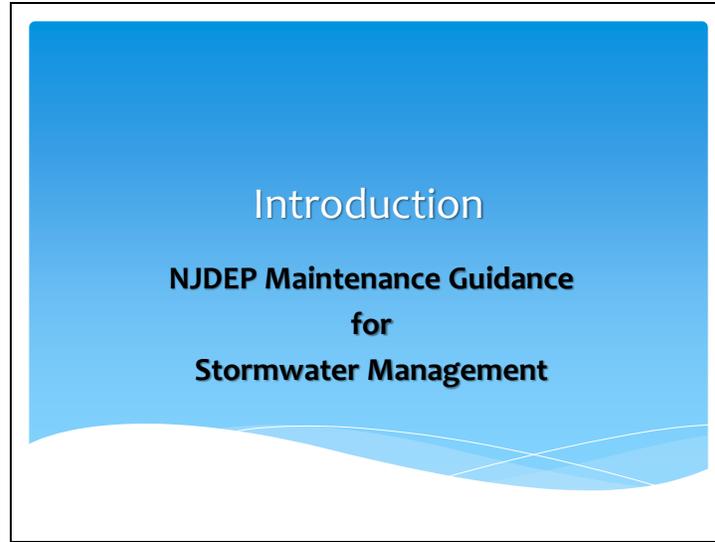
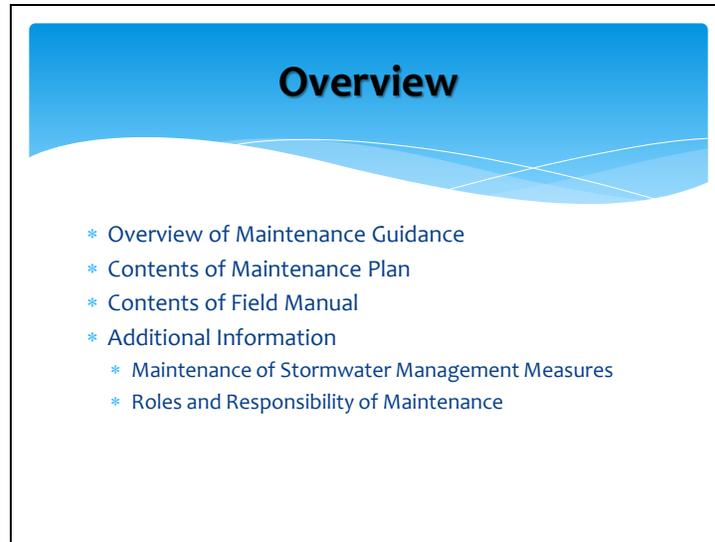


Slide 1



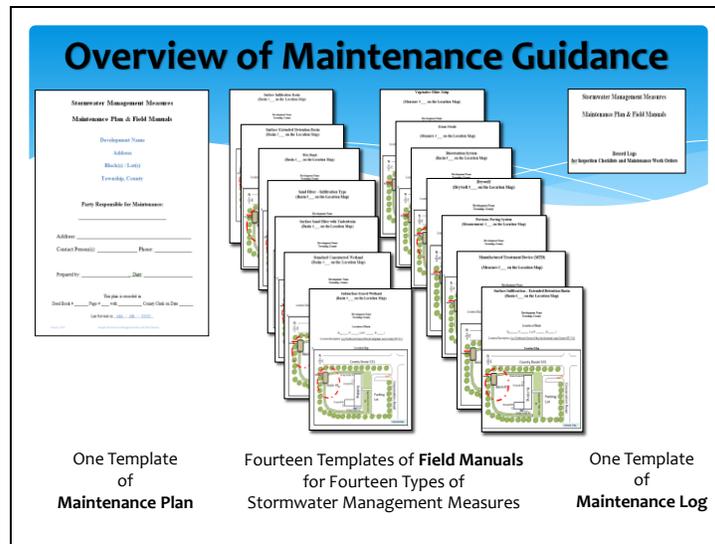
This is a brief introduction to the maintenance guidance developed by NJDEP.



Overview

- * Overview of Maintenance Guidance
- * Contents of Maintenance Plan
- * Contents of Field Manual
- * Additional Information
 - * Maintenance of Stormwater Management Measures
 - * Roles and Responsibility of Maintenance

This introduction will give an overview of the DEP-developed maintenance guidance and its contents. Also, additional information with regard to the general aspects of maintenance is provided. The maintenance guidance package you received also provides two examples of how to use the maintenance guidance. You can find them in the sample folders of the zipped file.

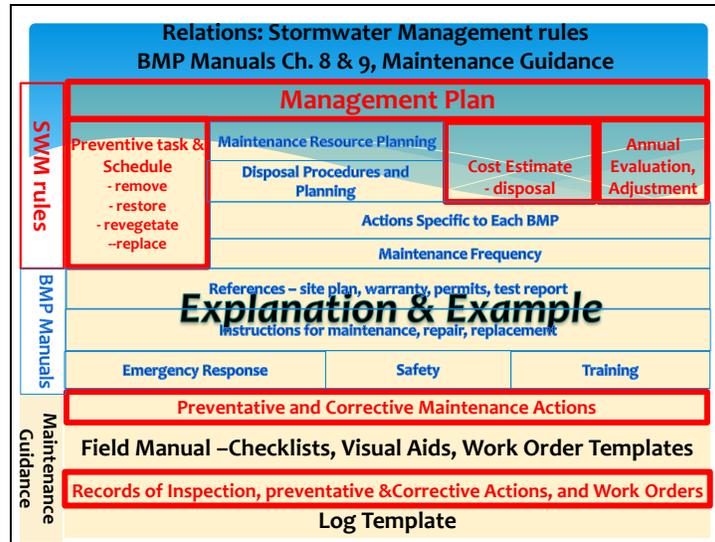


The Stormwater Management rules at N.J.A.C.7:8-5.8 requires maintenance of stormwater BMPs of a major development or project. Maintenance of stormwater BMPs can be divided into five parts: maintenance plan, inspection, preventative and corrective actions, maintenance of records, and annual evaluation. It is the design engineer’s responsibility to prepare a maintenance plan and provide it to the responsible party for the remaining four parts of the maintenance process. For more information regarding maintenance and roles and responsibilities, please see the Additional Information section of this introduction.

DEP has prepared maintenance guidance templates to assist design engineers and responsible parties in complying with the maintenance requirements. Here is an overview of the maintenance guidance templates:

- I. One template of Maintenance Plan,
- II. 14 templates of Field Manuals, covering 14 types of BMPs.
- III. Each Field Manual contains one template for Maintenance Logs and Inspection Records, which is an overall log for all maintenance and inspection records.

The next slides will explain the contents of the templates and how to use them.



This slide shows the relationships between the Stormwater Management rules, the Stormwater BMP Manuals, and the Maintenance Guidance. The Stormwater Management rules set forth the requirements for the maintenance of stormwater management measures. The Stormwater BMP Manuals, Chapters 8 and 9, set forth further items for thorough a maintenance of stormwater management measures.

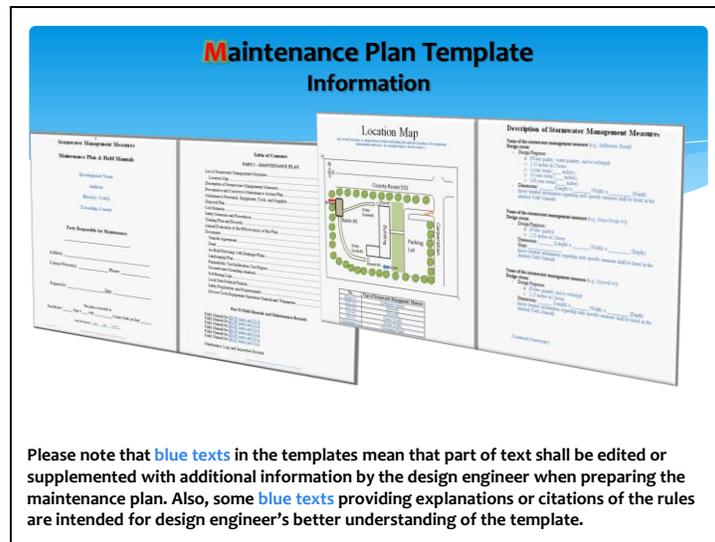
This Maintenance Guidance provides explanations and examples to assist design engineers, the responsible parties, and regulatory parties understanding the maintenance requirements, performing proper maintenance, and complying with the rules. Following the maintenance guidance is not mandatory. However, the maintenance guidance is a tool to assist with the maintenance of the stormwater management measures.

Maintenance Guidance for Different Roles			
	Design Engineer	Responsible Party	Regulatory Party
Maintenance Plan	Customize Maintenance Plan template to meet the conditions of the development	Use the customized Maintenance Plan to maintain BMPs	Approve designer's Maintenance Plan
Field Manual (including checklist)	Customize the Field Manual template(s) to specific BMP(s) in the development	Use Field Manuals to perform maintenance and inspection	Use Inspection Checklist to conduct inspection
Maintenance Log	Customize the Maintenance Log for the Responsible party	Use the customized Maintenance Log to track maintenance performance	Use the Maintenance Log to conduct auditing

As required by the Stormwater Management rules at NJAC 7:8-5.8, a design engineer shall prepare a maintenance plan for the stormwater BMPs incorporated in a major development. This Maintenance Guidance includes a Maintenance Plan template, Field Manual templates, and a Maintenance Log template. These templates are intended to assist design engineers in preparing a maintenance plan. The templates contain practical guidance that addresses the requirements by the Stormwater Management rules and BMP Manual Chapters 8 and 9.

The design engineer customizes the templates by providing design information about the BMPs on the development in order to address issues and conditions specific to the development. After preparing the customized maintenance plan, the field manuals, and the maintenance logs, the design engineer can transfer them to the responsible party. The responsible party follows the maintenance plan and the field manuals to perform the maintenance. The responsible party shall also keep all maintenance related records into the maintenance log.

The maintenance guidance can also be a tool to facilitate the regulatory party's supervision of the responsible party's maintenance of stormwater BMPs. Regulatory parties can include the municipality and state agencies reviewing the stormwater management design. The regulatory party may use the Management Plan template to facilitate its review. Also, the regulatory party can use the inspection checklist in the Field Manuals as the template to make its own inspection checklist for stormwater BMPs. Finally, the responsible party's maintenance logs can be used by the regulatory party as a basis for auditing the responsible party's maintenance performance.

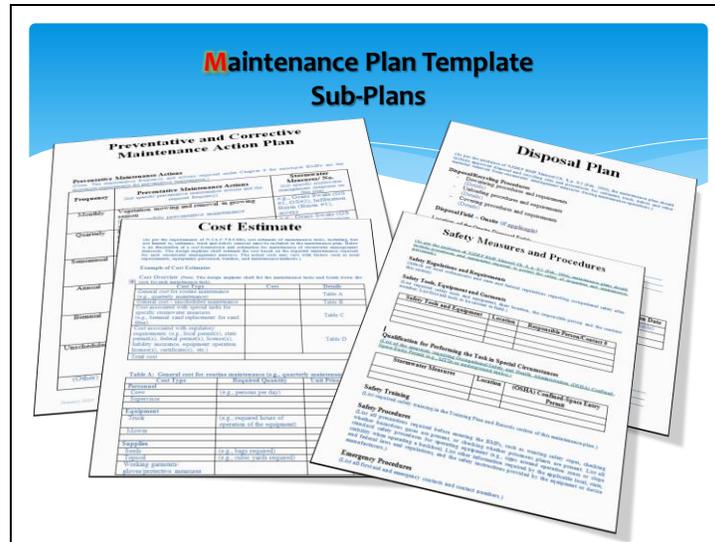


The Maintenance Plan template consists of the following parts:

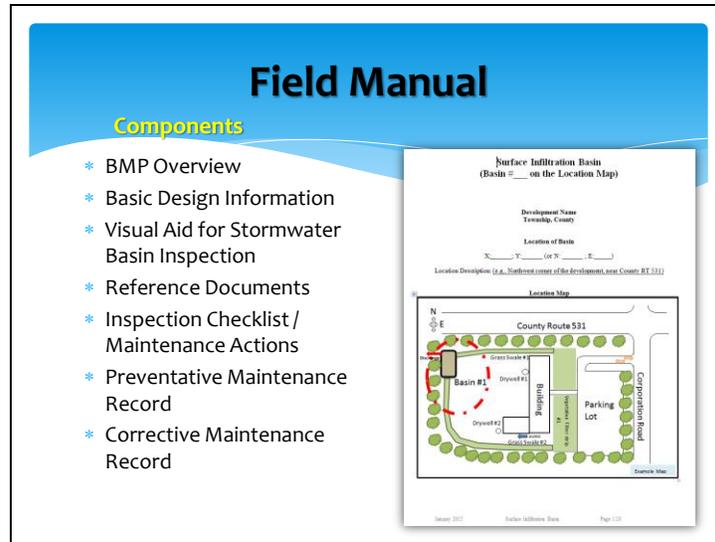
- List of Stormwater Management Measures and Location Map
- Description of Stormwater Management Measures
- Preventative and Corrective Maintenance Action Plan
- Maintenance Personnel, Equipment, Tools, and Supplies
- Disposal Plan
- Cost Estimate
- Safety Measures and Procedures
- Training Plan and Records
- Annual Evaluation of the Effectiveness of the Plan
- Documents

The template is in Microsoft Word® format so that design engineer can edit and fill in detailed information regarding maintenance. The responsible party can also edit the Maintenance plan when necessary, as a result of the annual evaluation.

Please note that blue text in the templates indicates that part of the text needs to be edited or supplemented with additional information by the design engineer. Also, in some areas, blue text provides explanations or citations of the rules, and is intended to provide the design engineer a better understanding of the template.



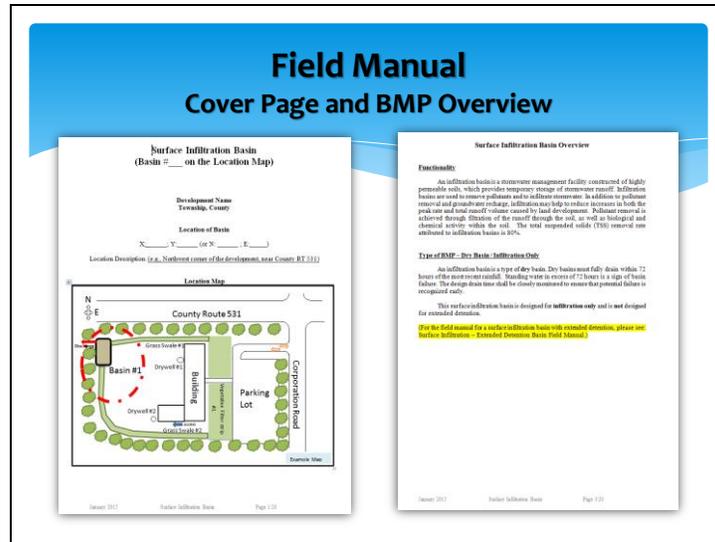
Here is another look at some of the subparts of the Maintenance Plan Template.



To facilitate the inspection of the BMPs, performance of preventative and corrective maintenance actions, and maintenance of records, NJDEP has developed Field Manual templates for each commonly used type of BMP. The Field Manual templates include the following components:

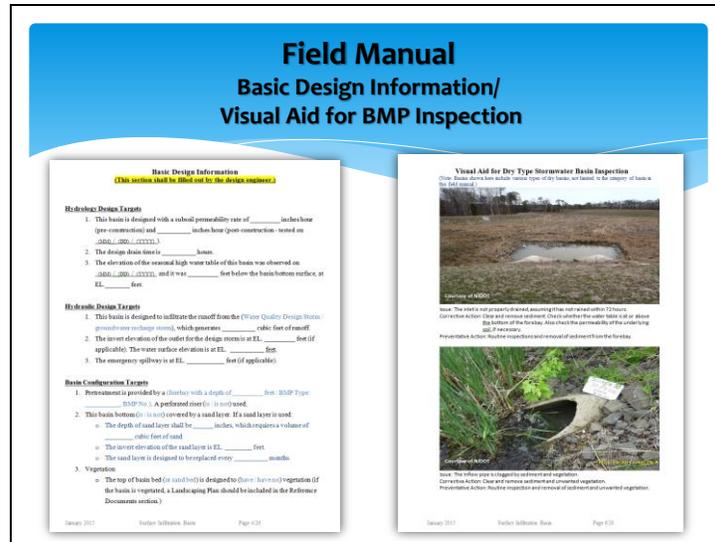
- Cover Page and Location Map
- BMP Overview
- Basic Design Information
- Visual Aid for Stormwater Basin Inspection
- Reference Documents
- Inspection Checklist / Maintenance Actions
- Preventative Maintenance Record
- Corrective Maintenance Record

The field manual, as a part of the maintenance plan, shall be prepared by the design engineer. The design engineer should edit or modify the contents of the Field Manual template with the design information of the BMPs incorporated in the development. The responsible party should follow the field manual to perform maintenance. Each BMP shall have its own field manual because each of them has different functions and components to be inspected and maintained.



The cover page shows the location of the BMP. The design engineer should provide a location map and the coordinates to locate the BMP.

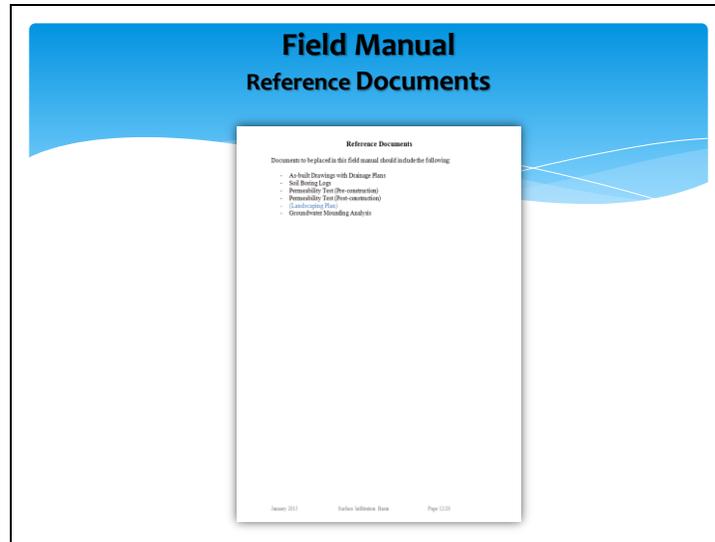
The BMP overview section provides a brief introduction to the functionality of the BMP.



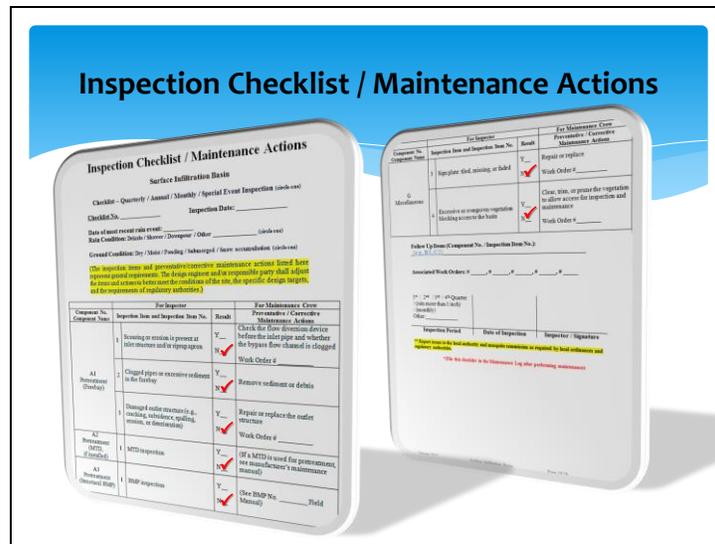
The Basic Design Information section provides hydrological, hydraulic, and geometrical information. The information shall be supplied by the design engineer. When performing BMP maintenance, the responsible party shall ensure that the BMP is maintained for the designed functions.

The Visual Aid for Stormwater Basin Inspection section provides commonly observed issues. It also suggests preventative and corrective actions to resolve the issues. Based on his/her experience, design engineer may provide more suggestions and tips for maintenance.

Slide 11



The next section in the Field Manual is the Reference Documents section. Reference documents include site plans or as-built drawings, permeability tests, etc., and can include any documents that will assist the responsible party.

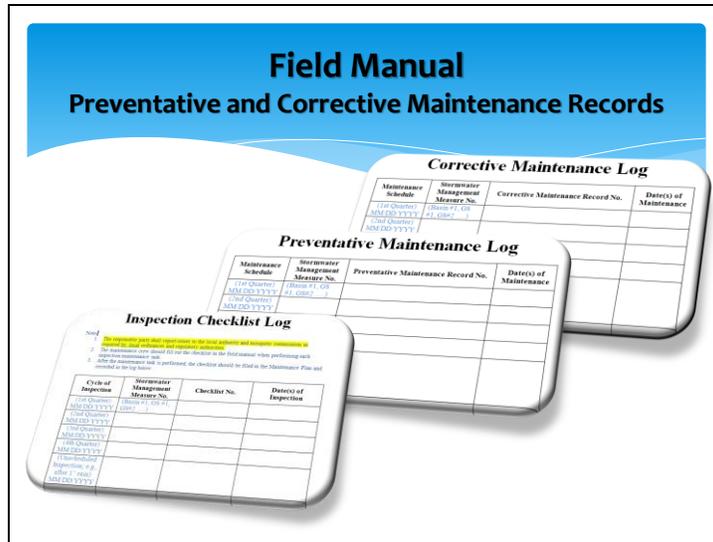


The Stormwater Management rules require that the responsible party regularly inspects BMPs and keeps records of inspections. A checklist provides a systematic method to conduct inspection.

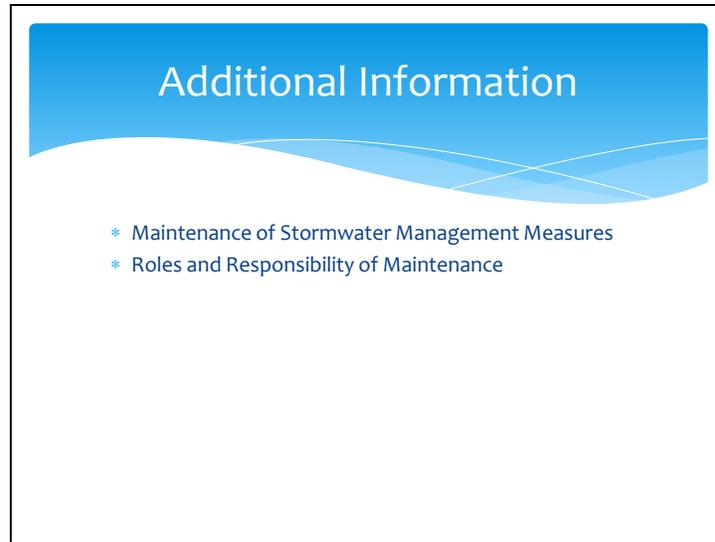
The Inspection Checklist/Maintenance Actions section lists key items that should be checked during inspection. The inspection items are tailored to each specific type of BMP. The Inspection Checklist/ Maintenance Actions section also provides preventative and corrective actions for the maintenance crew to follow up on the issues observed during the inspection. Design engineers should further tailor the checklist and the actions according to their practical experience and the specific design of the BMP.

The inspector first fills out information regarding the weather and ground conditions on the date of inspection. The inspector then proceeds with the inspection in order of the items on the checklist. If there is an issue, the inspector may circle the preventative or corrective actions for the maintenance crew to follow up. After the inspection, the inspector signs the inspection checklist and provides it to the responsible party to be kept on record.

The maintenance crew may further fill out the assigned work orders to resolve the issue. The completed inspection checklist shall be kept for future reference. As mentioned earlier, a regulatory party may also use the inspection checklist in the Field Manual to make its inspection.



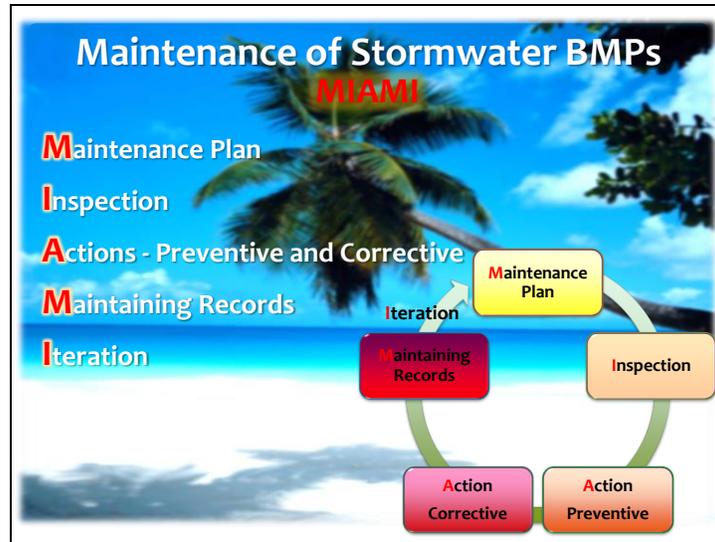
The Stormwater Management rules require a detailed log of inspections, preventative maintenance, and corrective maintenance. DEP has prepared a Maintenance Log template, which shows the cycle or the schedule of the inspections and maintenance, dates on which inspections and maintenance occur, and the BMP being inspected or maintained. Individual records should be attached after the log.



Additional Information

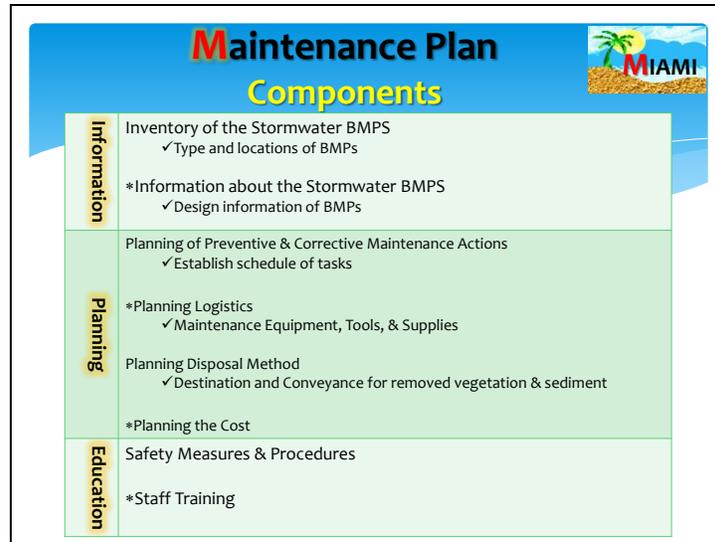
- * Maintenance of Stormwater Management Measures
- * Roles and Responsibility of Maintenance

This additional information provides an overview of the maintenance of stormwater management measures.



The maintenance requirements set forth in the Stormwater Management can be remembered as “MIAMI.” This acronym stands for Maintenance plan, Inspection, Actions – both preventive and corrective, Maintaining records, and Iteration.

The next slides will explain MIAMI.



The first M in MIAMI stands for Maintenance Plan. The Stormwater Management rules and Chapter 8 of the BMP Manual (Maintenance and Retrofit stormwater Management Measures) spell out the components of a maintenance plan.

A maintenance plan is an informational, planning, and tracking tool containing sub-plans: Inventory of the stormwater BMPs, information about the BMPs, planning for preventive and corrective maintenance, logistics, planning for disposal, planning for costs, and education of staff for training on safety procedures and maintenance work. These can be generally grouped into three areas – planning, information and education. To make it easy to remember, you can think of the word “PIE.” Basically making a maintenance plan is as easy as a PIE.

First, the maintenance plan needs to have an inventory of all BMPs, including the type of BMPs (sand filter, wet pond...), their location (located by GPS references or State Plane Coordinates), and their outfalls.

Second, the maintenance plan needs to provide detailed information about each BMP. The detailed information includes their design information, such as the depth of the basin or pond, the number of inlets, the size of the outlet orifices, the design detention time, the drain time, the material comprising the basin bottom, whether vegetation is required, etc. Also, the maintenance plan should include as-built plans, soil boring logs, field test data, and the manufacturer’s warrantee and operation and maintenance manual for specific machines or manufactured treatment devices.

Third, the maintenance plan shall have plans for preventive and corrective maintenance tasks. We will talk about preventive and corrective actions later. Also, the frequency and schedule of the maintenance tasks are required. For example, the basin may need to be inspected quarterly, and the sand layer of a sand filter may need to be replaced every two years.

Fourth, the maintenance plan should have a plan for the logistics required to perform maintenance tasks. This includes what type of maintenance personnel are required, the skills required to perform the tasks, the equipment, tools, and supplies needed to do the work. You may think that the maintenance yard already has everything needed, but it is easy to overlook some crucial element. A maintenance plan also needs to include the disposal method and the cost. The disposal method has to consider how to transport removed vegetation and sediment to the disposal site. Specific measures may be necessary to prevent leakage of wet sediment during transport to the disposal site, which may be a municipal or privately operated landfill, or in some cases, sediment may be disposed on-site. Since permits are often required for disposal at these facilities, it is essential to plan ahead for the costs, time, and tasks associated with these permits.

After planning the tasks and subjects mentioned above, you will have an estimate of the costs involved, which are required for both budgeting purposes and compliance with the Stormwater Management rules.

A maintenance plan should also include a plan to educate and train staff regarding safety procedures and measures, for example, the safety procedures for confined space entry. The maintenance plan should also set up a training schedule for maintenance staff to educate them on the stormwater BMPs, maintenance work, use of tools, operation of equipment, and record keeping of performed tasks.

To recap, what components are required in a maintenance plan? Creating a maintenance plan is as easy as remembering the word “PIE,” which is short for “Planning, Information, and Education.”

The Planning part of a maintenance plan includes:
Planning for Preventive and Corrective Maintenance Actions,
Planning logistics,
Planning for disposal, and
Planning for costs.

The Information part of a maintenance plan includes inventory of the stormwater BMPs and information about the stormwater BMPs.

The education part of a maintenance plan includes education of staff on safety procedures and elements required to perform maintenance work.



Inspection

Systematic
Effective
Correct
On a Schedule
No Hassles
Documentation

Wait a SECOND!

Use the Inspection Checklist

Inspection Checklist / Maintenance Actions
Surface Infiltration - Extended Detention Basin

Checklist - Quarterly / Annual / Monthly / Special Event Inspection (check one)

Checklist No. _____ Inspection Date: _____

Date of most recent rain event: _____

Rain Condition: Driest / Shower / Drizzle / Other _____ (check one)

Ground Condition: Dry / Moist / Pudding / Submerged / Bare accumulation (check one)

The inspection notes and pre-inspection corrective maintenance actions listed here represent general requirements. The design engineer shall be responsible for: 1) identifying the items and actions to be performed; 2) the condition of the site; 3) the specific design details; and 4) the requirements of regulatory authorities.

Component No. (Component Name)	For Inspection		Result	For Maintenance Crew	
	Inspection Item and Inspection Item No.			Preventative / Corrective Maintenance Actions	
A1 Pre-treatment (Pondway)	1	Insuring an erosion is present at inlet structure and/or spring apron	Y N	Check the flow diversion device before the rain pipe and whether the bypass flow channel is clogged	Work Order # _____
	2	Clogged pipes or excessive sediment in the flowway	Y N	Remove sediment or debris	Work Order # _____
	3	Damaged outlet structure (e.g., cracking, subsidence, spalling, erosion, or deterioration)	Y N	Repair or replace the outlet structure	Work Order # _____
A2 Pre-treatment (MTD)	1	MTD inspection	Y N	(If a MTD is used for pretreatment, see manufacturer's maintenance manual)	
A3 Pre-treatment (Storage BMP)	1	BMP inspection	Y N	(See BMP No. _____ Field Manual)	

The next step in maintenance is the “I” of MIAMI, which stands for Inspection. Regular inspections of the stormwater BMPs help the responsible party to discover problems before they evolve into big issues.

Another acronym may help us remember what an inspection entails. It is the word “SECOND.” The Stormwater management rules require regular inspections and records of those inspections. However, before we hit the road to perform an inspection, we should consider how we will do them in a way that is systematic and effective.

A responsible party may have many BMPs to manage; therefore, a tight schedule may be necessary if they are to inspect all of the basins in a timely fashion. It is best if problems are discovered, followed up on, and resolved. For this reason, we need a written way to keep track of everything.

All of these considerations can be addressed by using an inspection checklist which lists the items to be inspected, explains how to check them, and provides a space to record the problems, as well as other important information, such as the weather on the day of the inspection, who was present, etc. It is worth noting that each type of BMP may have different items to check; an obvious example is that inspection of a wet pond will be greatly different from that of a sand filter.



Actions – Preventive/Corrective

* Preventive Actions	* Corrective Actions
<ul style="list-style-type: none">✓ Clear inlet✓ Clear outlet✓ Remove sediment/trash✓ Care of vegetation<ul style="list-style-type: none">• Mow grass• Clear brush• Remove dead vegetation✓ Replacement of sand✓ Loosen compacted soil	<ul style="list-style-type: none">✓ Repair structural damage<ul style="list-style-type: none">• Basin banks• Racks• Inlet/outlet structures• Riprap apron✓ Backfill channelized area(s)✓ Remove sediment/trash✓ Restore vegetation<ul style="list-style-type: none">• Dry basin BMPs – 85%• Vegetative BMPs – 95%

Always Check (As-Built) Site Plans and /or
(MTD) Manufacturer's Maintenance Instructions

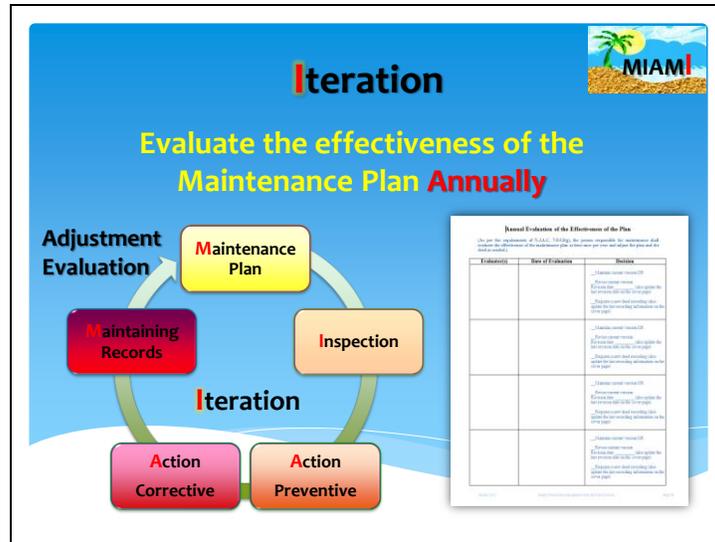
After the inspection, what is the next part of maintenance work? The Actions. They include preventive maintenance tasks and corrective maintenance tasks. Preventive action is geared towards housekeeping on a regular basis. Corrective actions are more likely to occur in response to problems discovered during the inspection.

The following is a list of preventive actions and corrective actions. It is by no means a full list; there could be many more actions required, depending on the type of BMPs and the design. For example, the sand layer of a sand filter or infiltration basin needs to be replaced at least once every two years. However, if these BMPs are located in an area having high pollutant loading, the designer of the BMP may request a more frequent replacement of the sand. Therefore, the design engineer has to specify the preventative and corrective actions for the BMPs.



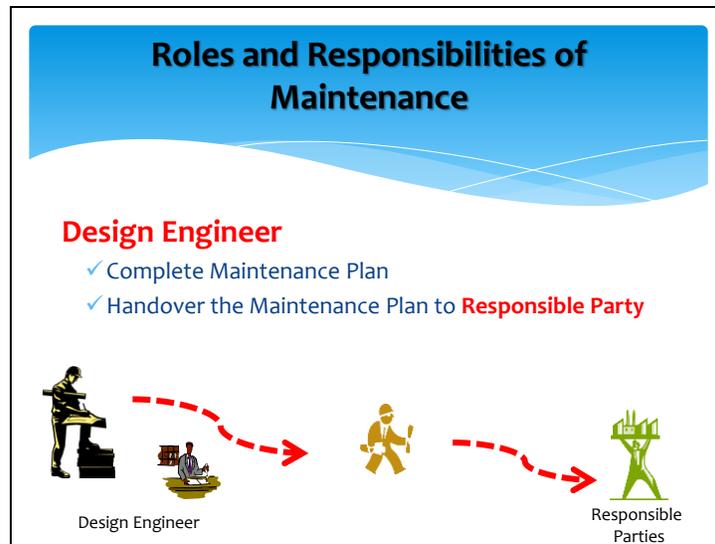
As required by the Stormwater Management rules, the responsible party needs to maintain records of inspections and maintenance for a public entity’s auditing. Practically, maintaining good records also provides a historical basis for the responsible party’s future cost estimation, management of resources, and annual evaluation of maintenance plan.

In addition to the inspection checklist, DEP also prepared templates for preventative and corrective maintenance records in the Field Manual template. The design engineer may modify the template to reflect the BMPs implemented on the site. The responsible party’s maintenance staff shall fill out the records. If the preventative or corrective maintenance is a follow-up task from an inspection conducted earlier, the maintenance record may reflect the inspection checklist number on its record, which allows easier tracking of issues found during inspection.



Finally, maintenance work is an ongoing, evolving process. The Stormwater Management rules require that the effectiveness of the maintenance plan be evaluated annually. The maintenance plan must be adjusted according to the resulting evaluation. Maintenance personnel should provide comments and suggestions to the manager for consideration of how to perform the work more effectively in the future. The manager should also review the inspections and preventive and corrective maintenance records to find whether any improvement can be made.

The result of annual evaluation shall be recorded in the Maintenance Plan. The Maintenance Plan template provides a sample evaluation record.



Under the Stormwater Management rules, it is a design engineer's responsibility to prepare a maintenance plan because he or she is the one who best understands the specifications of the BMPs he/she designed. The design engineer also has the most knowledge of all of the site conditions specific to the BMPs, such as the water table, the soil, and the drainage area, etc.

Roles and Responsibilities
Responsible Party

- ✓ Developer of the development
- ✓ Public entity for public owned and operated BMPs
- ✓ Entities other than the developer
(Transferred under agreement or assigned by ordinances/regulations)
 - ✓ Public agency
 - ✓ Homeowners' association
 - ✓ Owner/ Tenant of an individual property in a **nonresidential** development
 - ✓ Owner/ Tenant of an individual property in a **residential** development (only if the individual owns the **ENTIRE** residential development)

Under the Stormwater Management rules, the responsible party defaults to the developer of the development. However, the responsibility can be voluntarily transferred or mandatorily dedicated to other parties, such as the township public works or a homeowners' association. If this is the case, a transfer agreement or ordinance assigning the responsibility needs to be documented in the maintenance plan. It should be specially noted that an owner or a tenant of an individual property in a residential development, such as an owner of a dwelling in a residential 20-lot subdivision project, cannot be assigned or transferred as the responsible party. The exception to this restriction is when the individual also owns or leases all other properties of the residential development.

Roles and Responsibilities

Responsible Party

- ✓ Self-inspection
Perform preventative and corrective maintenance
- ✓ Maintain detailed logs
 - ✓ Inspection records
 - ✓ Preventative and corrective maintenance
 - ✓ Maintenance-related work orders
- ✓ Provide maintenance logs for public entities' auditing
- ✓ Evaluate the effectiveness of the maintenance plan at least once per year

As required by the Stormwater Management rules, a responsible party shall have the following duties to maintain stormwater BMPs on a major development:

Inspection

Perform preventative and corrective maintenance

Maintain detailed logs

Inspection records

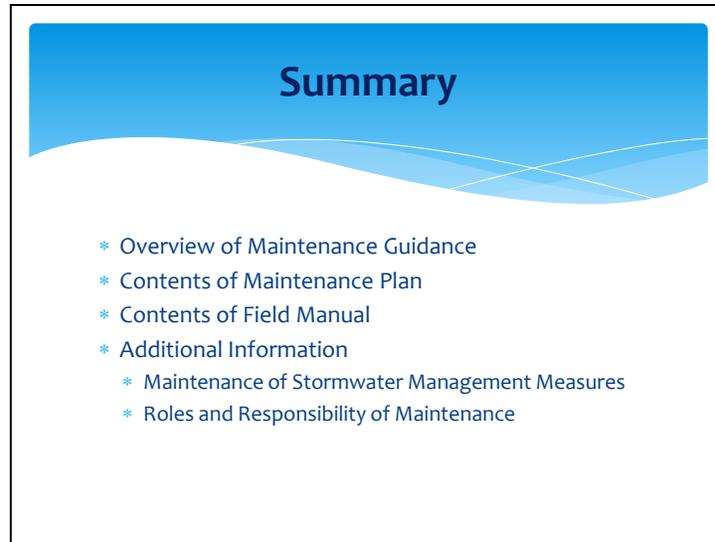
Preventative and corrective maintenance

Maintenance-related work orders

Provide maintenance logs for public entities' auditing

Evaluate the effectiveness of the maintenance plan at least once per year

It should be noted that public entities, such as the township or NJDEP may also conduct inspections of the stormwater BMPs on a major development. The inspections by the public entities, however, are geared toward an audit of the responsible party's performance of maintenance. They may not be as frequent as the schedules specified in Chapter 9 of the BMP Manual. They may also not be as detailed as explained in Chapter 9 of the BMP Manual. Therefore, the responsible party should conduct its own inspections according to Chapter 9 of BMP Manual.



Summary

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Summary