CIVIL ENGINEERING
ENVIRONMENTAL
SURVEYING
LANDSCAPE ARCHITECTURE
GEOTECHNICAL

STORMWATER MANAGEMENT MAINTENANCE MANUAL

Windsor Oaks Subdivision
Block 34; Lot 4
West Windsor Township
Robbinsville Township
Mercer County
New Jersey

Prepared For:
Pin Oak Builders, LLC
45 Roxy Avenue
Edison, New Jersey 08820
Revised Date: 07/10/2020

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TABLE OF CONTENTS

PART I - MAINTENANCE

PART II - FIELD MANUALS AND MAINTENANCE RECORDS

PARTY RESPONSIBLE FOR MAINTENANCE:

Pink Oak Builders, LLC
Address:45 Roxy Avenue, Edison, NJ 08820
Contact Person(s): _____
Phone: _____

This plan is recorded in

Deed Book # _____ Page # ____ with _____ County Clerk on Date _____

Last Revised on 07 / 09 / 2020

PART I - MAINTENANCE PLAN

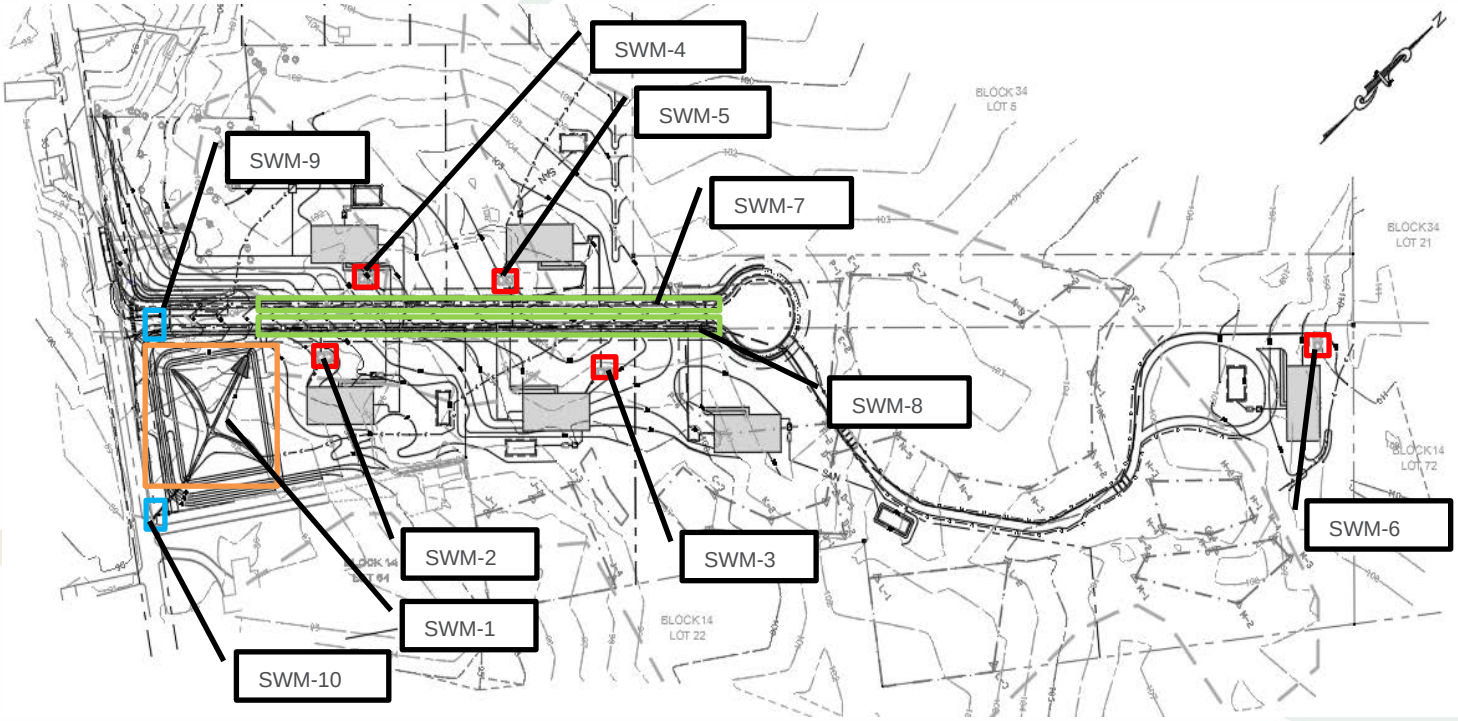
1. LIST OF STORMWATER MANAGEMENT MEASURES

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 Plan Coordinates / Lat., Long.
Extended Detention Basin	SWM-1	Southern Section of Site	N(Y): 516,261.87 E(X): 465,638.97
Drywell	SWM-2	On Each Proposed Lot	N(Y): 516,452.74 E(X): 465,668.86
Drywell	SWM-3	On Each Proposed Lot	N(Y): 516,772.51 E(X): 465,941.23
Drywell	SWM-4	On Each Proposed Lot	N(Y): 516,561.69 E(X): 465,621.48
Drywell	SWM-5	On Each Proposed Lot	N(Y): 516,729.38 E(X): 465,752.91
Drywell	SWM-6	On Each Proposed Lot	N(Y): 517,647.38 E(X): 466,561.85
Grass Swale	SWM-7	Along the Sides of Proposed Road	N(Y): 516,663.82 E(X): 465,739.78
Grass Swale	SWM-8	Along the Sides of Proposed Road	N(Y): 516,623.62 E(X): 465,749.24
Manufactured SWM-Treatment Device	SWM-9	Front Section of Site	N(Y): 516,253.30 E(X): 465,476.57
Manufactured SWM-Treatment Device	SWM-10	Front Section of Site	N(Y): 516,152.00 E(X): 465,675.88
Storm Sewer System	SWM-11	Throughout Site	Throughout Site

2. LOCATION MAP

The map below shows the proposed site improvements and stormwater management measures for the subject property.



BMP No.	Type of Stormwater Management Measure
SWM-1	Extended Detention Basin
SWM-2	Drywell
SWM-3	Drywell
SWM-4	Drywell
SWM-5	Drywell
SWM-6	Drywell
SWM-7	Grass Swale
SWM-8	Grass Swale
SWM-9	Manufactured Treatment Device
SWM-10	Manufactured Treatment Device
SWM-11	Storm Sewer System

3. DESCRIPTION OF STORMWATER MANAGEMENT MEASURES

Extended Detention Basin (SWM-1)
Design storm:

- Design Purposes:
    - Water Quality, Quantity, and Recharge
    - 1.25 inches in 2 hours;
      Max WSE: 93.48
      Drain Time: 17.30 hours
      Detention Time: 10 Hours
    - 2-year storm in 24 hours (3.32 inches)
      Max WSE: 94.15
      Drain Time: 47.35 hours
    - 10-year storm in 24 hours (5.07 inches)
      Max WSE: 94.60
      Drain Time: 48.85 hours
    - 100-year storm in 24 hours (8.52 inches)
      Max WSE: 95.47
      Drain Time: 50.05 hours
- Dimensions: 165’ (Length) x 126’ (Width) x 4.4’ (Depth)

Drywells (SWM-2 – SWM-5)
Design storm:

- Design Purposes:
    - Water Quality, Quantity, and Recharge
    - 1.25 inches in 2 hours;
      Max WSE: 92.53
      Drain Time: 41.50 hours
    - 2-year storm in 24 hours (3.32 inches)
      Max WSE: 92.56
      Drain Time: 25.20 hours
    - 10-year storm in 24 hours (5.07 inches)
      Max WSE: 92.64
      Drain Time: 25.30 hours
    - 100-year storm in 24 hours (8.52 inches)
      Max WSE: 92.82
      Drain Time: 25.45 hours
- Dimensions: 12’ (Length) x 12’ (Width) x 8.38’ (Depth)

Grass Swales (SWM-6 – SWM-7)
Design storm:

- Design Purposes:
  - Stormwater Conveyance
  - 100-year storm in 24 hours (8.52 inches)
  - Flow Capacity: 111.24 CFS
  - Velocity: 1.09 CFS
- Dimensions: 4 '(Bottom Width) x 500' (Length) x 0.5' (Depth)
- Slope: 2.5 % (Longitudinal), 25% (Side Slopes)

Manufactured Treatment Devices (SWM-8 – SWM-9)
Design storm:

- Design Purposes:
  - Water Quality
  - 1.25 inches in 2 hours;
  - Design Total Suspended Solids Removal Rate: 80%
- Dimensions: 6' (Length) x 4' (Width) x 6.1' (Depth)

4. PREVENTATIVE AND CORRECTIVE MAINTENANCE ACTION PLAN

Preventative Maintenance Actions

Frequency	Preventative Maintenance Actions	Stormwater Measures/ No.
Monthly	Trim grass and vegetation to maintain a neat and orderly appearance. Inspect for unwanted tree and shrub growth. Inspect bottom of basins and remove sediment and debris as required.	SWM-1
Quarterly	Inspect inflow points, manholes, cleanouts, structure interior, and structural integrity. Trash and debris should be removed immediately as required. Also applies after major storms in excess of 1 inch of rainfall.	SWM-1
Bi-Annually	Inspect vegetation for health, density and desired diversity. If 50% of the vegetation is substandard the entire basin shall be re-vegetated. Inspect vegetated areas for evidence of scour and erosion, repair and necessary. Inspect all components for cracking subsidence erosion, deterioration. Make necessary repairs or corrective action.	SWM-1
Quarterly	Inspect all components for clogging and excessive debris and sediment accumulation. Sediment	SWM-2 to SWM-6

	removal should take place when the drywell is thoroughly dry. Trash and debris should be removed immediately and disposed of at the proper sites.	
Annually	Inspect components for cracking, subsidence, spalling, erosion and deterioration	SWM-7 – SWM-8
Bi-Annually	Inspect components expected to receive or trap debris for clogging.	SWM-7 – SWM-8
Seasonal	Grass within the swale should be maintained to fall within the required grass height range of 3 to 6 inches. Moving and trimming should be performed on a regular schedule based on site conditions. Grass clippings should be removed or maintain small to avoid the facilitation of mosquito breeding.	SWM-7 – SWM-8
Quarterly	Remove weeds and other unwanted vegetation growth in accordance with the landscape plan included with the development drainage for the project site.	SWM-1, SWM-7 – SWM-8
Annually	Inspect outflow for evidence of scour and erosion, repair as necessary. Inspect for unwanted vegetative growth. Inspect all structural components for cracking, subsidence, spalling, erosion, and deterioration. Make necessary repairs or corrective action. Inspect discharge location (overflow) and ensure stability of grate and remove trash/debris.	SWM-1, SWM-7 – SWM-8
Quarterly	Inspect each storm water inlet for trash, sediment and debris. Remove as necessary. Ensure roof leader drains are functioning properly.	SWM-11
Annually	Inspect inlet for structural integrity and make any necessary repairs as required.	SWM-11
Unscheduled	Quick inspection after every 1" rain	SWM-1
All Times	No heavy equipment all be permitted on the basin surface.	SWM-1 – SWM-8

Corrective Maintenance Actions

Potential Corrective Maintenance Actions	**Stormwater Management Measures/No.**
<u>Repair/ Replacement of outlet structure</u>: The maximum 'allotted time' for a detention system to drain is 72 hours. If at any time the systems fail to drain within the 'allotted time', immediate corrective measures shall be employed.	SWM-1

- The roof leader drain collection system should be inspected semi-annually to confirm proper operation during storm conditions; check for clogging.

- Vegetation health should be inspected biweekly during the first growing season or until vegetation is established. Once, established, these inspections should be continued at least twice annually. Vegetative cover should be maintained at 85%, and if the area vegetation has greater than 50% damage, the area should be reestablished in accordance with the original specifications. All vegetation deficiencies should be addressed without the use of fertilizers and pesticides whenever possible. At least one full growing season should have elapsed prior to strip functioning as part of the stormwater management system.

5. INSPECTION AND LOGS OF ALL PREVENTATIVE AND CORRECTIVE MAINTENANCE

Inspection Checklists in the Field Manual for the stormwater management measures on this site include:

- Surface Detention Basin Field Manual
- Grass Swale Field Manual
- Drywell Field Manual
- Manufactured Treatment Device Field Manual

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

6. MAINTENANCE PERSONNEL, EQUIPMENT, TOOLS, AND SUPPLIES

Maintenance Personnel/Equipment/Tools/Supplies

Personnel/Equipment/Tools Name	Quantity
Access cover lifting tool	2
Gloves and safety shoes	2 per employee
Flashlight	2
Safety Cones and/or caution tape	10
Hard Hats and Safety Glasses	1 per employee
Proper Safety Equipment for confined space entry	As needed

Specialized, proprietary or nonstandard equipment, tools and supplies, if applicable

Name of the specialized, proprietary or nonstandard equipment, tools and supplies	Source
SWM-9 & SWM-10: Hydro International Up-Flow Filter Water Quality Systems	Note: Refer to manufacturer's maintenance manual per specific requirements

7. COST ESTIMATE

General cost for routine maintenance (e.g., quarterly maintenance)

Cost Type	Cost Per Task	No. Time/Year	No. of Components	Total Yearly Cost Estimate
Trim and Mow Grass and Vegetation in stormwater management areas	**$400**	**8**	**1**	**$3,200**
Inspect basin outlets control structures, inlets, manufactured treatment device, and cleanouts for trash, debris, and sediment (clean/remove as necessary)	**$250**	**4**	**6**	**$6,000**
Inspect roof leaders and gutters for trash, debris, and sediment (clean/remove as necessary)	**$150**	**Approx. 12**	**1**	**$1,800**

General cost – unscheduled maintenance in a year (e.g., inspection after 1 inch of rain)

The frequency of large storm events that require routine maintenance varies from year to year. Therefore, it is possible that the estimated quantities of tasks shown above will vary. In these cases, the 'Cost per Task' column may be used to estimate single unscheduled tasks.

8. SAFETY MEASURES AND PROCEDURES

As per NJDEP BMP Manual, procedures and equipment are required to protect the safety of inspection and maintenance personnel.

Qualification for Performing Maintenance in Special Circumstances

Maintenance tasks that require the entry of inlet/outlet structures, manholes, or MTDs are required to be performed by qualified personnel that have the necessary Occupational Safety and Health Administration (OSHA) Confined-Space Entry training and certification.

Safety Procedures

Observational monitoring maintenance of the underground chamber system and Pervious asphalt sections shall be carried out with the following safety precautions:

- Check for hazardous odors or gasses
- Check for sharp or dangerous debris or trash
- Wear all recommended safety equipment
- Establish traffic cones/signs/caution tape around work area

Maintenance personnel shall follow all other procedures required by local, state, and federal laws and regulations, and the safety instructions provided by the equipment or device manufacturers.

Training Plan and Records

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.

Safety Training

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: Structural Stormwater Management Measures
        - Chapter 9.1 Detention Systems
        - Chapter 9.2 Constructed Wetlands
        - Chapter 9.3 Dry Wells
        - Chapter 9.4 Extended Detention Basins
        - Chapter 9.5 Infiltration Basins
        - Chapter 9.6 Manufactured Treatment Devices
        - Chapter 9.7 Pervious Paving Systems
        - Chapter 9.8 Rooftop Vegetated Cover
        - Chapter 9.9 Sand Filters

- Chapter 9.10 Vegetative Filter Strips
- Chapter 9.11 Wet Ponds
- Chapter 9.12 Grass Swales
- Chapter 9.13 Subsurface Gravel Wetlands

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 (provides information on vegetation and landscaping for stormwater management measures)
  - Other
- Field Manual Usage Training. Example Training Material:
  - Field Manuals attached to this Maintenance Plan
  - Other
- Equipment and Tools Operation Training. Example Training Material:
  - Equipment or tool manufacturer's Operation & Maintenance Manual
  - Other
- Occupational Safety Training. Example Training Material:
  - OSHA Training
  - Equipment or tool manufacturer's Operation & Maintenance Manual
  - Other

9. TRAINING PLAN AND RECORDS

I. 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: Structural Stormwater Management Measures
      - Chapter 9.4 Extended Detention Basins
      - Chapter 9.7 Pervious Paving Systems
      - Chapter 9.10 Vegetative Filter Strips
      - Chapter 9.12 Grass Swales

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 *(provides information on vegetation and landscaping for stormwater management measures)*
  - Other

- Field Manual Usage Training

  Example Training Material
  - Field Manuals attached to this Maintenance Plan
  - Other

- Equipment and Tools Operation Training

  Example Training Material
  - Equipment or tool manufacturer's Operation & Maintenance Manual
  - Other

- Occupational Safety Training

  Example Training Material
  - OSHA Training
  - Equipment or tool manufacturer's Operation & Maintenance Manual
  - Other

II. Training Records

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

10. ANNUAL EVALUATION OF THE EFFECTIVENESS OF THE PLAN

Per N.J.A.C. 7:8-5.8(g), the Responsible Party designated at the beginning of this report shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan as needed.

The Responsible Party shall evaluate the effectiveness of the maintenance plan by comparing the maintenance plan with the actual performance of the maintenance. The following items shall be evaluated at a minimum:

- Whether inspections have been performed as scheduled;
- Whether 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 repairs were completed on time;
- Whether the actual cost was consistent with the estimated cost;
- Whether inspection, maintenance, and repair records have been kept.

If actual performance of these items has deviated from the maintenance plan, the Responsible Party should find the causes and implement solutions in a revised maintenance plan.

The following shall be provided to the township engineer prior to April 1st of each year:

- All inspection reports of prior years,
- Description of all maintenance performed on all components of SWM system during prior year.

Annual Evaluation Records

Evaluator(s)	Date of Evaluation	Decision

11. DOCUMENTS

The following documents shall be attached prior to issuance of Certificate of Occupancy:

Transfer Agreement
As per N.J.A.C. 7:8-5.8(b), 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.

Deed
As per N.J.A.C. 7:8-5.8(d), 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 per NJDEP BMP Manual Ch. 8 (Feb., 2004), 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
As per NJDEP BMP Manual Ch. 8 (Feb., 2004), if there is a Landscaping Plan for the stormwater management measures, it should be included in this Maintenance Plan.

Permeability Test/Infiltration Test Report
As per NJDEP BMP Manual Ch. 8 (Feb., 2004), 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
As per NJDEP BMP Manual Ch. 8 (Feb., 2004), 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
As per NJDEP BMP Manual Ch.8 (Feb., 2004), 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
As per NJDEP BMP Manual Ch. 8 (Feb., 2004), 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
As per NJDEP BMP Manual Ch. 8 (Feb., 2004), 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
As per NJDEP BMP Manual Ch. 8 (Feb., 2004), 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

Attachment of Field Manuals for Stormwater Management Measures on this Site

As per N.J.A.C. 7:8-5.8(b)&(e), 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.

Each Field Manual attached to this Maintenance Plan is a separate document pertaining to one specific stormwater management measure, and should be used by inspections and maintenance crews in order to carry out the maintenance work required by N.J.A.C. 7:8-5.8(e). Design engineers should prepare the field manuals in accordance with the design of each measure and the specific requirements of the site. See the sample field manuals for further guidance.

Field Manual for Surface Detention Basin (SWM-1)
Field Manual for Drywell (SWM-2)
Field Manual for Drywell (SWM-3)
Field Manual for Drywell (SWM-4)
Field Manual for Drywell (SWM-5)
Field Manual for Drywell (SWM-6)
Field Manual for Grass Swale (SWM-7)
Field Manual for Grass Swale (SWM-8)
Field Manual for Manufactured Treatment Device (SWM-9)
Field Manual for Manufactured Treatment Device (SWM-10)

Maintenance Logs and Inspection Records

As per N.J.A.C. 7:8-5.8(e), preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure(s), including 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.

As per N.J.A.C. 7:8-5.8(f), 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.

The responsible party shall maintain a record of all maintenance actions performed, including:

- Inspection checklists from each performed inspection
- Preventative maintenance logs
- Corrective maintenance logs, including work orders
- Other maintenance records

SURFACE DETENTION BASIN FIELD MANUAL

Development Name: Windsor Oak Subdivision

Township, County: West Windsor Township, Robbinsville Township, Mercer County, New Jersey

Location of Basin: E(X): 465,638.97; N(Y):516,261.87

Location Description: Southern Section of Site, along the easterly side of Edinburg Windsor Road (County Road #641)

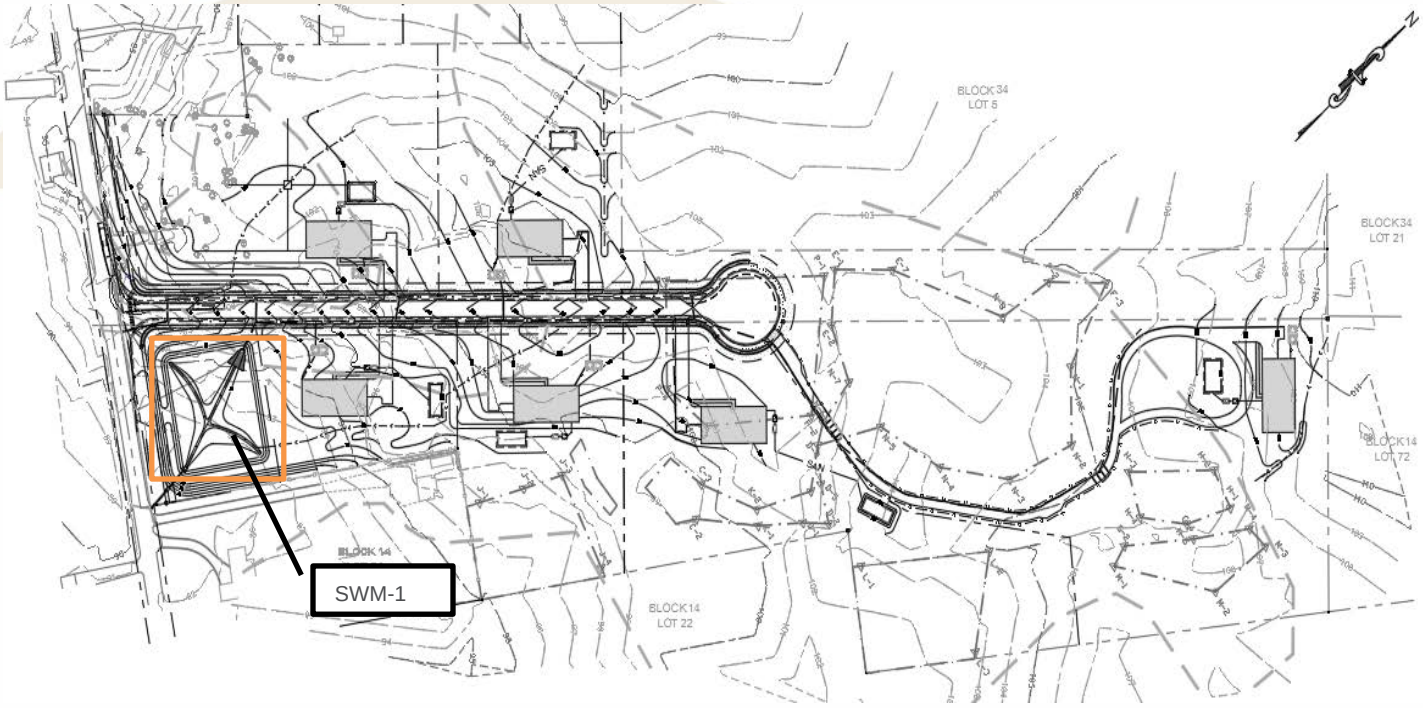


TABLE OF CONTENTS

1. SURFACE DETENTION BASIN OVERVIEW

Functionality
Detention basin is a stormwater management facility that temporarily stores and attenuates stormwater runoff.

Type of BMP – Dry Basin / Detention Only
A detention basin is a type of **dry** basin. This detention basin is designed for **detention only** and is **not** designed to infiltrate runoff; therefore, the basin may not be completely dry after the **design detention time** (see the Hydrology Design Targets in the Basic Design Information section). However, 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. Therefore, all dry basins must fully drain within 72 hours of the most recent rainfall. The design drain time shall be closely monitored to ensure potential failure is recognized early. **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.**

For the field manual for an extended detention basin with infiltration, please see: Surface Infiltration – Extended Detention Basin Field Manual.

2. BASIN DESIGN INFORMATION

Hydrology Design Targets:

1. The **design detention time** of this basin is 10.0 hours (Water Quality Storm)
2. The **design drain time** is 50.05 hours (100- Year Storm).
3. The elevation of the seasonal high-water table of this basin was observed on 01/08/2018 and it was 4.5 feet below the basin bottom surface, at EL. 88.55 feet.
4. This basin will be discharged to a point in the south section of the property, close to the transition area.
5.

Hydraulic Design Targets:

1. Design Parameters

	Water Quality Design Storm	2-year storm	10-year storm	100-year storm
Rainfall Depth (inches)	1.25" in 2 hours	3.32" in 24 hours	5.07" in 24 hours	8.52" in 24 hours
Runoff Volume (cubic feet)	8,320	32,590	61,041	127,001
Peak Flow Rate (cfs)	0.185	0.710	3.844	17.58
Water Surface Elevation (feet)	93.48	94.15	94.60	95.47

2. The emergency spillway is at EL. 95.50 feet.

Basin Configuration Targets:

1. Pretreatment is provided by grass swales (SWM-7 and SWM-8).
2. The outflow of the basin is then treated by a manufactured treatment device (SWM-10).
3. Outlet Information:

Outlet Description	Outlet Type	Orifice Size / Weir Length	Invert Elevation
Outlet #1	Orifice	2.5"	92.10
Outlet #2	Rectangular Weir	4'	94.50
Outlet #3	Riser Weir	4' x 4'	95.30
Outlet #4	Culvert / Discharge Pipe	24"	90.0'

4. The basin is not lined.

Critical Maintenance Features:

1. Grass clippings shall be collected from the basin and properly disposed.
2. Trash racks and discharge outlet shall be cleaned frequently.
3. Remove sediment in low flow channel.

3. VISUAL AID FOR DRY TYPE STORMWATER BASIN INSPECTION

Issue:	**The inlet is not properly drained, assuming it has not rained within 72 hours.**
Corrective Action:	**Clear and remove sediment. Check whether the water table is at or above the bottom of the forebay. Also check the permeability of the underlying soil, if necessary.**
Preventative Action:	**Routine inspections and removal of sediment from the forebay.**

Issue: The Inflow pipe is clogged by sediment and vegetation.

Corrective Action: Clear and remove sediment and unwanted vegetation.

Preventative Action: Routine inspection and removal of sediment and unwanted vegetation.

Issue: The Inflow pipe is entirely clogged by sediment and trees.

Corrective Action: Clear and remove sediment and trees.

Preventative Action: Routine inspection & removal of sediment and unwanted vegetation.

Courtesy of NJDOT

Issue:	**The excessive sediment in inflow pipe (shown above) might be caused by a blockage of flow to the basin due to excessive vegetation and overgrown trees.**
Corrective Action:	**Clear and remove trees and vegetation. If necessary, re-grade the bottom slope to ensure the flow properly spreads over the basin bottom.**
Preventative Action:	**Routine inspection and removal of sediment and unwanted vegetation.**

Courtesy of NJDOT

Issue:	**Eroded inflow apron.**
Corrective Action:	**Repair apron.**
Preventative Action:	**Routine inspection and rehabilitation, if necessary.**

Courtesy of NJDOT

Issue: The vegetation loss and the blackish soil may indicate frequent inundation.

Corrective Action: Check the permeability rate of the soil and the water table elevation. Replace the soil if necessary.

Preventative Action: Routine inspection and tilling/aeration, if necessary.

Issue: The low flow channel has excessive accumulation of sediment and debris. The outflow orifice is clogged by a trash bag and debris. Note that there is no trash rack installed.

Corrective Action: Check the permeability rate of the soil and the water table elevation. Replace the soil if necessary.

Preventative Action: Routine inspection and cleaning.

Issue:	**Trash rack is damaged.**
Corrective Action:	**Repair the trash rack.**
Preventative Action:	**Routine inspection, especially after large storm events. Tighten any loose bolts and repair structural flaws.**

A well-maintained detention basin

4. REFERENCE DOCUMENTS

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

- As-built Drawings with Drainage Plans
- Soil Boring Logs
- Landscaping Plan

5. INSPECTION CHECKLIST / MAINTENANCE ACTIONS

Detention 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
B Basin Bed	1	Observed detention time is longer than the design detention time. Observed detention time is approximately _____ hours.	Y__ N__	Check if outlets are clogged, see section E-Outlet of this checklist
	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 Check if the low flow outlet is clogged
	3	Excessive sediment, silt, or trash accumulation on low flow channel (if applicable)	Y__ N__	Clean pretreatment system Remove silt, sediment, and trash
	4	Excessive sediment, silt, or trash accumulation on basin bed	Y__ N__	Clean pretreatment system Remove silt, sediment, and trash
	5	Erosion or channelization is present	Y__ N__	Check whether the flow bypass or diversion device is clogged Re-grade the basin bed Work Order # _____
	6	Damaged low flow channel or scouring under the channel	Y__ N__	Check for new runoff source to the drainage area Repair or replace low flow channel Work Order # _____
Note:				

	For Inspector			For Maintenance Crew
B Basin Bed	7	Animal burrows/rodents are present	Y__ N__	Pest control Work Order # _____
	8	Liner of the basin is visible and/or is damaged (if applicable)	Y__ N__	Repair or replace liner Work Order #_____
C 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
D 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__	Check for excessive overland runoff flow through the embankment. Check for any sink hole development Direct the overland runoff to the forebay or pretreatment area Re-stabilize the bank Work Order # _____
E 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__	Re-stabilize 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
F 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 #_____
G 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 #_____

	For Inspector	For Maintenance Crew
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 Maintenance Log after performing maintenance.

6. PREVENTATIVE MAINTENANCE RECORD

Corresponding Checklist No. _____
Component No._____, Inspection Item No._____

Work Logs

Activities	Components	Date Completed
Sediment/debris removal **Sediment removal should be taken place when the basin is thoroughly dry**	B – Basin Bed	
	D – Basin Embankment and Side Slopes	
	E – Outlet	
Vegetation removal	B – Basin Bed	
	D – Basin Embankment and Side Slopes	
	E – Outlet	
	F – Emergency Spillway	

Vegetation is removed by _____ 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 _____, and _____ is applied _____.

Debris, sediment, and trash are handled (onsite / by _____ (contractor name) to disposal site _____). (See Part I: Maintenance Plan – Disposal Plan Section)

Crew member: _____/_____ **Date:** _____
(name/ signature)

Supervisor: _____/_____ **Date:** _____
(name/ signature)

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

7. CORRECTIVE MAINTENANCE RECORD

1. **Work Order # _____**
   Date Issued _____

2. **Issue to be resolved**:

3. The issue was from **Corresponding Checklist ___, Component No. ___, Inspection Item No. ___.**

4. **Required Actions**

Actions	Planned Date	Date Completed

5. **Responsible person(s):**

_____

6. **Special requirements**
   - o Time of the season or weather condition _____
   - o Tools/equipment: _____
   - o 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 after performing maintenance.

DRY WELL FIELD MANUAL

Development Name: Windsor Oak Subdivision

Township, County: West Windsor Township, Robbinsville Township, Mercer County, New Jersey

Location of Basin: E(X): 465,668.86; N(Y):516,452.74

Location Description: On Proposed Lot, along the easterly side of proposed road “A”

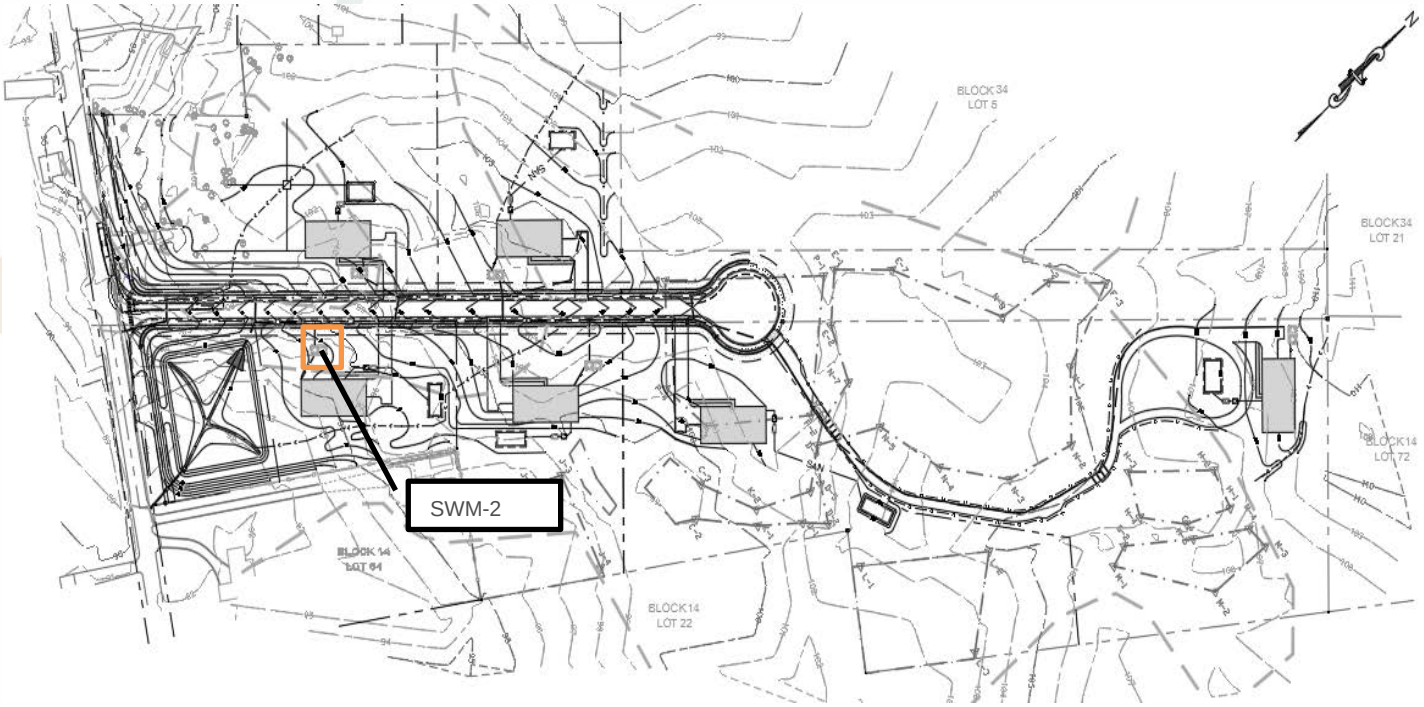


TABLE OF CONTENTS

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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.

2. BASIN DESIGN INFORMATION

Hydrology Design Targets:

1. This dry well is designed with a subsoil permeability rate 0.5 inches/hour (preconstruction) and _____ inches/hour (post-construction), tested on ____/_____/_____.
2. The **design drain time** is 41.50 hours (water quality storm)
3. The elevation of the seasonal high-water table of this basin was observed on 01/08/2018 and it was 4.5 feet below the basin bottom surface, at EL. 88.55 feet.
4. This basin will be discharged to a point in the south section of the property, close to the transition area.
5.

Hydraulic Design Targets:

1. This dry well is designed to infiltrate the runoff from the water quality design storm, which generates 402 cubic feet of runoff.

Dry Well Configuration Targets

1. The dimensions of the dry well are 12 ‘ (wide) x 12’ (length) x 8.38’ (Deep)
2. The perforated pipe is 6 inches in diameter. The perforations are 0.313 inches in diameter are arranged as 3 perforations with an angle of separation of 120 degrees, placed every 1 feet center to center.
3. The stone fill uses crushed stone 3/4 inches 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. REFERENCE DOCUMENTS

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

- As-built Drawings with Drainage Plans
- Soil Boring Logs
- Landscaping Plan

-

Attach Reference Documents Her

4. INSPECTION CHECKLIST / MAINTENANCE ACTIONS

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 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**
A 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

	For Inspector			For Maintenance Crew
Component No. Component Name	**Inspection Item and Inspection Item No.**		**Result**	**Preventative / Corrective Maintenance Actions**
Note:				
A Dry Well	4	Little or no flow into the dry well	Y__ N__	Check whether the gutter, inlet pipe, downspout, or flow diverter is clogged 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

	For Inspector			For Maintenance Crew
Component No. Component Name	**Inspection Item and Inspection Item No.**		**Result**	**Preventative / Corrective Maintenance Actions**
	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 Maintenance Log after performing maintenance.

5. 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.**	A- Dry Well	

Debris, sediment, and trash are handled (onsite / by _____ (contractor name) to disposal site _____). (See Part I: Maintenance Plan – Disposal Plan Section)

Crew member: _____/_____ **Date:** _____
(name/ signature)

Supervisor: _____/_____ **Date:** _____
(name/ signature)

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

6. CORRECTIVE MAINTENANCE RECORD

1. **Work Order # _____**
   Date Issued _____

2. **Issue to be resolved**:

3. The issue was from **Corresponding Checklist ___, Component No. ___, Inspection Item No. ___.**

4. **Required Actions**

Actions	Planned Date	Date Completed

5. **Responsible person(s):**

_____

6. **Special requirements**
   - o Time of the season or weather condition _____
   - o Tools/equipment: _____
   - o 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 after performing maintenance.

DRY WELL FIELD MANUAL

Development Name: Windsor Oak Subdivision

Township, County: West Windsor Township, Robbinsville Township, Mercer County, New Jersey

Location of Basin: E(X): 465,941.23; N(Y): 516,772.51

Location Description: On Proposed Lot, along the easterly side of proposed road “A”

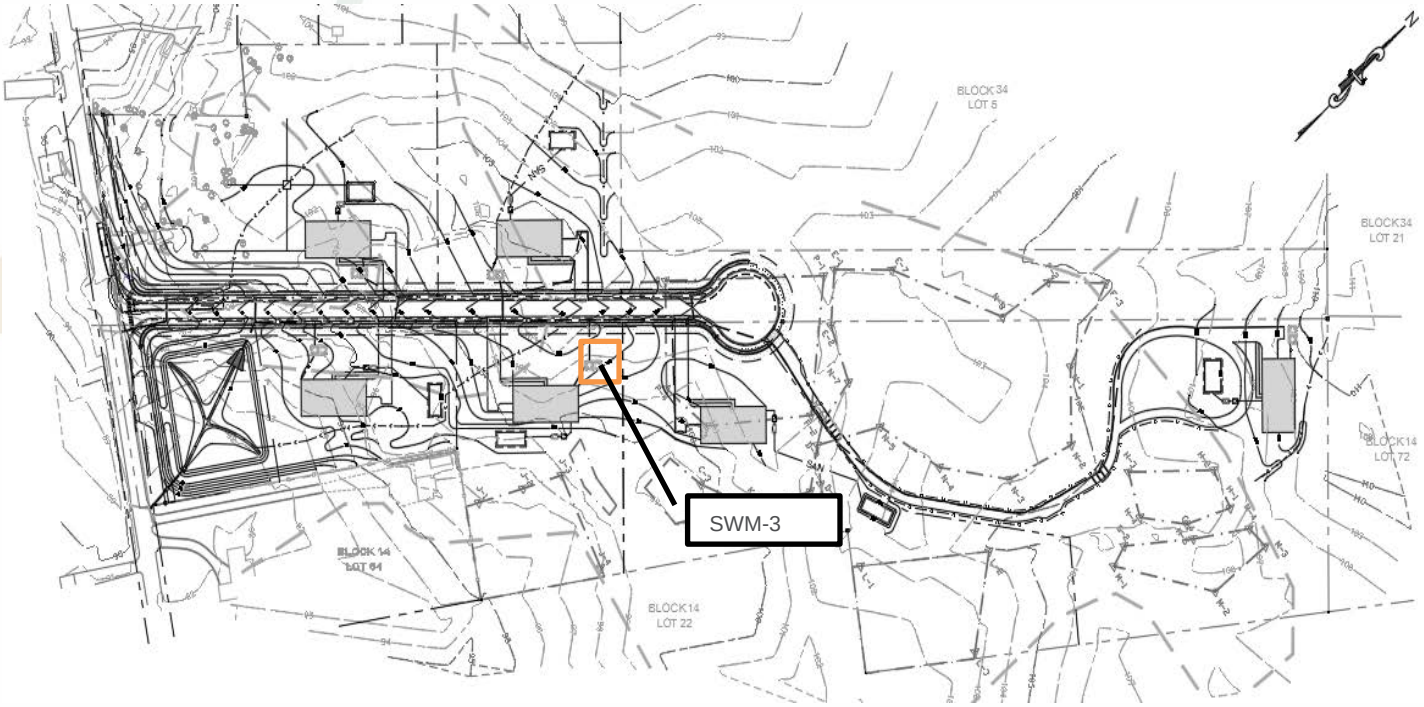

TABLE OF CONTENTS

1. 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.

2. BASIN DESIGN INFORMATION

Hydrology Design Targets:

1. This dry well is designed with a subsoil permeability rate 0.5 inches/hour (preconstruction) and _____ inches/hour (post-construction), tested on ____/_____/_____.
2. The **design drain time** is 41.50 hours (water quality storm)
3. The elevation of the seasonal high-water table of this basin was observed on 01/08/2018 and it was 4.5 feet below the basin bottom surface, at EL. 88.55 feet.
4. This basin will be discharged to a point in the south section of the property, close to the transition area.
5.

Hydraulic Design Targets:

1. This dry well is designed to infiltrate the runoff from the water quality design storm, which generates 402 cubic feet of runoff.

Dry Well Configuration Targets

1. The dimensions of the dry well are 12 ‘ (wide) x 12’ (length) x 8.38’ (Deep)
2. The perforated pipe is 6 inches in diameter. The perforations are 0.313 inches in diameter are arranged as 3 perforations with an angle of separation of 120 degrees, placed every 1 feet center to center.
3. The stone fill uses crushed stone 3/4 inches 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. REFERENCE DOCUMENTS

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

- As-built Drawings with Drainage Plans
- Soil Boring Logs
- Landscaping Plan

-

Attach Reference Documents Her

4. INSPECTION CHECKLIST / MAINTENANCE ACTIONS

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 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**
A 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

	For Inspector			For Maintenance Crew
Component No. Component Name	**Inspection Item and Inspection Item No.**		**Result**	**Preventative / Corrective Maintenance Actions**
Note:				
A Dry Well	4	Little or no flow into the dry well	Y__ N__	Check whether the gutter, inlet pipe, downspout, or flow diverter is clogged 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

	For Inspector			For Maintenance Crew
Component No. Component Name	**Inspection Item and Inspection Item No.**		**Result**	**Preventative / Corrective Maintenance Actions**
	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 Maintenance Log after performing maintenance.

5. 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.**	A- Dry Well	

Debris, sediment, and trash are handled (onsite / by _____ (contractor name) to disposal site _____). (See Part I: Maintenance Plan – Disposal Plan Section)

Crew member: _____/_____ **Date:** _____
(name/ signature)

Supervisor: _____/_____ **Date:** _____
(name/ signature)

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

6. CORRECTIVE MAINTENANCE RECORD

1. **Work Order # _____**
   Date Issued _____

2. **Issue to be resolved**:

3. The issue was from **Corresponding Checklist ___, Component No. ___, Inspection Item No. ___.**

4. **Required Actions**

Actions	Planned Date	Date Completed

5. **Responsible person(s):**

_____

6. **Special requirements**
   - o Time of the season or weather condition _____
   - o Tools/equipment: _____
   - o 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 after performing maintenance.

DRY WELL FIELD MANUAL

Development Name: Windsor Oak Subdivision

Township, County: West Windsor Township, Robbinsville Township, Mercer County, New Jersey

Location of Basin: E(X): 465,621.48; N(Y): 516,561.69

Location Description: On Proposed Lot, along the westerly side of proposed road “A”

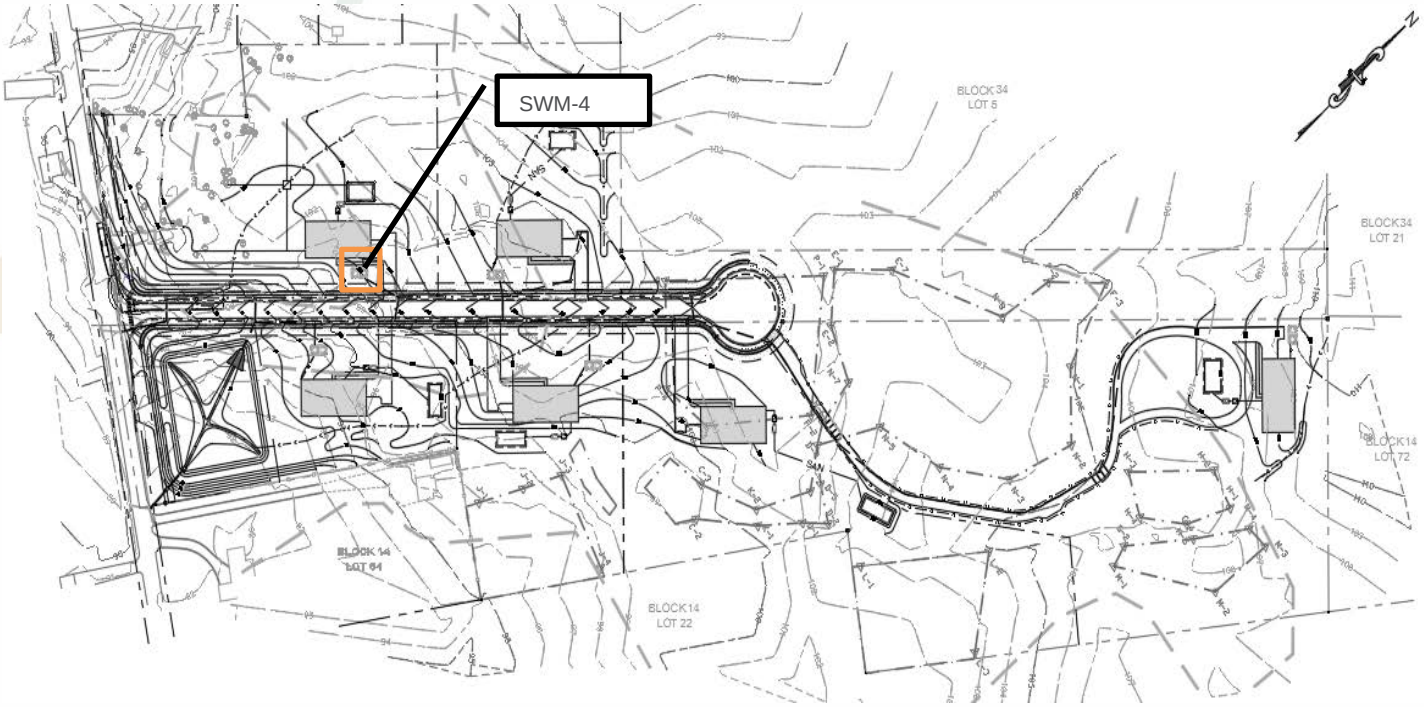

TABLE OF CONTENTS

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2. BASIN DESIGN INFORMATION

Hydrology Design Targets:

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2. The **design drain time** is 41.50 hours (water quality storm)
3. The elevation of the seasonal high-water table of this basin was observed on 01/08/2018 and it was 4.5 feet below the basin bottom surface, at EL. 88.55 feet.
4. This basin will be discharged to a point in the south section of the property, close to the transition area.
5.

Hydraulic Design Targets:

1. This dry well is designed to infiltrate the runoff from the water quality design storm, which generates 402 cubic feet of runoff.

Dry Well Configuration Targets

1. The dimensions of the dry well are 12 ‘ (wide) x 12’ (length) x 8.38’ (Deep)
2. The perforated pipe is 6 inches in diameter. The perforations are 0.313 inches in diameter are arranged as 3 perforations with an angle of separation of 120 degrees, placed every 1 feet center to center.
3. The stone fill uses crushed stone 3/4 inches 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. REFERENCE DOCUMENTS

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

- As-built Drawings with Drainage Plans
- Soil Boring Logs
- Landscaping Plan

-

Attach Reference Documents Her

4. INSPECTION CHECKLIST / MAINTENANCE ACTIONS

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 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**
A 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

	For Inspector			For Maintenance Crew
Component No. Component Name	**Inspection Item and Inspection Item No.**		**Result**	**Preventative / Corrective Maintenance Actions**
Note:				
A Dry Well	4	Little or no flow into the dry well	Y__ N__	Check whether the gutter, inlet pipe, downspout, or flow diverter is clogged 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

	For Inspector			For Maintenance Crew
Component No. Component Name	**Inspection Item and Inspection Item No.**		**Result**	**Preventative / Corrective Maintenance Actions**
	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 Maintenance Log after performing maintenance.

5. 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.**	A- Dry Well	

Debris, sediment, and trash are handled (onsite / by _____ (contractor name) to disposal site _____). (See Part I: Maintenance Plan – Disposal Plan Section)

Crew member: _____/_____ **Date:** _____
(name/ signature)

Supervisor: _____/_____ **Date:** _____
(name/ signature)

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

6. CORRECTIVE MAINTENANCE RECORD

1. **Work Order # _____**
   Date Issued _____

2. **Issue to be resolved**:

3. The issue was from **Corresponding Checklist ___, Component No. ___, Inspection Item No. ___.**

4. **Required Actions**

Actions	Planned Date	Date Completed

5. **Responsible person(s):**

_____

6. **Special requirements**
   - o Time of the season or weather condition _____
   - o Tools/equipment: _____
   - o 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 after performing maintenance.

DRY WELL FIELD MANUAL

Development Name: Windsor Oak Subdivision

Township, County: West Windsor Township, Robbinsville Township, Mercer County, New Jersey

Location of Basin: E(X): 465,752.91; N(Y): 516,729.38

Location Description: On Proposed Lot, along the westerly side of proposed road “A”

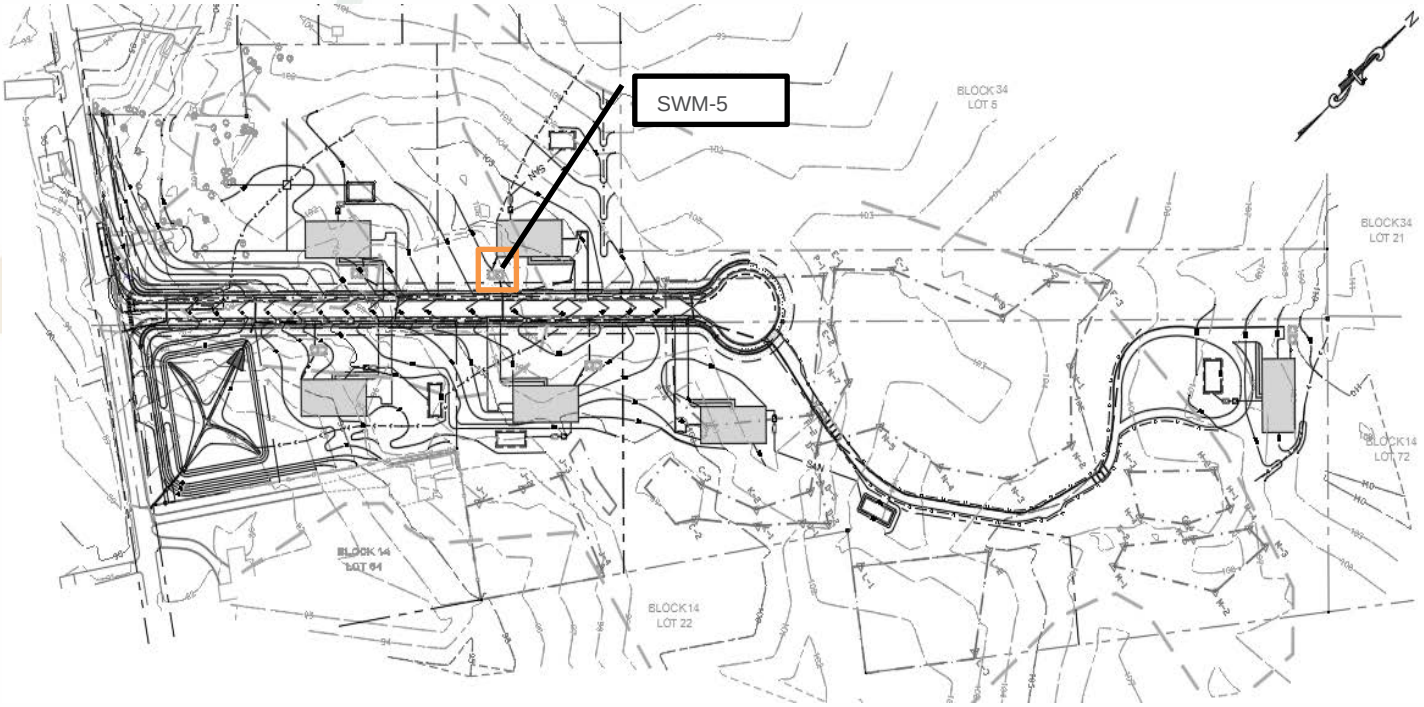

TABLE OF CONTENTS

1. 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.

2. BASIN DESIGN INFORMATION

Hydrology Design Targets:

1. This dry well is designed with a subsoil permeability rate 0.5 inches/hour (preconstruction) and _____ inches/hour (post-construction), tested on ____/_____/_____.
2. The **design drain time** is 41.50 hours (water quality storm)
3. The elevation of the seasonal high-water table of this basin was observed on 01/08/2018 and it was 4.5 feet below the basin bottom surface, at EL. 88.55 feet.
4. This basin will be discharged to a point in the south section of the property, close to the transition area.
5.

Hydraulic Design Targets:

1. This dry well is designed to infiltrate the runoff from the water quality design storm, which generates 402 cubic feet of runoff.

Dry Well Configuration Targets

1. The dimensions of the dry well are 12 ‘ (wide) x 12’ (length) x 8.38’ (Deep)
2. The perforated pipe is 6 inches in diameter. The perforations are 0.313 inches in diameter are arranged as 3 perforations with an angle of separation of 120 degrees, placed every 1 feet center to center.
3. The stone fill uses crushed stone 3/4 inches 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. REFERENCE DOCUMENTS

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

- As-built Drawings with Drainage Plans
- Soil Boring Logs
- Landscaping Plan

-

Attach Reference Documents Her

4. INSPECTION CHECKLIST / MAINTENANCE ACTIONS

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 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**
A 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

	For Inspector			For Maintenance Crew
Component No. Component Name	**Inspection Item and Inspection Item No.**		**Result**	**Preventative / Corrective Maintenance Actions**
Note:				
A Dry Well	4	Little or no flow into the dry well	Y__ N__	Check whether the gutter, inlet pipe, downspout, or flow diverter is clogged 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

	For Inspector			For Maintenance Crew
Component No. Component Name	**Inspection Item and Inspection Item No.**		**Result**	**Preventative / Corrective Maintenance Actions**
	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 Maintenance Log after performing maintenance.

5. 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.**	A- Dry Well	

Debris, sediment, and trash are handled (onsite / by _____ (contractor name) to disposal site _____). (See Part I: Maintenance Plan – Disposal Plan Section)

Crew member: _____/_____ **Date:** _____
(name/ signature)

Supervisor: _____/_____ **Date:** _____
(name/ signature)

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

6. CORRECTIVE MAINTENANCE RECORD

1. **Work Order # _____**
   Date Issued _____

2. **Issue to be resolved**:

3. The issue was from **Corresponding Checklist ___, Component No. ___, Inspection Item No. ___.**

4. **Required Actions**

Actions	Planned Date	Date Completed

5. **Responsible person(s):**

_____

6. **Special requirements**
   - o Time of the season or weather condition _____
   - o Tools/equipment: _____
   - o 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 after performing maintenance.

DRY WELL FIELD MANUAL

Development Name: Windsor Oak Subdivision

Township, County: West Windsor Township, Robbinsville Township, Mercer County, New Jersey

Location of Basin: E(X): 466,561.85; N(Y): 517,647.38

Location Description: On Proposed Lot, along the westerly side of proposed road “A”

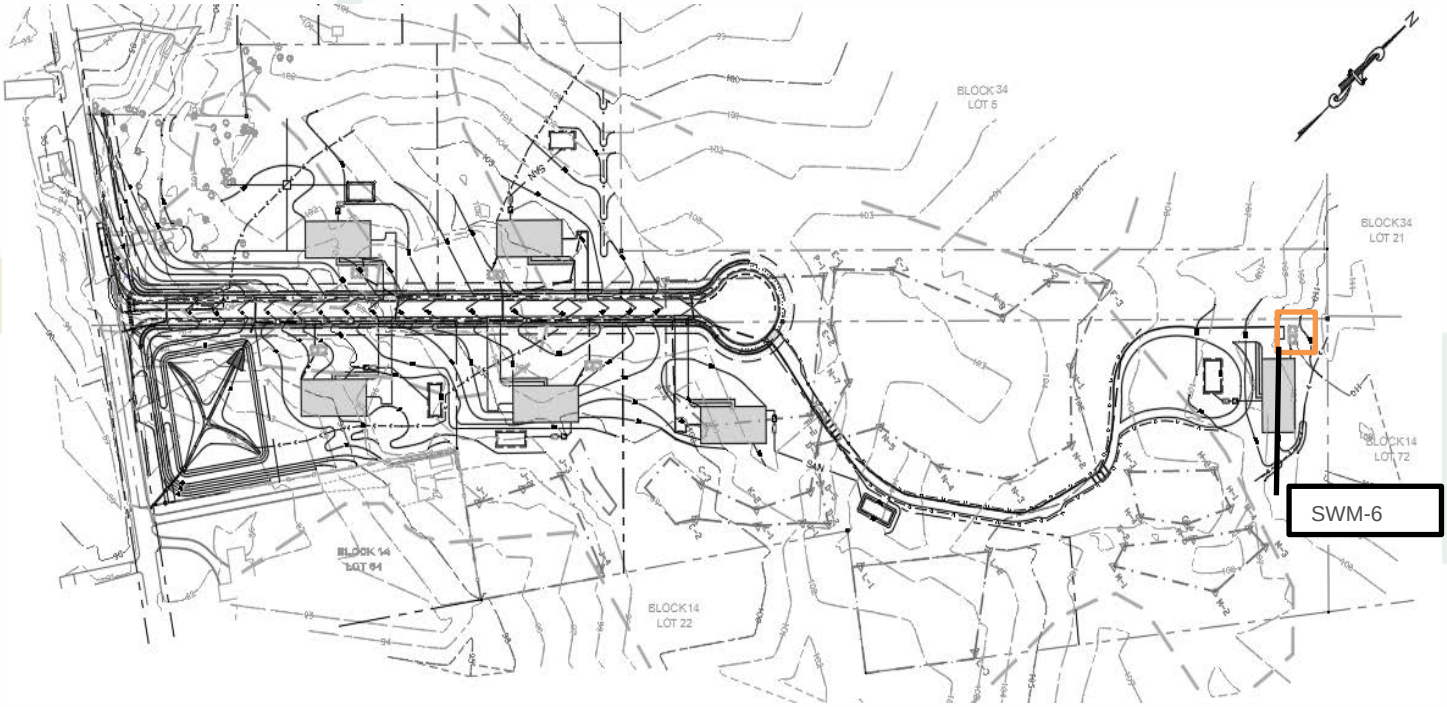

TABLE OF CONTENTS

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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.

2. BASIN DESIGN INFORMATION

Hydrology Design Targets:

1. This dry well is designed with a subsoil permeability rate 0.5 inches/hour (preconstruction) and _____ inches/hour (post-construction), tested on ____/_____/_____.
2. The **design drain time** is 41.50 hours (water quality storm)
3. The elevation of the seasonal high-water table of this basin was observed on 01/08/2018 and it was 4.5 feet below the basin bottom surface, at EL. 88.55 feet.
4. This basin will be discharged to a point in the south section of the property, close to the transition area.
5.

Hydraulic Design Targets:

1. This dry well is designed to infiltrate the runoff from the water quality design storm, which generates 402 cubic feet of runoff.

Dry Well Configuration Targets

1. The dimensions of the dry well are 12 ‘ (wide) x 12’ (length) x 8.38’ (Deep)
2. The perforated pipe is 6 inches in diameter. The perforations are 0.313 inches in diameter are arranged as 3 perforations with an angle of separation of 120 degrees, placed every 1 feet center to center.
3. The stone fill uses crushed stone 3/4 inches 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. REFERENCE DOCUMENTS

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

- As-built Drawings with Drainage Plans
- Soil Boring Logs
- Landscaping Plan

-

Attach Reference Documents Her

4. INSPECTION CHECKLIST / MAINTENANCE ACTIONS

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 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**
A 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

	For Inspector			For Maintenance Crew
Component No. Component Name	**Inspection Item and Inspection Item No.**		**Result**	**Preventative / Corrective Maintenance Actions**
Note:				
A Dry Well	4	Little or no flow into the dry well	Y__ N__	Check whether the gutter, inlet pipe, downspout, or flow diverter is clogged 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

	For Inspector			For Maintenance Crew
Component No. Component Name	**Inspection Item and Inspection Item No.**		**Result**	**Preventative / Corrective Maintenance Actions**
	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 Maintenance Log after performing maintenance.

5. 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.**	A- Dry Well	

Debris, sediment, and trash are handled (onsite / by _____ (contractor name) to disposal site _____). (See Part I: Maintenance Plan – Disposal Plan Section)

Crew member: _____/_____ **Date:** _____
(name/ signature)

Supervisor: _____/_____ **Date:** _____
(name/ signature)

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

6. CORRECTIVE MAINTENANCE RECORD

1. **Work Order # _____**
   Date Issued _____

2. **Issue to be resolved**:

3. The issue was from **Corresponding Checklist ___, Component No. ___, Inspection Item No. ___.**

4. **Required Actions**

Actions	Planned Date	Date Completed

5. **Responsible person(s):**

_____

6. **Special requirements**
   - o Time of the season or weather condition _____
   - o Tools/equipment: _____
   - o 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 after performing maintenance.

GRASS SWALE FIELD MANUAL

Development Name: Windsor Oak Subdivision

Township, County: West Windsor Township, Robbinsville Township, Mercer County, New Jersey

Location of Basin: E(X): 465,739.78; N(Y): 516,663.82

Location Description: On the westerly side of Road “A”

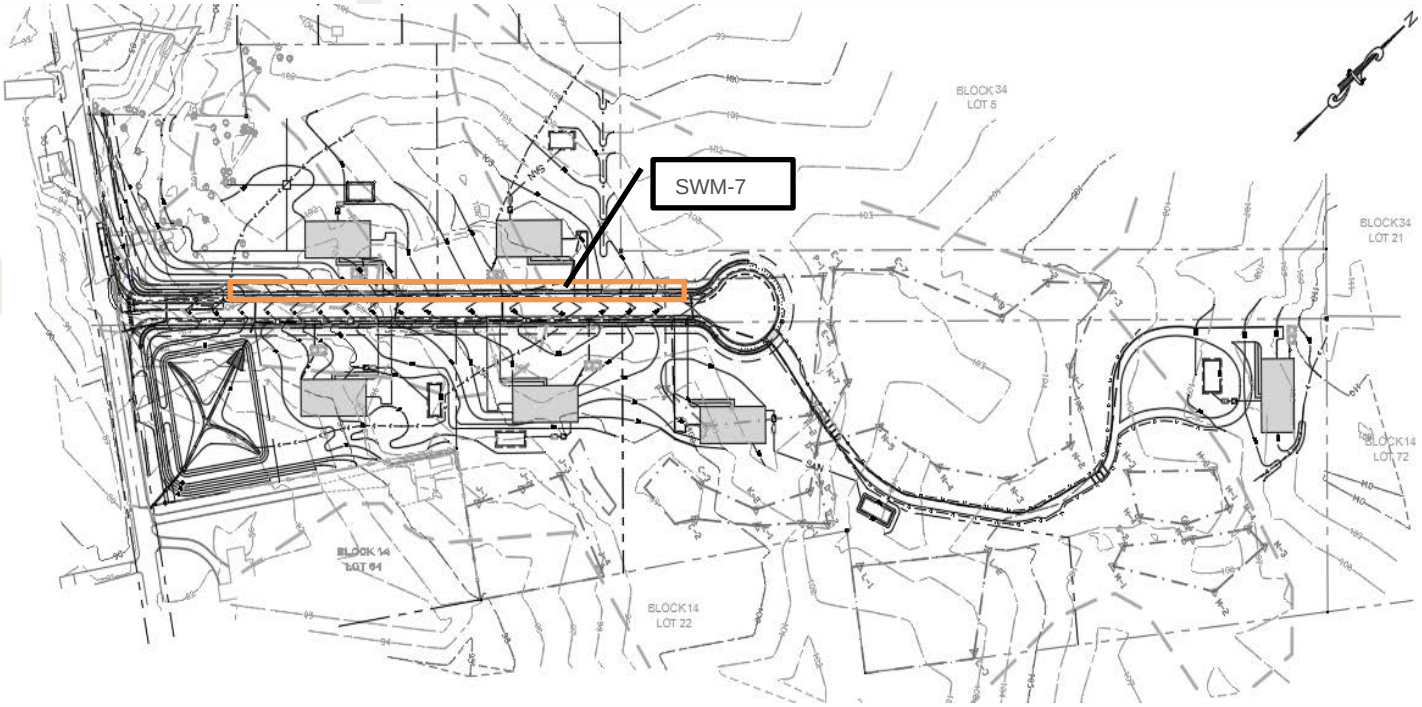

TABLE OF CONTENTS


E&LP

1. GRASS SWALE OVERVIEW

Functionality
A grass swale is a stable, parabolic or trapezoidal channel that is lined with turf; it is used to improve water quality and convey stormwater runoff. Grass swales do not rely on the permeability of the underlying soil for pollutant removal; instead, pollutants are removed by settling and filtration through the grass. The maximum total suspended solids (TSS) removal rate is 50%.

Low velocities and shallow depths of runoff generated from the Water Quality Design Storm allow for particulate settling; while at the same time, the blades of grass in the swale filter the suspended solids. Because these pollutant removal mechanisms do not rely on infiltration into the subsoil, soil permeability is not a design consideration. For larger storm events, the swale can be designed to convey stormwater downstream.

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
A grass swale 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. For the design drain time, please see **Hydrology Design Targets** in the **Basic Design Information** section.

2. BASIC DESIGN INFORMATION

Hydrology Design Targets:

1. The maximum design storm is 100-year storm, which corresponds to 8.52 inches of rain in 24 hours.
2. The design drain time is less than 72 hours.
3. The design total suspended solids removal rate is 50%.
4. The elevation of the seasonal high-water table of areas surrounding the grass swale was observed on 01/08/2018. From the values obtained, a seasonal high-water at a depth of ± 3.5 feet below the swale bottom is expected.

Hydraulic Design Targets:

1. The maximum design velocity in the grass swale is 1.09 feet per second.

Configuration Targets:

1. The longitude slope of the gras swale is 2.5%.
2. The side slope is 4:1.
3. The length of the grass swale is 500 feet.
4. The swale shape is trapezoidal, with a bottom width of 4 feet.
5. The grass height must be established and maintained between 6 to 8 inches.

Critical Maintenance Features:

1. Grass clippings shall be collected from the basin and properly disposed.
2. Check any eroded or channelized area, repair it immediately. Find the cause of erosion or channelization and find solution to prevent it.
3. Remove dead vegetation to keep grass swale aesthetic.

3. VISUAL AID FOR VEGETATIVE FILTER STRIP/GRASS SWALE MAINTENANCE

Courtesy of NJDOT

Issue:	**The inlet to the swale is clogged by sediment and leaves.**
Corrective Action:	**Clear and remove sediment and leaves.**
Preventative Action:	**Preventative Action: Routine inspection and removal of sediment and debris.**

Courtesy of NJDOT

Issue: **The sediment and loss of vegetation indicates that the swale is not well drained.**

Corrective Action:

Re-grade the swale to ensure proper drainage. A steeper slope may be required but must ensure that all criteria are met for the required TSS removal rate (see the Basic Design Information section). Revegetate the grass swale.

Preventative Action:

Routine inspection and monitoring of the drain time.

Issue: **The loss of vegetation on the side slope and bottom likely indicate an erosion problem.**

Corrective Action:

Re-grade the side slope of the swale to prevent erosion and revegetate the swale.

Preventative Action:

Routine inspection and reseeding the soil before the erosion becomes severe.

Issue: **Overgrown and dead vegetation in swale.**

Corrective Action: **Remove dead and unwanted vegetation.**

Preventative Action: **Routine inspection and mowing of the swale.**

Issue: **Ponding in swale. Vegetation loss due to long term inundation.**

Corrective Action: **Clear the outlet structure, clear the sediment in the outlet, and re-grade the swale to allow for better drainage.**

Preventative Action: **Routine inspection and cleaning.**

Courtesy of NJDOT

Issue: **The left slope of the swale is eroded by runoff from the roadside.**

Corrective Action: **Re-grade the slope or provide energy dissipation to reduce the flow velocity and alleviate the erosion. Revegetate the slope.**

Preventative Action: **Routine inspection and reseeding of bare soil.**

4. REFERENCE DOCUMENTS

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

- As-built Drawings with Drainage Plans
- Soil Boring Logs
- Landscaping Plan

Attach Reference Documents Here

5. INSPECTION CHECKLIST / MAINTENANCE ACTIONS

Grass Swale

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**
A Grass Swale Area	1	Standing water is present after the design drain time The observed drain time is approximately _____ hours.	Y__ N__	Remove excessive sediment and debris Check whether the outlet is clogged (if applicable) Re-grade the slope to allow the swale to drain within the design drain time. Revegetate if necessary If standing water is present longer than 5 days, report to mosquito commission. Work Order #_____
	2	Excessive sediment, silt, or trash accumulation in swale	Y__ N__	Remove sediment, silt, and trash
	3	Erosion or channelization is present	Y__ N__	Check whether the flow is concentrated. If so, re-grade the swale to ensure smoother flow. Work Order #_____
	4	Animal burrows/rodents are present	Y__ N__	Pest control Work Order # _____
	5	Sediment and/or debris on the edge between the contributing drainage area and the grass swale	Y__ N__	Remove sediment and debris

	For Inspector			For Maintenance Crew
Component No. Component Name		**Inspection Item and Inspection Item No.**	**Result**	**Preventative / Corrective Maintenance Actions**
Note:				
B Vegetation	1	Large spot(s) showing bare soil	Y__ N__	Vegetative cover must be maintained at 85%. Revegetate the entire swale if 50% or more vegetation has been lost. Check Landscaping plan for guidance (if available) Work Order # _____
	2	Excessive tree canopy shading the vegetated area inhibiting the growth of vegetation	Y__ N__	Prune and trim the trees
	3	Grass is overgrown and taller than the design height (_____ inches)	Y__ N__	Mow the grass to the design height
	4	Grass clippings are not collected and removed	Y__ N__	Remove the grass clippings

	For Inspector			For Maintenance Crew
Component No. Component Name		**Inspection Item and Inspection Item No.**	**Result**	**Preventative / Corrective Maintenance Actions**
Note:				
C 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 BMP 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 #_____

	For Inspector			For Maintenance Crew
Component No. Component Name	**Inspection Item and Inspection Item No.**		**Result**	**Preventative / Corrective Maintenance Actions**
	5	Standing water is present in the outlet structure longer than 72 hours	Y__ N__	Clean out the standing water 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 Maintenance Log after performing maintenance.

6. 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 ground is thoroughly dry.**	A - Grass Swale Area	
	C – Outlet	
Vegetation removal	B – Vegetation	

Vegetation is removed by _____ 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 _____, and _____ is applied _____.

Debris, sediment, and trash are handled (onsite / by _____ (contractor name) to disposal site _____). (See Part I: Maintenance Plan – Disposal Plan Section)

Crew member: _____/_____ **Date:** _____
(name/ signature)

Supervisor: _____/_____ **Date:** _____
(name/ signature)

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

7. CORRECTIVE MAINTENANCE RECORD

1. **Work Order # _____**
   Date Issued _____

2. **Issue to be resolved**:

3. The issue was from **Corresponding Checklist ___, Component No. ___, Inspection Item No. ___.**

4. **Required Actions**

Actions	Planned Date	Date Completed

5. **Responsible person(s):**

_____

6. **Special requirements**
   - o Time of the season or weather condition _____
   - o Tools/equipment: _____
   - o 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 after performing maintenance.

GRASS SWALE FIELD MANUAL

Development Name: Windsor Oak Subdivision

Township, County: West Windsor Township, Robbinsville Township, Mercer County, New Jersey

Location of Basin: E(X): 465,749.24; N(Y): 516,623.62

Location Description: On the easterly side of Road “A”

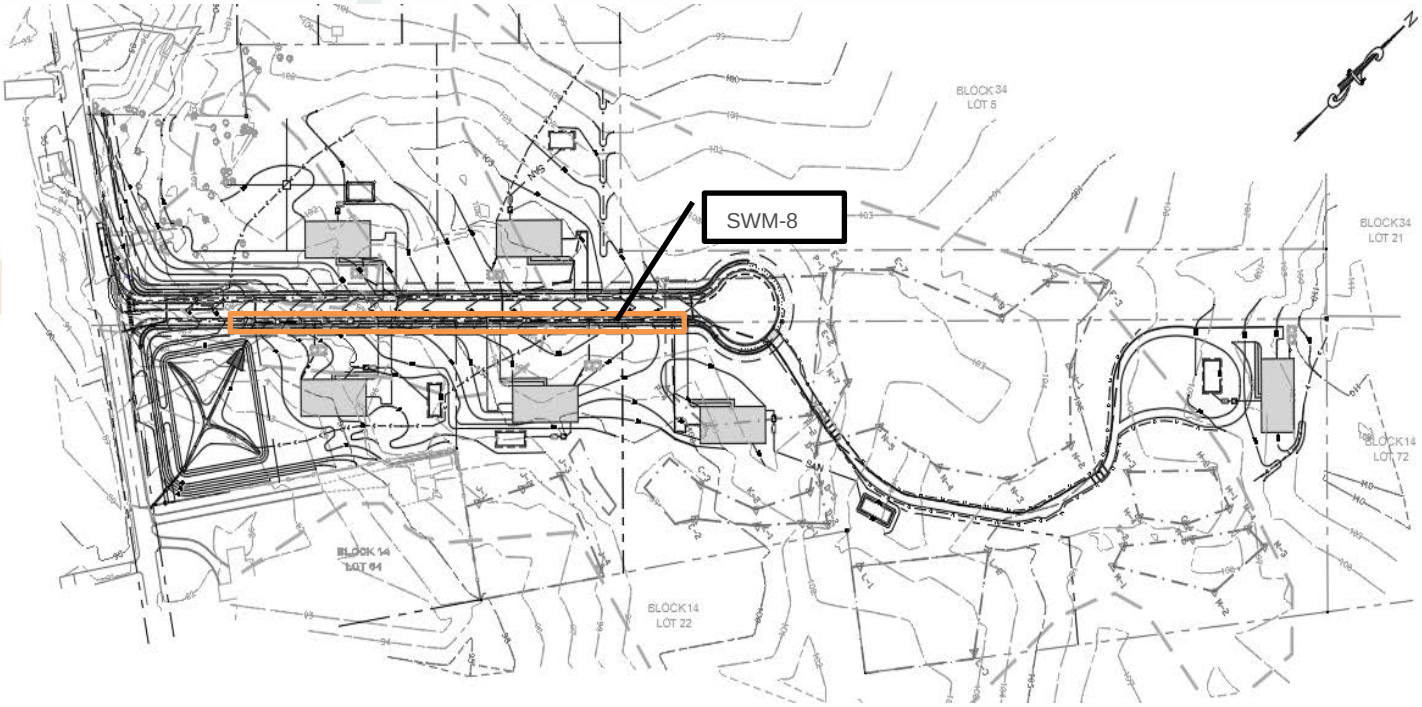

TABLE OF CONTENTS


E&LP

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Low velocities and shallow depths of runoff generated from the Water Quality Design Storm allow for particulate settling; while at the same time, the blades of grass in the swale filter the suspended solids. Because these pollutant removal mechanisms do not rely on infiltration into the subsoil, soil permeability is not a design consideration. For larger storm events, the swale can be designed to convey stormwater downstream.

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
A grass swale 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. For the design drain time, please see **Hydrology Design Targets** in the **Basic Design Information** section.

2. BASIC DESIGN INFORMATION

Hydrology Design Targets:

1. The maximum design storm is 100-year storm, which corresponds to 8.52 inches of rain in 24 hours.
2. The design drain time is less than 72 hours.
3. The design total suspended solids removal rate is 50%.
4. The elevation of the seasonal high-water table of areas surrounding the grass swale was observed on 01/08/2018. From the values obtained, a seasonal high-water at a depth of ± 3.5 feet below the swale bottom is expected.

Hydraulic Design Targets:

1. The maximum design velocity in the grass swale is 1.09 feet per second.

Configuration Targets:

1. The longitude slope of the gras swale is 2.5%.
2. The side slope is 4:1.
3. The length of the grass swale is 500 feet.
4. The swale shape is trapezoidal, with a bottom width of 4 feet.
5. The grass height must be established and maintained between 6 to 8 inches.

Critical Maintenance Features:

1. Grass clippings shall be collected from the basin and properly disposed.
2. Check any eroded or channelized area, repair it immediately. Find the cause of erosion or channelization and find solution to prevent it.
3. Remove dead vegetation to keep grass swale aesthetic.

3. VISUAL AID FOR VEGETATIVE FILTER STRIP/GRASS SWALE MAINTENANCE

Courtesy of NJDOT

Issue:	**The inlet to the swale is clogged by sediment and leaves.**
Corrective Action:	**Clear and remove sediment and leaves.**
Preventative Action:	**Preventative Action: Routine inspection and removal of sediment and debris.**

Courtesy of NJDOT

Issue: **The sediment and loss of vegetation indicates that the swale is not well drained.**

Corrective Action:

Re-grade the swale to ensure proper drainage. A steeper slope may be required but must ensure that all criteria are met for the required TSS removal rate (see the Basic Design Information section). Revegetate the grass swale.

Preventative Action:

Routine inspection and monitoring of the drain time.

Issue: **The loss of vegetation on the side slope and bottom likely indicate an erosion problem.**

Corrective Action:

Re-grade the side slope of the swale to prevent erosion and revegetate the swale.

Preventative Action:

Routine inspection and reseeding the soil before the erosion becomes severe.

Issue: **Overgrown and dead vegetation in swale.**

Corrective Action: **Remove dead and unwanted vegetation.**

Preventative Action: **Routine inspection and mowing of the swale.**

Issue: **Ponding in swale. Vegetation loss due to long term inundation.**

Corrective Action: **Clear the outlet structure, clear the sediment in the outlet, and re-grade the swale to allow for better drainage.**

Preventative Action: **Routine inspection and cleaning.**

Courtesy of NJDOT

Issue: **The left slope of the swale is eroded by runoff from the roadside.**

Corrective Action: **Re-grade the slope or provide energy dissipation to reduce the flow velocity and alleviate the erosion. Revegetate the slope.**

Preventative Action: **Routine inspection and reseeding of bare soil.**

4. REFERENCE DOCUMENTS

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

- As-built Drawings with Drainage Plans
- Soil Boring Logs
- Landscaping Plan

Attach Reference Documents Here

5. INSPECTION CHECKLIST / MAINTENANCE ACTIONS

Grass Swale

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**
A Grass Swale Area	1	Standing water is present after the design drain time The observed drain time is approximately _____ hours.	Y__ N__	Remove excessive sediment and debris Check whether the outlet is clogged (if applicable) Re-grade the slope to allow the swale to drain within the design drain time. Revegetate if necessary If standing water is present longer than 5 days, report to mosquito commission. Work Order #_____
	2	Excessive sediment, silt, or trash accumulation in swale	Y__ N__	Remove sediment, silt, and trash
	3	Erosion or channelization is present	Y__ N__	Check whether the flow is concentrated. If so, re-grade the swale to ensure smoother flow. Work Order #_____
	4	Animal burrows/rodents are present	Y__ N__	Pest control Work Order # _____
	5	Sediment and/or debris on the edge between the contributing drainage area and the grass swale	Y__ N__	Remove sediment and debris

	For Inspector			For Maintenance Crew
Component No. Component Name		**Inspection Item and Inspection Item No.**	**Result**	**Preventative / Corrective Maintenance Actions**
Note:				
B Vegetation	1	Large spot(s) showing bare soil	Y__ N__	Vegetative cover must be maintained at 85%. Revegetate the entire swale if 50% or more vegetation has been lost. Check Landscaping plan for guidance (if available) Work Order # _____
	2	Excessive tree canopy shading the vegetated area inhibiting the growth of vegetation	Y__ N__	Prune and trim the trees
	3	Grass is overgrown and taller than the design height (_____ inches)	Y__ N__	Mow the grass to the design height
	4	Grass clippings are not collected and removed	Y__ N__	Remove the grass clippings

	For Inspector			For Maintenance Crew
Component No. Component Name		**Inspection Item and Inspection Item No.**	**Result**	**Preventative / Corrective Maintenance Actions**
Note:				
C 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 BMP 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 #_____

	For Inspector			For Maintenance Crew
Component No. Component Name	**Inspection Item and Inspection Item No.**		**Result**	**Preventative / Corrective Maintenance Actions**
	5	Standing water is present in the outlet structure longer than 72 hours	Y__ N__	Clean out the standing water 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 Maintenance Log after performing maintenance.

6. 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 ground is thoroughly dry.**	A - Grass Swale Area	
	C – Outlet	
Vegetation removal	B – Vegetation	

Vegetation is removed by _____ 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 _____, and _____ is applied _____.

Debris, sediment, and trash are handled (onsite / by _____ (contractor name) to disposal site _____). (See Part I: Maintenance Plan – Disposal Plan Section)

Crew member: _____/_____ **Date:** _____
(name/ signature)

Supervisor: _____/_____ **Date:** _____
(name/ signature)

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

7. CORRECTIVE MAINTENANCE RECORD

1. **Work Order # _____**
   Date Issued _____

2. **Issue to be resolved**:

3. The issue was from **Corresponding Checklist ___, Component No. ___, Inspection Item No. ___.**

4. **Required Actions**

Actions	Planned Date	Date Completed

5. **Responsible person(s):**

_____

6. **Special requirements**
   - o Time of the season or weather condition _____
   - o Tools/equipment: _____
   - o 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 after performing maintenance.

MANUFACTURED TREATMENT DEVICE FIELD MANUAL

Development Name: Windsor Oak Subdivision

Township, County: West Windsor Township, Robbinsville Township, Mercer County, New Jersey

Location of Basin: E(X): 465,675.88; N(Y): 516,152.00

Location Description: Southern Section of Site, along the easterly side of Edinburg Windsor Road (County Road #641)

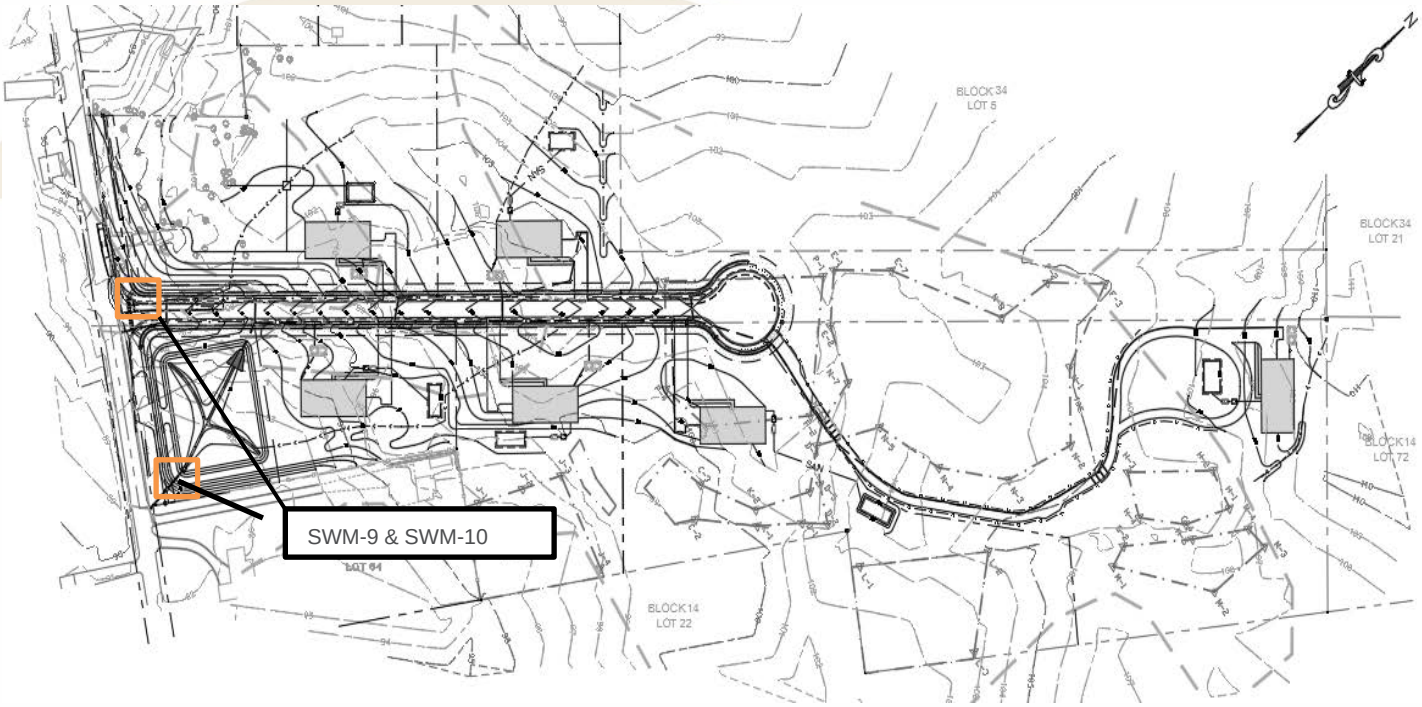

TABLE OF CONTENTS

1. 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, floatables, 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.

2. BASIC DESIGN INFORMATION

Hydrology Design Targets:

1. The MTD is designed as an online 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%.

Hydraulic Design Targets:

1. Design Parameters

	Water Quality Design Storm	2-year storm	10-year storm	100-year storm
Rainfall Depth (inches)	1.25" in 2 hours	3.32" in 24 hours	5.07" in 24 hours	8.52" in 24 hours
Runoff Volume (cubic feet)	8,320	32,590	61,041	127,001
Peak Flow Rate (cfs)	0.185	0.710	3.844	17.58
Water Surface Elevation (feet)	N/A	N/A	N/A	N/A

Configuration Targets:

1. The name of the MTD is Up-Flo Filter.
2. The manufacturer of the MTD is Hydro International.

3. REFERENCE DOCUMENTS

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

- As-built Drawings with Drainage Plans
- Operation and Maintenance Manual (provided by the manufacturer).
- MTD Specification Sheet (provided by the manufacturer).

4. INSPECTION CHECKLIST / MAINTENANCE ACTIONS

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 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
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__	
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 Maintenance Log after performing maintenance.

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 Part I: Maintenance Plan – Disposal Plan Section)

Crew member: _____/_____ **Date:** _____
(name/ signature)

Supervisor: _____/_____ **Date:** _____
(name/ signature)

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

Corrective Maintenance Record

1. **Work Order # _____**
   Date Issued _____

2. **Issue to be resolved**:

3. The issue was from **Corresponding Checklist ___, Component No. ___, Inspection Item No. ___.**

4. **Required Actions**

Actions	Planned Date	Date Completed

5. **Responsible person(s):**

_____

6. **Special requirements**
   - o Time of the season or weather condition _____
   - o Tools/equipment: _____
   - o 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 after performing maintenance.