

## Section 7.5 Filtterra Bioretention Systems

### 7.5.1 Product Description

The Filtterra<sup>®</sup> bioretention filtration system is a self-contained stormwater treatment system. The technology packages soil media, plants and drainage infrastructure similar to those found in typical bioretention best management practices (BMPs) into a specially designed, pre-fabricated concrete housing (Figure 1). The Filtterra<sup>®</sup> is a flow-through system, intended to provide decentralized, distributed stormwater treatment control within a wide range of urbanized settings. The Filtterra<sup>®</sup> technology is well-suited for incorporation into Low Impact Development (LID) site and stormwater treatment design. The Filtterra<sup>®</sup> technology is capable of providing effective removal of suspended sediments, nutrients, heavy metals, and TPH from treated stormwater flows. For more information, please review a Whitepaper on the Filtterra<sup>®</sup> technology at [www.filtterra.com](http://www.filtterra.com).



Figure 1. Filtterra<sup>®</sup> Bioretention Stormwater Treatment System

The Filtterra<sup>®</sup> design is based on the principles of traditional bioretention technologies such as filter strips and rain gardens. Bioretention systems and similar micro-scale controls are intended to enhance the treatment capacity of developed landscapes and reduce reliance on larger downstream controls such as detention basins. They may provide significant treatment over the entire course of a typical runoff event if designed, sited, installed and maintained appropriately. Bioretention technologies operate similarly to under drain filters in terms of particulate settling, filtration, adsorption and absorption of pollutants. Unit treatment processes more specific to bioretention include nutrient uptake, transpiration and other measures associated with the vegetation and root structure.

The Filtterra<sup>®</sup> technology is intended to address common problems and limitations of typical bioretention systems, providing an easily-installed, easily-maintained, standardized bioretention design. In terms of installation, maintenance and functionality, the Filtterra<sup>®</sup> also shares similarities with common sand or sand/organic filtration technologies. The most critical element of the Filtterra<sup>®</sup> design is the specialized soil media, composed to optimize the flow-through rates and treatment capacity of the system. The top of the Filtterra<sup>®</sup> system is typically enclosed, with a tree frame and grate incorporated into the lid to accommodate the specified vegetation and maintenance access. To help improve uniformity and consistency of performance, Americast offers comprehensive, customized sizing and installation guidance to Filtterra<sup>®</sup> customers and an extensive on-site maintenance service.

## 7.5.2 Design and Installation Criteria

The Filterra<sup>®</sup> system is considered an approved alternative to the General Standard BMPs described in the Chapter 500 Stormwater Manual Rules when it is designed as a stormwater treatment train that uses a combination of Filterra<sup>®</sup> systems draining in series to a StormTech Isolator Row (and chamber system when channel protection volume attenuation is required). It must be designed, installed and maintained in accordance with the following criteria.

1. The Filterra<sup>®</sup> system is installed with the inlet slot invert slightly below pavement grade. Captured flows percolate through the mulch; plant and soil filter media and eventually discharge via a perforated under-drain to an adjacent StormTech Isolator Row (Figure 2). Several inches of headspace is provided above the mulch surface layer to permit ponding of flows during high-intensity runoff events, and to collect trash and debris.



Figure 2. Typical Filterra<sup>®</sup> Design and Installation

2. When designed with the standard curb inlet design, the Filterra<sup>®</sup> will be configured “off-line” with the surface elevation at the Filterra<sup>®</sup> system being up gradient of an overflow inlet. In the grated inlet design, the Filterra<sup>®</sup> system will incorporate an internal bypass and does not require an overflow inlet. More specific installation information is provided in the Filterra<sup>®</sup> Installation, Operation and Maintenance (IOM) Manual also found on the Filterra<sup>®</sup> website. The applicant must demonstrate that the design meets all the manufacturer’s specifications and shall be reviewed by the manufacturer prior to submission for DEP approval. Review and approval of the design by the manufacturer will be sufficient to demonstrate conformance with the manufacturer’s specifications.
3. The Filterra<sup>®</sup> system will be configured in series upstream of a StormTech Isolator Row. The treated and bypass flow will be combined and directed to the Isolator Row which shall be sized to treat the flow from a 1-year, 24-hour storm event.
4. For proper trash collection ensure a minimum 4” and maximum 6” Filterra<sup>®</sup> throat opening depth. Positive drainage of each Filterra<sup>®</sup> system’s effluent treatment pipe is required to prevent free standing water from accumulating in the system or under drain. This could occur due to tidal influences or improper connection of Filterra’s<sup>®</sup> effluent pipe to the StormTech Isolator Row.
6. Plans and the completed Filterra<sup>®</sup> Project Information Form located in the Filterra<sup>®</sup> DAKit must be sent to Americast for Filterra<sup>®</sup> placement review. Plans sheets should include grading, drainage areas, stormwater schedules or profiles, landscape sheets and Filterra<sup>®</sup> detail sheets. This review is mandatory for warranty to apply and helps ensure that each Filterra<sup>®</sup> system operates efficiently to maximize performance and minimize maintenance.

7. The Filterra<sup>®</sup> Bioretention System(s) shall be delivered to the site with the engineered filter media and plumbing fully installed. The Filterra<sup>®</sup> shall be delivered sealed, preventing debris and sediment from entering the system during construction. The boards on top of the lid and boards sealed in the system's throat must **NOT** be removed prior to "activation". The activation of the system includes removal of the internal wooden forms and protective mesh cover, installation of plant(s) and mulch layers as necessary. Activation of the Filterra<sup>®</sup> unit is performed **ONLY** by the Supplier (Americast or its authorized dealer). The activation process cannot commence until the project site is fully stabilized and cleaned (full landscaping, grass cover, final paving and street sweeping completed), minimizing the risk of construction materials contaminating the Filterra<sup>®</sup> system.

8. A list of appropriate plants for use with the Filterra<sup>®</sup> system is provided on the Filterra<sup>®</sup> website. Use of native species may reduce the need for additional irrigation of the Filterra<sup>®</sup> vegetation. Each Filterra<sup>®</sup> must receive adequate irrigation to ensure survival of the living system during periods of drier weather. This may be achieved through a piped system, gutter flow or through the tree grate. In general, irrigation needs should be the same as that of the surrounding landscaping, i.e. if the landscaping is being watered, the Filterra<sup>®</sup> should be, as well.

### 7.5.3 Sizing Guidelines

Appropriate sizing, location and installation of the Filterra<sup>®</sup> are essential to the performance of the stormwater treatment system. The Filterra<sup>®</sup> system is specifically designed to treat runoff flows from small watersheds (or "microsheds"). As such, it is intended to be used as a distributed, upstream control, per the

design principles of Low Impact Development (LID) stormwater management. The Filterra<sup>®</sup> Bioretention System shall be sized in accordance with the manufacturer's standard New England sizing guidelines outlined in the following table to treat at least 90% of the annual runoff volume.

Filterra <sup>®</sup> Model Number	Area in Acres
4x6 or 6x4	0.32
4x8 or 8x4	0.42
6x6	0.47
6x8 or 8x6	0.64
6x10 or 10x6	0.79
6x12 or 12x6	0.95
7x13 or 13x7	1.20

This sizing table can also be found as Table 1. Filterra<sup>®</sup> Quick Sizing Table, located in the Filterra<sup>®</sup> Design Assistance Kit (DAKit) on the Filterra<sup>®</sup> website. The entire contributing drainage area to the Filterra<sup>®</sup> should be considered and the minimum allowable C factors noted. The maximum contributing drainage area will vary with site conditions.

Information on the pollutant removal efficiency of the Filterra<sup>®</sup> system is based on more than three-years of lab and field studies performed by the Civil Engineering Department at the University of Virginia, as well as field studies performed under the Washington TAPE protocol. Pollutant removal efficiencies for the Filterra<sup>®</sup> system are as follows:

- Total Suspended Solids: 85%
- Total Phosphorus: 60% - 70%
- Total Nitrogen: 43%
- Dissolved Zinc: 58%
- Dissolved Copper: 46%
- TPH: >93%

## 7.5.4 Maintenance Criteria

Routine clearing of accumulated trash and debris is required to prevent clogging of the inlet opening (just as with any catch basin, inlet or other in-curb unit). Americast includes a one-year maintenance plan with each Filtterra<sup>®</sup> system to ensure the systems are operating per specifications. In addition, the owner will provide an executed 5 year inspection and maintenance contract prior to final DEP approval. Said contract will be with a professional with knowledge of erosion and stormwater control, including a detailed working knowledge of the proposed BMP's.

The company recommends that long-term maintenance be performed on at least a semiannual basis (generally spring and fall servicing) to help preserve Filtterra<sup>®</sup> flow-through rates and treatment performance also found in the Filtterra<sup>®</sup> IOM. Each maintenance session should include, at a minimum, the following:

- Inspection of the system structure and media;
- Removal of trash and silt from the filter surface;
- Replacement of the surface mulch layer. Complete replacement of the soil media is generally required only as part of a spill clean-up.
- Pruning of vegetation. If the vegetation is in dead or in poor health, it will require replacement; and
- Appropriate disposal of all refused items.

Americast offers extended maintenance services or training to facilitate on-going maintenance. A more detailed description of the maintenance procedures is presented in the Filtterra<sup>®</sup> IOM.