**Sand Filter – Infiltration Type**

**Basin #\_\_\_ on the Location Map**

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

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

Location of Basin: X: \_\_\_\_\_\_; Y: \_\_\_\_\_\_ (or N: \_\_\_\_\_\_; E :\_\_\_\_\_)

Location Description: e.g., Northwest corner of the development, near County RT 531

Location Map

|  |
| --- |
| N  E  County Route 531  **Discharge**  Grass Swale #1  Basin #1  Drywell #1  Corporation Road  Building  Parking  Lot    Vegetative Filter strip #1  Drywell #2  Access  Grass Swale #2 |

Example Map: Use aerial photo, site plan, or other graphics showing the locations of BMPs.

**NOTE**

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

Blue text indicates information may be deleted and or replaced as necessary.

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# Sand Filter with Infiltration Overview

**Functionality**

Sand filters with infiltration are stormwater management systems designed to maximize the removal of pollutants from stormwater. They consist of a pre-treatment zone and a treatment zone. The treatment zone includes a sand bed and underlying components. Pollutants are treated through settling, filtration, and adsorption by the sand bed.

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

**Type of BMP – Dry Basin / Filtration and Infiltration**

A sand filter with infiltration is a type of **dry** basin. Dry basins must fully drain within 72 hours of the most recent rainfall. Standing water in excess of 72 hours is a sign of basin failure. It may also contribute to mosquito breeding and other health and safety issues. The design drain time shall be closely monitored to ensure that potential failure is recognized early. A sand filter designed for infiltration does not have an underdrain piping system. The runoff exits the system by infiltrating into the subsoil beneath the sand bed.

A sand filter with infiltration can also be designed for extended detention, in which case it will attenuate peak flows from storms larger than the Water Quality Design Storm.

**For the field manual for a sand filter with an underdrain piping system, please see: Sand Filter with Underdrain Field Manual.**

# Basic Design Information

This section shall be filled out by the design engineer.

**Hydrology Design Targets**

1. This sand filter is designed with a sand bed permeability rate of \_\_\_\_\_\_\_\_\_ inches/hour (pre-construction) and \_\_\_\_\_\_\_\_\_\_ inches/hour (post-construction - tested on (MM) / (DD) / (YYYY) ).
2. This sand filter is designed with a subsoil permeability rate of \_\_\_\_\_\_\_\_\_ inches/hour (pre-construction) and \_\_\_\_\_\_\_\_\_\_ inches/hour (post-construction - tested on

(MM) / (DD) / (YYYY) ).

1. The design drain time is \_\_\_\_\_\_\_\_\_\_ hours.
2. The elevation of the seasonal high water table of this basin was observed on

(MM) / (DD) / (YYYY) and it was \_\_\_\_\_\_\_\_\_ feet below the basin bottom surface, at EL.\_\_\_\_\_\_\_ feet.

1. This basin will be discharged to (municipal stormwater sewer system/combined sewer system/stream (stream name).)

**Hydraulic Design Targets**

1. Design parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Water Quality Design Storm** | **2-year**  **storm** | **10-year**  **storm** | **100-year**  **storm** |
| **Rainfall Depth (inches)** | 1.25 inch  in 2 hours | \_\_\_ inches  in 24 hours | \_\_\_ inches  In 24 hours | \_\_\_ inches  In 24 hours |
| **Runoff Volume (cubic feet)** |  |  |  |  |
| **Peak Flow Rate**  **(cfs)** |  |  |  |  |
| **Water Surface Elevation**  **(feet)** |  |  |  |  |

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

1. The emergency spillway is at EL. \_\_\_\_\_\_\_\_\_\_\_ feet (if applicable).

**Basin Configuration Targets**

1. Pretreatment is provided by (BMP Type: \_\_\_\_\_\_\_\_\_\_, BMP No.). A perforated riser (is / is not) used.
2. Outlet Information:

|  |  |  |  |
| --- | --- | --- | --- |
| **Outlet Description** | **Outlet Type** | **Orifice Size / Weir Length** | **Invert Elevation** |
| Water Quality Orifice |  |  |  |
| Outlet #1 |  |  |  |
| Outlet #2 |  |  |  |
| (Other) |  |  |  |

1. Sand Layer
   * The depth of sand layer shall be \_\_\_\_\_\_ inches, which requires a volume of \_\_\_\_\_\_\_\_ cubic feet of sand.
   * The invert elevation of the sand layer is EL. \_\_\_\_\_\_\_\_ feet.
   * The sand layer is designed to be replaced every \_\_\_\_\_\_\_\_\_\_ months.
   * The sand bed ( is / is not ) covered by top soil and vegetation.
2. Top soil (if applicable)
   * The permeability rate of the top soil must be at least twice the design permeability rate of the subsoil. The top soil permeability rate is \_\_\_\_\_\_\_\_\_ inches/hour (pre-construction) and \_\_\_\_\_\_\_\_\_\_ inches/hour (post-construction - tested on

(MM) / (DD) / (YYYY) ).

1. Vegetation
   * The top of the sand bed is designed to (have / have no) vegetation.

Note: The only type of vegetation allowed on a sand filter is turf grass.

**Critical Maintenance Features**

1. No heavy equipment on the basin surface or sand layer.
2. Keep the sand layer surface clean and no accumulation of dead leaves.
3. Grass clippings shall be collected from the basin and properly disposed.
4. (Others to be added by the design engineer, if necessary)

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

**Wetland Disturbance Notice**:

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

**Wildlife Disturbance Notice**:

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

# Visual Aid for Dry Type Stormwater Basin Inspection

(Note: Basins shown here include various types of dry basins, not limited to the category of basin in this field manual.)

|  |  |  |  |
| --- | --- | --- | --- |
| C:\Users\cwu\CIWU-D\New  stormwater\NJDEP\assigments\maintenance\draft\pictures\1 (5).JPG  **Courtesy of NJDOT** | | | |
| **Issue:**  **Corrective Action:**  **Preventative Action:** | | | **The inlet is not properly drained, assuming it has not rained within 72 hours.**  **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.**  **Routine inspections and removal of sediment from the forebay.** |
|  | | | |
| C:\Users\cwu\CIWU-D\New  stormwater\NJDEP\assigments\maintenance\draft\pictures\37-EB-1.10 (56).JPG  **Courtesy of NJDOT** | | | |
| **Issue:**  **Corrective Action:**  **Preventative Action:** | | | **The Inflow pipe is clogged by sediment and vegetation.**  **Clear and remove sediment and unwanted vegetation.**  **Routine inspection and removal of sediment and unwanted vegetation.** |
|  | | | |
| C:\Users\cwu\CIWU-D\New  stormwater\NJDEP\assigments\maintenance\draft\pictures\37-EB-0.61 (62).JPG  **Courtesy of NJDOT** | | | |
| **Issue:**  **Corrective Action:**  **Preventative Action:** | | | **The Inflow pipe is entirely clogged by sediment and trees.**  **Clear and remove sediment and trees.**  **Routine inspection & removal of sediment and unwanted vegetation.** |
|  | | | |
| C:\Users\cwu\CIWU-D\New  stormwater\NJDEP\assigments\maintenance\draft\pictures\012.jpg  **Courtesy of NJDOT** | | | |
| **Issue:**  **Corrective Action:**  **Preventative Action:** | | | **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.**  **Clear and remove trees and vegetation. If necessary, re-grade the bottom slope to ensure the flow properly spreads over the basin bottom.**  **Routine inspection and removal of sediment and unwanted vegetation.** |
|  | | | |
| C:\Users\cwu\CIWU-D\New  stormwater\NJDEP\assigments\maintenance\draft\pictures\DSCF5934.JPG  **Courtesy of NJDOT** | | | |
| **Issue:**  **Corrective Action:**  **Preventative Action:** | **Eroded inflow apron.**  **Repair apron.**  **Routine inspection and rehabilitation, if necessary.** | | |
|  | | | |
|  | | | |
| C:\Users\cwu\CIWU-D\New  stormwater\NJDEP\assigments\maintenance\draft\pictures\085.jpg  **Courtesy of NJDOT** | | | |
| **Issue:**  **Corrective Action:**  **Preventative Action:** | **The vegetation loss and the blackish soil may indicate frequent inundation.**  **Check the permeability rate of the soil and the water table elevation.**  **Replace the soil if necessary.**  **Routine inspection and tilling/aeration, if necessary.** | | |
|  | | | |
| **C:\Users\cwu\CIWU-D\New  stormwater\NJDEP\assigments\maintenance\draft\pictures\0_MG_8460.JPG** | | | |
| **Issue:**  **Corrective Action:**  **Preventative Action:** | | **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.**  **Check the permeability rate of the soil and the water table elevation. Replace the soil if necessary.**  **Routine inspection and cleaning.** | |
|  | | | |
| C:\Users\cwu\CIWU-D\New  stormwater\NJDEP\assigments\maintenance\draft\pictures\37-EB-0.61 (49).JPG  **Courtesy of NJDOT** | | | |
| **Issue:**  **Corrective Action:**  **Preventative Action:** | | **Trash rack is damaged.**  **Repair the trash rack.**  **Routine inspection, especially after large storm events. Tighten any loose bolts and repair structural flaws.** | |
|  | | | |
| C:\Users\cwu\CIWU-D\New  stormwater\NJDEP\assigments\maintenance\draft\pictures\_MG_8470.JPG | | | |
| **A well maintained detention basin** | | | |
|  | | | |

# Reference Documents

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

* As-built Drawings with Drainage Plans
* Soil Boring Logs
* Permeability Test – Sand Layer
* Permeability Test – Subsoil (Pre-construction)
* Permeability Test – Subsoil (Post-construction)
* Groundwater Mounding Analysis
* Landscaping Plan

**Attach Reference Documents Here**

# Inspection Checklist / Maintenance Actions

**Sand Filter with Infiltration**

**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** |
| A1  Pretreatment  (Forebay) | 1 | Scouring or erosion is present at inlet structure and/or riprap apron | Y\_\_  N\_\_ | Check the flow diversion device before the inlet pipe and whether the bypass flow channel is clogged  Work Order # \_\_\_\_\_\_\_\_\_\_ |
| 2 | Clogged pipes or excessive sediment in the forebay | Y\_\_  N\_\_ | Remove sediment or debris |
| 3 | Damaged outlet structure (e.g.,  cracking, subsidence, spalling, erosion, or deterioration) | Y\_\_  N\_\_ | Repair or replace the outlet structure  Work Order # \_\_\_\_\_\_\_\_\_\_ |
| A2  Pretreatment  (MTD,  If installed) | 1 | MTD inspection | Y\_\_  N\_\_ | (If a MTD is used for pretreatment, see manufacturer’s maintenance manual) |
| A3  Pretreatment  (Structural BMP) | 1 | BMP inspection | Y\_\_  N\_\_ | (See BMP No. \_\_\_\_\_\_\_\_ Field Manual) |
| Note: | | | | |
| B  Sand Bed | 1 | 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 |
| Remove any sediment buildup  If standing water is present longer than 5 days, report to mosquito commission.  Replace the sand layer (volume of replacement sand is specified in the Basin Configuration Targets in the Basic Design Information Section of this Manual)  Work Order # \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 2 | Excessive sediment, silt, or trash accumulation on basin bed | Y\_\_  N\_\_ | Clean pretreatment system  Remove silt, sediment, and trash |
| 3 | Erosion or channelization is present | Y\_\_  N\_\_ | Check whether the flow bypass or diversion device is clogged  Re-grade the infiltration bed  Work Order # \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 4 | Animal burrows/rodents are present | Y\_\_  N\_\_ | Pest control  Work Order # \_\_\_\_\_\_\_\_\_\_ |
| 5 | Uneven bed | Y\_\_  N\_\_ | Use light equipment to resurface the bed  Work Order # \_\_\_\_\_\_\_\_\_ |
| 6 | Evidence of sinkholes or subsidence | Y\_\_  N\_\_ | Monitor for sinkhole development |
| Note: | | | | |
| 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 Vegetation or Landscaping Plan    Inspect to determine if the tree roots caused any structural damage  Work Order # \_\_\_\_\_\_\_\_\_\_ |
| Note: | | | | |
| 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  Restabilize 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\_\_ | Restabilize the discharge riprap apron  Work Order #\_\_\_\_\_\_\_\_\_\_ |
| 5 | Standing water is present in the outlet structure longer than 72 hours |  | Pump out the standing water  Work Order # \_\_\_\_\_\_\_\_\_\_ |
| Note: | | | | |
| 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 #\_\_\_\_\_\_\_\_ |
| Note: | | | | |

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

(e.g., B/1, C/2)

**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** |
| Sediment/debris removal  **Sediment removal should take place when the basin is thoroughly dry.** | A1/A2/A3 – Pretreatment |  |
| B – Sand Bed |  |
| D – Basin Embankment and Side Slopes |  |
| E – Outlet |  |
|  |  |  |
| Vegetation removal | A1/A2/A3 – Pretreatment |  |
| B – Sand Bed |  |
| D – Basin Embankment and Side Slopes |  |
| E – Outlet |  |
| F – Emergency Spillway |  |
|  |  |  |
| (List additional tasks, if applicable) |  |  |

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

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

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

Replacement of the sand layer will occur according to the scheduled frequency (see Basin Configuration Targets above). The next scheduled replacement is \_\_\_\_\_\_\_\_\_\_\_\_\_ (date).

**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**:

(e.g., orifice plate is loose and bent)

1. The issue was from **Corresponding Checklist \_\_\_\_\_\_\_\_, Component No.** (e.g., E – Outlet), **Inspection Item No.**  (e.g., 2, 3) **.**
2. **Required Actions**

|  |  |  |
| --- | --- | --- |
| **Actions** | **Planned Date** | **Date Completed** |
| New bolts to fix the orifice plate |  |  |
| Repair/replace the trash rack |  |  |
| Restabilize side slope (indicate location) |  |  |
| Repair riprap apron with 100 cubic yards of aggregate |  |  |
| Revegetate |  |  |
| (List additional tasks, if applicable) |  |  |

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

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **Special requirements**
   * Time of the season or weather condition:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   * Tools/equipment:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   * Subcontractor (name or specific type):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Approved by** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Date** \_\_\_\_\_\_\_\_\_\_\_\_\_

(name/signature)

**Verification of completion by** \_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_ **Date** \_\_\_\_\_\_\_\_\_\_\_\_\_

(name/signature)

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