XIV.6. Treatment Control BMP Fact Sheets (TRT)

TRT-1: Sand Filters

Sand filters operate by filtering stormwater through a constructed media bed (generally sand) with an underdrain system. Runoff enters the filter and spreads over the surface. As flows increase, water backs up on the surface of the filter where it is held until it can percolate through the sand. The treatment pathway is vertical (downward through the media) to an engineered underdrain system that is connected to the downstream storm drainage system. As stormwater passes through the sand, pollutants are trapped on the surface of the filter, in the small pore spaces between sand grains, or are adsorbed to the sand surface.

Also known as:

- *Bed Media Filter*

Media Filter
Source: CABMPHB, TC-40

Feasibility

- Site conditions should be assess to determine if systems should be lined to prevent incidental infiltration.

Opportunity Criteria

- Intended for use when retention and biotreatment options are infeasible.
- Locate away from trees producing leaf litter or areas contributing significant sediment that could cause clogging.
- Pretreatment is necessary to eliminate significant sediment load or other large particles that could reduce the infiltration capacity of the filter. Refer to **Appendix XIV.7** for information on pretreatment devices. Pretreatment can also be performed in a sedimentation chamber, which precedes the filter bed.
- Drainage area topography and downstream drainage configuration must have adequate relief to allow for percolation through the sand and collection and conveyance through the underdrain stormwater conveyance system; four feet is recommended between inlet and outlet of filter.
- Not applicable in areas of permanent or seasonal high groundwater (less than five feet below ground surface)
- Open bed sand filters should not be placed in areas subject to seed sources and where hydrologic conditions promote prolific germination of plants in the media. Undesired plant growth will substantially increase maintenance costs and threaten to damage the filter or impair its performance.

OC-Specific Design Criteria and Considerations

☐ Where incidental infiltration would potentially cause geotechnical concerns, systems should be lined with an impermeable membrane or layer.

☐ Minimum set-backs from foundations and slopes should be observed if the facility is not lined.

☐ Filter bed depth (i.e., media thickness) is at least 24 inches, but 36 inches preferred.

☐ Max ponding depth above filter should not exceed 6 feet.

☐ Saturated hydraulic conductivity of media should be selected to address pollutants of concern and factors of safety in design should be set to account for deterioration of performance between maintenance.

☐ Side slopes should not exceed and 2:1 H:V unless stabilization approved by licensed geotechnical engineer.

☐ Minimum pretreatment should be provided upstream of the filter, and water bypassing pretreatment should not be directed to the filter.

☐ Filters should be designed and maintained such that ponded water should not persist for longer than 72 hours following a storm event.

Computing Sizing Criteria for Media Filter

- Media filters with significant surface storage should be sized as volume-based BMPs.
- Alternatively, media filters may be sized as flow-based BMPs when storage is not significant.

Calculating Sand Filter Drawdown Rate for Volume-based Sizing Calculations

Volume-based sizing of sand filters should be conducted identically to **bioretention with underdrains**.

Maximum ponding depth should be increased to 6 feet in this sizing calculation.

Calculating Sand Filter Design Flowrate Rate if Sized as Flow-based BMP

The required design flowrate should be calculated based on the **Capture Efficiency Method for Flow-based BMPs** (See **Appendix III.3.3**).

The flow-based treatment capacity of a sand filter may be estimated as:

$Q_{capacity} = K_{sat} \times I_{full} \times A$ / [24 hr/day]

Where,

K_{sat} = design saturated hydraulic conductivity, feet/day (set to account for long-term deterioration of performance)

I_{full} = gradient across filter bed when storage is full = (depth of water at overflow + depth of media bed)/(depth of media bed)

A = surface area of media bed, sq-ft

Configuration for Use in a Treatment Train

- Sand filters may be preceded in a treatment train by HSCs and LID BMPs in the drainage area, which would reduce the required size of the filter.
- Sand filters should be preceded by some form of pretreatment which will remove the largest particles before entering and potentially clogging the sand filter.
- Sand filters can be used to provide pretreatment for infiltration basins or other LID infiltration BMPs.

Additional References for Design Guidance

- CASQA BMP Handbook for New and Redevelopment: **http://www.cabmphandbooks.com/Documents/Development/TC-40.pdf**

- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 8: **http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf**
- LA County LID Manual: **http://dpw.lacounty.gov/wmd/LA_County_LID_Manual.pdf**
- San Diego County LID Handbook Appendix 4 (Factsheet 6): **http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf**
- SMC LID Manual: **http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf**
- LA County LID Manual: **http://dpw.lacounty.gov/wmd/LA_County_LID_Manual.pdf**
- Portland Stormwater Management Manual: **http://www.portlandonline.com/bes/index.cfm?c=47953&**
- Western Washington Stormwater Management Manual: **http://www.ecy.wa.gov/pubs/0510033.pdf**