

6.3 Tree Well Filter



Figure 6-15: Non-proprietary tree well filters in Fremont use bio-retention soils with an infiltration rate of 5 to 10 inches per hour. Spacing the units closely together provides a total tree well filter surface area that is 4 percent of the impervious surface area from which stormwater runoff is treated.

Tree filters consist of one or multiple chambered pre-cast concrete boxes or hoops with a small tree or shrub planted in a filter bed filled with engineered media or other absorptive filtering media. As stormwater flows into the chamber, large particles settle out on the mulch layer, and then finer particles and other pollutants are removed as stormwater flows through the filtering media. Underground, physical, chemical and biological processes work to remove pollutants from stormwater runoff. Stormwater flows through a specially designed filter media mixture that has a high rate of infiltration. The mixture immobilizes some pollutants, which may be decomposed and volatilized, or incorporated into the biomass of the tree filter 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. Tree filters are similar in concept to bioretention areas in function and applications, with the major distinction that a tree filter has been optimized for high volume/flow treatment, therefore the size of treatment area is proportionally less. A tree filter takes up little space and may be used on highly developed sites such as landscaped areas, green space, parking lots and streetscapes. A tree filter is adaptable and may be used for developments, in all soil conditions to meet stormwater treatment needs. **Beginning December 1, 2011**, manufactured tree well filters, and other tree well filters with long-term rates of infiltration that exceed 10 inches per hour, will be allowed only in Special Projects, as described in Appendix J.

Best Uses

- Limited space
- Parallel to roadways

Advantages

- Aesthetic
- Small surface land use
- Blends with the landscape

Limitations

- Can clog without maintenance
- High installation cost
- Systems with very high infiltration rates are allowed

only in Special Projects beginning December 2011

Design and Sizing Guidelines

- Flows in excess of the treatment flow rate shall bypass the tree filter to a downstream inlet structure or other appropriate outfall.
- Tree filters cannot be placed in sump condition; therefore tree filters shall have flow directed along a flow line of curb and gutter or other lateral structure. Do not direct flows directly to a tree filter.
- If a proprietary tree filter is used, it shall be reviewed by the manufacturer before installation.
- For proprietary tree filters, manufacturer will size the tree filter to the impervious surface of a site. The manufacturer shall certify the ratio of impervious area to treatment area for the project. For example, Filterra states that a tree filter of 6 x 6-feet can treat 0.25 acres of impervious surface.
- Proprietary tree filters are available in multi-sized pre-cast concrete drop in boxes, Sizes range from 4 x 6-feet up to 6 x 12-feet boxes.

INLETS TO TREATMENT MEASURE

Flow may enter the treatment measure (see example drawings in Section 5.13):

- As overland flow from landscaping (no special requirements)
- As overland flow from pavement (cutoff wall required)
- Through a curb opening (minimum 18 inches)
- Through a curb drain
- With drop structure through a stepped manhole (refer to Figure 5-3 in Chapter 5)
- Through a bubble-up manhole or storm drain emitter
- Through roof leader or other conveyance from building roof
- Where flows enter the biotreatment measure, allow a change in elevation of 4 to 6 inches between the paved surface and biotreatment soil elevation, so that vegetation or mulch build-up does not obstruct flow.
- Cobbles or rocks shall be installed to dissipate flow energy where runoff enters the treatment measure.

VEGETATION

- Suitable plant species are identified in Appendix A planting guidance.
- Use integrated pest management (IPM) principles in the landscape design to help avoid or minimize any use of synthetic pesticides and quick-release fertilizer. Check with the local jurisdiction for any local policies regarding the use of pesticides and fertilizers.
- Irrigation shall be provided, as needed, to maintain plant life.
- Trees and vegetation do not block inflow, create traffic or safety issues, or obstruct utilities.

SOIL REQUIREMENTS SPECIFIC TO TREE WELL FILTERS

- Filter media in tree well filter shall be specialized for expected site pollutant loads.
- Beginning December 1, 2011, if the long-term infiltration rate of media exceeds 10 inches per hour, use of the tree well filter will not be allowed, except for Special Projects (see Appendix J).
- An underdrain system is required for tree well filters.
- Underdrain trench shall include a 12-inch thick layer of Caltrans Standard Section 68-1.025 permeable material Class 2, or similar municipality-approved material. A minimum 4-inch diameter perforated pipe shall be placed within the backfill layer. To help prevent clogging, two rows of perforation may be used.

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- If there is at least a 10-foot separation between the base of the underdrain and the groundwater table, and other conditions allow infiltration, there shall be at least 6-inch separation between the perforated pipe and the base of the trench to allow percolation.

SOIL CONSIDERATIONS FOR ALL BIOTREATMENT SYSTEMS

- Filter fabric shall not be used in or around underdrain trench.
- If there is less than 10 feet separation to the groundwater table, an impermeable fabric shall be placed at the base of the underdrain and the perforated pipe shall be placed on the impermeable fabric.
- The underdrain shall include a perforated pipe with cleanouts and connection to a storm drain or discharge point. Clean-out shall consist of a vertical, rigid, non-perforated PVC pipe, with a minimum diameter of 4 inches and a watertight cap fit flush with the ground, or as required by municipality.
- There shall be adequate fall from the underdrain to the storm drain or discharge point.
- Beginning December 1, 2011, soils in the area of inundation within the facility shall meet biotreatment soil specifications approved by the Regional Water Board (Appendix K), which supersede other soil specifications. The minimum percolation rate for the biotreatment soil is 5 inches per hour. The long-term desired maximum infiltration rate is 10 inches per hour, although initial infiltration rate may exceed this to allow for tendency of infiltration rate to reduce over time.

CONSTRUCTION REQUIREMENTS FOR ALL BIOTREATMENT SYSTEMS

- When excavating, avoid spreading fines of the soils on bottom and side slopes. Remove any smeared soiled surfaces and provide a natural soil interface into which water may percolate.
- Minimize compaction of existing soils. Protect from construction traffic.
- Protect the area from construction site runoff. Runoff from unstabilized areas shall be diverted away from biotreatment facility.

MAINTENANCE CONSIDERATIONS FOR ALL TREATMENT MEASURES

- A Maintenance Agreement shall be provided.
- Maintenance Agreement shall state the parties' responsibility for maintenance and upkeep. Prepare a maintenance plan and submit with Maintenance Agreement. Maintenance plan templates are in Appendix G.



Figure 6-16: Non-proprietary Tree Filter with Overflow Bypass. Source: University of New Hampshire Environmental Research Group, 2006

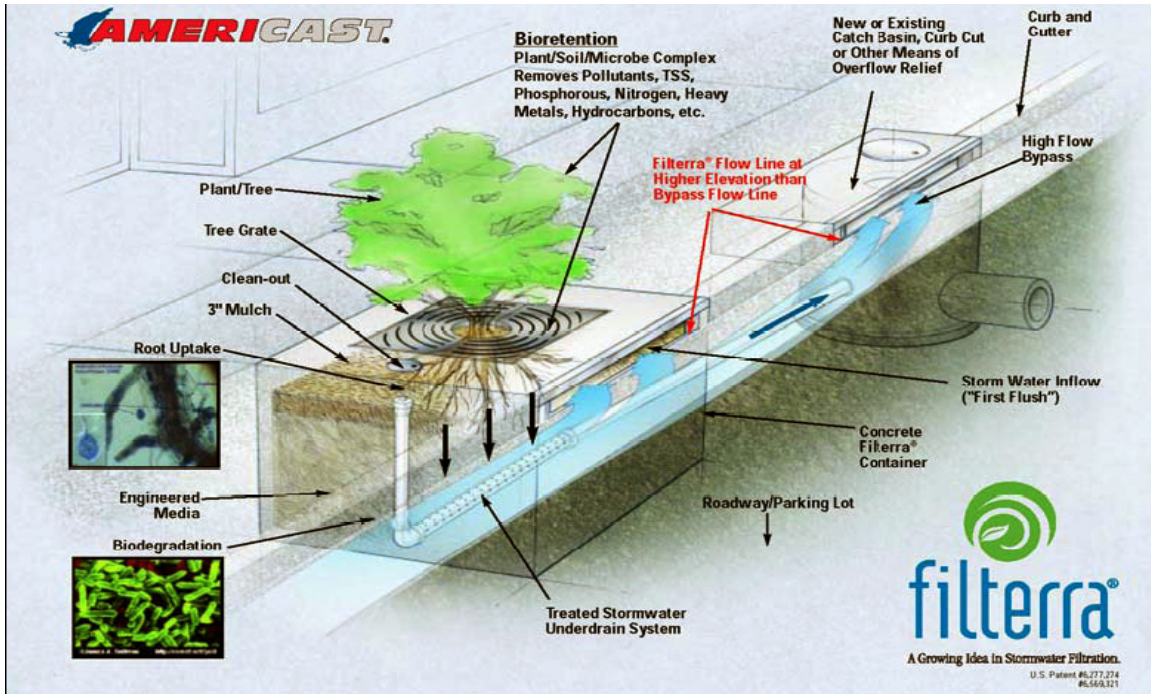


Figure 6-17: Cut Away View. Source: Americast, 2006. The use of this photo is for general information only, and is not an endorsement of this or any other proprietary stormwater treatment device.