

# Operation & Maintenance Manual

for:

## 295 Cedar Grove Lane

Block: 508.02

Lot: 12

Township of Franklin

Somerset County, New Jersey

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## Purpose

The intent of this manual is to provide a strategic plan for the party(s) responsible for the operation and maintenance of the stormwater management facility(s) located on the site in question. The plan must be complied with to insure the proper function and prolonged life span of the facility(s).

For regular maintenance, the plan describes a list of procedures to be completed and carried out under a specific schedule and contingency procedures during unusual or infrequent conditions that may arise. In addition to maintenance, a detailed inspection log of tasks/conditions/findings of the stormwater management facilities will be recorded in this manual upon every inspection performed.

THIS MANUAL IS BASED ON THE REQUIREMENTS SET FORTH BY THE *NEW JERSEY STORMWATER BEST MANAGEMENT PRACTICES MANUAL, APRIL 2004*.

## Description

This manual is intended to describe the maintenance of the stormwater management facilities for a development called 295 Cedar Grove Lane, located on Lot 12 in Block 508.02 situated in the Township of Franklin, Somerset County, New Jersey.

Owner/Applicant

Odin Dhun LLC  
55 Carter Drive, Suite L2  
Edison, NJ 08817

Project Designer

Menlo Engineering Associates, Inc.  
261 Cleveland Avenue  
Highland Park, New Jersey 08904

Township Engineer

Darren Mazzei, PE, CME  
3141 Bordentown Avenue  
Parlin, NJ 08859

The purpose of all these facilities is to provide some degree of the following conditions:

- Provide a temporary means of storage for stormwater
- Facilitate water quality (to help eliminate contaminants and particulate matter from stormwater runoff)
- Groundwater recharge

A stormwater management facility is also commonly referred to as a Best Management Practice (or BMP). The Five (5) BMP types for this project are as follows:

- Manufactured Treatment Devices (MTD) - Five (5) Manufactured treatment devices are pre-fabricated and are intended to capture sediments, metals, hydrocarbons, floatable, and/or other pollutants in stormwater runoff before being conveyed to a storm sewer system, additional stormwater quality treatment measure, or waterbody.
  - Five (5) Aqua-Ponic devices are located south of Road A between Lots 12.10 and 12.15.
- Small-Scale Infiltration Basin (subsurface)- Small-Scale subsurface infiltration basins are stormwater management systems constructed with highly permeable components

designed to both maximize the removal of pollutants from stormwater and to promote groundwater recharge. Pollutants are treated through settling, infiltration of the runoff through and biological and chemical activity within, the components.

- Six (6) basins is located below the porous pavers in driveways.
- Drywell - an underground structure that collects and disperses stormwater runoff into the ground.
- Large-Scale Infiltration Basin - the stormwater management systems constructed with highly permeable components designed to maximize the removal of pollutants from stormwater and reduce the peak runoff rate.
- Porous Pavement - a 10 ft wide porous pavement path used to address water quality impacts of the proposed development.

*\*See Appendix A for locations*

# Responsibility

All BMP operation tasks, maintenance and inspection log entries, as defined within this manual, will be performed by the maintenance staff employed or retained by owner of Lot 12 of Block 508.02, situated in the Township of Frankin, Somerset County, New Jersey or a *third party designated by said owner and/or operator*. The latest dated party listed below will be considered the party responsible. In accordance with NJ RSIS regulations, NJAC 7:8-5.8(c), the maintenance of stormwater BMPs cannot be assigned or transferred to the owner or tenant of an individual property in a residential development.

DATE:	<u>SPRING 2026</u>	DATE:	_____
COMPANY:	<u>ODIN DHUN LLC</u>	COMPANY:	_____
CONTACT:	<u>AKSHAY JOSHI</u>	CONTACT:	_____
PHONE:	<u>908-745-9020</u>	PHONE:	_____
ADDRESS:	<u>55 CARTER DRIVE, SUITE L2</u>	ADDRESS:	_____
	<u>EDISON, NJ 08817</u>		_____

Additional Information (if applicable): \_\_\_\_\_  
\_\_\_\_\_

DATE: \_\_\_\_\_

COMPANY: \_\_\_\_\_

CONTACT: \_\_\_\_\_

PHONE: \_\_\_\_\_

ADDRESS: \_\_\_\_\_  
\_\_\_\_\_

- Any amendment or alteration to this manual (i.e.: change in ownership, the inclusion of third-party maintenance agreements, a modification or addition to maintenance procedures) must be entered in this manual or attached as a rider to this manual, and complete copies submitted to all parties involved and must be in compliance with the most current guidelines set forth by the New Jersey Department of Environmental Protection Stormwater Management Rules.
- This manual as outlined, or any amendment or alteration to this manual is to be recorded in the deed of record for the property. The deed shall state that any future sale of the property carries with it the responsibility of the new owner to comply with the conditions of this Operation and Maintenance Manual.
- In addition, this manual as outlined, or any amendment or alteration to this manual, must be made available upon request to the local mosquito control or extermination committee and any public entity with administrative, health, environmental, or safety authority over the site.
- The person or party responsible (as named above) for maintenance must maintain a detail log of all preventive and corrective maintenance for the structural stormwater management measures as described in this manual, including inspections and copies of all maintenance related work orders.
- The person or party responsible (as named above) for maintenance shall evaluate the effectiveness of the Operation and Maintenance Plan at least once per year and adjust the plan and the deed as needed.

## **MANUFACTURED TREATMENT DEVICE MAINTENANCE:**

The site uses Manufactured Treatment Devices (MTD) for water quality treatment. Each one is considered to be Green Infrastructure. The maintenance reports for each have been provided by the manufacturer. The following are the MTD's used on the project:

- AQUA-PONIC STORMWATER BIOFILTRATION SYSTEM

**Harness the power of nature with sustainable, biological stormwater treatment. Deploy a living solution that restores water quality while supporting resilient green infrastructure.**



## BIOFILTRATION FOR SUSTAINABLE STORMWATER

Aqua-Ponic™ is a modular, vegetated biofiltration system that treats stormwater runoff through a natural process of filtration, plant uptake, and microbial action. Designed for below-grade installations, the system reduces total suspended solids (TSS), nutrients, metals, and hydrocarbons.

Ideal for GI, LID, green streets, and retrofit projects, Aqua-Ponic provides an attractive and functional solution that supports stormwater quality goals while blending into the surrounding landscape.

Aqua-Ponic delivers powerful benefits:

- **Natural Filtration:** Engineered media and vegetation remove stormwater pollutants via sorption, filtration, and biological uptake.
- **Green Infrastructure Support:** Promotes plant growth, biodiversity, and urban resilience.
- **Integrated Design:** Compatible with curb-cut streets, planters, tree box alternative, and stormwater bump-outs.
- **Flexible Sizing:** Custom-built units sized to fit site constraints and designed to meet regulatory flow and volume requirements.
- **Factory-Built:** Preassembled with engineered media, capillary wicks, and pea gravel for quick deployment.
- **Sustainable:** Natural processes, no chemicals or mechanical parts.

## KEY FEATURES

- ✓ 60% better performance than typical biofiltration
- ✓ 2X smaller size than competitors
- ✓ 60-70% lighter than concrete vaults
- ✓ Vegetated biofiltration
- ✓ Nutrient & TSS removal
- ✓ Sustainable & aesthetic
- ✓ Prepackaged and fast install
- ✓ Maintenance friendly
- ✓ LID & green infrastructure
- ✓ Made in USA

- **Regulatory Acceptance:** Meets many state and municipal biofiltration requirements and verified for performance by WADOE (GULD), NJDEP/NJCAT, and other state agencies.
- **Easy to Maintain:** Surface-level maintenance with routine plant care and simple sediment removal.

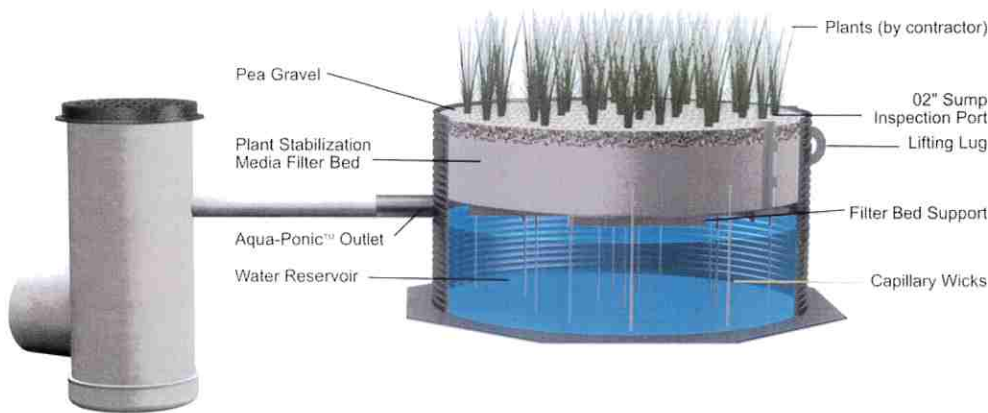
## PRODUCT SPECIFICATIONS

Aqua-Ponic biofiltration systems are available in round configurations ranging from 2 to 13 feet in diameter. Each unit can treat between 0.05 and 2.0 cubic feet per second (cfs), depending on its treatment surface area.

Each preassembled system includes:

- Engineered filter media, pre-loaded for optimal treatment
- Capillary wicks and a pea gravel layer for consistent flow and drainage
- Integrated outlet structure for controlled discharge

## DESIGNED FOR PERFORMANCE



## SUPPORT

### Inspection & Maintenance

Access complete I&M manuals and seasonal maintenance guides, including plant health checklists, debris removal tips, and replanting protocols.

Komline-AquaShield is part of the Komline family of end-to-end separation technologies used by municipal water, agricultural, and manufacturing industries.



[aquashield@komline.com](mailto:aquashield@komline.com)  
[www.komline.com](http://www.komline.com)  
 Tel. (800) 344-9044



## **INFILTRATION BASIN MAINTENANCE (SMALL-SCALE SUBSURFACE):**

### **DESCRIPTION**

Effective infiltration basin performance requires regular and effective maintenance. Maintenance involves routine periodic inspection of the basin, the removal of accumulated sediments, and the correction of any structural problems.

Schedule I - annually

#### **1) Maintenance: schedule i**

- A) Basin outlet works: inspect for and clear debris. This is to prevent clogging of the outlets and subsequent backup of detained water.
- B) Inspect receiving waters for damage, obstructions and unsightly debris. All obstructions shall be removed immediately, and any damage repaired.
- C) Inspect for and clear excessive debris from the cleanouts and pipes.
- D) Any problems or defects shall be reported to the owner.

#### **2) Basin performance criteria**

- A) *The infiltration basin complete drain times are located in the field manual (see appendix).*

*If significant increases or decreases in the normal drain time are observed, or if the 72 hour maximum drain time is exceeded, the basin's outlet structure, sand bottom, underdrain system, and both groundwater and tailwater levels must be evaluated and appropriate measures taken to comply with the maximum drain time requirements and maintain the proper functioning of the basin.*

## **DRY WELL MAINTENANCE:**

### **DESCRIPTION**

A dry well is a structural chamber or an excavated vault that is used to collect and temporarily store stormwater runoff generated by a clean roof. Regular and effective maintenance are required to ensure effective dry well performance. A detailed inspection and maintenance logs must be maintained.

Schedule I - four times annually and after every storm exceeding 1 inch of rainfall

Schedule III – annually

### **3) Maintenance: General**

- a) The Contractor shall inspect all areas to verify that all work is being performed properly and as scheduled, locate potential problems, and correct unacceptable conditions. A brief verbal report is to be submitted to the Owner. Problems requiring immediate attention shall be reported to the Owner.

### **4) Maintenance: Schedule I**

- a) At least one inspection port that extends into the subsoil must be provided in the area of the dry well to monitor the functionality of the dry well.
- b) The screens provided at the downspouts are designed to prevent debris from entering the dry well and must be inspected for clogging at least four times annually, as well as after every storm exceeding 1 inch of rainfall. Any broken or damaged components must be replaced.

### **5) Maintenance: Schedule III (annually)**

- a) The dry well must not be connected to non-rooftop sources of runoff for its entire lifespan.
- b) All structural components must be inspected, at least once annually, for cracking, subsidence, spalling, erosion and deterioration. Damaged components must be replaced.

### **4) Maintenance: Records**

- a) A detailed, written log of all preventative and corrective maintenance performed on the dry well must be kept, including a record of all inspections and copies of maintenance-related work orders.

### **5) Drain Time**

- a) The drain time for the dry well is 36 hours. If the dry well fails to fully drain within 72 hours, corrective action must be taken, and the maintenance manual revised accordingly to prevent similar failures in the future.

## **INFILTRATION BASIN MAINTENANCE (LARGE-SCALED):**

### **DESCRIPTION**

Effective infiltration basin performance requires regular and effective maintenance. Maintenance involves routine periodic inspection of the basin and vegetation, the removal of accumulated sediment and debris, and the correction of any structural or erosion problems.

Schedule I - four times annually and after every storm exceeding 1 inch of rainfall

Schedule IA - once a month during the growing season

Schedule II - bi-annually, during the growing season and the non-growing season

Schedule III – annually

### **1) Maintenance: General**

- a) The Contractor shall inspect all areas to verify that all work is being performed properly and as scheduled, locate potential problems, and correct unacceptable conditions. A brief verbal report is to be submitted to the Owner. Problems requiring immediate attention shall be reported to the Owner.

### **2) Maintenance: Schedule I**

- a) Basin Outlet Works: Inspect for and clear debris from the trashrack and exit ports of the basin outlet structures. This is to prevent clogging of the outlets and subsequent backup of detained water.
- b) Inspect receiving waters for damage, obstructions and unsightly debris. All obstructions shall be removed immediately, and any damage repaired.
- c) Inspect for and clear excessive debris from the basin bottom, pipe inlets and aprons.
- d) Inspect for any erosion of banks or other hazards. Any erosion shall be immediately repaired and stabilized accordingly. Maintain seeded areas until they are established.
- e) Any problems or defects shall be reported to the Owner.

### **3) Maintenance: Schedule IA (monthly during growing season)**

- a) Vegetated Areas: Mowing and/or trimming of vegetation must be performed on a regular schedule based on specific site conditions. Grass should be mowed at least once a month during the growing season.

### **4) Maintenance: Schedule II (bi-annually)**

- a) Once established, inspections of vegetation health, density, and diversity should be performed during both the growing and non-growing season at least twice annually.
- b) The vegetative cover should be maintained at 85 percent. If vegetation has greater than 50 percent damage, the area should be reestablished in accordance with the original specifications (see seeding specification) and the inspection requirements presented above. All use of fertilizers, mechanical treatments, pesticides and other means to assure optimum vegetation health must not compromise the intended purpose of the vegetative filter. All vegetation deficiencies should be addressed without the use of fertilizers and pesticides whenever possible.

**5) Maintenance: Schedule III (annually)**

- a) Vegetated areas must be inspected annually for erosion and scour. Vegetated areas must be inspected for unwanted growth, which must be removed with minimum disruption to the planting soil bed and remaining vegetation.
- b) When establishing or restoring vegetation, biweekly inspections of vegetation health must be performed during the first growing season or until the vegetation is established.
- c) Till the basin bottom sand surface with light equipment as field conditions warrant.

**6) Basin Performance Criteria**

- a) The infiltration basin complete drain times are located in the Field Manual (see appendix).

*If significant increases or decreases in the normal drain time are observed, or if the 72 hour maximum drain time is exceeded, the basin's outlet structure, sand bottom, underdrain system, and both groundwater and tailwater levels must be evaluated and appropriate measures taken to comply with the maximum drain time requirements and maintain the proper functioning of the basin.*

**7) Prevention of Water Pollution**

- a) The contractor's activities shall be performed by methods that will prevent entrance or accidental spillage of solid matter, contaminants, debris or other pollutants and wastes into the downstream conveyance system. Such pollutants and wastes include, but are not restricted to, refuse, garbage, cement, collected silt and sediment, etc. Disposal of debris and trash should be done only at suitable disposal / recycling sites and must comply with all applicable local, state, and federal waste regulations.

## **POROUS PAVEMENT SYSTEM:**

### **DESCRIPTION**

Pervious concrete pavement is a Portland cement-based, rigid permeable pavement that serves not only as the surface layer of a stormwater management system, but also as a vital part of a water filtration system. The pervious concrete allows on-site infiltration of stormwater and also filters sediments and pollution from stormwater deposited on the pavement surface.

Maintenance involves general maintenance, scheduled maintenance, storage bed drain-time inspection, and winter maintenance. Over time, deep cleaning/unclogging of pervious concrete pavement may become necessary.

Schedule I - four times annually and after every storm exceeding 1 inch of rainfall

Schedule II - bi-annually, during the growing season and the non-growing season

Schedule III - annually

### **1) General Maintenance**

- a) Failure to correctly maintain a pervious paving system will shorten its lifespan or result in system failure; therefore, the maintenance plan must ensure proper training of personnel and include the special equipment necessary in accordance with the industries or manufacturer's requirements.
- b) The surface course must be inspected after every storm exceeding 1 inch of rainfall. If mud or sediment is tracked onto the surface course, it must be removed as soon as possible. Removal should take place when all runoff has drained from the surface course.
- c) The surface course must be inspected, at least once annually, for cracking, subsidence, spalling, erosion, deterioration, and unwanted vegetation. Remedial measures must be taken as soon as possible. Herbicides must not be applied.
- d) The surface course of a pervious paving system must be vacuum swept, not power swept, at least four times per year. Vacuum sweeping must be followed by either air blowing or high-pressure power washing performed in accordance with the specifications recommended for the particular type of system. All dislodged material must be promptly removed.
  - The first annual maintenance must be performed in the spring.
  - Maintenance must additionally be performed in the autumn, after the fallen leaves are collected and removed.
- e) Each spring, after the last snow or ice event, the infiltration rate of the surface course must be tested in accordance with the methods of either ASTM C1701 or C1781, as corresponds to the post-construction test performed for the system. At least 3 locations must be tested. One of the locations must be in an area where sediment is most likely to be deposited, such as, but not limited to, a parking lot entrance. The other test locations must be evenly spaced across the system surface. The locations and results obtained must be recorded in the maintenance plan for future reference and compared to the as-built testing results as a metric for determining if a system requires corrective action.
- f) Corrective action must be immediately taken to restore the infiltration capacity of the pervious paving system under the following scenarios:
  - Standing water is observed on the surface course; or

- The testing methods above show an infiltration rate of 20 inches per hour or less for a system designed for quantity control or 6.4 or less for a system designed for water quality control only.
- g) Disposal of debris, trash, sediment, and other waste material must be done at suitable disposal/recycling sites and in compliance with all applicable local, state, and federal waste regulations.
- h) Under no circumstances may any sealants or coatings be applied to pervious paving systems, except for those approved by the manufacturer to improve surface course resistance to de-icing chemicals or refresh traffic striping.
- i) Over the lifetime of the surface course, no more than 10% of its surface area may be patched with impervious material such as bituminous asphalt or concrete. All patching must be recorded in the maintenance manual for future reference to prevent exceedance of this maximum.

## 2) **Maintenance: Routine**

- a) Visual inspection of the pervious pavement to ensure that it is clean of debris and sediments, and that it will dewater between storms.
- b) Properly clean concrete areas by blowing with leaf blower or similar equipment, truck-sweeping and/or dry vacuuming performed as needed. (at least monthly as included in the General Landscape Maintenance)
- c) Remove moss growth if occurs with lime water applications.

## 3) **Maintenance: Periodic**

- a) In areas that see freezing temperatures, perform periodic maintenance just before winter to ensure that the pervious concrete voids are clean and free of noncompressible material.
- b) Following the winter season remove any anti-skid materials that may have been used. Proper cleaning procedures would include pressure washing and/or vacuuming the area with either a dry vacuum or a regenerative vacuum sweeper.
- c) Cleaning equipment should allow for the debris to be bagged and removed from the unit so it can be weighed and recorded.

## 4) **Maintenance: Deep Cleaning/Unclogging**

- a) If a pervious concrete pavement system is not periodically cleaned, the void structure system will become clogged with debris over time.
- b) Infiltration rate less than 100 inches per hour, triggers the need for deep cleaning/unclogging.
- c) Deep cleaning/unclogging is best accomplished by simultaneous pressure washing and vacuuming.
- d) Use of Chemicals to clean pervious concrete should be done with extreme caution to prevent damage to the aquifer, the biological organisms within the pervious system, or the pervious concrete pavement itself.

## 5) **Storage Bed Drain Time**

- a) If the system fails to drain the maximum design storm volume within 72 hours, corrective action must be taken.

## 6) **Winter Maintenance**

- a) Anti-icing pre-treatments should never be used on pervious concrete pavements. If these products are used on adjacent pavements, care should be taken to prevent the adjacent runoff from infiltrating the pervious concrete.

- b) Deicers containing magnesium chloride, calcium magnesium acetate or potassium acetate should never be used on pervious concrete pavement.
- c) Deicing agents that contain fertilizer ingredients such as Ammonium Sulfate and Ammonium Nitrate cause chemical deterioration to any Portland cement-based concrete pavement and should never be used.
- d) Calcium Chloride impregnated sand can be used for de-icing pavements after the first year.
- e) Coarse sand (minimum 1/8"), or small crushed aggregate (1/4 – 10, or similar gradation) can be used as an anti-skid material with the understanding that vacuum cleaning will be performed after the winter season.
- f) Snow plowing can be performed with trucks mounted with plows, but the plow should be fitted with a polyurethane cutting edge. The use of snow blowers may be a better alternative to plowing, if available. Snow removal should not be performed using front end loaders or skid loaders by either scooping or back dragging.
- g) Pervious concrete should never be used as a storage area to pile snow from other areas unless it has been specifically designed as a snow shelf, with special consideration for resistance to deicing chemicals, water quality issues and additional maintenance as requisite.

# Maintenance Equipment and Materials:

- 1) Grass Maintenance Equipment
  - a) Riding mowers
  - b) Hand mowers
  - c) Gas powered trimmers
  - d) Gas powered edgers
  - e) Seed spreaders
  - f) Fertilizer spreaders
  - g) De-thatching equipment
  - h) Pesticide and herbicide application equipment
  - i) Grass clipping and leaf collection equipment
  
- 2) Vegetative Maintenance Equipment
  - a) Saws
  - b) Pruning shears
  - c) Hedge trimmers
  - d) Wood chippers
  
- 3) Transportation Equipment
  - a) Trucks for transportation of materials & equipment
  - b) Vehicles for transportation of personnel
  
- 4) Debris, Trash and Sediment Removal Equipment
  - a) Loader
  - b) Backhoe
  - c) Grader
  - d) Dredging equipment
  - e) Portable pump for dewatering
  
- 5) Miscellaneous Equipment
  - a) Shovels
  - b) Rakers
  - c) Picks
  - d) Wheelbarrows
  - e) Gloves
  - f) Brooms
  
- 6) Standard Mechanics Tools
  
- 7) Tools for Maintenance of Equipment
  
- 8) Parking Maintenance Equipment
  - a) Sweeping/Vacuuming Equipment
  - b) Snow Plowing Equipment
  - c) Snow Shovels

- 9) Materials
  - a) Topsoil
  - b) Fill
  - c) Seed
  - d) Soil amenities (fertilizer, lime, etc.)
  - e) Chemicals (pesticides, herbicides, etc.)
  - f) Mulch
  - g) Paint removers
  - h) Spare parts for equipment

# Disposal of Materials Generated:

## Disposal Procedures

- Dewatering procedures and requirements
- Unloading procedures and requirements
- Covering procedures and requirements

## Disposal Field – Onsite (if applicable)

### Location of the Onsite Disposal Field:

Provide a description of the site and any nearby wetland, floodplain, or water body

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### Permits for the Proposed Onsite Disposal Field

Local/State permits  not required

required

Permit Number	Government Entity	Issuance Date	Expiration Date

A copy of all permits should be included in the Documents section of the Maintenance Plan.

## Disposal Field – Offsite (if applicable)

### Description of the Offsite Disposal:

By the township, by a private operator and conveyance entity, etc.

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*A copy of the contract should be included in Appendix E.*

## Maintenance Costs

The following is a summary of the required maintenance costs with associated tasks in written and tabular form:

- Inspections to be performed by the property owner and/or a maintenance designee on a monthly basis and/or after a storm event exceeding 1 inch of rainfall
- Stormwater conveyance system and outlet control structure access for debris removal to be performed on an annual basis and/ or as inspection routine dictates
- Surface debris removal including garbage and organic matter to be performed in conjunction with lawn and grounds maintenance, includes leave removal in the Fall and removal of excessive amounts of snow, if necessary, in the Winter. These tasks are encouraged as necessary to maintain safe operating conditions (once a month from Spring through Winter recommended or on as needed basis).

### Manufactured Treatment Device Maintenance

*Schedule I - four times annually*

Item	Description	Approximate Cost
Inspection: Schedule I	Check for degradation, displacement, sediment or trash accumulation or oil in upper layers of the unit	\$250/unit
Maintenance: Schedule I	See Inspection & Maintenance Manual in Appendix J	\$750/unit

### Small-Scale Infiltration Basin Maintenance (Subsurface)

*Schedule I - four times annually and after every storm exceeding 1 inch of rainfall*

*Schedule III - annually*

Item	Description	Approximate Cost
Inspection: Schedule I	Inspect for and clear excessive debris from the system, replace damaged components	\$250
Inspection: Schedule III	Inspect for and clear excessive debris from the system, replace damaged components	\$250

### Dry Well

*Schedule I - four times annually and after every storm exceeding 1 inch of rainfall*

*Schedule III - annually*

Item	Description	Approximate Cost
Inspection: Schedule I	Inspect for and clear excessive debris from the system, replace damaged components	\$250
Inspection: Schedule III	Inspect for and clear excessive debris from the system, replace damaged components	\$250

Large-Scale Infiltration Basin Maintenance

*Schedule I - four times annually and after every storm exceeding 1 inch of rainfall*

*Schedule IA - once a month during the growing season*

*Schedule II - bi-annually, during the growing season and the non-growing season*

*Schedule III - annually*

Item	Description	Approximate Cost
Inspection: General	Inspect all areas to verify that all work is being performed properly and as scheduled, locate potential problems, and correct unacceptable conditions	Included in General Inspection for Infiltration Basin Maintenance costs
Inspection: Schedule I	Inspect for and clear excessive debris from the system	\$1,500/basin
Inspection: Schedule IA	Mowing Trimming of vegetation	\$250/acre \$100/1,000 sf
Inspection: Schedule II	One (1) Fertilize in fall One (1) Liming in fall Soil Testing from grass area for analysis Turf Disease and Pest Control as required Overseeding designated lawn area if required Aerate lawn areas in fall	\$20/1,000 sf \$20/1,000 sf \$200/unit \$20/1,000 sf \$200/1,000 sf \$10/1,000 sf
Inspection: Schedule III	Topsoil if needed for erosion and scour area Till basin bottom sand surface if required Seeding	\$35/cy \$250/acre \$200/1,000 sf

Pervious Pavement System

*Schedule I - four times annually and after every storm exceeding 1 inch of rainfall*

*Schedule II - bi-annually, during the growing season and the non-growing season*

*Schedule III - annually*

Item	Description	Approximate Cost
Inspection: Schedule I	Inspect surface and clear excessive debris from the system	\$200
Inspection: Schedule II	Vacuum swept	\$1,000
Inspection: Schedule III	Deep cleaning/unclogging	\$1,500

# Safety Measures and Procedures

## Safety Regulations and Requirements

As per NJDEP BMP Manual Ch. 8 (February 2004), all local ordinances, state, OSHA and other federal regulations regarding occupational safety should be included in the Maintenance Plan unless the Owner has a safety plan that covers this information in which case that plan shall be included. These documents should be included in Appendix H. At a minimum the below should be considered:

- Chapter 8: Maintenance and Retrofit of Stormwater Management Measures
  - <https://dep.nj.gov/stormwater/bmp-manual/>
- For a BMP that is classified as a dam see <https://dep.nj.gov/wlm/drec/dam-safety/>
- In the event of an overflow of a bioretention basin and/or a drywell, the discharge must be consistent with The Standards for Soil Erosion and Sediment Control in New Jersey, 7<sup>th</sup> Edition, dated January 2014 and revised July 2017, in section “Off-Site Stability analysis”, Section 21-1.
- Downstream access entry points must adhere to all Federal, State, County and municipal safety standards such as those for confined space entry.
  - <https://www.osha.gov/confined-spaces/hazards-solutions>
- New Jersey Pollutant Discharge Elimination System (NJPDDES)
  - N.J.A.C 7:14A <https://dep.nj.gov/rules/current-rules-and-regulations/>

## Safety Tools, Equipment and Garments

The following safety tools and equipment should be available onsite with maintenance personnel at a minimum.

Safety Tools and Equipment
Safety Cones
Caution Tape
Safety Helmet
Reflective Vest
First Aid Kit

## Qualification for Performing the Task in Special Circumstances

The following tasks shall require appropriate Occupational Safety and Health Administration (OSHA) Confined-Space Entry Permits/Certifications (where applicable):

Stormwater Measures	Location
Stormwater Collection System Inspection	
Underground Basin Inspection	
Outlet Control Structures Inspection	

## Emergency Procedures

911

Township of Hillside Police Department

Local Utility Company

List of Local Utility Companies:

Comcast Cable  
279 Amwell Road  
Hillsborough, NJ 08844  
800-934-6489

Public Service Electric & Gas Co.  
472 Weston Canal Rd  
Somerset, NJ 08873  
800-436-7734

Franklin Township Sewerage Authority  
70 Commerce Drive  
Somerset, NJ 08873  
732-873-2121

Franklin Township Department of Public  
Work  
40 Churchill Ave,  
Somerset, NJ 08873  
732-249-7800

# Training Plan and Records

## I. Training Plan

As per NJDEP BMP Manual Ch. 8 (February 2004), maintenance training begins with a basic description of the purpose and function of the overall stormwater management measure and its major components. Such understanding will enable maintenance personnel to provide more effective component maintenance and more readily detect maintenance-related problems. Depending on the size, character, location, and components of each stormwater management measure, maintenance personnel may also require training in specialized inspection and maintenance tasks and/or the operation and care of specialized maintenance equipment. Training should also be provided in the need for and use of all required safety equipment and procedures.

### Types of Training

- Mandatory Stormwater Management Basic Training and Field Manual Usage Training for new maintenance crews
- Occupational Safety Training
- Subcontractor training, if applicable

### Content of Training

- **Stormwater Management Basic Training**
  - Purposes and Functions of BMPs

#### Example Training Material

- NJDEP Stormwater BMP Manual
  - Bioretention Systems (Chapters 9.7 & 10.1)
  - Constructed Wetlands (Chapter 10.4)
  - Dry Wells (Chapter 9.2)
  - Manufactured Treatment Devices (Chapters 9.5 & 11.3)
  - Pervious Paving Systems (Chapter 9.7)
  - Sand Filters (Chapters 9.9, 10.3 & 11.4)
  - Vegetative Filter Strips (Chapter 9.10)

More training information is available at NJ Stormwater.org (<http://dep.nj.gov/stormwater/stormwater-training/>)

- Vegetation Care

#### Example Training Material

- NJDEP Stormwater BMP Manual, Chapter Seven: Landscaping (*provides information on vegetation and landscaping for stormwater management measures*)
- “Stormwater Management Sites”, prepared by Ernst Seeds, dated 2022-2023; [www.ernsteed.com](http://www.ernsteed.com)
- Field Manual Usage Training
  - Field Manuals attached to this Maintenance Plan (see appendices)

- Equipment and Tools Operation Training
  - Equipment or tool manufacturer's Operation & Maintenance Manual
- Occupational Safety Training
  - OSHA Training
  - Equipment or tool manufacturer's Operation & Maintenance Manual

## **II. Training Records**

Training attendance sheets should be attached in Appendix H by the party responsible after each training.

## **APPENDIX A**

### **BMP Location Map**

## **APPENDIX B**

### **Inspection Logs**

**Inspection Log Entry**

Date: \_\_\_\_\_

Performed By \_\_\_\_\_

**Bioretention System**

Checklist	Physical Condition*				Required Cleaning (y/n)	Description of Maintenance or Damage Report
	1	2	3	4		
Inflow/Outflow Structure						
Standing Water						
Tree Grate Condition						
Trash/Debris						

**Drywell Maintenance**

Checklist	Physical Condition*				Required Cleaning (y/n)	Description of Maintenance or Damage Report
	1	2	3	4		
System Integrity						
Downspouts						
Inspection Port						
Accumulated Sediment						

**Infiltration Basin Maintenance**

Checklist	Physical Condition*				Required Cleaning (y/n)	Description of Maintenance or Damage Report
	1	2	3	4		
Forebay						
Outlet						
Spillway						
Miscellaneous						

**Porous Pavement**

Checklist	Physical Condition*				Required Cleaning (y/n)	Description of Maintenance or Damage Report
	1	2	3	4		
Inspect for deterioration						
Maintain upland and adjacent grassy areas						
Surface free of debris and sediment						
Divert excessive water						

Additional Notes: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\* Denotes a rating table to describe the condition of item (1 being in excellent condition and 4 needing immediate repair).

## **APPENDIX C**

### **Maintenance Logs**

## MAINTENANCE LOG FOR STORMWATER MANAGEMENT FACILITIES

NAME OF FACILITY: \_\_\_\_\_  
 LOCATION: \_\_\_\_\_ DATE: \_\_\_\_\_  
 WEATHER: \_\_\_\_\_ WORK STARTED: \_\_\_\_\_  
 MAINTENANCE PERFORMED BY: \_\_\_\_\_ WORK COMPLETED: \_\_\_\_\_

PREVENTATIVE MAINTENANCE	
WORK ITEM	✓ COMPLETED
<b>1. GRASS CUTTING</b>	
A. BOTTOMS	
B. EMBANKMENTS AND SIDE SLOPES	
C. PERIMETER AREAS	
D. ACCESS AREAS AND ROADS	
E. OTHERS	
<b>2. GRASS MAINTENANCE</b>	
A. FERTILIZING	
B. RE-SEEDING	
C. DE-THATCHING	
D. PEST CONTROL	
E. OTHERS	
<b>3. VEGETATIVE COVER</b>	
A. FERTILIZING	
B. PRUNING	
C. PEST CONTROL	
D. POISONOUS PLANTS	
E. OTHERS	
<b>4. TRASH AND DEBRIS REMOVAL</b>	
A. BOTTOMS	
B. EMBANKMENTS AND SIDE SLOPES	
C. PERIMETER AREAS	
D. ACCESS AREAS AND ROADS	
E. INLETS	
F. OUTLETS AND TRASH RACKS	
G. OTHERS	
<b>5. SEDIMENT REMOVAL</b>	
A. INLETS	
B. OUTLETS AND TRASH RACKS	



CORRECTIVE MAINTENANCE					
WORK ITEM	✓ COMPLETED				
1. REMOVAL OF DEBRIS AND SEDIMENT					
2. STRUCTURAL REPAIRS					
3. EMBANKMENTS AND SIDE SLOPES					
4. DEWATERING					
5. BASIN MAINTENANCE					
6. CONTROL OF MOSQUITOES					
7. EROSION REPAIR					
8. FENCE REPAIR					
9. SNOW AND ICE REMOVAL					
10. SAND LAYER REPLACEMENT					
11. OTHER					

AESTHETIC MAINTENANCE					
WORK ITEM	✓ COMPLETED				
1. GRAFFITI REMOVAL					
2. GRASS TRIMMING					
3. WEEDING					
4. OTHER					

## **APPENDIX D**

### **Local, State & Federal Permits**

## **APPENDIX E**

**Disposal Facility Credentials & Contract**  
*(to be added upon selection)*

## **APPENDIX F**

**As-Built Plan**  
*(to be added upon completion)*

## **APPENDIX G**

**Landscaping Plan**  
*(to be added upon completion)*

## **APPENDIX H**

**Safety Regulations and Requirements**  
*(to be added by responsible party)*

## **APPENDIX I**

**Deed and/or Transfer Agreements**  
*(to be added upon completion)*

## **APPENDIX J**

Manufactured Treatment Device Field Manual

# Manufactured Treatment Device (MTD)

*See Appendix A for Location Map*

Development Name: \_\_\_\_\_

Township, County: \_\_\_\_\_

Location of MTD# E7.2: N: 608,753.1; E :480,364.7

Location Description: Between Lots 12.10 and 12.11

Location of MTD# E6.2: N: 608,702.2; E :480,560.2

Location Description: Between Lots 12.11 and 12.12

Location of MTD# E5.2: N: 608,649.6; E :480,755.4

Location Description: Between Lots 12.12 and 12.13

Location of MTD# E4.2: N: 608,596.6; E :480,952.1

Location Description: Between Lots 12.13 and 12.14

Location of MTD# G3: N: 608,552.2; E :481,147.9

Location Description: Between Lots 12.14 and 12.15

## **NOTE**

**This Field Manual is intended to be editable and adjustable in accordance with the design of stormwater management measures, the site conditions, and the special needs of responsible party. The Engineer should supplement information and best management practice to assist the responsible party to perform maintenance.**

# **MTD Overview**

## **Functionality**

A Manufactured Treatment Device (MTD) is a pre-fabricated stormwater treatment structure utilizing settling, filtration, absorptive/adsorptive materials, vortex separation, vegetative components, and/or other appropriate technology to remove pollutants from stormwater runoff.

Manufactured treatment devices are intended to capture sediments, metals, hydrocarbons, floatable, and/or other pollutants in stormwater runoff before being conveyed to a storm sewer system, additional stormwater quality treatment measure, or waterbody.

**Proper care and attention in the long-term maintenance of the stormwater management measure is critically important to the safety and health of the public.**

## **Type of BMP – Dry Stormwater Management Measure**

These MTDs remove TSS and/or nutrients for water quality.

# Basic Design Information

MTD # E7.2

## Hydrology Design Targets

1. The MTD is designed as an offline system.
2. The maximum design storm is (Water Quality Design Storm, which corresponds to 1.25 inches of rain in 2 hours.
3. The design total suspended solids removal rate is 80 %.
4. The design drain time is N/A hours (if applicable).

## Hydraulic Design Targets

1. Design parameters

	Water Quality Design Storm	2-year storm	10-year storm	100-year storm
Rainfall Depth (inches)	1.25 inch in 2 hours	___ inches in 24 hours	___ inches in 24 hours	___ inches in 24 hours
Runoff Volume (cubic feet)	3,220	N/A	N/A	N/A
Peak Flow Rate (cfs)	1.96	N/A	N/A	N/A
Water Surface Elevation (feet)	N/A	N/A	N/A	N/A

Note: The design engineer shall fill out the table in accordance with the design of the MTD. If the item is not applicable, enter **N/A** in the table.

## Configuration Targets

1. The name of the MTD is Aqua-Ponic, Model AP-13, Serial No. \_\_\_\_\_.
2. The manufacturer of the MTD is AquaShield.

# Basic Design Information

## MTD # E6.2

### Hydrology Design Targets

1. The MTD is designed as an offline system.
2. The maximum design storm is Water Quality Design, which corresponds to 1.25 inches of rain in 2 hours.
3. The design total suspended solids removal rate is 80 %.
4. The design drain time is N/A hours (if applicable).

### Hydraulic Design Targets

1. Design parameters

	Water Quality Design Storm	2-year storm	10-year storm	100-year storm
Rainfall Depth (inches)	1.25 inch in 2 hours	___ inches in 24 hours	___ inches In 24 hours	___ inches In 24 hours
Runoff Volume (cubic feet)	1,440	N/A	N/A	N/A
Peak Flow Rate (cfs)	0.93	N/A	N/A	N/A
Water Surface Elevation (feet)	N/A	N/A	N/A	N/A

Note: The design engineer shall fill out the table in accordance with the design of the MTD. If the item is not applicable, enter **N/A** in the table.

### Configuration Targets

1. The name of the MTD is Aqua-Ponic, Model AP-9, Serial No. \_\_\_\_\_.
2. The manufacturer of the MTD is AquaShield.

# Basic Design Information

## MTD # 5.2

### Hydrology Design Targets

1. The MTD is designed as an offline system.
2. The maximum design storm is Water Quality Design Storm, which corresponds to 1.25 inches of rain in 2 hours.
3. The design total suspended solids removal rate is 80 %.
4. The design drain time is N/A hours (if applicable).

### Hydraulic Design Targets

1. Design parameters

	<b>Water Quality Design Storm</b>	<b>2-year storm</b>	<b>10-year storm</b>	<b>100-year storm</b>
<b>Rainfall Depth (inches)</b>	1.25 inch in 2 hours	___ inches in 24 hours	___ inches in 24 hours	___ inches in 24 hours
<b>Runoff Volume (cubic feet)</b>	1,600	N/A	N/A	N/A
<b>Peak Flow Rate (cfs)</b>	1.05	N/A	N/A	N/A
<b>Water Surface Elevation (feet)</b>	N/A	N/A	N/A	N/A

Note: The design engineer shall fill out the table in accordance with the design of the MTD. If the item is not applicable, enter **N/A** in the table.

### Configuration Targets

1. The name of the MTD is Aqua-Ponic, Model AP-10, Serial No. \_\_\_\_\_.
2. The manufacturer of the MTD is AquaShield

# Basic Design Information

MTD # E4.2

## Hydrology Design Targets

1. The MTD is designed as an offline system.
2. The maximum design storm is Water Quality Design, which corresponds to 1.25 inches of rain in 2 hours.
3. The design total suspended solids removal rate is 80 %.
4. The design drain time is N/A hours (if applicable).

### 1. Design parameters

	Water Quality Design Storm	2-year storm	10-year storm	100-year storm
Rainfall Depth (inches)	1.25 inch in 2 hours	___ inches in 24 hours	___ inches in 24 hours	___ inches in 24 hours
Runoff Volume (cubic feet)	1,525	N/A	N/A	N/A
Peak Flow Rate (cfs)	0.98	N/A	N/A	N/A
Water Surface Elevation (feet)	N/A	N/A	N/A	N/A

Note: The design engineer shall fill out the table in accordance with the design of the MTD. If the item is not applicable, enter **N/A** in the table.

## Configuration Targets

1. The name of the MTD is Aqua-Ponic, Model AP-9, Serial No. \_\_\_\_\_.
2. The manufacturer of the MTD is AquaShield.

# Basic Design Information

MTD # G3

## Hydrology Design Targets

1. The MTD is designed as an offline system.
2. The maximum design storm is Water Quality Design, which corresponds to 1.25 inches of rain in 2 hours.
3. The design total suspended solids removal rate is 80 %.
4. The design drain time is N/A hours (if applicable).

## Hydraulic Design Targets

1. Design parameters

	Water Quality Design Storm	2-year storm	10-year storm	100-year storm
Rainfall Depth (inches)	1.25 inch in 2 hours	___ inches in 24 hours	___ inches in 24 hours	___ inches in 24 hours
Runoff Volume (cubic feet)	3,050	N/A	N/A	N/A
Peak Flow Rate (cfs)	1.96	N/A	N/A	N/A
Water Surface Elevation (feet)	N/A	N/A	N/A	N/A

Note: The design engineer shall fill out the table in accordance with the design of the MTD. If the item is not applicable, enter N/A in the table.

## Configuration Targets

1. The name of the MTD is Aqua-Ponic, Model AP-13, Serial No. \_\_\_\_\_.
2. The manufacturer of the MTD is AquaShield.

Attach the following Disturbance Notices, if applicable to the site:

### Wetland Disturbance Notice:

Maintenance of this BMP may disturb a wetland area. Contact NJDEP Division of Land Use Regulation for guidance and any required permit(s) before performing maintenance.

**Wildlife Disturbance Notice:** Maintenance of this BMP may disturb or remove vegetation in an area designated to endangered and/or threatened species. Contact NJDEP Division of Fishing and Wildlife for guidance and any required permit(s) before performing maintenance.

# Visual Aid for MTD Maintenance

Photos will be updated upon availability.

## Reference Documents

Documents to be placed in this field manual should include the following:

- As-built Drawings with Drainage Plans (Appendix F)
- Operation and Maintenance Manual (provided by the manufacturer)
- MTD Specification Sheet (provided by the manufacturer), if available
- Soil Boring Logs, if applicable
- Permeability Test (pre-construction) , if applicable
- Permeability Test (post-construction) , if applicable
- Groundwater Mounding Analysis, if applicable

**Attach Additional Reference Documents Here**  
*(see appendices where noted)*

# Inspection Checklist

MTD # \_\_\_\_\_

Checklist (circle one): Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. \_\_\_\_\_ Inspection Date: \_\_\_\_\_

Date of most recent rain event: \_\_\_\_\_

Rain Condition (circle one):

Drizzle / Shower / Downpour / Other \_\_\_\_\_

Ground Condition (circle one):

Dry / Moist / Ponding / Submerged / Snow accumulation

The inspector should make copies of this checklist as needed.

Component No. Component Name	For Inspector		For Maintenance Crew
	Inspection Item and Inspection Item No.	Result	Preventative / Corrective Maintenance Actions
A	1	Y__ N__	
	2	Y__ N__	
	3	Y__ N__	
	4	Y__ N__	
	5	Y__ N__	
B	1	Y__ N__	
	2	Y__ N__	
	3	Y__ N__	
	4	Y__ N__	
	5	Y__ N__	
Note:			

**Follow Up Items: (Component No. / Inspection Item No.):**

\_\_\_\_\_

**Associated Work Orders: # \_\_\_\_\_, # \_\_\_\_\_, # \_\_\_\_\_, # \_\_\_\_\_, # \_\_\_\_\_**

\_\_\_\_\_  
**Inspector Name                      Signature                      Date**

**Report issues to the local authority and mosquito commission as required by local ordinances and regulatory authorities.**

**File this checklist in the Inspection Log in Appendix B after performing maintenance.**

# Preventative Maintenance Record

MTD # \_\_\_\_\_

Checklist (circle one): Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. \_\_\_\_\_ Inspection Date: \_\_\_\_\_

Date of most recent rain event: \_\_\_\_\_

Rain Condition (circle one):

Drizzle / Shower / Downpour / Other \_\_\_\_\_

Ground Condition (circle one):

Dry / Moist / Ponding / Submerged / Snow accumulation

The inspector should make copies of this Preventative Maintenance Record as needed.

# Preventative Maintenance Record

Corresponding Checklist No. \_\_\_\_\_  
Component No. \_\_\_\_\_, Inspection Item No. \_\_\_\_\_

## Work Logs

Activities	Components	Date Completed

Debris, sediment, and trash are handled (onsite / by \_\_\_\_\_ (contractor name) to disposal site \_\_\_\_\_). (See Appendix E)

Crew member: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
(name/ signature)

Supervisor: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
(name/ signature)

**File this Preventative Maintenance Record in the Maintenance Log in Appendix C after performing maintenance.**

# Corrective Maintenance Record

MTD # \_\_\_\_\_

Checklist (circle one): Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. \_\_\_\_\_ Inspection Date: \_\_\_\_\_

Date of most recent rain event: \_\_\_\_\_

Rain Condition (circle one):

Drizzle / Shower / Downpour / Other \_\_\_\_\_

Ground Condition (circle one):

Dry / Moist / Ponding / Submerged / Snow accumulation

The inspector should make copies of this Corrective Maintenance Record as needed.

# Corrective Maintenance Record

1. Work Order # \_\_\_\_\_ Date Issued \_\_\_\_\_

2. Issue to be resolved:

3. The issue was from Corresponding Checklist No. \_\_\_\_\_, Component No. \_\_\_\_\_, Inspection Item No. \_\_\_\_\_.

4. Required Actions

Actions	Planned Date	Date Completed

5. Responsible person(s):

\_\_\_\_\_

6. Special requirements

- Time of the season or weather condition: \_\_\_\_\_
- Tools/equipment: \_\_\_\_\_
- Subcontractor (name or specific type): \_\_\_\_\_

Approved by \_\_\_\_\_ / \_\_\_\_\_ Date \_\_\_\_\_  
(name/signature)

Verification of completion by \_\_\_\_\_ / \_\_\_\_\_ Date \_\_\_\_\_  
(name/signature)

**File this Corrective Maintenance Record in the Maintenance Log in Appendix C after performing maintenance.**

# *INSPECTION & MAINTENANCE MANUAL*



## **Aqua-Ponic™ Stormwater Biofiltration System**



Manufactured By:



**AquaShield,™ Inc.**  
2733 Kanasita Drive  
Suite 111  
Chattanooga, TN 37343  
(888) 344-9044  
[www.aquashieldinc.com](http://www.aquashieldinc.com)

**January 2022**

## INTRODUCTION

As the stormwater industry has matured there has been an ever-increasing movement toward the implementation of Low Impact Development (LID) products and practices as the preferred means to implement stormwater control measures within “green infrastructure” (GI) stormwater management programs. The Aqua-Ponic™ Stormwater Biofiltration System is now offered by AquaShield™, Inc. to meet the design challenges of LID principles along with enhanced aesthetics in an urban environment.

This Inspection & Maintenance (I&M) Manual includes information to better assist stakeholders with understanding the importance of implementing an effective program to ensure long-term functionality of an Aqua-Ponic™ system installation. The following aspects of an Aqua-Ponic™ system are described in this I&M manual:

- Aqua-Ponic™ Basics
- Mode of Operation
- Inspection and Maintenance.

### ***AQUA-PONIC™ BASICS***

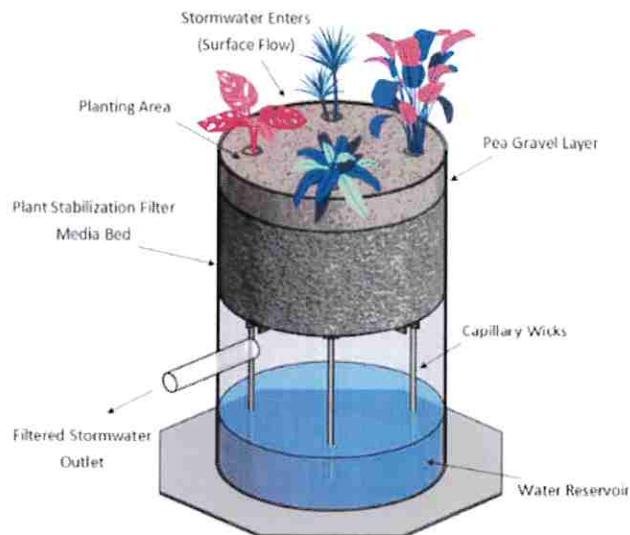
Aqua-Ponic™ technology is a modular proprietary, permanent, post-construction biofiltration system designed to remove total suspended solids (TSS), Total (insoluble) Phosphorus, and heavy metals such as copper and zinc from stormwater runoff. A distinguishing feature of the Aqua-Ponic™ is its combination of filtration with the principles of *hydroponics* - a method of hydroculture for growing plants without soil by instead using mineral nutrient solutions in a water solvent. That is, the Aqua-Ponic™ uses stormwater runoff as a nutrient asset instead of a liability. Terrestrial plants are grown with only their roots exposed to the nutrient liquid while being physically supported by a plant stabilization filter medium. The hydroponic design provides a sustainable water supply to the vegetation during those periods of time when hot and/or dry conditions may prevail.

The Aqua-Ponic™ system utilizes hardy low-profile perennial vegetation such as native grasses, shrub grasses and/or ornamental flowering plants. A facility can utilize a single type or multiple types of plants to enhance the viewscape. It is important to specify plants that demonstrate viability within the climatic zone of a site installation.

### ***MODE of OPERATION***

The minimum 12-inch plant stabilization media layer within the Aqua-Ponic™ serves three operational roles by providing (1) pollutant filtration, (2) plant stabilization and (3) nutrient uptake. Figure 1 is an illustration of the Aqua-Ponic™ Biofiltration System. Design elements include a three (3)-inch top layer of pea gravel underlain by the plant stabilization filter bed. Water enters the system as sheet flow and then flows downward under gravity flow conditions through the pea gravel, filter bed and the associated root systems of the vegetation. The pea gravel layer serves to protect the underlying plant stabilization filter bed while dispersing the influent stormwater runoff across the treatment area. The filtered water then percolates further downward into the underlying water sump. A supporting and removeable perforated stainless-steel sheet underlies the filter bed. A post-filtration flow control orifice is placed across the outlet pipe opening in order to facilitate an even distribution of influent runoff across the filter treatment area. Crushed recycled

landscaping glass can be used as an alternative to the top pea gravel layer which further enhances colorful viewscape options for the Aqua-Ponic™.



**Figure 1. Diagram of Aqua-Ponic™ Biofiltration System.**

The sump serves as a water reservoir for the vegetation during quiescent periods. A series of wicks are suspended from the base of the plant stabilization bed via rubber grommets (eyelets). The wicks extend downward to near the base of the sump. Using capillary action, water is wicked up to the plant stabilization filter bed which serves to provide a sustainable supply of water and any soluble nutrients and metals not trapped in the filter bed during a runoff event. Treated water in excess of the sump storage volume exits the system via the outlet opening just below the base of the filter bed.

Each Aqua-Ponic™ unit is constructed of lightweight and durable Polymer Coated Steel (PCS) to provide long term operational and structural functionality. Aqua-Ponic™ units are shipped with the inclusion of any perforated sheets and the capillary wicks in place according to the model size. The plant stabilization filter media is shipped simultaneously in separate containers. For aesthetic reasons it is the responsibility of others to choose either the pea gravel or any recycled glass landscaping stone for the top bed layer. It is also the responsibility of others to specify, acquire and plant the vegetation. AquaShield™ does not specify the plants for Aqua-Ponic™ systems but can assist where warranted.

### ***INSPECTION & MAINTENANCE***

Maintenance frequency for the Aqua-Ponic™ will ultimately be determined by site-specific pollutant loading conditions. Inspections of the, plants, top gravel layer and the upper portion of the plant stabilization filter media can be accomplished from the surface without special tools. AquaShield™ recommends periodic inspections following installation to determine a site-specific maintenance cycle to ensure functionality of the media and the vegetation.

We recommend that periodic system inspections be performed to determine the pollutant and trash loading characteristics. In general, quarterly inspections should be performed during the first year of operation to better anticipate maintenance frequency in the first year and subsequent years of operation.

An Aqua-Ponic™ maintenance event should first determine any obvious signs of degradation, displacement, sediment or trash accumulation, or oil in the upper layers of the unit. The top gravel layer should be completely replaced and can be removed by shoveling or vacuuming. The top several inches of the underlying plant stabilization filter media may be replaced at the same time if warranted. Care should be taken not to damage the plants or disturb rootballs during limited media replacement. Care should also be taken when replacing a plant to avoid disturbing remaining plants.

Depending on site conditions, it may be necessary to remove all the media and all the plants and completely replace these components of the system. It is recommended that the wicks be replaced if a system is fully replaced with stabilization media and plants.

Sediment can accumulate in the base of the water supply sump over a period of time. After removing the pea gravel layer, the plants and the plant stabilization filter media bed, the perforated metal plate should be removed to access the water supply sump from the surface for the purpose of vacuuming water and any accumulated sediment. The wicking ropes should also be replaced at this time. The perforated metal plate with the new wicking ropes should be set in place prior to installing the plant stabilization filter media on top of the plate.

AquaShield™ can provide the plant stabilization filter media, wicks and any associated grommets. Although unlikely, the supporting stainless-steel plate can also be supplied by AquaShield™ if its replacement is necessary. While we recommend that the pea gravel be replaced as warranted, it may be feasible to wash the gravel during a maintenance event. However, in most cases it is more efficient to replace the pea gravel or any landscaping glass to avoid disposal of water that was used to clean either of those materials.

All I&M activities can be performed from the surface without the need for AquaShield™ personnel to be present. We recommend that all materials removed during the maintenance process be handled and disposed in accordance with all applicable federal, state and local guidelines. Depending on the influent pollutant characteristics of the facility drainage area, it may be appropriate to perform Toxicity Characteristics Leaching Procedure (TCLP) analyses on representative samples of the spent filter media to ensure that the handling and disposition of materials complies with any applicable environmental regulations and practices.

Attached is a two-page Aqua-Ponic™ I&M Log to document service provider(s), activities and scheduling.

*Next two pages include I&M Logs*

## ***AQUA-PONIC™ INSPECTION & MAINTENANCE LOG***

**MAINTENANCE COMPANY INFORMATION**

Company Name: \_\_\_\_\_

Street Address: \_\_\_\_\_

City: \_\_\_\_\_ State/Prov.: \_\_\_\_\_ Zip/Postal Code: \_\_\_\_\_

Contact: \_\_\_\_\_ Title: \_\_\_\_\_

Office Phone: \_\_\_\_\_ Cell Phone: \_\_\_\_\_

**ACTIVITY LOG**

Date of Cleaning: \_\_\_\_\_

Time of Cleaning: Start: \_\_\_\_\_ End: \_\_\_\_\_

Date of Next Inspection: \_\_\_\_\_

Floatable debris present: Yes No Action taken: \_\_\_\_\_

Oil present: Yes No Action taken: \_\_\_\_\_

Filter Media Needs Replacement: Yes No

Structural damage: Yes No Where: \_\_\_\_\_

Clogging: Yes No Describe: \_\_\_\_\_

Additional Comments and/or Actions to be Taken	Time Frame



## Inspection & Maintenance Schedule Log

### First Year Post-Construction

*Date Installed/Activated:* \_\_\_\_\_

Activity	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Inspect and Clean as needed			X			X			X			X
Inspect Bypass and maintain as needed			X			X			X			X
Clean System*												X

### Second and Subsequent Years Post-Construction

Activity	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Inspect and Clean as needed												X
Inspect Bypass, maintain as needed												X
Clean System												X

## **APPENDIX K**

Dry Well Field Manual

## Dry Well

*See Appendix A for Location Map*

Development Name: \_\_\_\_\_

Township, County: \_\_\_\_\_

Location of Dry Well-1: N: 608,737.6 E: 480,455.7

Location Description: Front yard of Lot 12.11

Location of Dry Well-2: N: 608,685.9 E: 480,632.5

Location Description: Front yard of Lot 12.12

Location of Dry Well-3: N: 608,639.4 E: 480,830.3

Location Description: Front yard of Lot 12.13

Location of Dry Well-4: N: 608,582.7 E: 481,025.6

Location Description: Front yard of Lot 12.14

### NOTE

**This Field Manual is intended to be editable and adjustable in accordance with the design of stormwater management measures, the site conditions, and the special needs of responsible party. The Engineer should supplement information and best management practice to assist the responsible party to perform maintenance.**

# Dry Well Overview

## Functionality

A dry well is a subsurface storage facility that receives and temporarily stores stormwater runoff from roofs of structures. Discharge of this stored runoff from a dry well occurs through infiltration into the surrounding soils. A dry well may be either a structural chamber and/or an excavated pit filled with aggregate. Due to the relatively low level of expected pollutants in roof runoff, a dry well cannot be used to directly comply with the suspended solids and nutrient removal requirements contained in the NJDEP Stormwater Management Rules at N.J.A.C. 7:8. However, due to its storage capacity, a dry well may be used to reduce the total stormwater quality design storm runoff volume that a roof would ordinarily discharge to downstream stormwater management facilities.

Dry wells can be used to reduce the increased volume of stormwater runoff caused by roofs of buildings. While generally not a significant source of runoff pollution, roofs are one of the most important sources of new or increased runoff volume from land development sites. Dry wells can also be used to indirectly enhance water quality by reducing the amount of stormwater quality design storm runoff volume to be treated by the other, downstream stormwater management facilities. Dry wells can also be used to meet the groundwater recharge requirements of the NJDEP Stormwater Management Rules.

**Proper care and attention in the long-term maintenance of the stormwater management measure is critically important to the safety and health of the public.**

## Type of BMP – Dry Stormwater Management Measure / Infiltration Only

A dry well is a type of dry stormwater management measure. Dry stormwater management measures must fully drain within 72 hours of the most recent rainfall. Standing water in excess of 72 hours is a sign of failure. It may also contribute to mosquito breeding and other health and safety issues. The design drain time shall be closely monitored to ensure that potential failure is recognized early.

Dry wells can detain, infiltrate, and recharge stormwater runoff; however, dry wells not designed to treat stormwater runoff for water quality; therefore, no TSS removal is assigned to a dry well.

## Basic Design Information

### Dry Well # 1-4

#### Hydrology Design Targets

1. This dry well is designed with a subsoil permeability rate of 0.5 inches/hour (pre-construction) and \_\_\_\_\_ inches/hour (post-construction - tested on \_\_\_\_/\_\_\_\_/\_\_\_\_ (date).
2. The design drain time is 6 hours.
3. The elevation of the seasonal high water table of this dry well was observed on 09/06/2023 (date) and it was 2 feet below the dry well bottom surface, at EL. 123.5 feet.

#### Hydraulic Design Targets

1. This dry well is designed to infiltrate the runoff from the groundwater recharge storm), which generates varies cubic feet of runoff.

#### Dry well Configuration Targets

1. The dimensions of the dry well are 9' by 14' by 5' (width, length (or diameter), depth).
2. The stone fill uses crushed stone 3 / 4 inch in diameter.

#### Critical Maintenance Features

1. Check downspout and bypass frequently and remove leaves and other debris immediately.
2. Check inspection port for excessive sediment.
3. (Others to be added by the design engineer, if necessary)

Attach the following Disturbance Notices, if applicable to the site:

#### Wetland Disturbance Notice:

Maintenance of this BMP may disturb a wetland area. Contact NJDEP Division of Land Use Regulation for guidance and any required permit(s) before performing maintenance.

#### Wildlife Disturbance Notice:

Maintenance of this BMP may disturb or remove vegetation in an area designated to endangered and/or threatened species. Contact NJDEP Division of Fishing and Wildlife for guidance and any required permit(s) before performing maintenance.

## **Visual Aid for Dry Well Inspection**

Photos will be updated upon availability.

## Reference Documents

Documents to be placed in this field manual when available should include the following:

- As-built Drawings (specs if manufactured dry well is used) w/ Drainage Plans (Appendix F)
- Operation and Maintenance Manual, if a manufactured dry well is used
- Permeability Test (Pre-construction)
- Permeability Test (Post-construction)
- Fabric Specifications and Maintenance Information
- Groundwater Mounding Analysis

**Attach Additional Reference Documents Here**  
*(see appendices where noted)*

# Inspection Checklist

Dry Well # \_\_\_\_\_

Checklist (circle one): Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. \_\_\_\_\_

Inspection Date: \_\_\_\_\_

Date of most recent rain event: \_\_\_\_\_

Rain Condition (circle one):

Drizzle / Shower / Downpour / Other \_\_\_\_\_

Ground Condition (circle one):

Dry / Moist / Ponding / Submerged / Snow accumulation

The inspector should make copies of this Checklist as needed.

Component No. Component Name	For Inspector		For Maintenance Crew
	Inspection Item and Inspection Item No.	Result	Preventative / Corrective Maintenance Actions
Dry Well	1	The cap of the inspection port is loose, damaged, or missing.	Y__ N__ Fix, repair, or replace the cap Work Order # _____
	2	Standing water is present after the design drain time  The observed drain time is approximately _____ hours.	Y__ N__ Recheck to determine if there is standing water after 72 hours  If standing water is present longer than 5 days, report to mosquito commission.  Remove any sediment buildup and replace the stone fill if necessary  Check the perforated pipe for clogging and clean it if necessary  Check the perforated pipe for damage and repair it if necessary  Check subsoil permeability and replace subsoil if necessary  Work Order # _____
	3	Excessive sediment or debris present in the inspection port	Y__ N__ Clear and remove sediment or debris

Note:

Component No. Component Name	For Inspector		For Maintenance Crew
	Inspection Item and Inspection Item No.	Result	Preventative / Corrective Maintenance Actions
Dry Well	4	Little or no flow into the dry well	Y__ N__  Clear and remove debris
	5	Downspout or Overflow pipe is clogged	Y__ N__  Clear the clog
	6	Odor present	Y__ N__  Clear and remove sediment and debris Investigate the roof and gutters
	7	Overflow from the top of the dry well	Y__ N__  Clear and remove sediment and debris Check the bypass pipe if any clog Remove any sediment buildup and replace the stone fill if necessary Check the perforated pipe for clogging and clean it if necessary Check the perforated pipe for damage and repair it if necessary Check subsoil permeability and replace subsoil if necessary
Note:			

**Follow Up Items: (Component No. / Inspection Item No.):**

---

**Associated Work Orders: # \_\_\_\_\_, # \_\_\_\_\_, # \_\_\_\_\_, # \_\_\_\_\_, # \_\_\_\_\_**

---

Inspector Name

---

Signature

---

Date

**Report issues to the local authority and mosquito commission as required by local ordinances and regulatory authorities.**

**File this checklist in the Inspection Log in Appendix B after performing maintenance.**

# Preventative Maintenance Record

Dry Well # \_\_\_\_\_

Checklist (circle one): Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. \_\_\_\_\_ Inspection Date: \_\_\_\_\_

Date of most recent rain event: \_\_\_\_\_

Rain Condition (circle one):

Drizzle / Shower / Downpour / Other \_\_\_\_\_

Ground Condition (circle one):

Dry / Moist / Ponding / Submerged / Snow accumulation

The inspector should make copies of this Maintenance Record as needed.

# Preventative Maintenance Record

Corresponding Checklist No. \_\_\_\_\_  
 Component No. \_\_\_\_\_, Inspection Item No. \_\_\_\_\_

## Work Logs

Activities	Components	Date Completed
Sediment/debris removal Sediment removal should take place when the dry well is thoroughly dry.	Dry Well	
(List additional tasks, if applicable)		

Debris, sediment, and trash are handled (onsite / by \_\_\_\_\_ (contractor name) to disposal site \_\_\_\_\_). (See Appendix E)

Crew member: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
 (name/ signature)

Supervisor: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
 (name/ signature)

**File this Preventative Maintenance Record in the Maintenance Log in Appendix C after performing maintenance.**

# Corrective Maintenance Record

Dry Well # \_\_\_\_\_

Checklist (circle one): Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. \_\_\_\_\_ Inspection Date: \_\_\_\_\_

Date of most recent rain event: \_\_\_\_\_

Rain Condition (circle one):

Drizzle / Shower / Downpour / Other \_\_\_\_\_

Ground Condition (circle one):

Dry / Moist / Ponding / Submerged / Snow accumulation

The inspector should make copies of this Maintenance Record as needed.

# Corrective Maintenance Record

1. Work Order # \_\_\_\_\_ Date Issued \_\_\_\_\_

2. Issue to be resolved:  
(e.g., damaged cap)

3. The issue was from Corresponding Checklist No. \_\_\_\_\_, Component No. \_\_\_\_\_,  
Inspection Item No. \_\_\_\_\_.

4. Required Actions

Actions	Planned Date	Date Completed
Repair cap		
Repair perforated pipe		
Repair fabric		
Repair bypass pipe		
Repair downspout		

5. Responsible person(s):  
\_\_\_\_\_

6. Special requirements

- Time of the season or weather condition: \_\_\_\_\_
- Tools/equipment: \_\_\_\_\_
- Subcontractor (name or specific type): \_\_\_\_\_

Approved by \_\_\_\_\_ / \_\_\_\_\_ Date \_\_\_\_\_  
(name/signature)

Verification of completion by \_\_\_\_\_ / \_\_\_\_\_ Date \_\_\_\_\_  
(name/signature)

**File this Corrective Maintenance Record in the Maintenance Log in Appendix C after performing maintenance.**

## **APPENDIX L**

Large Scale Infiltration Basin Field Manual

# Large Scale Surface Infiltration Basin

*See Appendix A for Location Map*

Development Name: \_\_\_\_\_

Township, County: \_\_\_\_\_

Location of Basin: N: 608,438.5 ; E :481,342.9

Location Description: Lot 12.15

## NOTE

**This Field Manual is intended to be editable and adjustable in accordance with the design of stormwater management measures, the site conditions, and the special needs of the responsible party. The Engineer should supplement information and best management practice to assist the responsible party to perform maintenance.**

# Large Scale Surface Infiltration Basin Overview

## Functionality

An infiltration basin is a stormwater management facility constructed of highly permeable soils, which provides temporary storage of stormwater runoff. Infiltration basins are used to remove pollutants and to infiltrate stormwater. In addition to pollutant removal and groundwater recharge, infiltration may help to reduce increases in both the peak rate and total runoff volume caused by land development. Pollutant removal is achieved through filtration of the runoff through the soil, as well as biological and chemical activity within the soil. The total suspended solids (TSS) removal rate attributed to infiltration basins is 80%.

**Proper care and attention in the long-term maintenance of the stormwater management measure is critically important to the safety and health of the public.**

## Type of BMP – Dry Basin / Infiltration Only

An infiltration basin is a type of *dry* basin. Dry basins must fully drain within 72 hours of the most recent rainfall. Standing water in excess of 72 hours is a sign of basin failure. It may also contribute to mosquito breeding and other health and safety issues. The design drain time shall be closely monitored to ensure that potential failure is recognized early.

This surface infiltration basin is designed for **infiltration only** and is **not** designed for extended detention.

# Large Scale Infiltration Basin Design Information

## Hydrology Design Targets

1. This basin is designed with a subsoil permeability rate of 1.12 inches/hour (pre-construction) and \_\_\_ inches/hour (post-construction - tested on \_\_\_/\_\_\_/\_\_\_ (date)).
2. The design drain time is 6 hours.
3. The elevation of the seasonal high water table of this basin was observed on 09/06/2023 (date) and it was 5 feet below the basin bottom surface, at EL. 114 feet.
4. This basin will be discharged to municipal stormwater sewer system.

## Hydraulic Design Targets

1. This basin is designed to infiltrate the runoff from the Water Quality Design Storm, which generates 14,500 cubic feet of runoff.
2. The invert elevation of the outlet for the design storm is at EL. 119.65 feet (if applicable). The water surface elevation is at EL 119.65 feet.
3. The emergency spillway is at EL. 125.25 feet (if applicable).

## Basin Configuration Targets

1. Pretreatment is provided by a (forebay with a depth of \_\_\_\_\_ feet / BMP Type: Aquaponics, BMP No. \_\_\_\_\_). A perforated riser is not used.
2. This basin bottom is covered by a sand layer. If a sand layer is used:
  - o The depth of sand layer shall be 6 inches, which requires a volume of 10,000 cubic feet of sand.
  - o The invert elevation of the sand layer is EL. 118.50 feet.
3. Vegetation
  - o The top of sand bed is designed to have no vegetation (if the basin is vegetated, a Landscaping Plan should be included in the Reference Documents section.)

## Critical Maintenance Features

1. No heavy equipment on the basin surface or sand layer.
2. Trash racks and discharge outlet shall be cleaned frequently.
3. Grass clippings shall be collected from the basin and properly disposed.

## Wetland Disturbance Notice:

Maintenance of this BMP may disturb a wetland area. Contact NJDEP Division of Land Use Regulation for guidance and any required permit(s) before performing maintenance.

## Wildlife Disturbance Notice:

Maintenance of this BMP may disturb or remove vegetation in an area designated to endangered and/or threatened species. Contact NJDEP Division of Fishing and Wildlife for guidance and any required permit(s) before performing maintenance.

# **Visual Aid for Dry Type Stormwater Basin Inspection**

Photos will be updated upon availability.

## Reference Documents

Documents to be placed in this field manual when available should include the following:

- As-built Drawings with Drainage Plans (Appendix F)
- Soil Boring Logs
- Permeability Test (Pre-construction)
- Permeability Test (Post-construction)
- Groundwater Mounding Analysis

**Attach Additional Reference Documents Here**

*(see appendices where noted)*

# **Inspection Checklist / Maintenance Actions**

## **Large Scale Surface Infiltration Basin**

**Checklist** (circle one): Quarterly / Annual / Monthly / Special Event Inspection

**Checklist No.** \_\_\_\_\_

**Inspection Date:** \_\_\_\_\_

**Date of most recent rain event:** \_\_\_\_\_

**Rain Condition** (circle one):

Drizzle / Shower / Downpour / Other \_\_\_\_\_

**Ground Condition** (circle one):

Dry / Moist / Ponding / Submerged / Snow accumulation

**The inspection items and preventative/corrective maintenance actions listed below represent general requirements. The design engineer and/or responsible party shall adjust the items and actions to better meet the conditions of the site, the specific design targets, and the requirements of regulatory authorities.**

	For Inspector		For Maintenance Crew
Component No. Component Name	Inspection Item and Inspection Item No.	Result	Preventative / Corrective Maintenance Actions
Pretreatment (Forebay)	1	Scouring or erosion is present at inlet structure and/or riprap apron	Y__ N__  Check the flow diversion device before the inlet pipe and whether the bypass flow channel is clogged  Work Order # _____
	2	Clogged pipes or excessive sediment in the forebay	Y__ N__  Remove sediment or debris
	3	Damaged outlet structure (e.g., cracking, subsidence, spalling, erosion, or deterioration)	Y__ N__  Repair or replace the outlet structure  Work Order # _____
Pretreatment (MTD, if installed)	1	MTD inspection	Y__ N__  (If an MTD is used for pretreatment, see manufacturer's maintenance manual)
Pretreatment (Structural BMP)	1	BMP inspection	Y__ N__  (See BMP No. _____ Field Manual)
Note:			

		For Inspector		For Maintenance Crew
Component No. Component Name	Inspection Item and Inspection Item No.	Result	Preventative / Corrective Maintenance Actions	
Infiltration Bed	1	<p>Standing water is present after the design drain time</p> <p>The observed drain time is approximately _____ hours.</p>	Y__	<p>Recheck to determine if there is standing water after 72 hours</p> <p>If standing water is present longer than 5 days, report to mosquito commission.</p> <p>Remove any sediment buildup</p> <p>Replace the sand layer (if sand layer is installed; volume of replacement sand is specified in the Basin Configuration Targets in the Basin Design Information Section of this Manual)</p> <p>Work Order # _____</p>
	2	Excessive sediment, silt, or trash accumulation on basin bed	Y__  N__	<p>Clean pretreatment system</p> <p>Remove silt, sediment, and trash</p> <p>Work Order # _____</p>

Note:

		For Inspector		For Maintenance Crew
Component No. Component Name	Inspection Item and Inspection Item No.		Result	Preventative / Corrective Maintenance Actions
Infiltration Bed	3	Erosion or channelization is present	Y__  N__	Check whether the flow bypass or diversion device is clogged  Re-grade the infiltration bed  Work Order # _____
	4	Animal burrows/rodents are present	Y__  N__	Pest control  Work Order # _____
	5	Uneven bed	Y__  N__	Use light equipment to resurface the bed  Work Order # _____
	6	Evidence of sinkholes or subsidence	Y__  N__	Monitor for sinkhole development

Note:

		For Inspector		For Maintenance Crew
Component No. Component Name	Inspection Item and Inspection Item No.		Result	Preventative / Corrective Maintenance Actions
Vegetation	1	Large spot(s) showing bare soil	Y__  N__	Vegetative cover must be maintained at 85%. Revegetate the entire basin if 50% or more vegetation has been lost.  Check Landscaping plan for guidance (if available)  Work Order # _____
	2	Overgrown vegetation	Y__  N__	Mow/trim the vegetation  Work Order # _____
	3	Tree growth in the basin	Y__  N__	Clear, trim, or prune the trees according to the original Landscaping Plan  Inspect to determine if the tree roots caused any structural damage  Work Order # _____

Note:

		For Inspector		For Maintenance Crew
Component No. Component Name	Inspection Item and Inspection Item No.	Result	Preventative / Corrective Maintenance Actions	
Basin Embankment and Side Slopes	1 Signs of erosion, soil slide or bulges, seeps and wet spots, loss of vegetation, or erosion on the basin slope	Y___  N___	<p>Check for excessive overland runoff flow through the embankment.</p> <p>Check for any sink hole development</p> <p>Direct the overland runoff to the forebay or pretreatment area</p> <p>Restabilize the bank</p> <p>Work Order # _____</p>	
Note:				

		For Inspector		For Maintenance Crew
Component No. Component Name	Inspection Item and Inspection Item No.	Result	Preventative / Corrective Maintenance Actions	
Outlet	1	Trash or debris accumulation more than 20%	Y__ N__	Clean and remove  Determine source of trash and address to reduce future maintenance costs or basin failure
	2	Trash rack is damaged or rusted greater than 50%  Trash rack is bent, loose, or missing parts	Y__  N__	Repair or replace trash rack  Work Order # _____
	3	Outlet components (e.g., orifice plates or weir plate) skewed, misaligned, or missing	Y__  N__	Repair or replace component  Work Order # _____
	4	Discharge pipe apron is eroded or scoured	Y__  N__	Restabilize the discharge riprap apron  Work Order # _____
	5	Standing water is present in the outlet structure longer than 72 hours	Y__  N__	Pump out the standing water  Work Order # _____

Note:

	For Inspector		For Maintenance Crew
Component No. Component Name	Inspection Item and Inspection Item No.	Result	Preventative / Corrective Maintenance Actions
Emergency Spillway	1	Trees or excessive vegetation present	Y__ N__ Remove trees and roots, and restore berms if necessary Work Order #_____
	2	Damaged structure	Y__ N__ Repair Work Order #_____
Miscellaneous	1	Fence: broken or eroded parts	Y__ N__ Repair or replace Work Order #_____
	2	Gate: missing gate or lock	Y__ N__ Repair or replace Work Order #_____
	3	Sign/plate: tiled, missing, or faded	Y__ N__ Repair or replace Work Order #_____
	4	Excessive or overgrown vegetation blocking access to the basin	Y__ N__ Clear, trim, or prune the vegetation to allow access for inspection and maintenance Work Order #_____
Note:			

Follow Up Items (Component No. / Inspection Item No.):

---

Associated Work Orders: # \_\_\_\_\_, # \_\_\_\_\_, # \_\_\_\_\_, # \_\_\_\_\_, # \_\_\_\_\_

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Inspector Name	Signature	Date
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Report issues to the local authority and mosquito commission as required by local ordinances and regulatory authorities, if standing water is present longer than 5 days.

File this checklist in the Maintenance Log (Appendix C) after performing maintenance.

# Preventative Maintenance Record

## Large Scale Surface Infiltration Basin

Checklist (circle one): Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. \_\_\_\_\_

Inspection Date: \_\_\_\_\_

Date of most recent rain event: \_\_\_\_\_

Rain Condition (circle one):

Drizzle / Shower / Downpour / Other \_\_\_\_\_

Ground Condition (circle one):

Dry / Moist / Ponding / Submerged / Snow accumulation

**The inspection items and preventative/corrective maintenance actions listed below represent general requirements. The design engineer and/or responsible party shall adjust the items and actions to better meet the conditions of the site, the specific design targets, and the requirements of regulatory authorities.**

# Preventative Maintenance Record

Corresponding Checklist No. \_\_\_\_\_  
 Component No. \_\_\_\_\_, Inspection Item No. \_\_\_\_\_

## Work Logs

Activities	Components	Date Completed
Sediment/debris removal <b>Sediment removal should take place when the basin is thoroughly dry</b>	Pretreatment	
	Infiltration Bed	
	Basin Embankment and Side Slopes	
	Outlet	
Vegetation removal	Pretreatment	
	Infiltration Bed	
	Basin Embankment and Side Slopes	
	Outlet	
	Emergency Spillway	

Vegetation is removed by \_\_\_\_\_ (type of equipment) with minimum disruption to the remaining vegetation.

All use of fertilizers, pesticides, mechanical treatments, and other means to ensure optimum vegetation health must not compromise the intended purpose of the stormwater management measure. The fertilizer applied is \_\_\_\_\_ (type), and \_\_\_\_\_ (quantity per usage) is applied \_\_\_\_\_ (frequency of use).

Debris, sediment, and trash are handled onsite or by \_\_\_\_\_ (contractor name) to disposal site \_\_\_\_\_. (See Appendix E)

\*If a sand layer is installed, replacement of the sand will occur according to the scheduled frequency (see Basin Configuration Targets). The next scheduled replacement is \_\_\_\_\_ (date).

Crew member: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
 (name/ signature)

Supervisor: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
 (name/ signature)

**File this Preventative Maintenance Record in the Maintenance Log (Appendix C) after performing maintenance.**

# Corrective Maintenance Record

## Large Scale Surface Infiltration Basin

Checklist (circle one): Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. \_\_\_\_\_

Inspection Date: \_\_\_\_\_

Date of most recent rain event: \_\_\_\_\_

Rain Condition (circle one):

Drizzle / Shower / Downpour / Other \_\_\_\_\_

Ground Condition (circle one):

Dry / Moist / Ponding / Submerged / Snow accumulation

The inspection items and preventative/corrective maintenance actions listed below represent general requirements. The design engineer and/or responsible party shall adjust the items and actions to better meet the conditions of the site, the specific design targets, and the requirements of regulatory authorities.

# Corrective Maintenance Record

1. Work Order # \_\_\_\_\_ Date Issued \_\_\_\_\_

2. Issue to be resolved: (e.g., orifice plate is loose and bent)

3. The issue was from Corresponding Checklist No. \_\_\_\_\_, Component No. \_\_\_\_\_, Inspection Item No \_\_\_\_\_.

4. Required Actions

Actions	Planned Date	Date Completed

5. Responsible person(s):

\_\_\_\_\_

6. Special requirements

- Time of the season or weather condition: \_\_\_\_\_
- Tools/equipment: \_\_\_\_\_
- Subcontractor (name or specific type): \_\_\_\_\_

Approved by \_\_\_\_\_ / \_\_\_\_\_ Date \_\_\_\_\_  
(name/signature)

Verification of completion by \_\_\_\_\_ / \_\_\_\_\_ Date \_\_\_\_\_  
(name/signature)

File this Corrective Maintenance Record in the Maintenance Log (Appendix C) after performing maintenance.

## **APPENDIX M**

Pervious Paving System/Subsurface Infiltration Basin Field Manual

# Pervious Paving System/Subsurface Infiltration Basin

*See Appendix A for Location Map*

Development Name: \_\_\_\_\_

Township, County: \_\_\_\_\_

Location of Pervious System 2A: N: 608,756.8 E: 480,079.5

Location Description: In driveway on Lot 12.09

Location of Pervious System 2B: N: 608,986.9; E: 480,177.8

Location Description: In driveway on Lot 12.08

Location of Pervious System 2C: N: 608,858.3; E: 480,557.9

Location Description: In driveway on Lot 12.06

Location of Pervious System 2D: N: 608,802.0; E: 480,752.9

Location Description: In driveway on Lot 12.05

Location of Pervious System 2E: N: 608,699.6 E: 481,146.5

Location Description: In driveway on Lot 12.03

Location of Pervious System 2F: N: 608,652.9; E: 481,343.9

Location Description: In driveway on Lot 12.02

## NOTE

**This Field Manual is intended to be editable and adjustable in accordance with the design of stormwater management measures, the site conditions, and the special needs of responsible party. The Engineer should supplement information and best management practice to assist the responsible party to perform maintenance.**

# **Pervious Paving System/Subsurface Infiltration Basin**

## **Functionality**

Pervious paving systems are paved areas that produce less stormwater runoff than areas paved with conventional paving. This reduction is achieved primarily through the infiltration of a greater portion of the rain falling on the area than would occur with conventional paving. This increased infiltration occurs either through the paving material itself or through void spaces between individual paving blocks known as pavers.

Pervious paving systems are divided into two general types. Each type depends primarily upon the nature of the pervious paving surface course and the presence or absence of a runoff storage bed beneath the surface course. Porous paving and permeable paver with storage bed systems treat the stormwater quality design storm runoff through storage and infiltration. Therefore, these systems have adopted TSS removal rates similar to infiltration structures. The adopted TSS removal rate for each type of pervious paving system is from 80%.

Pervious paving systems are used to reduce runoff rates and volumes from paved, on-grade surfaces such as patios, walkways, driveways, fire lanes, and parking spaces. Pervious paving systems with runoff storage beds achieve these reductions through storage of runoff and eventual infiltration into the subgrade soils. Through this infiltration process, these types of pervious paving systems also achieve stormwater quality requirements.

**Proper care and attention in the long-term maintenance of the stormwater management measure is critically important to the safety and health of the public.**

## **Type of BMP – Dry Stormwater Management Measure**

The pervious pavement system shall fully drain within 72 hours of the most recent rainfall. Standing water in excess of 72 hours is a sign of the porous pavement failure. It may also contribute to mosquito breeding and other health and safety issues. At no time shall there be ponding on the surface of the pavement.

# Basic Design Information

## Pervious Pavement System # 2A-2F

### Hydrology Design Targets

1. The system is Porous Paver
2. This system is designed with a soil permeability rate of 0.5 inches/hour (pre-construction) and \_\_\_\_\_ inches/hour (post-construction - tested on \_\_\_\_/\_\_\_\_/\_\_\_\_ (date)).
3. The design drain time is 3 hours.
4. The elevation of the seasonal high water table of this pavement area was observed on 09/06/2023 (date) and it was 2 feet below the pavement bottom surface, at EL. 123 feet.
5. The TSS removal rate is 80 %.

### Hydraulic Design Targets

1. This system is designed to infiltrate the runoff from the groundwater recharge storm, which generates varies cubic feet of runoff. The peak flow entering the system is n/a cubic feet per second.  
(If the system is designed to take runoff from larger storms)
2. The invert elevation of the overflow outlet is at EL. n/a feet (if an overflow is designed).

### System Configuration Targets

1. The system has pretreatment.
2. The depth of uniformly graded coarse aggregate in the storage bed is 3 / 4 inches.
3. The top of the system is not vegetated (for permeable pavers only).

### Critical Maintenance Features

1. Avoid sand or silt onto the porous pavement area.
2. Sweep and vacuum the porous pavement area often to prevent clog.
3. Do not apply sealant to cracks or entire surface.
- 4.

**Attach the following Disturbance Notices, if applicable to the site:**

#### Wetland Disturbance Notice:

Maintenance of this BMP may disturb a wetland area. Contact NJDEP Division of Land Use Regulation for guidance and any required permit(s) before performing maintenance.

#### Wildlife Disturbance Notice:

Maintenance of this BMP may disturb or remove vegetation in an area designated to endangered and/or threatened species. Contact NJDEP Division of Fishing and Wildlife for guidance and any required permit(s) before performing maintenance.

# **Visual Aid for Pervious Paving System/Subsurface Infiltration Basin Inspection**

Photos will be updated upon availability.

## Reference Documents

Documents to be placed in this field manual should include the following:

- As-built Drawings with Drainage Plans (Appendix F)
- Manufacturer's Operation and Maintenance Manual
- Soil Boring Logs
- Permeability Test (Pre-construction)
- Permeability Test (Post-construction)
- Landscaping Plan (Appendix G)
- Groundwater Mounding Analysis

**Attach Additional Reference Documents Here**  
*(see appendices where noted)*

# Inspection Checklist

Pervious Paving System/Subsurface Infiltration Basin # \_\_\_\_\_

Checklist (circle one): Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. \_\_\_\_\_ Inspection Date: \_\_\_\_\_

Date of most recent rain event: \_\_\_\_\_

Rain Condition (circle one):

Drizzle / Shower / Downpour / Other \_\_\_\_\_

Ground Condition (circle one):

Dry / Moist / Ponding / Submerged / Snow accumulation

The inspector should make copies of this checklist as needed.

Component No. Component Name	For Inspector		For Maintenance Crew
	Inspection Item and Inspection Item No.	Result	Preventative / Corrective Maintenance Actions
Pretreatment (Vegetative Filter Strip)	1 Poor quality vegetation, erosion, sedimentation, or debris	Y__ N__	(See Vegetative Filter Strip Field Manual)
Pavement Surface (Porous Pavement)	1 Standing water is present after the design drain time  The observed drain time is approximately _____ hours.  Excessive sediment or mud accumulation on top of the pavement	Y__ N__	Recheck to determine if there is standing water after 72 hours  If standing water is present longer than 5 days, report to mosquito commission.  If excessive sediment is present, the system may be clogged - Sweep the surface - Power wash (at 45 degree angle to the top) - Vacuum the surface - Excavate to inspect the storage bed for clogging, replace the storage bed material if it is severely clogged - Check the permeability rate of the subsoil  Work Order # _____
Pavement Surface (Porous Pavement)	2 Cracking, subsidence, spalling, or other damage to the pavement	Y__ N__	Repair according to the manufacturer's procedures and material. See Reference Documents section.  Work Order # _____
	3 Weeds or other vegetation on the porous pavement	Y__ N__	Remove the vegetation
Note:			

Component No. Component Name	For Inspector		For Maintenance Crew
	Inspection Item and Inspection Item No.	Result	Preventative / Corrective Maintenance Actions
Pavement Surface (Permeable Paver)	1	<p>Standing water is present after the design drain time</p> <p>The observed drain time is approximately _____ hours..</p>	<p>Y__</p> <p>N__</p> <p>Recheck to determine if there is standing water after 72 hours</p> <p>If standing water is present longer than 5 days, report to mosquito commission.</p> <p>If excessive sediment is present, the system may be clogged</p> <ul style="list-style-type: none"> <li>- Sweep the surface</li> <li>- Vacuum the surface</li> <li>- Excavate to inspect the storage bed for clogging, replace the storage bed material if it is severely clogged</li> <li>- Check the permeability rate of the subsoil</li> </ul> <p>Work Order # _____</p> <p>(Note: Do not power wash a permeable paver system)</p>
	2	Excessive sediment or mud accumulation on the system	<p>Y__</p> <p>N__</p> <p>Sweep and/or vacuum surface</p> <p>Replenish aggregate in joints</p> <p>Work Order # _____</p>
	3	Cracking, subsidence, spalling, deformation, uneven settlement, broken unit(s), or other damage to the pavers	<p>Y__</p> <p>N__</p> <p>Repair according to the manufacturer's procedures and material. See Reference Documents section.</p> <p>Work Order # _____</p>
	4	Loss of aggregate between joints	<p>Y__</p> <p>N__</p> <p>Replenish aggregate in joint</p> <p>Work Order # _____</p>
Note:			

Component No. Component Name	For Inspector		For Maintenance Crew
	Inspection Item and Inspection Item No.	Result	Preventative / Corrective Maintenance Actions
Vegetation (for permeable pavers with vegetation)	1 Vegetation is overgrown	Y__ N__	Remove the vegetation according to the permeable paver manufacturer's instruction  Work Order # _____
Outlet	1 Clogged overflow outlet	Y__ N__	Clear and remove sediment
	2 Discharge pipe apron is eroded or scoured	Y__ N__	Restabilize the discharge riprap apron  Work Order # _____
Note:			

**Follow Up Items (Component No. / Inspection Item No.):**

\_\_\_\_\_

**Associated Work Orders: # \_\_\_\_\_, # \_\_\_\_\_, # \_\_\_\_\_, # \_\_\_\_\_, # \_\_\_\_\_**

\_\_\_\_\_  
Inspector Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

**Report issues to the local authority and mosquito commission as required by local ordinances and regulatory authorities.**

**File this checklist in the Inspection Log in Appendix B after performing maintenance.**

# Preventative Maintenance Record

Pervious Pavement System # \_\_\_\_\_

Checklist (circle one): Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. \_\_\_\_\_ Inspection Date: \_\_\_\_\_

Date of most recent rain event: \_\_\_\_\_

Rain Condition (circle one):

Drizzle / Shower / Downpour / Other \_\_\_\_\_

Ground Condition (circle one):

Dry / Moist / Ponding / Submerged / Snow accumulation

The inspector should make copies of this Maintenance Record as needed.

# Preventative Maintenance Record

Corresponding Checklist No. \_\_\_\_\_  
 Component No. \_\_\_\_\_, Inspection Item No. \_\_\_\_\_

## Work Logs

Activities	Components	Date Completed
Sediment/debris removal	Pretreatment	
	Pavement Surface (Porous Pavement)	
	Pavement Surface (Permeable Paver)	
	Outlet	
Vegetation removal	Pretreatment	
	Pavement Surface (Permeable Paver)	
	Vegetation	

Debris, sediment, and trash are handled (onsite / by \_\_\_\_\_ (contractor name) to disposal site \_\_\_\_\_). (See Appendix E)

Crew member: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
 (name/ signature)

Supervisor: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
 (name/ signature)

**File this Preventative Maintenance Record in the Maintenance Log in Appendix C after performing maintenance.**

# Corrective Maintenance Record

Pervious Paving System/Subsurface Infiltration Basin # \_\_\_\_\_

Checklist (circle one): Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. \_\_\_\_\_ Inspection Date: \_\_\_\_\_

Date of most recent rain event: \_\_\_\_\_

Rain Condition (circle one):

Drizzle / Shower / Downpour / Other \_\_\_\_\_

Ground Condition (circle one):

Dry / Moist / Ponding / Submerged / Snow accumulation

The inspector should make copies of this Maintenance Record as needed.

## Corrective Maintenance Record

1. Work Order # \_\_\_\_\_ Date Issued \_\_\_\_\_

2. Issue to be resolved:

3. The issue was from Corresponding Checklist No. \_\_\_\_\_, Component No. \_\_\_\_\_, Inspection Item No. \_\_\_\_\_.

4. Required Actions

Actions	Planned Date	Date Completed

5. Responsible person(s):

\_\_\_\_\_

6. Special requirements

- Time of the season or weather condition: \_\_\_\_\_
- Tools/equipment: \_\_\_\_\_
- Subcontractor (name or specific type): \_\_\_\_\_

Approved by \_\_\_\_\_ / \_\_\_\_\_ Date \_\_\_\_\_  
(name/signature)

Verification of completion by \_\_\_\_\_ / \_\_\_\_\_ Date \_\_\_\_\_  
(name/signature)