

Operation & Maintenance (OM) Manual v01



Filterra® Stormwater Bioretention Filtration System

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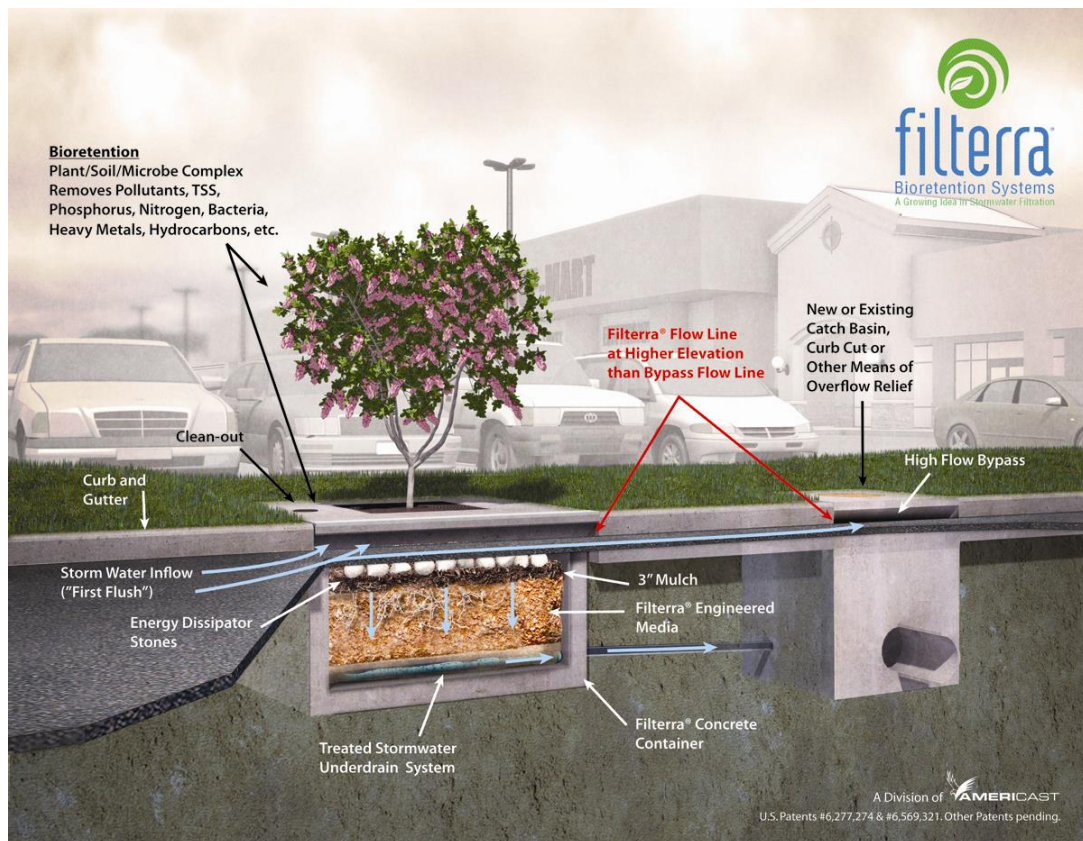
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General Description

The following general specifications describe the general operations and maintenance requirements for the Ocean Protect stormwater bioretention filtration system, the Filterra®. The system utilizes physical, chemical and biological mechanisms of a soil, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system is a fully equipped, pre-constructed drop-in place unit designed for applications in the urban landscape to treat contaminated runoff.



Stormwater flows through a specially designed filter media mixture contained in a landscaped concrete container. The mixture immobilizes pollutants which are then decomposed, volatilized and incorporated into the biomass of the Filterra® system's micro/macro fauna and flora. Stormwater runoff flows through the media and into an underdrain system at the bottom of the container, where the treated water is discharged. Higher flows bypass the Filterra® to a downstream inlet or outfall.

Maintenance is a simple, inexpensive and safe operation that does not require confined space access, pumping or vacuum equipment or specialized tools. Properly trained landscape personnel can effectively maintain Filterra® Stormwater systems by following instructions in this manual.

Basic Operations

Filtterra® is a bioretention system in a concrete box. Contaminated stormwater runoff enters the filter box through the curb inlet spreading over the 75mm layer of mulch on the surface of the filter media. As the water passes through the mulch layer, most of the larger sediment particles and heavy metals are removed through sedimentation and chemical reactions with the organic material in the mulch. Water passes through the soil media where the finer particles are removed and other chemical reactions take place to immobilize and capture pollutants in the soil media. The cleansed water passes into an underdrain and flows to a pipe system or other appropriate discharge point. Once the pollutants are in the soil, the bacteria begin to break down and metabolize the materials and the plants begin to uptake and metabolize the pollutants. Some pollutants such as heavy metals, which are chemically bound to organic particles in the mulch, are released over time as the organic matter decomposes to release the metals to the feeder roots of the plants and the cells of the bacteria in the soil where they remain and are recycled. Other pollutants such as phosphorus are chemically bound to the soil particles and released slowly back to the plants and bacteria and used in their metabolic processes. Nitrogen goes through a very complex variety of biochemical processes where it can ultimately end up in the plant/bacteria biomass, turned to nitrogen gas or dissolves back into the water column as nitrates depending on soil temperature, pH and the availability of oxygen. The pollutants ultimately are retained in the mulch, soil and biomass with some passing out of the system into the air or back into the water.

Design and Installation

Each project presents different scopes for the use of Filtterra® systems. To ensure the safe and specified function of the stormwater BMP, Ocean Protect reviews each application before supply. Information and help may be provided to the design engineer during the planning process. Correct Filtterra® box sizing (by MUSIC or Mass Loading) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Filtterra units as shown in approved plans. A comprehensive installation manual is available at oceanprotect.com.au/filtterra.

Maintenance

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement.

- Avoid legal challenges from your jurisdiction's maintenance enforcement program.
- Prolong the expected lifespan of your Filtterra media.
- Avoid more costly media replacement.
- Help reduce pollutant loads leaving your property.

Simple maintenance of the Filtterra® is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The unit will recycle and accumulate pollutants within the biomass, but is also subjected to other materials entering the throat. This may include litter, silt and leaves etc. which will be contained within the void below the top grate and above the mulch layer. Too much silt may inhibit the Filtterra's® flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

When to Maintain?

Ocean Protect includes a 1-year maintenance plan with each system purchase. Annual included maintenance consists of a maximum of one to two (1-2) scheduled visits. Additional maintenance may be necessary depending on sediment and litter loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated for full operation. Full operation is defined as the unit installed, kerb and gutter and transitions in place and activation (by Supplier) when mulch and plant are added and temporary throat protection removed.

Activation cannot be carried out until the site is **fully** stabilized (full landscaping, grass cover, final paving and street sweeping completed). Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands. The fall visit helps the system by removing excessive leaf litter.

A first inspection to determine if maintenance is necessary should be performed at least twice annually after every major storm event of greater than (25-40mm) twenty-five to forty millimetres total depth (subject to regional climate). Please refer to the maintenance checklist for specific conditions that indicate if maintenance is necessary.

It has been found that in regions which receive greater than 760mm of annual rainfall (without rainwater tanks installed on-lot) , (2) two visits are generally required. Regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency; e.g. some fast food restaurants require more frequent litter removal. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented require additional maintenance visits.

Some sites may be subjected to extreme sediment or litter loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Supplier and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the (maintenance) Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance to the Supplier (i.e. no pruning or fertilizing).

Exclusion of Services

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Filterra® system.

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the Supplier maintenance contract. Should a major contamination event occur, the Owner must block off the outlet pipe of the Filterra® (where the cleaned runoff drains to, such as drop-inlet) and block off the throat of the Filterra®. The Supplier should be informed immediately.

Maintenance Visit Summary

Regardless of the type of Filterra system, ie Precast Pit Filterra or Filterra Bioscape (large basin type systems) the processes for maintenance is the same. Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of Filterra® and surrounding area
2. Removal of tree grate and erosion control stones
3. Removal of debris, litter and mulch
4. Mulch replacement
5. Plant health evaluation and pruning or replacement as necessary
6. Clean area around Filterra®
7. Complete paperwork

Maintenance Tools, Safety Equipment and Supplies

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of litter is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes. A T-Bar or crowbar should be used for moving the tree grates (up to 70kg ea.).

Most visits require only replacement mulch. Three bags of double shredded mulch are used per unit (on a standard 1.8 x 1.8 size). Some visits may require additional Filterra® engineered soil media available from the Supplier. The volume require for mulch replace is calculated by multiplying the surface area of the Filterra system by 0.075 in cubic metres.

Maintenance Visit Procedure



1. Inspection of Filterra® and surrounding area

- Record individual unit **before** maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water	yes no
Damage to Box Structure	yes no
Damage to Grate	yes no
Is Bypass Clear	yes no

If yes answered to any of these observations, record with close-up photograph (numbered).



2. Removal of tree grate and erosion control stones

- Remove metal grates for access into Filterra® box.
- Dig out silt (if any) and mulch and remove litter & foreign items.

Record on Maintenance Report the following:

Silt/Clay	yes no
Cups/ Bags	yes no
Leaves	yes no
# of Buckets Removed	



3. Removal of debris, litter and mulch

- After removal of mulch and debris, measure distance from the top of the Filterra® engineered media soil to the bottom of the top slab. If this distance is greater than 305mm, add Filterra® media (not top soil or other) to recharge to a 230mm distance.

Record on Maintenance Report the following:

Distance to Bottom of Top Slab (inches)	
# of Buckets of Media Added	



4. Mulch replacement

- Add double shredded mulch evenly across the entire unit to a depth of 75mm.
- Ensure correct repositioning of erosion control stones by the Filterra® inlet to allow for entry of litter during a storm event.
- Replace Filterra® grates correctly using appropriate lifting or moving tools, taking care not to damage the plant.



5. Plant health evaluation and pruning or replacement as necessary

- Examine the plant's health and replace if dead.
- Prune as necessary to encourage growth in the correct directions

Record on Maintenance Report the following:

Height above Grate	(mm)
Width at Widest Point	(mm)
Health	alive dead
Damage to Plant	yes no
Plant Replaced	yes no



6. Clean area around Filterra®

- Clean area around unit and remove all refuse to be disposed of appropriately.



7. Complete paperwork

- Deliver Maintenance Report and photographs to appropriate location (normally Ocean Protect during maintenance contract period).
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check For	Conditions That Should Exist	Actions
Inlet	Excessive sediment or litter accumulation	Accumulated sediments or litter impair free flow of water into Filterra	Inlet should be free of obstructions allowing free distributed flow of water into Filterra.	Sediments and/or litter should be removed.
Mulch Cover	Litter and floatable debris accumulation	Excessive litter and/or debris accumulation.	Minimal litter or other debris on mulch cover.	Litter and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	"Ponding" of water on mulch cover.	"Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation	Plant growth excessive	Plants should be appropriate to the species and location of Filterra.		Trim/prune plants in accordance with typical landscaping and safety needs.
Structure	Structure has visible cracks	Cracks wider than ½ inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.

Maintenance is ideally to be performed twice annually.
 Inspection to be performed after every major storm event >25-40mm total depth, subject to climate.

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Filterra® Project Maintenance Order

Project

Address

Directions

**Project
Owner**

Company

Contact Name

Telephone #

Owner Notified
of Mtce on (date)

Filterra Units on this Order
Total Units on this Project

Date of Maintenance

Arrival Time

Departure Time

of Workers

Notes on Project

Maintenance Supervisor

Filterra® Structure Maintenance Report

Project	<input type="text"/>	Structure Number	<input type="text"/>
Plant Type	<input type="text"/>	Structure Size	<input type="text"/>
Date	<input type="text"/>	GPS	<input type="text"/>
		Pre Mtce Photo #	<input type="text"/>

Initial Observations

Standing Water	<input type="text"/> Y	<input type="text"/> N	Damage to Grate	<input type="text"/> Y	<input type="text"/> N
IF Yes, STOP NOW & call 1300 354 722			Is Bypass Clear	<input type="text"/> Y	<input type="text"/> N
Damage to Box Structure	<input type="text"/> Y	<input type="text"/> N	Notes		
If YES to any observation take close up photo					

Waste

Silt / Clay	<input type="text"/> Y	<input type="text"/> N	Buckets Removed (# of)	<input type="text"/>
Cups/Bags	<input type="text"/> Y	<input type="text"/> N	Notes	
Leaves	<input type="text"/> Y	<input type="text"/> N		
Other	<input type="text"/>			

Media

Distance to Bottom of Top Slab (in.)	<input type="text"/>	Notes
Buckets of Media Added (# of)	<input type="text"/>	

Mulch

Netting Replaced	<input type="text"/> Y	<input type="text"/> N	Bags of Mulch Added (# of)	<input type="text"/>
Stones Replaced	<input type="text"/> Y	<input type="text"/> N	Notes	

Plant

	#1	(#2)		#1	(#2)
Height above Grate (feet)	<input type="text"/>	<input type="text"/>	Plant Replaced	<input type="text"/> Y / N	<input type="text"/> Y / N
Width at Widest Point (feet)	<input type="text"/>	<input type="text"/>	Notes		
Health	Alive/Dead	Alive/Dead			
Damage to Plant	<input type="text"/> Y / N	<input type="text"/> Y / N			
If YES to plant damage take close up photo					

Other Notes

(use back if necessary)

Filterra® Warranty

Seller warrants goods sold hereunder against defects in materials and workmanship only, for a period of (1) year from date the Seller activates the system into service. Seller makes no other warranties, express or implied.

Seller's liability hereunder shall be conditioned upon the Buyer's installation, maintenance, and service of the goods in strict compliance with the written instructions and specifications provided by the Seller. Any deviation from Seller's instructions and specifications or any abuse or neglect shall void warranties.

In the event of any claim upon Seller's warranty, the burden shall be upon the Buyer to prove strict compliance with all instructions and specifications provided by the Seller.

Seller's liability hereunder shall be limited only to the cost or replacement of the goods. Buyer agrees that Seller shall not be liable for any consequential losses arising from the purchase, installation, and/or use of the goods.