

Bioretention Planter/Bioretention Cell with underdrain

This checklist is intended to highlight items critical to the performance of a bioretention system that need to be addressed in the design plans and verified by a City of Seattle (COS) Seattle Public Utilities (SPU) plan reviewer or a designated representative. Some items have detailed requirements that may not be explicitly stated; refer to the Stormwater Flow Control and Water Quality Treatment Technical Requirements Manual (Manual) and the Right-of-Way Improvements Manual (ROWIM) for specifics. Resources and their links are listed at the bottom of this checklist.

Items identified by a **FC** are GSI Engineering Design Feasibility Considerations as discussed in Appendix B of the “Requirements for Green Stormwater Infrastructure to the Maximum Extent Feasible” Director’s Rule that may prevent this technology from being implemented on the project site.

Technology Description
A bioretention planter is an impervious ponding reservoir containing a minimum of 18 inches of bioretention soil, a layer of uniformly graded washed gravel, an underdrain, and an overflow. See Figure 4.9 of the Manual.

Site Assessment (Manual Volume 3, Section 4.4.5)

	Review Item
	Since there is no infiltration of water to the surrounding soils, bioretention planter or lined bioretention cell construction is permitted regardless of native soil infiltration rate, depth to water table, and topography.

Design Requirements (Manual Volume 3, Section 4.4.1.2)

	Review Item
	1. Flow Entrance/Presetting
	<ul style="list-style-type: none"> ▪ If concentrated flows (such as through curb cuts or a culvert) are entering the cell, engineered flow energy dissipation (e.g., rock pad or flow dispersion weir) is incorporated
	<ul style="list-style-type: none"> ▪ A minimum 1-inch grade change between the edge of a contributing impervious surface and the vegetated flow entrance is required
	<ul style="list-style-type: none"> ▪ Plan sheet shows flow diversion and erosion control measures that will be installed until the upstream catchment area is thoroughly stabilized to protect the cell from sedimentation
	<ul style="list-style-type: none"> ▪ A presetting technique (e.g. variation on filter strip, presetting catch basin or vault) proceeds the bioretention cell when the catchment area exceeds 2,000 square feet and flow is concentrated
FC	2. Site Considerations
	<ul style="list-style-type: none"> ▪ Slope is less than 7%
	3. Sizing
	<ul style="list-style-type: none"> ▪ GSI sizing based on Table A.5 of the GSI to the MEF Director’s Rule, or if a performance standard must be met the pre-sized approach shown in Table

	4.7 was used and all of the following criteria were met:
	<ul style="list-style-type: none"> □ Project has < 10,000 square feet of new and replaced impervious area
	<ul style="list-style-type: none"> □ Bottom area was sized using the applicable sizing factor in Table 4.5 or 4.17 or 5.17 for water quality treatment only (bottom area may be no smaller or larger)
	<ul style="list-style-type: none"> □ Bottom area is flat (0 percent slope)
	<ul style="list-style-type: none"> □ Underdrain included
	<ul style="list-style-type: none"> □ Side slopes within ponded area are vertical
	<ul style="list-style-type: none"> □ Imported bioretention soil per COS Soil Standard Specification is specified
	<ul style="list-style-type: none"> □ Bioretention soil depth is a minimum of 18 inches for flow control and water quality treatment
	<ul style="list-style-type: none"> □ Minimum ponding depth is set at the designated height (12 inches for flow control; 6 or 12 inches for water quality treatment only).
	<ul style="list-style-type: none"> ▪ Continuous model was used and all of the following criteria were met:
	<ul style="list-style-type: none"> <ul style="list-style-type: none"> □ Assumptions listed in Table 4.17A were used
	4. Cell Ponding Area
	<ul style="list-style-type: none"> ▪ Ponding depth of 12 inches measured from the top of mulch layer to invert of overflow; 6 inches in high density ROW areas
	<ul style="list-style-type: none"> ▪ Maximum surface pool drawdown time of 24 hours
	<ul style="list-style-type: none"> ▪ Maximum planted side slope is 2.5H:1V. If total cell depth exceeds 3 feet, the maximum planted side slope is 3.0H:1V. If steeper sides are necessary, rockery, concrete walls or steeper soil wraps may be used
	<ul style="list-style-type: none"> ▪ Bottom width is at least two feet
	<ul style="list-style-type: none"> ▪ Runoff from no more than 5,000 square feet of impervious area enters any single cell. Runoff from more than 5,000 square feet of impervious area may be directed to an interconnected series of cells
	<ul style="list-style-type: none"> ▪ Bottom area of each individual cell is no larger than 800 square feet
	<ul style="list-style-type: none"> ▪ Minimum freeboard is 2 inches for drainage areas < 1,000 square feet and 6 inches for drainage areas = 1,000 square feet. Freeboard is measured from the invert or rim elevation of the overflow pipe (depending on configuration) or bottom of earthen channel to cell overtopping elevation
	<ul style="list-style-type: none"> ▪ Berming is sometimes used to achieve the minimum top cell elevation needed to meet ponding depth and freeboard needs. Maximum slope on berm is 2.5H:1V and maximum top width is 1 foot. Soil specified for berming is imported bioretention soil or amended native soil and compacted to a minimum of 90 percent dry density
	<ul style="list-style-type: none"> ▪ Plans show that there are no utility conflicts and that cells located adjacent to power poles have at least a 3-foot flat area around the poles before grading down.
	5. Bioretention Soil
	<ul style="list-style-type: none"> ▪ Cell uses imported bioretention soil per COS Standard Specification
	<ul style="list-style-type: none"> ▪ Minimum imported soil depth is 18 inches for flow control credit and/or water quality treatment
	<ul style="list-style-type: none"> ▪ Imported bioretention soil design infiltration rate used for modeling meets that specified in Table 4.13

	6. Overflow
	<ul style="list-style-type: none"> ▪ Overflow is shown and conveys excess flows to approved discharge point ▪ If pipe used, see minimum pipe size under Section 1 ROWIM Requirements
	7. Underdrain
	<ul style="list-style-type: none"> ▪ Flows are conveyed to an approved discharge point ▪ Slotted thick-walled plastic pipe is used and meets the COS specification below; for SFR only pipe may be perforated <ul style="list-style-type: none"> □ PVC per ASTM D1785, SCH 40 with solvent welded joints □ Slots are to be 0.064 inch wide by 1.0 inch long and spaced 0.125 inch apart. ▪ Pipe is a minimum of 6 inches per ROWIM requirements, 4 inches on private property ▪ Placed in filter material with a minimum of 1-foot of filter material above pipe and 6 inches below pipe per ROWIM requirements ▪ Filter material is COS Type 26 mineral aggregate. Filter fabric is not used to wrap pipe. SFR only may use COS Type 22 mineral aggregate. ▪ Underdrain pipe is a minimum of 5 feet from current and proposed tree locations and side sewer pipes
	8. Flow Restrictor (Optional)
	<ul style="list-style-type: none"> ▪ Clean out or inspection chamber for underdrain included on plans with clearances per COS Standard Plans 270 and 272A. This requirement may be waived for SFR projects. ▪ Minimum orifice diameter is 0.25 inches
	9. Impermeable Reservoir/Layer
	<ul style="list-style-type: none"> ▪ The cell is not hydraulically connected to the surrounding native soils.
	10. Plant Materials
	<ul style="list-style-type: none"> ▪ Plans specify vegetation coverage of selected plants will be at least 90% within 2 years or additional plantings will be provided to meet 90%; for sites with = 5000 sf of new or replaced impervious surface, the plant size and spacing is certified by a landscape architect ▪ ROW – Plants meet requirements of the approved planting list (see GSI website)
	11. Mulch Layer
	<ul style="list-style-type: none"> ▪ A minimum of 2 inches and a maximum of 3 inches of compost is specified in the bottom of the cells ▪ A maximum of 4 inches of arborist wood chip mulch composed of shredded or chipped hardwood or softwood on cell slopes above ponding depth
	12. Maintenance
	<ul style="list-style-type: none"> ▪ A Landscape Management Plan for all non-single family residential projects is submitted and identifies the responsible parties and their contact information for warranty period inspection reporting. ▪ Plans include a note stating that adjacent property owner will provide long-term vegetation maintenance for facility

Resources:

- Green Stormwater Infrastructure (GSI) website (specifications, CADD drawings, plant lists, links to other resources)
<http://www.seattle.gov/util/greeninfrastructure>
- Seattle Right-of-Way Improvements Manual
<http://www.seattle.gov/transportation/rowmanual/manual/>
- Stormwater Code, Director's Rules (Manual and GSI to MEF), Client Assistance Memos (CAMs), GSI and flow control calculators for pre-sized facilities
<http://www.seattle.gov/dpd/Codes/StormwaterCode/Overview/default.asp>