing and emergency contact information must be added below.

Owner; \_\_\_\_\_

Mailing Address; \_\_\_\_\_

\_\_\_\_\_

Emergency Contact Name; \_\_\_\_\_

Phone; \_\_\_\_\_

### Transfer of Ownership

In the event that the owner of any property included in the Owners Association changes, the current owner (grantor) must provide a copy of this document to the new owner (grantee). In addition, the Owners Association must provide all new members with a copy of this document. The new owner must notify the Rhode Island Department of Environmental Management of the change of ownership and provide a signed updated Operations and Maintenance Plan to the Rhode Island Department of Environmental Management.

### **The Stormwater System Owner is the Party Responsible for the ongoing O&M of the system.**

The two key components to adequately maintain the stormwater infrastructure are:

1. Performance of periodic and scheduled inspections
2. Performance of scheduled maintenance

The actual operation and maintenance of the system may be performed by a third party designated by the owner. If the owner contracts with a third party for O&M the name, address, and emergency contact information must be added below and updated if the third party designee changes.

Name; \_\_\_\_\_

Mailing Address; \_\_\_\_\_

\_\_\_\_\_

Emergency Contact Name; \_\_\_\_\_

Phone; \_\_\_\_\_

---

## Public Safety

Public safety was a critical factor in designing the stormwater system. Public safety features included in this design are:

- Winter & Non-Winter Maintenance

### Winter Maintenance

The following tasks shall be performed to protect public safety during the winter season:

- No sand is to be used on site to prevent clogging of the permeable pavement.
- Snow should melt and percolate through the permeable pavement before it can ice over however, should any icing occur, calcium magnesium acetate (CMA) shall be used as a deicer.
- Inspect roadway and culverts post storm event to alleviate any signs of clogging, icing or damming.
- Vacuum sweeping or hosing may be required more frequently in winter months. Should any clogging be observed (i.e. ponding or unusually slow infiltration), vacuum sweeping or hosing should be employed as soon as possible.

### Non-Winter Maintenance

The following tasks shall be performed to protect public safety during the non-winter seasons:

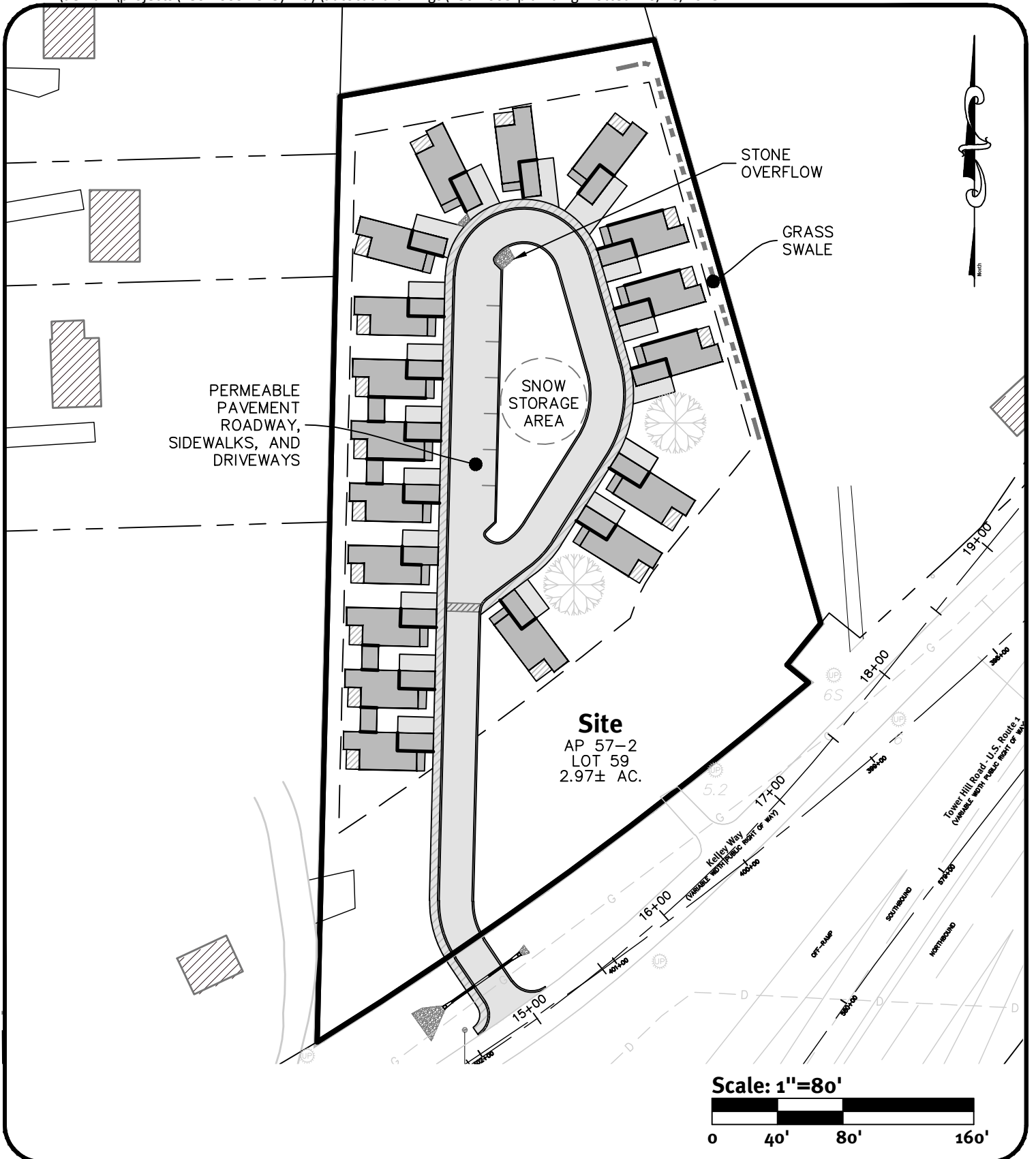
- Vacuum sweeping or hosing is required every three months at a minimum or as recommended by the manufacturer to keep the surface free from clogging. Alternatively, if any signs of clogging are observed (i.e. ponding or unusually slow infiltration), vacuum sweeping or hosing should be employed as soon as possible.
- The contractor will inspect and maintain the storm water management systems in accordance with the enclosed Operations & Maintenance Plan

Particular care must be taken in the operation and maintenance of these features.

---

## **Stormwater System Plan**

A plan identifying each component of the stormwater system is included on the following page.



SHEET 1 OF 1

# O&M Plan Hillside Commons

City/Town, Rhode Island

Applicant

**Scot V. Hallberg**

57 Edgewood Farm Rd, Wakefield, RI 02879

Date:

10-17-2018



## DiPrete Engineering

Two Stafford Court Cranston, RI 02920

tel 401-943-1000 fax 401-464-6006 www.diprete-eng.com

**Boston • Providence • Newport**

---

## Inspections & Maintenance

Inspections shall be performed on a regular basis and scheduled based on the BMP type and configuration. It is not mandatory that all inspectors be trained engineers, but they shall have some knowledge or experience with stormwater systems and in general, trained stormwater engineers should direct the inspectors. Follow-up inspections by registered professional engineers shall be performed where a routine inspection has revealed a question of structural or hydraulic integrity affecting public safety.

Not all inspections can be conducted by direct human observation. For subsurface systems, video equipment may be required. There may be cases where other specialized equipment is necessary. The inspection program shall be tailored to address the operational characteristics of the system.

The inspection process shall document observations made in the field and shall cover structural conditions, hydraulic operational conditions, evidence of vandalism, condition of vegetation, occurrence of obstructions, unsafe conditions, and build-up of trash, sediments and pollutants.

Maintenance of the stormwater management system is essential and can be divided into two types, scheduled and corrective.

**Scheduled** maintenance tasks are those that are typically accomplished on a regular basis and can generally be scheduled without referencing inspection reports. These items consist of such things as vegetation maintenance (such as mowing) and trash and debris removal. These tasks are required at well-defined time intervals and are a requirement for all stormwater structural facilities.

**Corrective** maintenance tasks consist of items such as sediment removal, stream bank stabilization, and outlet structure repairs that are done on an as-needed basis. These tasks are typically scheduled based on inspection results or in response to complaints.

Since specialized equipment may be required, some maintenance tasks can be effectively handled on a contract basis with an outside entity specializing in that field. In addition, some maintenance may also require a formal design and bid process to accomplish the work.

Appendix A provides an "Inspection Schedule & Maintenance Checklist" for the stormwater system components on this site. Completed checklists shall be maintained as an ongoing record of inspections for each component of the stormwater system.

In addition to the maintenance of the stormwater system, maintenance of other site improvements can significantly enhance the ability for the BMPs to function as designed. We have identified several of these below, along with the suggested maintenance.



---

## **Lawn, Garden and Landscape Management**

- Lawns shall be cut no shorter than 1-1/2" in the spring and fall to stimulate root growth, and no shorter than 2 to 3 inches throughout the summer.
- Fertilize no more than twice per year, once in May-June and once in September-October.
- Avoid spreading fertilizer on impervious surfaces.
- Weeds should be dug or pulled out. Large area of weeds can be removed by covering with large plastic sheet for a few days
- Chemical pesticides should be as a last resort. A healthy lawn is naturally diseases resistant.
  - Visible insects can be removed by hand, by spraying with water, or even vacuum cleaning.
  - Store bought traps, specific for a species, can be used
  - Slugs and other soft bodied insects and slugs can be eliminated using diatomaceous earth.
  - Plants infected with bacteria and fungi should be removed and disposed of.
  - Beneficial organisms should be maintained on the property and should be encouraged/attracted to the property. Homeowners and property facility maintenance personal should become familiar with beneficial organisms.
- Irrigation should be minimal if required at all. Most lawns do not require watering and will become dormant during dry periods.
  - Established lawns require no more than one inch of water per week.
  - Areas should be watered before 9am to avoid evaporation.

## **Road and Parking Area Management**

### **Street and Parking Lot Sweeping**

- All street and parking areas on site shall be vacuum swept or hosed every 3 months at a minimum or as recommended by the manufacturer.

### **Deicing:**

- No sand may be used on site in order to prevent clogging of the permeable pavement.
- Snow should melt and infiltrate the permeable pavement without use of deicers. However, if icing occurs, calcium magnesium acetate (CMA) shall be used as a deicer.

---

**Sealants:**

- No sealants are permitted. All repairs must be made with permeable asphalt.

**Snow Removal:**

- Snow shall not be dumped in any water body including rivers, reservoirs, ponds, lakes, wetlands, bays, or the ocean.
- Avoid disposing of snow on top of stormwater drainage swales or ditches.
- Snow shall be stored in the landscaped island, not in or adjacent to water bodies or wetlands. Snow shall be stored to allow snow melt to enter the onsite drainage system and be treated by onsite BMPs.
- Snow removal per permeable pavement manufacturer's recommendations.

*Reference; Additional information relating to operation and maintenance of specific BMPs can be found in the Rhode Island Stormwater Design and Installation Standards Manual.*

[www.dem.ri.gov/pubs/regs/regs/water/swmanual.pdf](http://www.dem.ri.gov/pubs/regs/regs/water/swmanual.pdf)

---

## Estimated Inspections & Maintenance Budget

It is important to be able to budget for the O&M costs associated with the stormwater system. To assist the owner in budgeting, we have developed an estimate of the costs that may be incurred in maintaining the system. The costs have been estimated on an annual basis.

### **Permeable Pavement:**

Permeable pavement costs approximately \$3,960 per acre of tributary area per year. The site contains approximately 2.08 acres of area flowing to permeable pavement. This equates to an approximate cost of \$8,236.80 per year to maintain the permeable pavement

Based on the costs outlined above, the stormwater system will cost approximately \$8,236.80 per year to maintain. This is only an estimate and costs may vary.

These costs are the responsibility of the stormwater system owner. Funding for the costs will be provided by the Owners Association.

***Reference;** Maintenance costs are based on information provided by Horsely Witten during the January 19, 2011 Stormwater Manual Training.*

*(<http://www.dem.ri.gov/programs/benviron/water/permits/ripdes/stwater/t4guide/slides/sess210.ppt>)*

---

**Appendix A – Inspection Schedule & Maintenance Checklists**

## Permeable Pavement Operation, Maintenance and Management Inspection Checklist

Project:

Location:

Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
<b>1. Sediment and Debris Cleanout (3 Months or Manufacturer's Recommendation)</b>		
Contributing area free of sediment and debris		
Contributing area stabilized and mown, with grass clippings removed		
Surface free of sediment and debris (e.g. mulch, leaves, trash, etc.)		
No signs of clogging (e.g., standing water)		
Surface does not require vacuuming		
<b>2. Dewatering (Monthly)</b>		
Permeable pavement dewateres between storms		
<b>3. Underdrain Outfall, If Present (Annual)</b>		
No evidence of erosion		
<b>4. Surface repairs (annual)</b>		
Surface has not been sealed		
No evidence of surface deterioration or spalling		
Surface (top and base course) does not need to be Replaced		

## Permeable Pavement Operation, Maintenance and Management Inspection Checklist

Project:

Location:

Site Status:

Date:

Time:

Inspector:

<b>5. Vacuum Sweeping (Semi-Annual)</b>		
Semi-Annual Vacuum Sweeping		
<b>6. Miscellaneous</b>		
Do not use of sand and salt in winter months. Use only non sand/salt deicing agent.		
Post signs indentifying permeable pavement		
Attached rollers to the bottoms of snowplows to prevent them from catching on the edges of grass pavers and some paving stones		
Annual inspection for damaged and clogged voids		

COMMENTS:

---



---



---



---



---



---



---



---



---



---

**Permeable Pavement Operation, Maintenance and  
Management Inspection Checklist**

Project:

Location:

Site Status:

Date:

Time:

Inspector:

ACTIONS TO BE TAKEN:

---

---

---

---

---

---

---

---

---

---

---

## Grass Swale Operation, Maintenance, And Management Inspection Checklist

Project:

Location:

Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
<b>1. Debris Cleanout (Monthly, After Major Storms)</b>		
Swale and contributing areas clean of debris		
Inspect for sediment, remove annually or when depth of sediment is greater than 3".		
Litter (branches, etc.) have been removed		
<b>2. Vegetation (Monthly, After Major Storms)</b>		
Plant height not less than design water depth		
Plant composition according to approved plans No placement of inappropriate plants		
Grass height not greater than 10 inches		
No evidence of erosion. Revegetate as necessary.		
Mow grass as applicable to maintain a height of 4"-6". When mowing remove any trash and debris present.		
<b>3. Dewatering (Twice per Year, After Major Storms)</b>		
Dewaters between storms		



# Grass Swale Operation, Maintenance, And Management Inspection Checklist

Project:

Location:

Site Status:

Date:

Time:

Inspector:

No evidence of standing water		
-------------------------------	--	--

**Note: A major storm is defined as any storm exceeding 2.5" of rainfall over a 24 hours period.**

COMMENTS:

---

---

---

---

---

---

---

---

---

---

ACTIONS TO BE TAKEN:

---

---

---

---

---

---

---

---

---

---

---

## Appendix B – RIDEM Sample Stormwater Facility Maintenance Agreement

**\*\*A site specific Stormwater Facility Maintenance Agreement between the Owner and RIDEM shall be developed prior to construction\*\***

### **Sample Stormwater Facility Maintenance Agreement**

THIS AGREEMENT, made and entered into this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between (Insert Full Name of Owner)

\_\_\_\_\_ hereinafter called the "Landowner", and the [Local Jurisdiction], hereinafter called the "[Town/City]".

WITNESSETH, that WHEREAS, the Landowner is the owner of certain real property described as (Tax Map/Parcel Identification Number) \_\_\_\_\_ as recorded by deed in the land records of [Local Jurisdiction] Deed Book \_\_\_\_\_ Page \_\_\_\_\_, hereinafter called the "Property".

WHEREAS, the Landowner is proceeding to build on and develop the property; and WHEREAS, the Site Plan/Subdivision Plan known as \_\_\_\_\_, (Name of Plan/Development) hereinafter called the "Plan", which is expressly made a part hereof, as approved or to be approved by the [Town/City], provides for detention of stormwater within the confines of the property; and

WHEREAS, the [Town/City] and the Landowner, its successors and assigns, including any homeowners association, agree that the health, safety, and welfare of the residents of [Local Jurisdiction] require that on-site stormwater management facilities be constructed and maintained on the Property; and

WHEREAS, the [Town/City] requires that on-site stormwater management facilities as shown on the Plan be constructed and adequately maintained by the Landowner, its successors and assigns, including any homeowners association.

NOW, THEREFORE, in consideration of the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The on-site stormwater management facilities shall be constructed by the Landowner, its successors and assigns, in accordance with the plans and specifications identified in the Plan.
2. The Landowner, its successors and assigns, including any homeowners association, shall adequately maintain the stormwater management facilities in accordance with the required Operation and Maintenance Plan. This includes all pipes, channels or other conveyances built to convey stormwater to the facility, as well as all structures, improvements, and vegetation provided to control the quantity and quality of the stormwater. Adequate maintenance is herein defined as good working condition so that these facilities are performing their design functions. The Stormwater Best Management Practices Operation, Maintenance and Management Checklists are to be used to establish what good working condition is acceptable to the [Town/City].

---

3. The Landowner, its successors and assigns, shall inspect the stormwater management facility and submit an inspection report annually. The purpose of the inspection is to assure safe and proper functioning of the facilities. The inspection shall cover the entire facilities, berms, outlet structure, basin areas, access roads, etc. Deficiencies shall be noted in the inspection report.

4. The Landowner, its successors and assigns, hereby grant permission to the [Town/City], its authorized agents and employees, to enter upon the Property and to inspect the stormwater management facilities whenever the [Town/City] deems necessary. The purpose of inspection is to follow-up on reported deficiencies and/or to respond to citizen complaints. The [Town/City] shall provide the Landowner, its successors and assigns, copies of the inspection findings and a directive to commence with the repairs if necessary.

5. In the event the Landowner, its successors and assigns, fails to maintain the stormwater management facilities in good working condition acceptable to the [Town/City], the [Town/City] may enter upon the Property and take whatever steps necessary to correct deficiencies identified in the inspection report and to charge the costs of such repairs to the Landowner, its successors and assigns. This provision shall not be construed to allow the [Town/City] to erect any structure of permanent nature on the land of the Landowner outside of the easement for the stormwater management facilities. It is expressly understood and agreed that the [Town/City] is under no obligation to routinely maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the [Town/City].

6. The Landowner, its successors and assigns, will perform the work necessary to keep these facilities in good working order as appropriate. In the event a maintenance schedule for the stormwater management facilities (including sediment removal) is outlined on the approved plans, the schedule will be followed.

7. In the event the [Town/City] pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner, its successors and assigns, shall reimburse the [Town/City] upon demand, within thirty (30) days of receipt thereof for all actual costs incurred by the [Town/City] hereunder.

8. This Agreement imposes no liability of any kind whatsoever on the [Town/City] and the Landowner agrees to hold the [Town/City] harmless from any liability in the event the stormwater management facilities fail to operate properly.

9. This Agreement shall be recorded among the land records of [Local Jurisdiction] and shall constitute a covenant running with the land, and shall be binding on the Landowner, its administrators, executors, assigns, heirs and any other successors in interests, including any homeowners association.

WITNESS the following signatures and seals:

\_\_\_\_\_  
Company/Corporation/Partnership Name (Seal)

By: \_\_\_\_\_

---

\_\_\_\_\_  
(Type Name and Title)

The foregoing Agreement was acknowledged before me this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by

\_\_\_\_\_.

\_\_\_\_\_  
NOTARY PUBLIC

My Commission Expires: \_\_\_\_\_

By: \_\_\_\_\_

\_\_\_\_\_  
(Type Name and Title)

The foregoing Agreement was acknowledged before me this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by

\_\_\_\_\_.

\_\_\_\_\_  
NOTARY PUBLIC

My Commission Expires: \_\_\_\_\_

Approved as to Form:

\_\_\_\_\_  
[Town/City] Attorney Date