

# **Appendix 3**

## **Operations and Maintenance Manual**



Hydroworks® HydroFilter

Operations & Maintenance Manual

Version 1.1

## **Introduction**

The HydroFilter is a stormwater management device designed to both treat stormwater.

As storm water treatment structures fill up with pollutants they become less and less effective in removing new pollution. This is especially true of any stormwater treatment practice that includes filtration such as HydroFilter. Therefore, it is important that storm water treatment structures be maintained on a regular basis to ensure that they are operating at optimum performance. The HydroFilter is no different in this regard and this manual has been assembled to provide the owner/operator with the necessary information to inspect and coordinate maintenance of their HydroFilter.

## **Hydroworks® HydroFilter Operation**

### **Hydroworks HF Operation**

Under normal or low flows, water enters the structure through a grate or inlet pipe . Incoming water builds up around the filters and creates head to drive water radially into the filter cartridges from the outside through to the center of the cartridge. There is a 6” (150mm) diameter open center that runs through the center of each cartridge. Water reaching the center flows down into the base plug and is conveyed out of the structure by a pipe(s). A solid cone with a check valve is placed on top of the top filter cartridge to prevent incoming water from entering the 6” (150 mm) diameter opening while still allowing air to escape from the center of the cartridges as water enters the filter.

HydroFilter was scour tested according to the NJDEP 2013 filter protocol, and can be used either online or offline.

HydroFilter comes in various configurations:

1. Normal drop  
Water comes into the HydroFilter at a higher elevation and leaves at a lower elevation. The drop from inlet to outlet creates the head required to drive water through the filters. (Figure 1)
2. Minimal drop  
Water enters and leaves the HydroFilter structure at approximately the same elevation. A weir wall is used in the structure to create head to drive water through the filters. The height of the weir wall provides the necessary head to push the inlet water through the filter and depends on the difference in elevation between the inlet and outlet pipe(s) (Figure 2).
3. Exfiltration  
HydroFilter can be designed with exfiltration to promote maintenance of the hydrologic cycle (Low Impact Development) (Figure 3). Exfiltration can be designed with either a normal drop or minimal drop system. Designs with exfiltration will look the same as designs without exfiltration since the exfiltration is done outside of the structure housing the HydroFilter. As such,



owners who are uncertain whether their system incorporates exfiltration should contact HydroFilter who can clarify the design premise for their site.

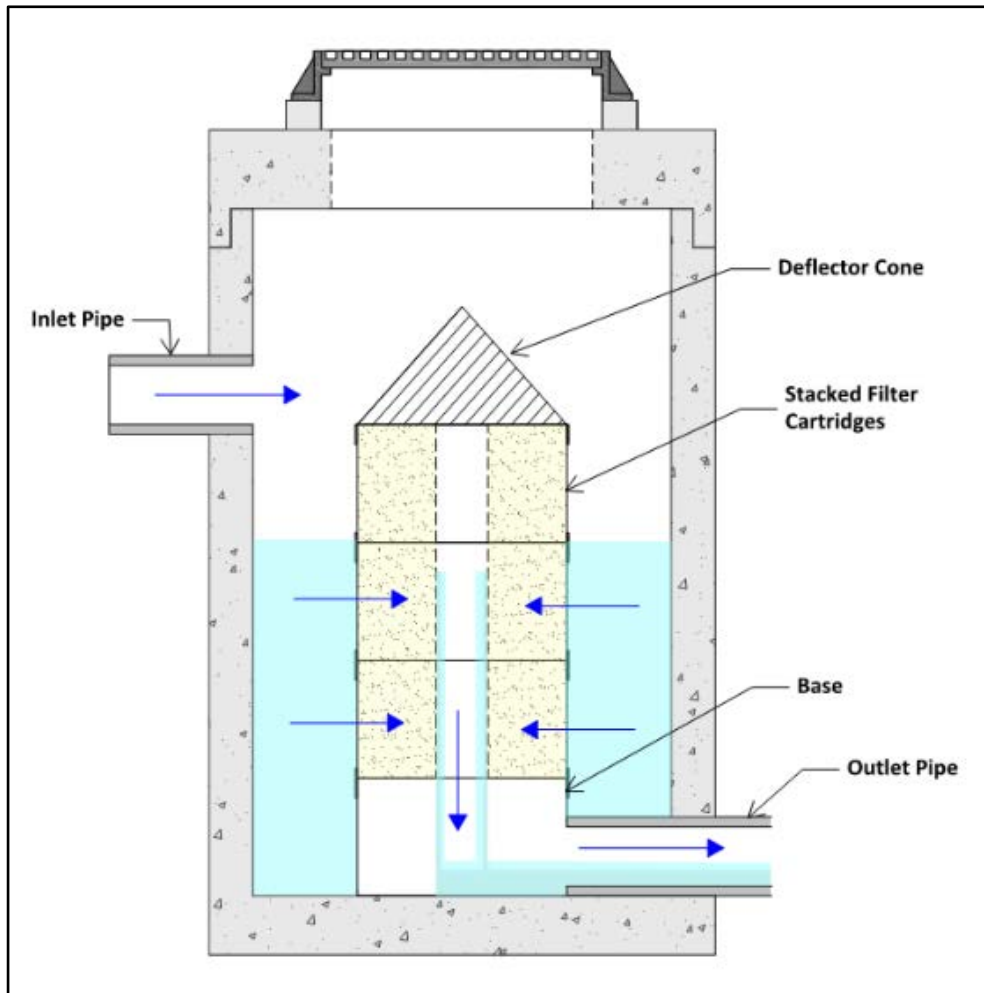
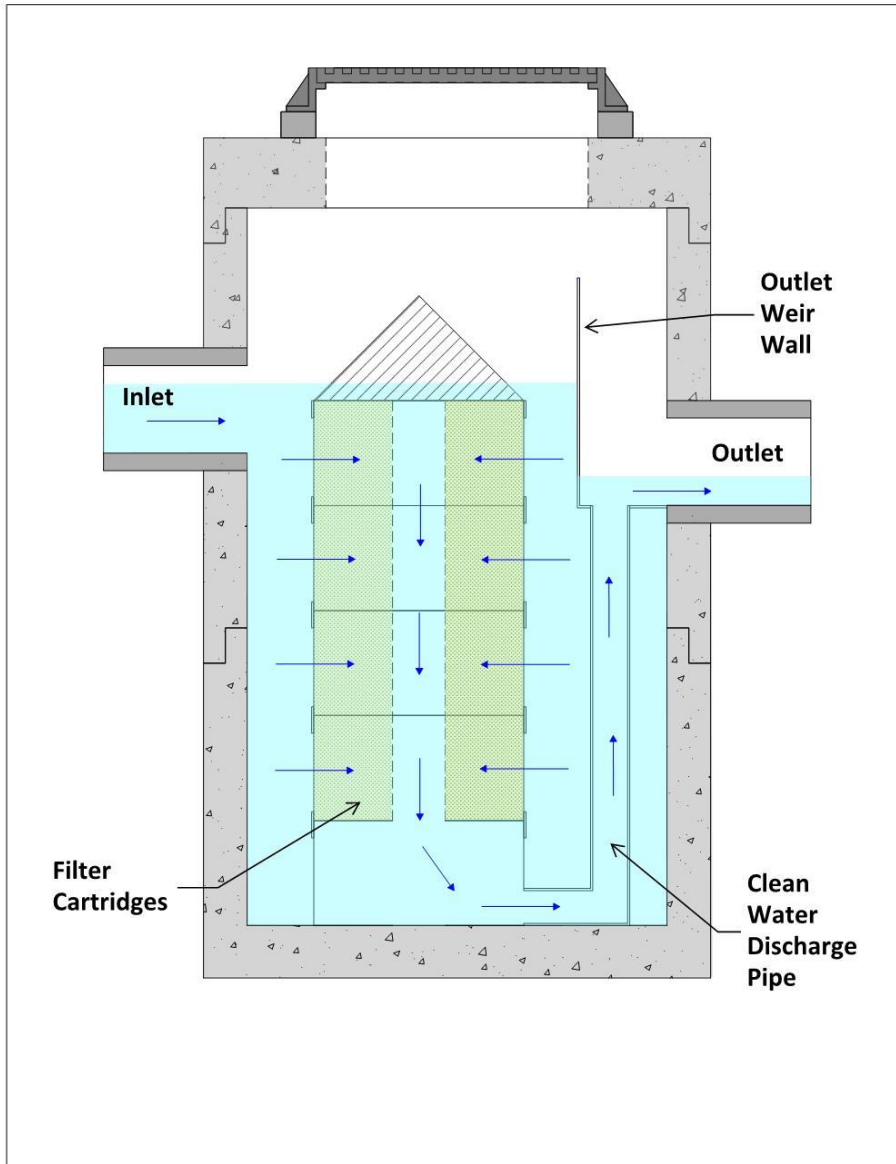


Figure 1. Hydroworks HydroFilter Operation – Normal Drop Filter



**Figure 2. Hydroworks HydroFilter Operation – Minimal Drop Filter**

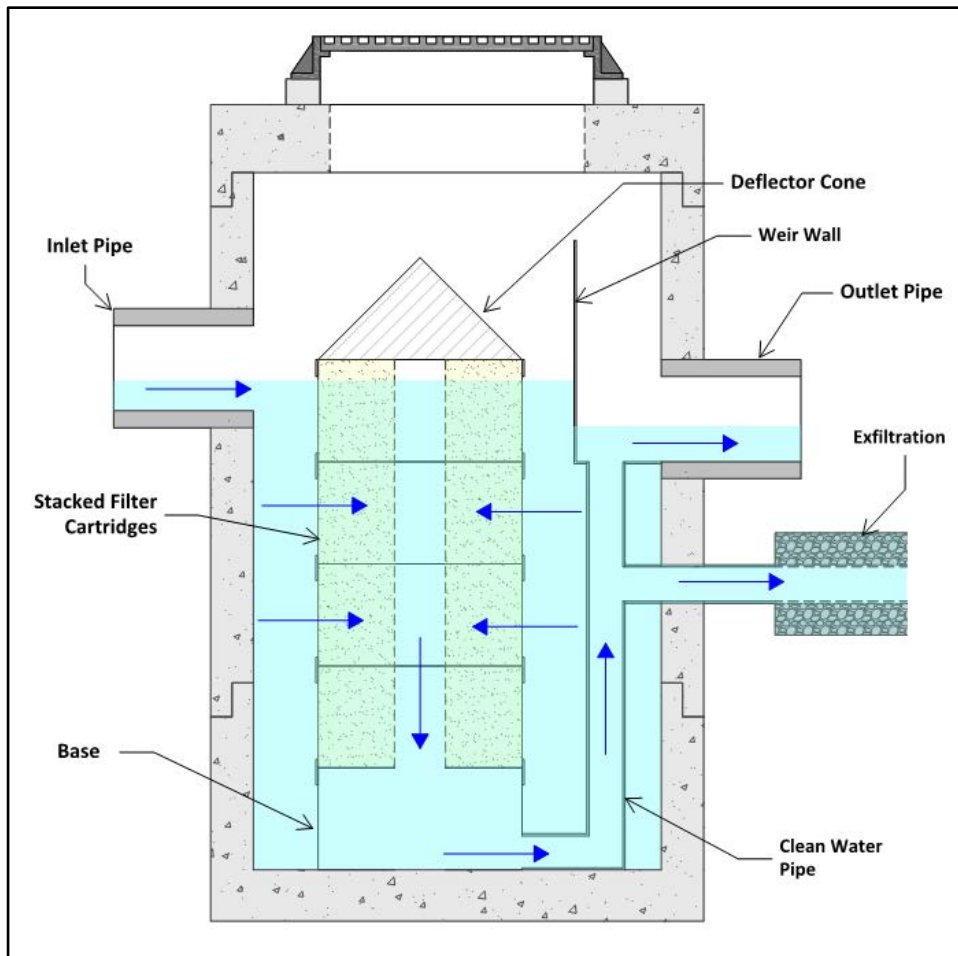


Figure 3. Hydroworks HydroFilter Operation – Minimal Drop with Exfiltration

## Inspection

### Procedure

The HydroFilter should be inspected between 24 hours and 72 hours after rainfall.

If the structure has not drained down to the outlet pipe within 24 hours of the last rainfall, the HydroFilter requires maintenance.

A foot of standing water is common in the HydroFilter. This water provides scour protection for any sediment on the structure floor and keeps the filter cartridges above floor of the structure away from the sediment. This depth of water **does not** indicate that maintenance is required.

### Frequency

#### Construction Period

The filter cartridges **should not** be installed in the HydroFilter during the construction period if the HydroFilter is located **online** since construction sediment will prematurely plug the cartridges requiring excessive maintenance during the construction period. A plate is installed in the base for the construction period to remind the contractor that the cartridges should only be installed for post construction operation. This plate needs to be removed when the cartridges are installed for post development operation.

If the HydroFilter is installed in an **offline** configuration, the cartridges in the HydroFilter can be installed prior to delivery of the structure during the construction period, however, the inlet and outlet from the HydroFilter structure must be plugged such that any sediment-laden water bypasses the HydroFilter. These plugs then have to be removed after the construction period to allow post construction operation of the HydroFilter. If you are uncertain as to whether your HydroFilter is located online or offline please contact Hydroworks at 888-290-7900 for clarification.

#### Post-Construction Period

The Hydroworks HydroFilter should be inspected twice during the first year of operation for normal stabilized sites (no exposed soil or materials storage). The initial inspections will indicate the required future frequency of inspection and maintenance if the structure was maintained and put into service (filters installed) after the construction period.

It is anticipated that the filter cartridges will need to be replaced annually. However, this will depend on pollutant loadings both on the site and from off-site activities (nearby construction, etc.). Filters are different from separators in that sediment levels at the bottom of a filter do not dictate maintenance frequency.



A filter does not need to be maintained until its' rated treatment rate decreases to the point where it can no longer provide the required annual percentage of pollutant removal. This is a hydraulic requirement that will depend on the hydrology (rainfall intensity distribution) and characteristics of the site (imperviousness, area, pollutant loading) being designed. That is why the frequency of cleaning is based on the presence of water after a storm since the presence of water indicates a reduction in filter flow rate.

## **Reporting**

Reports should be prepared as part of each inspection and include the following information:

1. Date of inspection
2. GPS coordinates of Hydroworks unit
3. Time since last rainfall
4. Date of last inspection
5. Installation deficiencies (missing parts, incorrect installation of parts)
6. Structural deficiencies (concrete cracks, broken parts)
7. Operational deficiencies (leaks, blockages)
8. Presence of oil sheen or depth of oil layer
9. Estimate of depth/volume of floatables (trash, leaves) captured
10. Sediment depth measured
11. Recommendations for any repairs and/or maintenance for the unit
12. Estimation of time before maintenance is required if not required at time of inspection

A sample inspection checklist is provided at the end of this manual.

## **Maintenance**

### **Procedure**

#### **1. Water/Sediment Removal**

Maintenance involves removing the water and replenishing or replacing the filter cartridges. In all cases, sediment that has been collected around the filter cartridges in the sump of the device must be removed first. This is typically done by vacuum truck.

**It is important to remove all sediment and water from the structure before trying to replenish or remove and replace the filter cartridges.**

#### **2. Filter Replenishment (Weir Wall without Exfiltration)**

Once the water and sediment have been removed from the HydroFilter structure, the HydroFilter can be backwashed by flushing water backwards





through the system from the outlet through the vertical standpipe and back through the filter cartridges. As the water is backflushed through the cartridges from the inside to the outside the water exiting the cartridges should be removed by the vacuum truck. Accordingly, HydroFilter units with this configuration (weir wall) can be backflushed in-place to extend the life of the filter cartridges without the need for cartridge removal.

### 3. Filter Cartridge Replacement

Replacement of filter cartridges is made easy due to the modular nature of each cartridge. The cartridges are stacked vertically on top of each other. Each cartridge has a sleeve such that they fit together.

A lifting bar is located in the center of the 6" hollow center of each cartridge near the top of the cartridge. The top cone has a lifting ring on the top of it. For shallow installations, vertical stacks of filters should have an access opening in the structure directly above them or close to being above them to facilitate maintenance.

A winch with a hook is lowered down to hook on to the cone lifting ring and the cone is winched out of the structure. Similarly, the winch is hooked under the lifting bar of each successive filter cartridge and they are winched out of the structure.

Fresh cartridges are similarly winched in stacking them as required ending each stack with a cone. Call Hydroworks at 888-290-7900 since we offer a cartridge exchange program.

The local municipality should be consulted for the allowable disposal options for both the water and sediments that are removed from the HydroFilter.

# HYDROFILTER INSPECTION SHEET

**Date** \_\_\_\_\_  
**Date of Last Inspection** \_\_\_\_\_

**Site** \_\_\_\_\_  
**City** \_\_\_\_\_  
**State** \_\_\_\_\_  
**Owner** \_\_\_\_\_

**GPS Coordinates** \_\_\_\_\_

**Date of last rainfall** \_\_\_\_\_  
**Depth of rainfall (last 72h)** \_\_\_\_\_

<b>Site Characteristics</b>	<b>Yes</b>	<b>No</b>
Soil erosion evident	<input type="checkbox"/>	<input type="checkbox"/>
Exposed material storage on site	<input type="checkbox"/>	<input type="checkbox"/>
Large exposure to leaf litter (lots of trees)	<input type="checkbox"/>	<input type="checkbox"/>
High traffic (vehicle) area	<input type="checkbox"/>	<input type="checkbox"/>

<b>HydroFilter</b>	<b>Yes</b>	<b>No</b>
Standing water (above outlet invert)	<input type="checkbox"/> *	<input type="checkbox"/>
Missing internal components	<input type="checkbox"/> **	<input type="checkbox"/>
Internal component damage (cracked, broken, loose pieces)	<input type="checkbox"/> **	<input type="checkbox"/>
Floating debris in the structure (oil, leaves, trash)	<input type="checkbox"/>	<input type="checkbox"/>
Concrete cracks/deficiencies	<input type="checkbox"/> ***	<input type="checkbox"/>
Exposed rebar	<input type="checkbox"/> **	<input type="checkbox"/>

- \* Maintenance required
- \*\* Repairs required
- \*\*\* Further investigation is required

**Other Comments:** \_\_\_\_\_  
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Please call Hydroworks at 888-290-7900 or email us at support@hydroworks.com if you have any questions regarding the Inspection Checklist. Please fax a copy of the completed checklist to Hydroworks at 888-783-7271 for our records.





## Hydroworks® HydroFilter

### One Year Limited Warranty

Hydroworks, LLC warrants, to the purchaser and subsequent owner(s) during the warranty period subject to the terms and conditions hereof, the Hydroworks HydroFilter to be free from defects in material and workmanship under normal use and service, when properly installed, used, inspected and maintained in accordance with Hydroworks written instructions, for the period of the warranty. The standard warranty period is 1 year.

The warranty period begins once the filter has been manufactured and is available for delivery. Any components determined to be defective, either by failure or by inspection, in material and workmanship will be repaired, replaced or remanufactured at Hydroworks' option provided, however, that by doing so Hydroworks, LLC will not be obligated to replace an entire insert or concrete section, or the complete unit. This warranty does not cover shipping charges, damages, labor, any costs incurred to obtain access to the unit, any costs to repair/replace any surface treatment/cover after repair/replacement, or other charges that may occur due to product failure, repair or replacement.

This warranty does not apply to any material that has been disassembled or modified without prior approval of Hydroworks, LLC, that has been subjected to misuse, misapplication, neglect, alteration, accident or act of God, or that has not been installed, inspected, operated or maintained in accordance with Hydroworks, LLC instructions and is in lieu of all other warranties expressed or implied. Hydroworks, LLC does not authorize any representative or other person to expand or otherwise modify this limited warranty.

The owner shall provide Hydroworks, LLC with written notice of any alleged defect in material or workmanship including a detailed description of the alleged defect upon discovery of the defect. Hydroworks, LLC should be contacted at 257 Cox St., Roselle, NJ 07203 or any other address as supplied by Hydroworks, LLC. (888-290-7900).

This limited warranty is exclusive. There are no other warranties, express or implied, or merchantability or fitness for a particular purpose and none shall be created whether under the uniform commercial code, custom or usage in the industry or the course of dealings between the parties. Hydroworks, LLC will replace any goods that are defective under this warranty as the sole and exclusive remedy for breach of this warranty.

Subject to the foregoing, all conditions, warranties, terms, undertakings or liabilities (including liability as to negligence), expressed or implied, and howsoever arising, as to the condition, suitability, fitness, safety, or title to the Hydroworks HydroFilter are hereby negated and excluded and Hydroworks, LLC gives and makes no such representation, warranty or undertaking except as expressly set forth herein. Under no circumstances shall Hydroworks, LLC be liable to the Purchaser or to any third party for product liability claims; claims arising from the design, shipment, or installation of the HydroFilter, or the cost of other goods or services related to the purchase and installation of the HydroFilter. For this Limited Warranty to apply, the HydroFilter must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and Hydroworks' written installation instructions.

Hydroworks, LLC expressly disclaims liability for special, consequential or incidental damages (even if it has been advised of the possibility of the same) or breach of expressed or implied warranty. Hydroworks, LLC shall not be liable for penalties or liquidated damages, including loss of production and profits; labor and materials; overhead costs; or other loss or expense incurred by the purchaser or any third party. Specifically excluded from limited warranty coverage are damages to the HydroFilter arising from ordinary wear and tear; alteration, accident, misuse, abuse or neglect; improper maintenance, failure of the product due to improper installation of the concrete sections or improper sizing; or any other event not caused by Hydroworks, LLC. This limited warranty represents Hydroworks' sole liability to the purchaser for claims related to the HydroFilter, whether the claim is based upon contract, tort, or other legal basis.