Technical Note

TN 1.14 EcoStream® Basic Treatment - 85% TSS

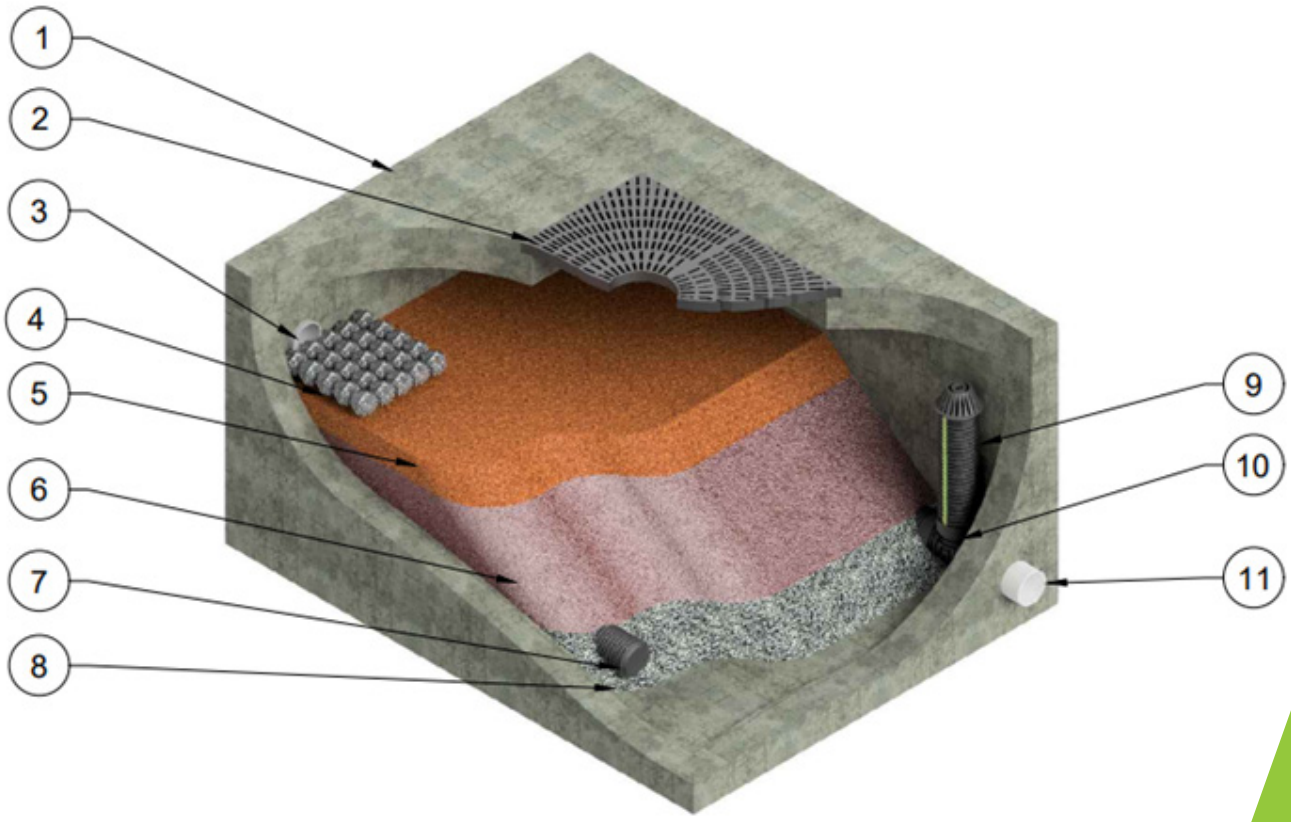
Overview

The ADS EcoStream Biofiltration system is a manufactured water quality treatment device intended for removal of Total Suspended Solids (TSS) as approved by NJDEP for 80% removal, as well as contaminants like oil, grease, trash, heavy metals, and compounds such as nitrogen & phosphorus. This unit introduces the ability to receive both surface and subsurface runoff, allowing it to be installed in many locations and applications.

Once installed, the unit's ability to treat through filtration, adsorption and biological processes will ensure sufficient water quality treatment of the influent runoff.

System Components

Figure 1: EcoStream System Components



1	**Concrete Vault**	Designed for H-20 loading, meeting the specifications outlined in ASTM C857 and ASTM C858. The concrete shall have a minimum unconfined compressive strength of 4000 psi.
2	**Solid Lid or Solid Cover**	Supplied by precaster. Solid cover can be used when trees or plants are not required.
3	**Inlet Pipe or Curb Inlet**	Size and material per plan.
4	**Energy Dissipation Stone**	Supplied by contractor. Rip rap stone for energy dissipation.
5	**Mulch**	Supplied by contractor. Mulch shall be hardwood brown mulch, double shredded, with no dyes added.
6	**Biofiltration Media**	Engineered media targeting treatment requirements.
7	**Underdrain Pipe**	Supplied by ADS. Perforated underdrain comprised of HDPE and PVC pipe and fittings.
8	**Underdrain Stone**	Supplied by ADS. Underdrain stone shall be washed, clean, #57 stone installed by ADS precaster.
9	**High Flow Bypass w/ Beehive Grate**	Supplied by ADS. Standpipe comprised of HDPE pipe and fittings.
10	**Flow Control Orifice**	Supplied by ADS. Orifice control sized to ensure treatment flow rates are met.
11	**Outlet Pipe**	Size and material per plan.

The unit consists of a biofiltration cell and underdrain surrounded by gravel. The EcoStream system has two primary inlet configurations:

- Curb cut: This configuration routes flow into the filtration cell from an opening in the curb at street level.
- Piped inlet: The piped inlet configuration allows flow to enter the settling cell through a pipe below grade. This inlet can be both a conveyance pipe and/or a building roof leader.

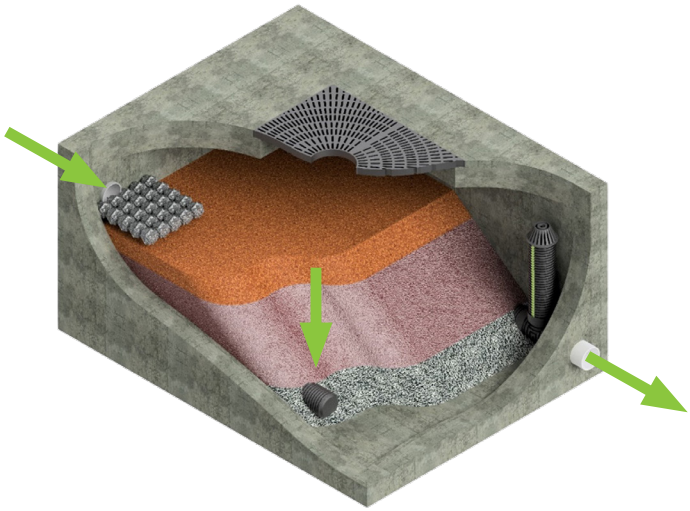
Typically, 3” to 4” (75 mm to 100 mm) angular stone is used as an energy dissipator at all inlet points to the filtration cell.

The EcoStream is commercially available with a growth layer (i.e., mulch layer) and optional plants. Within the filtration cell, the underdrain and fittings are made of ADS single-wall perforated pipe and ADS snap tees. The bypass riser is typically constructed from ADS pipe. The filtration cell of the EcoStream system contains a bed of proprietary media that removes a wide variety of pollutants including sediments, heavy metals, and nutrients. The total depth of the media bed in the EcoStream is 26” (650 mm). There are 6” (150 mm) from the top of the mulch to the bypass invert.

Functionality

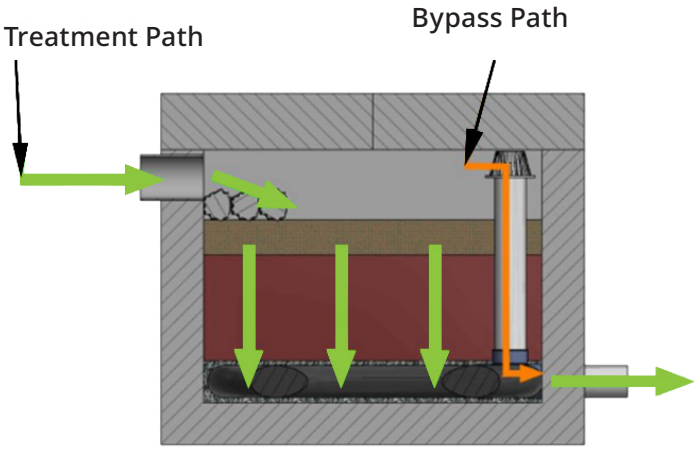
1. Stormwater runoff enters the unit through a curb inlet or subsurface influent pipe. (Item 3 in Figure 1) Energy dissipation stone is present to reduce the flow velocity. (Item 4 in Figure 1)

Figure 2: Treatment Flow Path Shown through a Unit with an Inlet Pipe



2. After entering the unit, runoff will flow downward via gravity through the EcoStream system. The top mulch layer will filter out course sediment and gross pollutants. The biofiltration media layer is designed to capture and retain a variety of pollutants including sediment, nutrients, heavy metals, phosphorous, and hydrocarbons.
3. Treated water enters the perforated underdrain pipe (Item 7 in Figure 1) and then exits the EcoStream through the outlet pipe. (Item 11 in Figure 1) A flow control orifice is included in the underdrain piping to limit the flow rate through the system, to ensure adequate residence time within the system (Item 10 in Figure 1).

Figure 3: Treatment Flow Pathway shown in Profile View



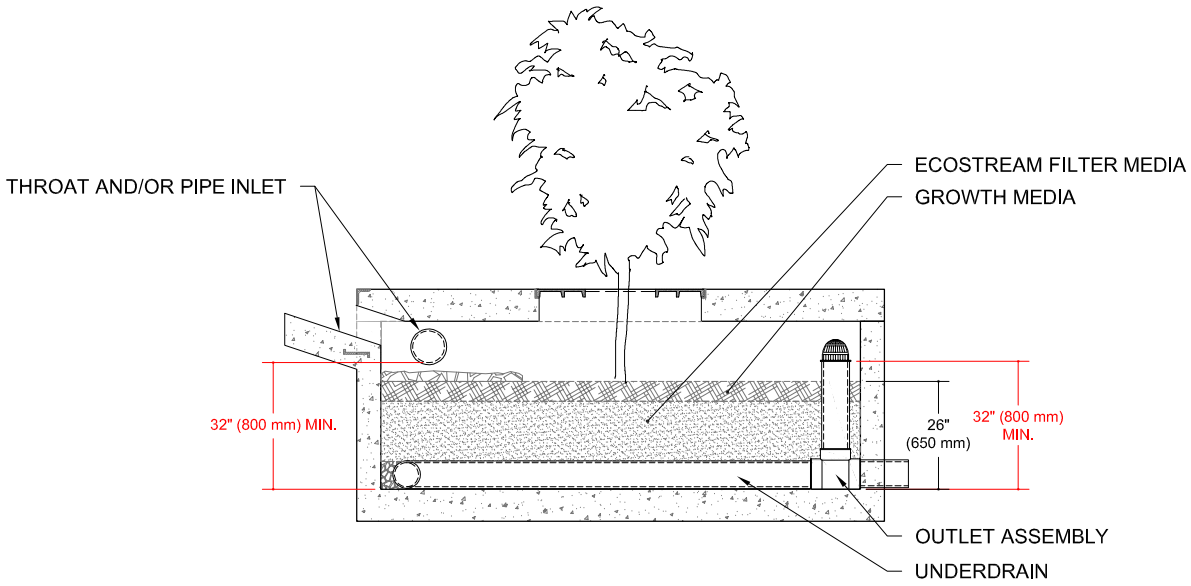
4. During peak storm events where the treatment capacity of the system is exceeded, runoff will pond up and begin to flow through the bypass standpipe. (Item 9 in Figure 1.) Figure 3 above shows the treatment flow path through the unit in green and the bypass flow path in orange.

Design Considerations – Inverts/Elevations

In addition to ensuring that the correctly sized EcoStream unit is selected for the project based upon the above treatment parameters, there are additional factors to consider when designing a site with an EcoStream unit.

The required design head of the system is 32” (800 mm), meaning a minimum of 32” (800 mm) should be provided from the invert of the outlet pipe to the top of the bypass pipe. Inlet connections to the unit should be designed with the flowline above the bypass at a minimum of 32” (800 mm) above the outlet of the unit.

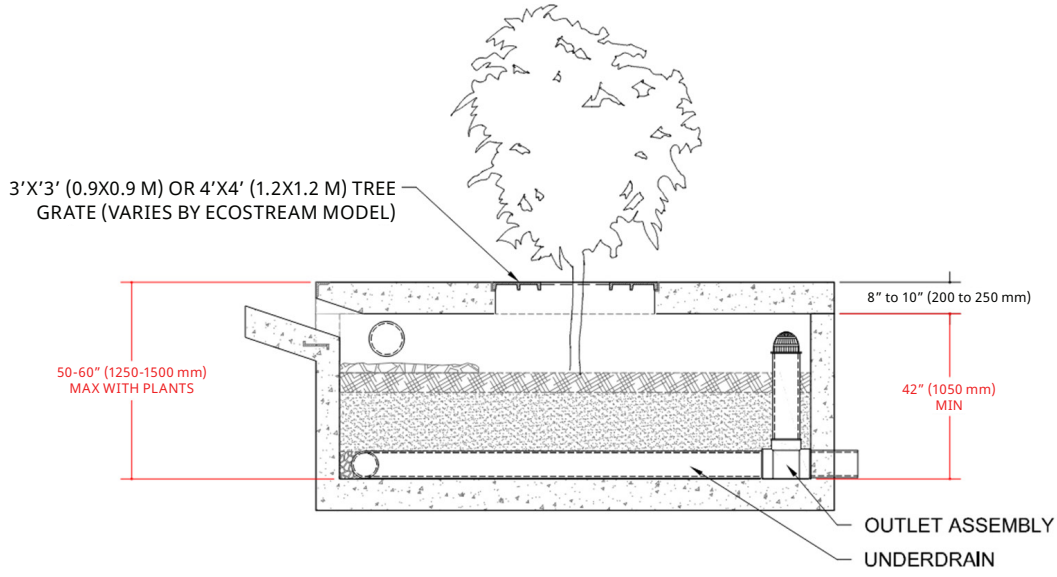
Figure 4: Minimum Inlet Invert and Bypass Requirements



The total depth of the media is 26” (650 mm); a layer of growth media at 5” (125 mm) thick, a layer of the EcoStream media at 15” (375 mm) thick, and a stone layer at 6” (150 mm) thick.

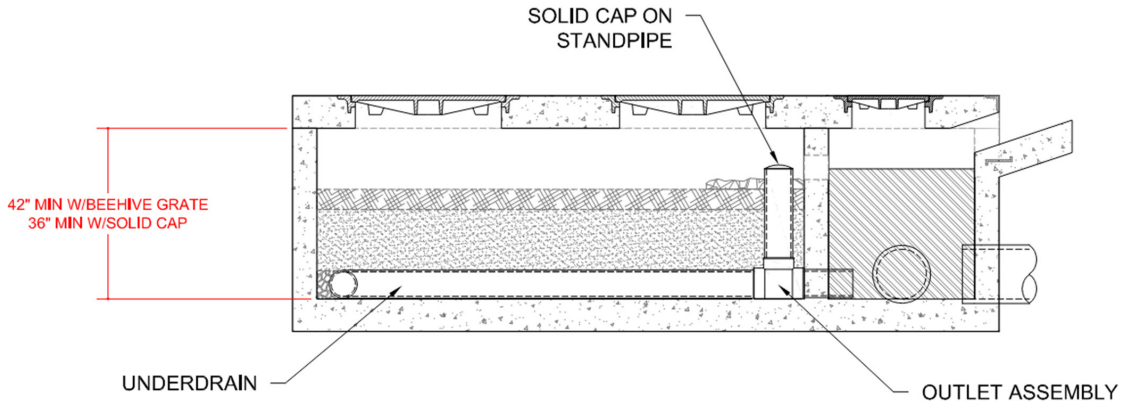
When trees are utilized, the maximum depth from top of structure to outlet is limited to 60” (1500 mm). For planted units without a bypass bay, minimum internal vault height from the bottom of top slab to outlet invert is 42” (1050 mm).

Figure 5: Minimum and Maximum Vault Heights for Planted Units



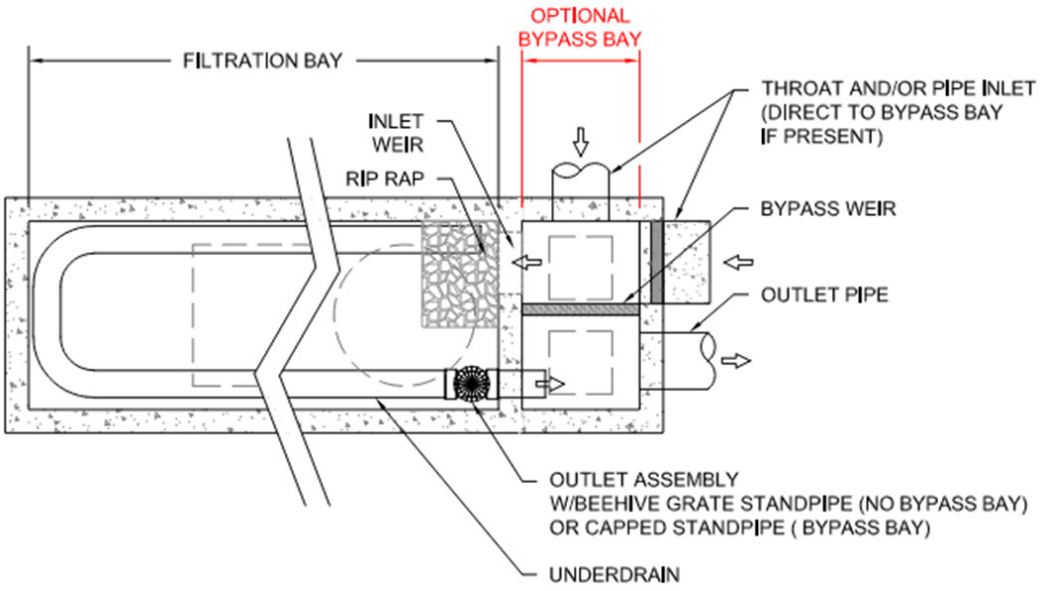
For units without plants, it is possible to lower the minimum internal height to 42” (1050 mm) with the typical bypass grate, or 36” (900 mm) with a solid cap. Note, a solid cap prevents bypass from occurring within the media bay. Appropriate measures should be taken to ensure peak flows can still bypass the unit (i.e., the addition of a bypass bay or an external bypass).

Figure 6: Minimum Internal Vault Heights for Non-Planted Units



For units where peak flows exceed the maximum hydraulic capacity of a unit, a bypass bay is recommended. All flows should be routed to the bypass when this configuration is utilized. The width of the bypass bay should be adjusted based on the required length of the bypass weir to achieve peak flows based on available head and freeboard. Note, the weir should maintain a minimum height of 32” (800 mm) corresponding to the design head required to achieve the treatment flow rate. The inlet weir to the treatment bay should be set 29” (725 mm) above the outlet invert to ensure the treatment flow enters the treatment bay prior to any water bypassing the EcoStream media.

Figure 7: Three Bay Configuration for Units with Optional Bypass Bay



Installation

Installation of the EcoStream unit will involve subsurface excavation, placement of sub-base aggregate material, positioning/casting of the vault, and arrangement of the internal components. Proper installation of the unit is crucial to ensure performance in alignment with the parameters specified above. Please refer to the *EcoStream BioFiltration Installation Guide* for specifics on how the unit should be installed. Variance from the steps outlined in this document can result in an improperly functioning unit.

Plants

Plants are not required to be utilized but if desired, choice of plant should align with local requirements and/or be chosen by a qualified landscape architect. If guidance is required, ADS can provide a generic plant guide for assistance in design. Please refer to local requirements/ approvals to determine if plants are required for the EcoStream BioFilter in your area.

Design Summary Table

EcoStream Model	Media Bay Size ft x ft (m x m)	Treatment Rate cfs (L/s)	Maximum Allowable Drainage Area[1] acres (hectare)
ES16	4 x 4 (1.2 x 1.2)	0.147 (4.2)	0.451 (0.183)
ES24	4 x 6 (1.2 x 1.8)	0.221 (6.3)	0.677 (0.274)
ES32	4 x 8 (1.2 x 2.4)	0.294 (8.3)	0.903 (0.365)
ES36	6 x 6 (1.8 x 1.8)	0.331 (9.4)	1.016 (0.411)
ES40	4 x 10 (1.2 x 3.0)	0.368 (10.4)	1.129 (0.457)
ES48	4 x 12 (1.2 x 3.7) or 6 x 8 (1.8 x 2.4)	0.441 (12.5)	1.354 (0.548)
ES60	6 x 10 (1.8 x 3.0)	0.551 (15.6)	1.693 (0.685)
ES72	6 x 12 (1.8 x 3.7)	0.662 (18.7)	2.032 (0.822)
ES80	8 x 10 (2.4 x 3.0)	0.735 (20.8)	2.257 (0.913)
ES96	8 x 12 (2.4 x 3.7)	0.882 (25.0)	2.709 (1.096)
ES112	8 x 14 (2.4 x 4.3)	1.029 (29.1)	3.160 (1.279)
ES128	8 x 16 (2.4 x 4.9)	1.176 (33.3)	3.612 (1.462)

1. Drainage area is based on 18.75 lb./ft^2 (300 lb./16 ft^2) / 8.50 kg/m^2 (136.08 kg/4.9m^2) of effective filtration treatment area and the equation in the NJDEP Filtration Protocol Appendix, where drainage area is calculated based on 600 lbs. (272.16 kg) of mass contributed per acre of drainage area annually.

adspipe.com
800-821-6710