

## 6.11 Proprietary Devices



**Figure 6-33: Filterra Tree Box Filter**

*Photo Credit: Filterra Bioretention Systems*

### 6.11.1 Description

Proprietary devices are commercial products that typically aim to provide storm water treatment in space-limited applications, often using patented innovative technologies. The most commonly encountered classes of proprietary storm water management controls include hydrodynamic separation, catch basin insert technologies, cartridge filters, and proprietary biotreatment devices.

Hydrodynamic separation devices (alternatively, swirl concentrators) are devices that remove trash, debris, and coarse sediment from incoming flows using screening, gravity settling, and centrifugal forces generated by forcing the influent into a circular motion. By having the water move in a circular fashion, rather than a straight line, it is possible to obtain significant removal of suspended sediments and attached pollutants with less space as compared to wet vaults and other settling devices. Hydrodynamic devices were originally developed for combined sewer overflows (CSOs), where they were used primarily to remove coarse inorganic solids. Hydrodynamic separation has been adapted for storm water treatment by several manufacturers and is currently used to remove trash, debris, and other coarse solids down to sand-sized particles. Several types of hydrodynamic separation devices are also designed to remove floating oils and grease using sorbent media. For more information on specific hydrodynamic devices and their vendors refer to Table 6-79.

Catch basin inserts are manufactured filters or fabric placed in a drop inlet to remove sediment and debris and may include sorbent media to remove floating oils and grease. There are a multitude of inserts of various shapes and configurations, typically falling into one of three groups: socks, boxes, and trays. The sock-type filters are typically constructed of a fabric, usually polypropylene. The fabric may be attached to a frame or the grate of the inlet may hold

### Applications

- Roads, highways, parking lots
- Commercial and mixed use
- Industrial
- Residential

### Advantages

- Can be selected to target specific contaminants
- Often smaller footprint required

### Limitations

- Must be purchased from private sector firm
- May require more maintenance
- Performance must be verified by third party

the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene “bag” is placed in the wire mesh box and the bag takes the form of the box. Most box products are one box; that is, settling and filtration through media occur in the same box. Other products consist of one or more trays or mesh grates. The trays may hold different types of media. Filtration media vary by manufacturer. Types include polypropylene, porous polymer, treated cellulose, and activated carbon. Inserts are an easy and inexpensive retrofitting option because drain inlets are already a component of most standard drainage systems. Inserts are usually only suitable for mitigating relatively small tributary areas (less than 1 acre); however, depending on the size of the project, this structure normally does not meet BMP requirements for water quality treatment but does assist with pretreatment. For more information on specific catch basin inserts and their vendors refer to Table 6-79.

Cartridge filters typically consist of a series of vertical filters contained in a vault or catch basin that provide treatment through filtration and sedimentation. The vault may be divided into multiple chambers where the first chamber acts as a pre-settling basin for removal of coarse sediment while another chamber acts as the filter bay and houses the filter cartridges. The performance and capacity of a cartridge filter installation depends on the properties of the media contained in the cartridges. Cartridge filter manufacturers often provide an array of media types each with varying properties, targeting various pollutants and a range of particle sizes. Commonly used media include media that target solids, such as perlite, and media that target both dissolved and non-dissolved constituents, such as compost leaf media, zeolite, and iron-infused polymers. Manufacturers try to distinguish their products through innovative cartridge designs that aim at providing self cleaning and draining, uniform loading, and clog resistance allowing the devices to function properly over a wide range of hydraulic loadings and pollutant concentrations. For more information on specific cartridge filter models and their vendors refer to Table 6-79.

Proprietary biotreatment devices are devices that are manufactured to mimic natural systems such as bioretention areas by incorporating plants, soil, and microbes engineered to provide treatment at higher flow rates or volumes and with smaller footprints than their natural counterparts. Incoming flows are typically filtered through a planting media (mulch, compost, soil, plants, microbes, etc) and either infiltrated or collected by an underdrain and delivered to the storm water conveyance system. Tree box filters are an increasingly common type of proprietary biotreatment device that are installed at curb level and filled with a bioretention type soil. For low to moderate flows they operate similarly to bioretention systems and are bypassed during high flows. Tree box filters are highly adaptable solutions that can be used in all types of development and in all types of soils but are especially applicable to dense urban parking lots, street, and roadways. Tributary areas for biotreatment devices tend to be limited to 0.25 to 1.0 acres. For more information on specific biotreatment devices and their vendors refer to Table 6-79.

The vendors of the various proprietary BMPs provide detailed documentation for device selection, sizing, and maintenance requirements. Tributary area sizes are limited to the capacities of the largest available model. The latest manufacturer supplied documentation must be used for sizing and selection of all proprietary devices. Links to the websites of a number of vendors of proprietary devices are included in Table 6-79.

### ***6.11.2 Performance, Applicability, and Limitations***

The treatment effectiveness of specific proprietary devices must be provided by the manufacturer and shall be verified by independent third-party sources and data or assessed by a water quality professional. The Santa Barbara County Flood Control District requires that proprietary devices used in the County be accompanied by a certification from a licensed civil engineer that the device will maintain an effluent quality of 10-30 mg/L of total suspended solids with no visible oily sheen under design operating conditions. The following provides general performance guidance for the different proprietary devices.

#### Hydrodynamic Devices

Hydrodynamic separation devices are effective for removal of coarse sediment, trash, and debris, and are useful as pretreatment in combination with other BMP types that target smaller particle sizes. Hydrodynamic devices represent a wide range of device types that have different unit processes and design elements (e.g., storage versus flow-through designs, inclusion of media filtration, etc.) that vary significantly within the category. These design features likely have significant effects on BMP performance; therefore, generalized performance data for hydrodynamic devices is not practical.

#### Catch Basin Inserts

Catch basin inserts come in such a wide range of configurations that it is practically impossible to generalize the expected performance. Inserts shall mainly be used for catching coarse sediments and floatable trash, and are effective as pretreatment in combination with other types of structures that are recognized as water quality treatment BMPs. Trash and large objects can greatly reduce the effectiveness of catch basin inserts with respect to sediment and hydrocarbon capture. Frequent maintenance and the use of screens and grates to keep trash out may decrease the likelihood of clogging and prevent obstruction and bypass of incoming flows.

#### Cartridge Filters

Cartridge filters have been proven to provide efficient removals of both dissolved and non-dissolved constituents. Cartridge filters are, however, less adept at handling high flow rates as compared to catch basin inserts and hydrodynamic devices, mainly due to the enhanced treatment provided through the filtration mechanism.

#### Biotreatment Devices

Proprietary biotreatment devices are relatively new compared to the other types of proprietary treatment devices included in this document. Therefore, there are fewer third party studies on proprietary biotreatment devices and the available performance information is mostly vendor-supplied. Tree box filters remove pollutants through the same processes as bioretention and reduce runoff volume and peak discharge rate for small frequently occurring storms and are not intended to capture and or detain large volumes. According to the vendors, like their natural counterparts, proprietary biotreatment devices are highly efficient at mitigating dissolved metals, nutrients, and suspended solids.

More detailed performance information is available from the vendors of each class of proprietary device. The performance numbers are typically presented as percent removals rather than effluent quality measurements and can be found on the vendor websites using the links provide in Table 6-79.

### ***6.11.3 Design Criteria and Procedure***

Proprietary BMP vendors are constantly updating and expanding their product lines, so refer to the latest design guidance from each of the vendors. General guidelines on the performance, sizing, operations and maintenance of proprietary devices are provided below.

The City of Santa Barbara does not keep a list of "approved" proprietary BMPs; however, in general, any proprietary device BMP must meet the following minimum standards:

1. The device shall be accompanied by a certification from a licensed civil engineer that the device will maintain effluent quality of 10-30 mg/L of total suspended solids with no visible oily sheen under design operating conditions;
2. It must not adversely affect the level of flood protection provided by the drainage system - head loss must be verifiable by the County Flood Control District;
3. It shall be selected to have high or very high treatment effectiveness for the primary pollutants of concern (as identified in Section 6.3).
4. It shall be vector-resistant, or not pond water for more than 72 hours after the end of a storm;
5. It shall not worsen water quality by resuspending trash, sediments, or bacteria (through regrowth), or by leaching heavy metals or semi-volatile organic compounds during subsequent storms;
6. If it is to be an underground device with access shafts, it must: (a) meet or exceed American Public Works Association (APWA) standards, (b) be reasonably accessible by a qualified maintenance worker, (c) have ladder rungs, have the ability to withstand lateral soil pressures, (d) have provisions for confined space entry, and (e) have safety guard rails around the rim;
7. It shall have no plastic or fiberglass interior parts that would break or shatter in the path of direct flow;
8. Its pipes, conduits and vaults shall not be more than 20 feet below ground and be easily accessible by a vacuum truck hose for clean-out; and
9. It shall provide means to block off the inflow and tail water backflow to isolate the device for safe maintenance and repair of the unit.

### *Sizing*

Hydrodynamic devices, catch basin inserts, and cartridge filters are flow-based BMPs and therefore, shall be sized to capture and treat the water quality design flow rate if used as a standalone BMP. Proprietary biotreatment devices, on the other hand include, both volume-based and flow-based BMPs. Volume-based proprietary devices shall be sized to capture and treat the water quality design volume if used as a standalone BMP.

Auxiliary components of proprietary devices such as sorbent media, screens, baffles, and sumps are selected based on site specific conditions such as the loading that is expected and the desired frequency of maintenance. Sizing of proprietary devices is reduced to a simple process whereby a model can simply be selected from a table or a chart based on a few known quantities (tributary area, location, design flow rate, design volume, etc). A few of the manufacturers either size the devices for potential clients or offer calculators on their websites that simplify the design process even further and lessens the possibility of using obsolete design information. For the latest sizing guidelines, refer to the manufacturer's website.

#### **6.11.4 Operation and Maintenance**

##### Hydrodynamic Separation Devices

Hydrodynamic separators do not have any moving parts and are consequently not maintenance intensive. Maintenance is important, however, to ensure that they are operating as efficiently as possible. Proper maintenance involves frequent inspections throughout the first year of installation, especially after major storm events. The systems are considered full when the sediment level is within one foot of the unit's top, at which point it must be cleaned out. Removal of sediment can be performed with a sump vac or vacuum truck. Some hydrodynamic separator systems may contribute to mosquito breeding if they hold standing water between storms for longer than 72 hours. Refer to the manufacturer's guidelines for inspection and maintenance activities.

##### Catch Basin Inserts

Catch basin inserts can be maintenance intensive due to their susceptibility for accumulating trash and debris. Regular maintenance activities include cleanup and removal of accumulated trash and sediment, while major maintenance activities include replacing filter media (if used) and/or repairing/replacing geotextile fabrics. There are a number of proprietary catch basin inserts and proper maintenance procedures that shall be determined based on manufacturer's recommendations for the selected catchbasin insert.

##### Cartridge filters

Maintenance activities include periodically removing captured trash, debris, and sediment from the vault floor, typically twice per year depending on the accumulation rate using a sump vac or vacuum truck. The media in media filters has to be replaced when it becomes saturated; typically about once every other year depending on the pollutant accumulation rate. The manufacturers of these devices typically provide contract operations and maintenance services.

All storm water vaults containing cartridge filters that have standing water for longer than 72 hours can become a breeding area for mosquitoes. Manufacturers have developed systems to completely drain the vault, such as a perforated pipe installed in the bottom of the vault that is encased in a filter sock to prevent clogging.

#### Biotreatment Devices

Maintenance of biotreatment devices can be provided by the manufacturers and typically consists of routine inspection and hand removal of accumulated trash and debris. As opposed to other proprietary treatment devices, no vacuum trucks or mechanical maintenance is needed.

#### ***Online Resources***

Table 6-79 provides a list of links to the websites of several proprietary storm water management controls manufacturers current as of April 2008. The products listed in Table 6-79 are proprietary and nonproprietary products that are meant to improve or eliminate pollution associated with urban runoff and storm water. The phrase "Best Management Practice" is a common term used in Federal, State, and local regulations to label these types of products, activities, and services. Usage of the term does not imply that some products, activities, or services are better than others, or that the City of Santa Barbara evaluates or decides which product, activity, or service shall be listed. The inclusion of vendors, manufacturers, and products on this list in no way represents an endorsement or guarantee of effectiveness as a result of the use of these products, nor for any compliance issues regarding the Americans with Disabilities Act. Please contact the vendor and follow the manufacturers' specifications for proper preparation, installation, and maintenance of these products.

Table 6-79: Proprietary Device Manufacturer Websites

Category	Device	Manufacturer	Website
Hydrodynamic Device	BayFilter	BaySaver Inc.	<a href="http://www.baysaver.com">www.baysaver.com</a>
	V2B1™ Stormwater Treatment System	Environment 21, LLC	<a href="http://www.env21.com">www.env21.com</a>
	Aqua-Swirl™ Concentrator	Aquashield, Inc.	<a href="http://www.aquashieldinc.com">www.aquashieldinc.com</a>
	Vortechs™, CDS™, VortSentry™, VortSentry™ HS	Contech Stormwater Solutions	<a href="http://www.contech-cpi.com/stormwater/products/14">www.contech-cpi.com/stormwater/products/14</a>
	Downstream Defender™	H.I.L. Technology, Inc.	<a href="http://www.hydro-international.biz/us/stormwater_us/downstream.php">www.hydro-international.biz/us/stormwater_us/downstream.php</a>
	Continuous Deflection Separation(CDS) Unit,	CDS Technologies, Inc.	<a href="http://www.CDStech.com">www.CDStech.com</a>
	CrystalStream	CrystalStream Technologies	<a href="http://www.crystalstream.com">www.crystalstream.com</a>
Catch Basin Insert	Curb Inlet Basket, Grate Inlet Skimmer	Suntree Technologies Inc.	<a href="http://www.suntreetech.com">www.suntreetech.com</a>
	Ultra-CurbGuard, Hydro-Kleen	UltraTech International, Inc.	<a href="http://www.spillcontainment.com/stormwater">www.spillcontainment.com/stormwater</a>
	The Hydro-Cartridge®	Advanced Aquatic International, Inc.	<a href="http://www.hydro-cartridge.com">www.hydro-cartridge.com</a>
	Streamguard™ Catch Basin Insert	Bowhead Manufacturing Co.	<a href="http://www.b-bmarketingcorp.com/streamguard.htm">www.b-bmarketingcorp.com/streamguard.htm</a>
	Aqua-Guard™ Catch Basin Insert	Aquashield, Inc.	<a href="http://www.aquashieldinc.com">www.aquashieldinc.com</a>
	Ultra-Urban Filter	AbTech Industries	<a href="http://www.abtechindustries.com">www.abtechindustries.com</a>
	FloGard+Plus,	KriStar Enterprises, Inc.	<a href="http://www.kristar.com">www.kristar.com</a>

Category	Device	Manufacturer	Website
	Triton™	Contech Stormwater Solutions	<a href="http://www.contech-cpi.com/stormwater/products/14">www.contech-cpi.com/stormwater/products/14</a>
Cartridge Filter	MFS™ StormFilter™	Contech Stormwater Solutions	<a href="http://www.contech-cpi.com/stormwater/products/14">www.contech-cpi.com/stormwater/products/14</a>
Proprietary Biotreatment	Filterra	Americast	<a href="http://www.filterra.com">www.filterra.com</a>
	StormTreat Systems	StormTreat Systems Inc	<a href="http://www.stormtreat.com/home.htm">www.stormtreat.com/home.htm</a>

**Note:** Web links last accessed in April 2008.