

CASEY & KELLER, INC.

LAND SURVEYORS + CIVIL ENGINEERS + PLANNERS

N.J. STATE BOARD OF PROFESSIONAL ENGINEERS & LAND SURVEYORS
CERTIFICATE OF AUTHORIZATION NO. 24GA27985400

258 MAIN STREET, MILLBURN, NEW JERSEY, 07041
VOICE: 973-379-3280 FAX: 973-379-7993

Stormwater Management Measures
Maintenance Plan & Field Manuals

PROPOSED UNDERGROUND DETENTION
AND

POROUS PAVERS SYSTEM

512-516 Pleasant Valley Way, West Orange, Essex County, NJ
Block 154.06, Lots 11 & 12
Job #1240815

Party Responsible for Maintenance:
127 Mitchell Street, LLC
516 Pleasant Valley Way
West Orange, NJ 07052
Tel—347-370-2056

Prepared By:

Casey & Keller, Inc.
258 Main Street
Millburn, New Jersey 07041
973-379-3280


MICHAEL LANZAFAMA, P.E. & P.L.S.
NJ REG. # GB 30084

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Note:

This manual is based on the documents and guidance provided by the New Jersey Department of Environmental Protection (NJDEP).

Casey and Keller, Inc. (258 Main Street, Millburn, NJ, 973-379-3280) has only assembled these maintenance documents as per the guidance of the NJDEP. All responsibility and costs associated with the operation and maintenance of the stormwater management system including but not limited to the detention facilities is solely with the owner and/or his other designated managers, operators, contractors and maintenance personnel. The owner/maintainer is solely responsible for adhering to any supplier or manufacturer requirements and directions whether or not included in these documents. The owner/maintainer is also solely responsible for following all safety protocols including but not limited to the occupational safety and hazard act whether or not included in this document.

Part I- Maintenance Plan

A. List of Stormwater Management Measures

The stormwater management measures incorporated into this development are listed below. The corresponding Field Manuals for the stormwater management measures are located in Part II of the Maintenance Plan.

Type of Stormwater Management Measure	BMP No.	Location Description	State Plane Coordinates / Lat., Long.
Porous Pavers System	1	Southwest corner of the development, at the rear of the site.	40°48'30.47" 74°15'38.26"
Underground Pipe System	2	Southeast corner of the development, at the rear of the site.	40°48'29.89" 74°15'38.28"

B. LOCATION MAP (AT END OF REPORT)

C. LOCAL AGENCIES

The following agencies are listed for the owner/operator's reference:

Hudson, Essex & Passaic Soil Conservation District
15 Bloomfield Ave.
North Caldwell, New Jersey 07006
Tel.—(973) 364-0786

Essex County Engineering Department
900 Bloomfield Ave.
Verona, New Jersey 07044
Tel.—(973) 226-8506
Fax.—(973) 226-7469

Township of West Orange Engineering Department
25 Lakeside Avenue
West Orange, New Jersey 07052
Tel.—(973) 325-4160

New Jersey Department of Environmental Protection
Division of Land Use Regulation
P.O. Box 420—501 East State Street
Station Plaza 5—Second Floor
Trenton, New Jersey 08625
Tel—609-777-0454
Website— www.nj.gov/dep/landuse

D. Description of Stormwater Management Measures

Porous Pavers- BMP #1

Design storm:

- Design Purposes:
 - o Water quantity 1.25 inches in 2 hours
 - o 2-year storm (3.47 inches);
 - o 10-year storm (5.38 inches);
 - o 100-year storm (9.18 inches)
- Dimensions: 60 ft (Length) x 32 ft (Width) x 2.67 ft (Depth)

Underground 24" Pipes- BMP #2

Design storm:

- Design Purposes:
 - o Water quantity 1.25 inches in 2 hours
 - o 2-year storm (3.47 inches);
 - o 10-year storm (5.38 inches);
 - o 100-year storm (9.18 inches)
- Dimensions: 40 ft (Length) x 10 ft (Width) x 3.0 ft (Depth)

E. Preventative and Corrective Maintenance Action Plan

Preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure, including, but not limited to, repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of non-vegetated linings.

Maintenance plans should include specific preventative and corrective maintenance tasks such as removal of sediment, trash, and debris; mowing, pruning, and restoration of vegetation; restoration of eroded areas; elimination of mosquito breeding habitats; control of aquatic vegetation; and repair or replacement of damaged or deteriorated components.

Maintenance plans should include recommended corrective responses to various emergency conditions that may be encountered during and immediately after a storm event. It should be noted that if the stormwater management measure includes a Class I or II dam as defined in the NJDEP Dam Safety Standards at N.J.A.C. 7:20, an emergency action plan for the dam is also required. See N.J.A.C. 7:20-1.7(f) for more information. (Note: This project does not include a dam as part of the stormwater management system).

The maintenance plan should address the maintenance of access points to the stormwater management measures in accordance with the following:

- all components of the stormwater management measures must be readily accessible for inspection and maintenance;

- trees, shrubs, and underbrush must be pruned or trimmed as necessary to maintain access to the stormwater management measure via roadways, paths, and ramps, including paths through perimeter vegetation to permanent pools, aquatic benches, and safety ledges to allow for the inspection and control of mosquito breeding; and
- the exact limits of inspection and maintenance easements and rights-of-way should be specified on stormwater management measure plans and included in the maintenance plan.

Preventative Maintenance Actions

Frequency	Preventative Maintenance Actions	Stormwater Measures/ No.
Monthly	Sediment removal	Porous Pavers - BMP #1 Underground Pipes–BMP#2
Quarterly	Sediment removal and examine system for debris, ensure inlets are clean and other semiannual preventative maintenance actions, as per manufacturer Basin Structural Inspection Other annual preventative maintenance actions- examine inlets, access points and other system components Sweeper for Porous Pavers	Porous Pavers - BMP #1 Underground Pipes–BMP#2
Unscheduled	Quick inspection after every rain of one (1) inch or more	Porous Pavers - BMP #1 Underground Pipes–BMP#2

Corrective Maintenance Actions

Potential Corrective Maintenance Actions	Stormwater Management Measures/No.
- Debris removal - Avoid sand or silt on top of the pavers - Repair pavers without any sealant	Porous Pavers - BMP #1
- Repair/Replacement of missing or damaged trash racks - Repair/Replacement of outlet pipes or orifices	Underground Pipes–BMP#2

Inspection and Logs of All Preventative and Corrective Maintenance

The person responsible for maintenance shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders.

A maintenance plan shall include a schedule of regular inspections and tasks, and detailed logs of all preventative and corrective maintenance performed on the stormwater management measure, including all maintenance-related work orders. The person with maintenance responsibility must retain and, upon request, make available the maintenance plan and associated logs and other records for review by a public entity with administrative, health, environmental, or safety authority over the site.

The logs of all inspections, and both preventative and corrective maintenance performed should be attached in the “**Maintenance Logs and Inspection Records**” section. See Part II of the Maintenance Plan

F. Maintenance Personnel, Equipment, Tools, and Supplies

Maintenance plans should include equipment, tools, and supplies necessary to perform the various preventative and corrective maintenance tasks specified in the plan. Sources of specialized, proprietary, and nonstandard equipment, tools, and supplies will also be provided.

This section applies to both maintenance tasks that are performed by in-house personnel or are outsourced. The design engineer has to list the required amount of maintenance personnel, equipment, tools, and supplies necessary to perform the various preventative and corrective maintenance tasks specified in the plan. In addition, the sources of specialized, proprietary, and nonstandard equipment, tools and supplies for specific measures, such as manufactured treatment devices will also be listed.

Maintenance Personnel/Equipment/Tools/Supplies

Personnel/Equipment/Tools Name	Quantity
general maintenance crew	2
debris removal tools, shovels, buckets, wheel barrels, flashlight	1 set
lightweight backhoe	1
Street sweeper, leave blower	1

G. Disposal Plan

The maintenance plan includes approved disposal and recycling sites and procedures for sediment, trash, debris and other material removed from stormwater management measures during maintenance operations.

Disposal/Recycling Procedures

- There is the potential for debris or sediment to block the system’s outlet pipes and the storage pipes may fill up with water. The procedure would be to remove the obstruction to allow the pipe to drain. If necessary a sump pump could be used.
- Dewatering discharged from blocked pipes may be a contributor of sediment to surface waters during maintenance. The majority of sediment suspended in waters may easily be removed prior to leaving the site. Filters and materials are

readily available and are easy to install and maintain. Sediment Tank / Silt Control Bags are containers through which sediment laden water is pumped to trap and retain the sediment. A sediment tank or a silt control bag is to be used on sites where excavations are deep, and space is limited and where direct discharge of sediment laden water to stream and storm drainage systems is to be avoided

- The use of retractable tarps to replace the use of daily cover soil is being tested by some landfills. The avoidance of the use of daily cover soil can substantially increase the landfill space available for the waste. Use of sprayed foam material as an alternative to daily cover soil has also been suggested.

Disposal Field – Offsite Class B

FACILITY NAME/COUNTY	NJEMS PI	WASTE TYPE	PHONE	LOCATION	MUNICIPALITY
ESSEX					
Caputo Brothers	168325	BR, L, TP, TRS, TS	(973) 857- 5410	Village Park Rd.	Cedar Grove
Evergreen Recycling Solutions, LLC	499991	T, TP, TS, W	(973) 242- 3030	110 Evergreen Avenue	Newark
Silva Construction & Demolition	502757	A, BB, BR, C, T, TP, TRS, TS, W	(973) 483- 3792	100 Riverside Avenue	Newark
T. Fiore Recycling Corp.	132148	A, AS, BB, BR, C, T, TP, TRS, TS, W	(973) 465- 1818	411 Wilson Avenue	Newark

Class C

FACILITY NAME	NJEMS PI Number	WASTE TYPE	TELEPHONE	LOCATION	MUNICIPALITY
ESSEX					
Millburn Township Compost	132121	BR, L	(973) 564-7060	Kennedy Parkway	Millburn

Description of the Offsite Disposal:

Disposal may be by the township, by a private operator and conveyance entity, etc.

Class B

A = Asphalt	AM = Asphalt Millings
AS = Asphalt Shingles	BB = Brick & Block
BR = Brush	C = Concrete
CW = Creosote Wood	FW = Food Waste
G = Grass	GY = Gypsum
L = Leaves	LW = Lake Weed
PCS = Petroleum Contaminated Soil	PWR = Potable Water Residue
SS = Street Sweepings	T = Tires
TL = Tree Limbs/Tree Branches	TP = Tree Parts
TRS = Trees	TS = Tree Stumps
TT = Tree Trunks	W = Wood
WC = Wood Chips	WP = Wood Pallets

Class C

A = Asphalt	AM = Asphalt Millings
AS = Asphalt Shingles	BB = Brick & Block
BR = Brush	C = Concrete
CW = Creosote Wood	FW = Food Waste
G = Grass	GY = Gypsum
L = Leaves	LW = Lake Weed
PCS = Petroleum Contaminated Soil	PWR = Potable Water Residue
SS = Street Sweepings	T = Tires
TL = Tree Limbs/Tree Branches	TP = Tree Parts
TRS = Trees	TS = Tree Stumps
TT = Tree Trunks	W = Wood
WC = Wood Chips	WP = Wood Pallets

H. Cost Estimate

Cost estimates of maintenance tasks, including, but not limited to, sediment, trash and debris removal must be included in the maintenance plan. Below is an illustration of a cost breakdown and estimation for maintenance of stormwater management measures. The actual costs may vary widely from what is shown here with factors such as local requirements, equipment, personnel, weather, and maintenance methods and other factors.

Cost Overview

Cost Type	Cost	Details
Cost of sediment , trash, and debris removal (monthly)	\$1,160.00 / year	Table A
General cost for routine maintenance (quarterly maintenance)	\$4,040.00 / year	Table B
Unscheduled maintenance inspection after 1 inch of rain	\$300.00 / year	Table C
Total cost	\$5,500.00 / year	

Table A: General cost for routine maintenance (monthly maintenance)

Cost Type	Required Quantity	Unit Price	Cost
Personnel			
Crew	1 person/day- 3 hours each	\$ 25.00/hr	\$ 75.00
Equipment			
Mower	1	\$ 40.00	\$ 40.00
Supplies			
Working garments/ gloves/protective measures			\$30.00
Subtotal	x8	\$145.00 / monthly	
Total Cost		\$ 1,160.00 / yr	

Table B: General cost for routine maintenance (quarterly maintenance)

Cost Type	Required Quantity	Unit Price	Cost
Inspector	1 persons/day-4 hours each	\$ 165.00/hr	\$ 660.00
Personnel			
Crew	2 persons/day-3 hours each	\$ 25.00/hr	\$ 150.00
Equipment			
Mower			
Supplies			
Working garments/ gloves/protective measures			\$ 50.00
Services			
Subcontractor for disposal	1	\$ 150.00	\$ 150.00
Subtotal	x4	\$1010.00	
Total Cost		\$ 4,040.00 / yr	

Table C: General cost – unscheduled maintenance inspection after 1 inch of rain

Cost Type	Required Quantity	Unit Price	Cost
Personnel			
Crew	2 workers- 3 hours each	\$ 25.00	\$ 150.00
Subtotal	x2		\$ 150.00
Total Cost			\$ 300.000 / yr

I. Safety Measures and Procedures

Maintenance plans should include procedures and equipment required to protect the safety of inspection and maintenance personnel. 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 a 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.

Safety Regulations and Requirements

The maintenance personnel/contractor to follow the safety protocols as is already regulated and standardized in the industry, including but not limited to the requirements of the following:

- Occupational Safety & Health Act of 1970
- Administrative Procedures Act (APA)
- National Environmental Policy Act (NEPA)
- Regulatory Planning and Review (Executive Order 12866)

Safety Tools, Equipment and Garments

Safety Tools and Equipment	Location	Responsible Person/Contact #
Subcontractor certified by OSHA to do work necessary for clean up.		Owner: 127 Mitchell Street, LLC 516 Pleasant Valley Way West Orange, NJ 07052 Tel—347-370-2056
All tools and equipment necessary to be accessible by subcontractor to do the work.		OSHA Certified Subcontractor
All tools and equipment to be OSHA certified.		OSHA Certified Subcontractor
Design Engineer		Casey and Keller, Inc. 258 Main Street Millburn, NJ 973-379-3280

Qualification for Performing the Task in Special Circumstances

Stormwater Measures	Location	(OSHA) Confined-Space Entry Permit
1926.1207 Training (a) The employer must provide training to each employee whose work is regulated by this standard, at no cost to the employee, and ensure that the employee possesses the understanding, knowledge, and skills necessary for the safe performance of the duties assigned under this standard. This training must result in an understanding of the hazards in the permit space and the methods used to isolate, control or in other ways protect employees from these hazards, and for those employees not authorized to perform entry rescues, in the dangers of attempting such rescues		Obtained by Subcontractor if needed.
Personnel entering underground pipes and manholes to use safe confined space entry procedures		OSHA Certified Subcontractor

Safety Training

OSHA Training Requirements, 1926.1207 Training (d) The employer must maintain training records to show that the training required by paragraphs 1926.1207(a) through (c) of this standard has been accomplished. The training records must contain each employee's name, the name of the trainers, and the dates of training. The documentation must be available for inspection by employees and their authorized representatives, for the period of time the employee is employed by that employer.

Safety Procedures

To effectively control and prevent hazards, employers should:

- Involve workers, who often have the best understanding of the conditions that create hazards and insights into how they can be controlled.
- Identify and evaluate options for controlling hazards, using a "hierarchy of controls."

- Use a hazard control plan to guide the selection and implementation of controls, and implement controls according to the plan.
- Develop plans with measures to protect workers during emergencies and nonroutine activities.
- Evaluate the effectiveness of existing controls to determine whether they continue to provide protection, or whether different controls may be more effective. Review new technologies for their potential to be more protective, more reliable, or less costly.

Emergency Procedures

OSHA Training Requirements, 1910.146 Permit required confined spaces

(k) Rescue and emergency services (1) An employer who designates rescue and emergency services, pursuant to paragraph (d)(9) of this section, shall: (i) Evaluate a prospective rescuer's ability to respond to a rescue summons in a timely manner, considering the hazard(s) identified; Note to paragraph (k)(1)(i): What will be considered timely will vary according to the specific hazards involved in each entry. For example, §1910.134, Respiratory Protection, requires that employers provide a standby person or persons capable of immediate action to rescue employee(s) wearing respiratory protection while in work areas defined as IDLH atmospheres. (g) and (k)(1)(i) through (iv) 52 Training Requirements in OSHA Standards (ii) Evaluate a prospective rescue service's ability, in terms of proficiency with rescue-related tasks and equipment, to function appropriately while rescuing entrants from the particular permit space or types of permit spaces identified; (iii) Select a rescue team or service from those evaluated that: (A) Has the capability to reach the victim(s) within a time frame that is appropriate for the permit space hazard(s) identified; (B) Is equipped for and proficient in performing the needed rescue services; (iv) Inform each rescue team or service of the hazards they may confront when called on to perform rescue at the site.

East Orange General Hospital

300 Central Avenue
East Orange, NJ 07018-2897
(973) 672-8400
Fax: (973) 266-8488

Kessler Inst. for Rehabilitation West Orange

1199 Pleasant Valley Way
West Orange, NJ 07052
(973) 731-3600
Fax: (973) 243-6819

Newark Beth Israel Medical Center

201 Lyons Avenue at Osborne Terrace
Newark, NJ 07112
(973) 926-7000
Fax: (973) 926-8371

Saint Michael's Medical Center

111 Central Avenue

Newark, NJ 07102

(973) 877-5000

Fax: (973) 877-5672

University Hospital

150 Bergen Street

Newark, NJ 07103-1709

(973) 972-4300

Fax: (973) 972-6943

J. Training Plan and Records

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.

Training Plan

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, Chapter Nine, Ten and Eleven: Structural Stormwater Management Measures
 - Chapter 9.1 Cisterns
 - Chapter 9.2 Drywells
 - Chapter 9.3 Grass Swales
 - Chapter 9.4 Green Roofs
 - Chapter 9.5 Manufactured Treatment Devices
 - Chapter 9.6 Porous Pavers Systems
 - Chapter 9.7 Small Scale Bioretention Systems

- Chapter 9.8 Small Scale Infiltration Basins
- Chapter 9.9 Small Scale Sand Filters
- Chapter 9.10 Vegetative Filter Strips
- Chapter 10.1 Large Scale Bioretention Systems
- Chapter 10.2 Large Scale Infiltration Basins
- Chapter 10.3 Large Scale (GI) Sand Filter
- Chapter 10.4 Standard constructed Wetlands
- Chapter 10.5 Wet Ponds (GI)
- Chapter 11.1 Blue Roofs (Non-GI)
- Chapter 11.2 Extended Detention Basins (Non-GI)
- Chapter 11.3 Manufactured Treatment Device (Non-GI)
- Chapter 11.4 Sand Filters with Underdrain (Non-GI)
- Chapter 11.5 Subsurface Gravel Wetlands
- Chapter 11.6 Wet Ponds (Non-GI)

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

- Vegetation Care
Example Training Material
 - NJDEP Stormwater BMP Manual, Chapter Seven: Landscaping
- Field Manual Usage Training
Example Training Material
 - Field Manuals attached to this Maintenance Plan
 - “Pointy end of shovel goes into ground”.
- Equipment and Tools Operation Training
Example Training Material
 - Equipment or tool manufacturer’s Operation & Maintenance Manual
- Occupational Safety Training
Example Training Material
 - OSHA Training
 - Equipment or tool manufacturer’s Operation & Maintenance Manual

Training Records

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

K. Annual Evaluation of the Effectiveness of the Plan

The person responsible for maintenance shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed.

The responsible party should evaluate the effectiveness of the maintenance plan by comparing the maintenance plan with the actual performance of the maintenance. The items to evaluate may include, but not limited to,

- Whether the inspections have been performed as scheduled;
- Whether the preventive maintenance has been performed as scheduled;
- Whether the frequency of preventative maintenance needs to increase or decrease;
- Whether the planned resources were enough to perform the maintenance;
- Whether the repairs were completed on time;
- Whether the actual cost was consistent with the estimated cost;
- Whether the inspection, maintenance, and repair records have been kept.

If actual performance of those items has been deviated from the maintenance plan, the responsible party should find the causes and implement solutions in a revised maintenance plan.

Annual Evaluation Records

Evaluator(s)	Date of Evaluation	Decision
		☐ Maintain current version OR ☐ Revise current version Revision date _____ (also update the last revision date on the cover page) ☐ Requires a new deed recording (also update the last recording information on the cover page)
		☐ Maintain current version OR ☐ Revise current version Revision date _____ (also update the last revision date on the cover page) ☐ Requires a new deed recording (also update the last recording information on the cover page)
		☐ Maintain current version OR ☐ Revise current version Revision date _____ (also update the last revision date on the cover page) ☐ Requires a new deed recording (also update the last recording information on the cover page)

L. Documents

Transfer Agreement

If the maintenance plan identifies a person other than the developer as having the responsibility for maintenance, the plan shall include documentation of such person's agreement to assume this responsibility, or the developer's obligation to dedicate a stormwater management facility to such person under an applicable ordinance or regulation.

OWNER OF RECORD:

127 Mitchell Street, LLC
516 Pleasant Valley Way
West Orange, NJ 07052
Tel—347-370-2056

TRANSFER OF OWNERSHIP:

EFFECTIVE DATE OF OWNERSHIP: _____

OWNER: _____

ADDRESS: _____

PHONE: _____ FAX: _____

ALTERNATE PHONE: _____ EMAIL: _____

NOTES: _____

Deed

If the person responsible for maintenance is not a public agency, the maintenance plan and any future revisions shall be recorded upon the deed of record for each property on which the maintenance described in the maintenance plan must be undertaken.

As-Built Drawings with Drainage Plans

As-built construction plans of the stormwater management measure and copies of pertinent construction documents, such as laboratory test results, permits, and completion certificates should be included in this Maintenance Plan.

Landscaping Plan for the Stormwater Management Measures

If there is a Landscaping Plan for the stormwater management measures, it should be included in this Maintenance Plan.

Permeability Test/Infiltration Test Report

If a permeability test or infiltration test is required and available, the reports for pre-construction and post-construction testing should be included in this Maintenance Plan.

Groundwater Mounding Analysis

If a groundwater mounding analysis is required and the groundwater mounding analysis was performed, a copy of the analysis should be included in this Maintenance Plan.

Soil Boring Logs

If any soil borings were taken prior to construction, a copy of the soil boring logs should be included in this Maintenance Plan.

Local, State, Federal Permits

Local, state, or federal permits related to the stormwater management measures for this development should be included in this Maintenance Plan. See Cost Estimate Section of This Maintenance Plan for more information.

The requirement to obtain State permits depends on specific circumstances, such as, but not limited to, the specific design of the stormwater management measures, the maintenance actions, the access and disturbance, the disposal methods, the location of disposal, the method to empty a basin, the method to dredge the basin, the pollutants in the basin, the damages to the basin, and the method to repair the basin.

Check Maintenance Guidance in NJDEP Stormwater Management Website for details and links to the relevant permits and program areas (<http://www.njstormwater.org>).

Safety Regulations and Requirements

All local ordinances and state and federal regulations regarding occupational safety should be included in this Maintenance Plan.

Devices/Tools/Equipment Operation and Maintenance Manual and Warranties

Maintenance, repair, and replacement instructions for specialized, proprietary, and nonstandard equipment, tools, supplies, manufacturers' product instructions, and user manuals should be included in this Maintenance Plan.

Part II- Field Manuals

Preventative and corrective maintenance shall be performed to maintain the function of stormwater management measures, including repair or replacement of the structure; removal of sediment, debris or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; repair or replacement of non-vegetated linings, and removal of rodent/wildlife and repair/restoration to damaged affected areas caused by them.

1. **INLETS**—In parking lots and driveways, rain (and melting snow) will travel across the ground as runoff to be collected into an underground piping system, by first dropping through metal grates into concrete boxes called inlets. The inlets have specially designed grates to prevent large pieces of debris and trash from getting into the inlet and pipes. All structures should be periodically inspected for debris and clean as needed.
2. **PIPES**—The runoff travels underground through the pipes to a point of discharge. These pipes are usually made of reinforced concrete (RCP), high density polypropylene (HDPeP—usually black plastic), or polyvinyl chloride (PVC—usually white plastic). Most pipes are of solid wall construction to transport runoff water or to be used to temporarily detain water as part of the detention system. Other pipes may be perforated, which can be used to let water drain out through the holes into the surrounding ground or water from the ground can flow into the pipes depending on soils, ground conditions, elevations, and so forth. Pipes should be periodically inspected for debris and clean as needed. Also the pipe system should be flush periodically in order to keep the sediment from accumulating inside the pipes.
3. **DISCHARGE CONTROL STRUCTURES**—The pipes and basins then flow to the “heart” of the stormwater management system—the discharge control structure. Runoff water from underground pipes or directly from the basin flows into this box-like device, which may have trash racks and top grates to further eliminate any debris that may have made it all the way through the system to this point. The box (usually of precast concrete or concrete block construction) may have an additional shorter wall inside with a small opening at the bottom. The small opening in the concrete wall (often covered with a metal plate with a hole in it) is designed to slow down the rate of water leaving the developed site in order to prevent flooding downstream properties. In larger rainstorms the runoff water will flow into the basin and pipes faster than it can flow out and will begin backing up creating a temporary pond. In even larger storms the runoff water may flow over the top of the discharge control structure grates—however, this is all accounted for in the design calculations. The discharge structure should be checked for debris and maintain cleaned so it can function properly.

4. **GUTTERS/DOWNSPOUTS/SPLASH PADS**—Under state and local stormwater regulations, runoff water flowing off of roofs is considered “clean” and does not necessarily have to be directed to the detention system which maybe basins, ponds, drywells, underground pipes and so forth. In general, allowing the water to flow through areas of dense vegetation (woodlands, meadows, and so forth, but not basic lawn areas) is sufficient to clean the water even further. In order for the water to flow clean, the system should be maintain clean.
5. **DRYWELLS**- In general these are large concrete cylinders (similar to concrete manholes) with numerous openings in the side walls and open bottoms. The concrete cylinders are placed below ground and are almost always surrounded by several feet of clean crushed stone beneath the cylinder and along its side walls. A plastic type filter cloth (called a “geotextiles” is placed between the stone and the surrounding soil to keep soil particles from getting into the spaces between the stones. Runoff water is piped to the drywells where it first slows into the concrete cylinders. If the inflow of water is large enough, the openings in the stone will fill with water and the cylinder will fill with water. This rising water will pass through the openings in the cylinder grove walls into the surrounding stone. If the inflow is sufficiently large the concrete cylinder may fill to the top and spill out through an overflow pipe or bubble out through a grate covering the top of the cylinder.

PART III—Gutters and Leaders

As part of good maintenance procedure, it is recommended that the gutters and leaders be periodically inspected and cleaned. The building drainage system should particularly be inspected during the autumn when falling and blowing leaves and miscellaneous materials can easily clog drain pipes, plug downspouts, and cover inlet grates. Gutters and leaders should also be inspected in the springtime for debris, correct pitch, loose connections, and other various problems that may have occurred over the winter. It is also suggested that the system be examined whenever large storms are predicted.

Debris removed from the drainage system should be examined for reuse. That is, it can be separated into trash, recyclables, and organic matter. Organic materials such as leaves and twigs could possibly be composted if there is sufficient room at the site for such activity.

Equipment for gutter and leader cleaning could include ladders, “grab” poles, rakes, plumber’s snakes, and garden hoses. Heavy duty rubber or leather work gloves, non-slip work shoes, and protective eyewear are also recommended.

PART IV—Inlets

Inlets and discharge control devices should be inspected after several storms to ensure that they are functioning properly and that there is no erosion or debris problems developing. Source of sediment contamination should be identified and controlled when native soil is exposed or erosion channels are present. Inspect for sediment and debris buildup. Sediment buildup exceeding 2 inches in depth or that begins to constrict the flow path should be removed. The Inlet control devices should particularly be inspected during the autumn when falling and blowing leaves and miscellaneous materials can easily clog drain pipes, plug downspouts, and cover inlet grates. Clean out leaves, trash, debris, etc.

Maintain records of all inspections and maintenance activity. Include estimate of sediment and/or debris removed. Indicate sediment and/or debris disposal methods.

PART V - Porous Pavers System BMP#1

Porous Pavers System Overview

Functionality

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

Porous pavers systems are divided into two general types. Each type depends primarily upon the nature of the Porous pavers surface course and the presence or absence of a runoff storage bed beneath the surface course. Porous pavers 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 Porous pavers system is from 80%.

Porous pavers systems are used to reduce runoff rates and volumes from paved, on-grade surfaces such as patios, walkways, driveways, fire lanes, and parking spaces. Porous pavers 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 Porous pavers 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 Porous pavers 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 pavers 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 pavers.

Basic Design Information

This section shall be filled out by the design engineer.

Hydrology Design Targets

1. The system is porous pavers with storage bed.
2. This system is designed with a soil permeability rate of 5.8 inches/hour (pre-construction) and 2.9 inches/hour (post-construction).
3. The design drain time is 24.10 hours.
4. The elevation of the seasonal high water table of this pavers area was observed on 06-30-2025 and it was more than 7 feet below the pavers bottom surface, at EL. 413.50 feet.
5. The TSS removal rate is 80%.

Hydraulic Design Targets

1. This system is designed to infiltrate the runoff from the (Water Quality Design Storm / groundwater recharge storm), which generates 0.168 acre feet of runoff. The peak flow entering the system is 0.45 cubic feet per second.
2. The invert elevation of the overflow outlet is at EL. 414.50 feet.

System Configuration Targets

1. The system has no pretreatment.
2. The depth of uniformly graded coarse aggregate in the storage bed is 32 inches.
3. The top of the system is for permeable pavers only.

Critical Maintenance Features

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

PART VI – Underground Pipe System BMP#2

Functionality

The underground detention system is a subsurface storage facility that receives and temporarily stores stormwater runoff from roofs of structures, parking lots, and grass areas. Discharge of the stored runoff from the underground system occurs through gravity by a discharge structure. An underground system may be either a structural chamber and/or an excavated pit filled with aggregate. The system may also be a set of pipes surrounded in stone or a set of pipes without stone. Due to its storage capacity, an underground system may be used to reduce the total stormwater quantity design storm runoff volume that a site would ordinarily discharge to downstream stormwater management facilities.

Underground systems can be used to reduce the increased volume of stormwater runoff caused by a whole site. Underground systems 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. Underground systems 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

An underground system 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.

Underground systems can detain, infiltrate, and recharge stormwater runoff; however, underground systems are not designed to treat stormwater runoff for water quality; therefore, no TSS removal is assigned to the system. Basic Design Information

Hydrology Design Targets

- This underground system is designed with a subsoil permeability rate of 5.8 inches/hour (pre-construction) and 2.9 inches/hour (post-construction).
- The design drain time is 24.30 hours.
- The elevation of the seasonal high water table of this system was observed to be 7 feet below the systems bottom surface, at EL.410.50 feet.

Hydraulic Design Targets

- This underground system is designed to infiltrate the runoff from the (Water Quality Design Storm / groundwater recharge storm), which generates 0.005 acre feet of runoff.

Underground System Configuration Targets

- The dimensions of the system are 10' x 40' x 3' deep.
- The perforated pipes are 24 inches in diameter. The perforations are 3/8" inches in diameter and are arranged 6 inches center to center, 6 perforations per row, and 48 rows of perforations per 20' pipe.
- The stone fill uses crushed stone 3/4 inches in diameter.

Critical Maintenance Features

- Check downspout and bypass frequently and remove leaves and other debris immediately.
- Check inspection port for excessive sediment.

PART VII - Inspection Checklist / Maintenance Actions

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

Checklist No. _____

Inspection Date: _____

Preventative Maintenance

Date of most recent rain event: _____

Frequency Circle One

Quarterly

Annual

Rain Event

Rain Condition (circle one):

Drizzle / Shower / Downpour / Other _____

Ground Condition (circle one):

Dry / Moist / Ponding / Submerged / Snow accumulation

Component No. Component Name	For Inspector		For Maintenance Crew
	Inspection Item and Inspection Item No.	Inspected	Preventative / Corrective Maintenance Actions Comments
Porous Pavers BMP#1	1	Standing water observed. Y__ N__	.
	2	Excessive sediment, mud or debris accumulation on top of the pavement Y__ N__	
	3	Cracking, subsidence, spalling, or other damage to the pavement Y__ N__	
	4	Weeds or other vegetation on the porous pavement Y__ N__	
	5	Y__ N__	

Inspector Name

Signature

Date

	For Inspector		For Maintenance Crew	
Component No. Component Name	Inspection Item and Inspection Item No.	Inspected	Preventative / Corrective Maintenance Actions Comments	
Underground Pipe System BMP#2	1	Man holes broken or in disrepair Y__ N__		
	2	Pipes have standing water after the design drain time Sediment and standing water observed. Y__ N__		
	3	Excessive sediment or debris present in the inspection port Y__ N__		
	4	Little or no flow into the system Y__ N__		
	5	Downspout or Overflow pipe is clogged Y__ N__		
	6	Odor present Y__ N__		
	7	Overflow from the top of the discharge structure Y__ N__		
	8	Storm Collection System Y__ N__		
	9		Y__ N__	
Note:				

Inspector Name

Signature

Date