

## 6.2 Flow-through Planter

### Overview

#### Description

Flow-through planters are a type of contained biotreatment system designed to treat and detain runoff without allowing infiltration into the underlying soil. They can be used next to buildings and other locations where soil moisture, water infiltration or intrusion is a potential concern. Flow-through planters are typically constructed above grade in concrete boxes receiving runoff via downspouts from roofs of adjacent buildings. However, they can also be built level with surrounding surfaces receiving sheet flow (“below-grade flow-through planter”). Pollutants are removed as the runoff passes through the BSM and is collected in an underlying layer of Class 2 permeable material. A perforated underdrain must be directed to a storm drain or other discharge point. An overflow inlet conveys flows that exceed the capacity of the planter.



Figure 6-12: Flow-through planter (Credit: EOA, Inc.)

#### Best uses

- Treating roof runoff
- Next to buildings
- Dense urban areas
- Locations where infiltration is not desired and/or feasible

#### Advantages

- Can be adjacent to structures
- Multi-use
- Versatile
- May be any shape
- Low maintenance

#### Limitations

- May require sufficient head
- Careful selection of plants
- Does not allow for infiltration of water into native soil
- Needs redundant systems in case of clogging.

## 6.2 Flow-through Planter

For strategies and examples of how to retrofit sites and parcels to include flow-through planters, see **Sections 3.2 and 3.3 of the GI Design Guide**.

Remember that stormwater control measures should be located in areas that can be accessible at any given time for the purpose of operation and maintenance and inspections. Flow-through planters should not be located on inaccessible private property such as residential backyards. Ideally, planters should be located in areas that are visible from the nearby walkway/patio. Make sure the planter wall is low enough to allow for visual inspection from the adjacent walking surface. A maximum height of 5 feet from the walking surface to the top of the planter wall is recommended.

### Siting

*Table 6-4: Recommended locations for flow-through planters*

Recommended Locations	Flow-through Planter
Parking Lot	●
Roof	●
Driveway	●
Podium-level	●
Close to building	●
Away from Buildings	●
Underground	



*Figure 6-13: Flow-through planter with gravel rock mulch. (Credit: City of Burlingame)*

## Design and Sizing Guidelines

### Treatment Dimensions and Sizing

- It is recommended that flow-through planters be designed with a 4% sizing factor (percentage of the surface area of planter compared to the surface area of the tributary impervious area). The area of impervious surface multiplied by 0.04 sizing factor will equal the footprint of the flow-through planter. Alternatively, if there are site constraints, calculations may be performed using either the hydraulic sizing criteria for flow-based treatment measures or the hydraulic sizing criteria for combination flow- and volume-based treatment measures, included in Section 5.1.
- Install an overflow system adequate to meet municipal drainage requirements.
- Flow-through planters can be used adjacent to building and within set back areas, if allowed.
- Flow-through planters can be used above or below grade and on podiums or roof tops with sufficient structural capacity and waterproofing.
- Size the overflow grate per the MRP C.3.d sizing or per any locally-required design storm, set rim elevation of grate at least 2" below top of planter box walls and top of water proofing on building side. A minimum sized grate opening of 4" is recommended to allow for cleanout.
- Planter wall set against the building should be at least 2" higher than the opposite side of the planter to avoid overflow against building.
- Elevation of the surface area should be generally level, but may vary as needed to distribute stormwater flows throughout the surface area. For example the BSM can be graded slightly (1%) away from inlet(s) to the rest of the planter area. If the available planter surface area exceeds the C.3.d-required sizing (4%), then the excess square footage can be mounded, can have different soil types, and/or can have different plant types in those areas providing more variety.
- Provide a minimum of 2 inches, and a maximum of 12 inches of water surface storage between the BSM and rim of overflow. 6 inches is the recommended design ponding depth.
- Flow-through planters should be located in areas that can be accessible at any given time for the purpose of operation and maintenance and inspections. A maximum planter wall height (measured from the walking surface to top of wall) of 5 feet is recommended for inspections.

### 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;
  - Through a curb drain;
  - Within a drop structure through a stepped manhole (refer to Figure 5-3 in Chapter 5);
  - Through a bubble-up inlet or storm drain emitter with sufficient head;
  - Through a roof leader, downspout or other conveyance from building roof; and/or
  - Through a runnel, swale, valley gutter or other conveyance system.



## 6.2 Flow-through Planter

- If the flow-through planter is installed at grade, allow a change in elevation of 4 to 6 inches between the surrounding paved surface and the biotreatment soil media elevation, so that vegetation or mulch build-up does not obstruct flow.
- If the flow-through planter is installed above grade, sufficient head must be provided for bubble-up emitters to discharge to the planter surface.
- Bubble-up emitters and pipes to bubble-up emitters should have weep holes to avoid standing water inside after storm events.
- Splash blocks, inlet boxes, strategically located plants or rock mulch should be installed to dissipate flow energy where runoff enters the treatment measure.
- Curb openings should be a minimum of 18 inches wide (or 12" if allowed by the municipality) with the number of openings and locations designed so that runoff is dispersed throughout the bioretention area or with the use of a flow spreader system.
- For long linear planters, space inlets to planter at 10-foot intervals or install a flow spreader.



Figure 6-14: Close-up of flow-through planter with flow spreader. (Credit: EOA, Inc)

### Vegetation

- Plantings should be selected for viability in a well-drained soil. See plant guidance in Appendix A.
- Use ReScape (Bay-Friendly) principles and practices such as choosing the right plant for the right place and integrated pest management (IPM) 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 should be provided, as needed, to maintain plant life. If irrigation cannot be provided, then watering by hand should be accommodated weekly through plant establishment – typically through the first six months depending on the season and levels of precipitation.

- Choose vegetation that will not block inflows, outlets, create traffic or safety issues, or obstruct utilities at the time of installation or when plants grow to their mature size.

### Soil and Drainage Considerations Specific to Flow-through Planters

- Waterproofing should be installed as required to protect adjacent building foundations.
- An underdrain system is required for flow through planters.
- To avoid excess hydraulic pressure on subsurface treatment system structures:
  - The depth to seasonal high groundwater level should be at least 5 feet from the bottom of the structure.
  - A geotechnical engineer should be consulted for situations where the bottom of the structure is less than 5 feet from the seasonal high groundwater level.

### Soil and Drainage Considerations for All Biotreatment Systems

- The biotreatment soil media should have long term minimum permeability of 5 inches per hour (although the initial permeability may exceed this to allow for a tendency of the permeability to reduce over time.) Soil specifications are provided in Appendix K. Check with municipality for additional requirements.
- The biotreatment soil media layer should be a minimum of 18 inches deep.
- Soil used in the planter must meet the BASMAA biotreatment soil media (BSM) specification included in Appendix K. Check with municipality for any additional requirements.
- Install and maintain a 3-inch layer of composted arbor mulch (also called “aged mulch”) in areas between plantings. Rock mulches such as river cobble or pea gravel, or other mulches that resist floating may be used, but large rock mulch, such as cobble, should be used sparingly and only where absolutely necessary. Dyed, “micro-bark”, or “gorilla hair” mulches, as well as chipped or ground wood mulch from recycled pallets and dimensional lumber, are not recommended. **See Sections 4.9 and 6.3 of the GI Design Guide** for more information on mulch.
- Filter fabric should not be used around the underdrain or between the BSM and Class 2 Perm layer. Class 2 Perm performs the function of filter fabric (keeping the BSM from exiting the system through the underdrain) but is less prone to clogging.
- The underdrain should consist of a solid perforated or slotted HDPE or PVC pipe connected to a cleanout pipe(s) and to a storm drain or discharge point. Solid HDPE or triple-walled HDPE pipe, with smooth inner and outer layers and a corrugated middle layer, are recommended. The cleanout should consist of a vertical, rigid, non-perforated, non-corrugated PVC or HDPE pipe, with a minimum diameter of 4 inches and a watertight cap fit, raised or flush with the ground, or as required by municipality. There should be adequate fall (min. 0.5% slope) from the underdrain to the storm drain or discharge point. See Section 5.14 for more information on underdrains.
- The underdrain should be placed at the bottom of a 12-inch thick layer of Caltrans Class 2 permeable material, or similar municipality-approved material. See Section 5.14 for more information on Class 2 Perm material.

### *Construction Requirements and Maintenance Plans*

#### Construction Requirements for All Biotreatment Systems

- Minimize compaction of BSM. Protect from construction traffic.
- Protect the area from construction site runoff. Runoff from unstabilized areas should be diverted away from the Flow-through Planter.
- For **additional construction guidelines, see Chapter 4 of the GI Design Guide**. Specifically, **see Sections 4.3 through 4.9 of the GI Design Guide** for construction strategies for dealing with slopes, overflows, poor soils, utilities, runoff capture, etc.

#### Remember

#### Maintenance Considerations for All Treatment Measures

- See Chapter 8 for specific maintenance guidance. Specifically, see Section 8.3.2 for common maintenance problems specific to flow-through planters.
- **See Chapter 6 of the GI Design Guide** for landscape maintenance recommendations and practices.
- A Maintenance Agreement should be provided and should state the parties' responsibility for maintenance and upkeep.
- Prepare a maintenance plan and submit with Maintenance Agreement. Maintenance plan templates are in Appendix G.

Typical Design Details

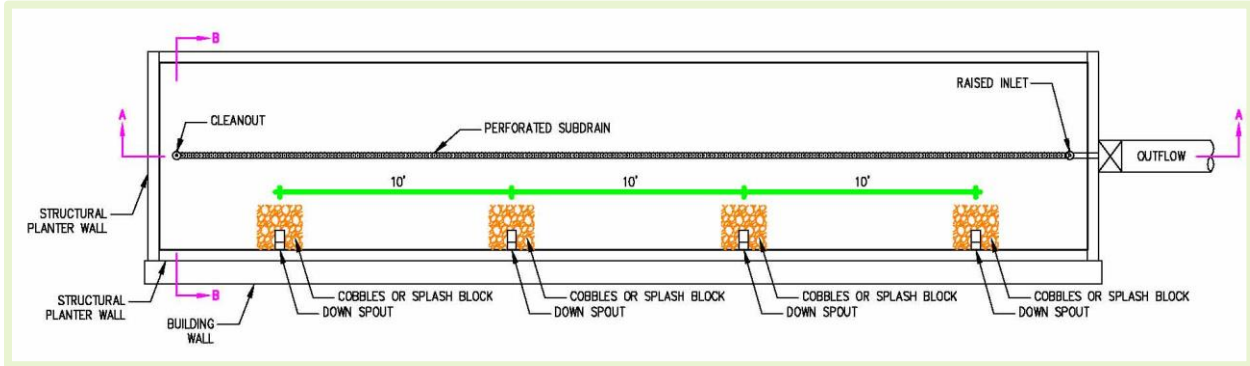


Figure 6-15: Plan view of long, linear planter, with inlets to the planter distributed along its length at 10' intervals.

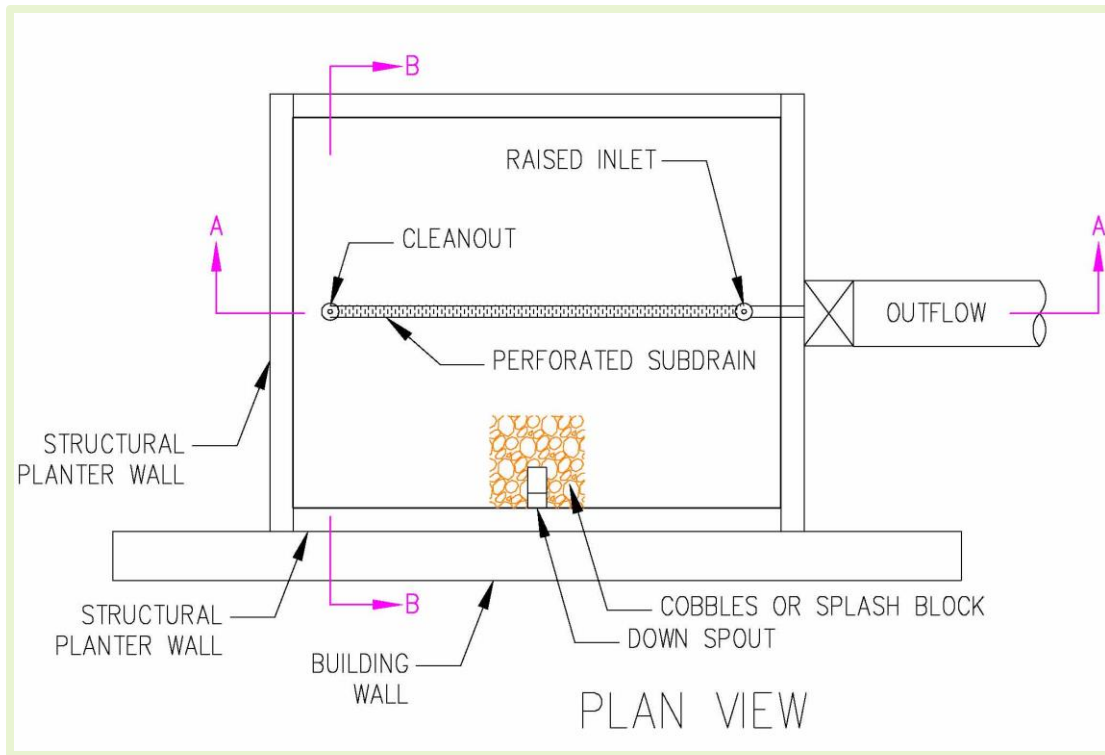


Figure 6-16: Plan view of planter designed to disperse flows adequately with only one inlet to planter

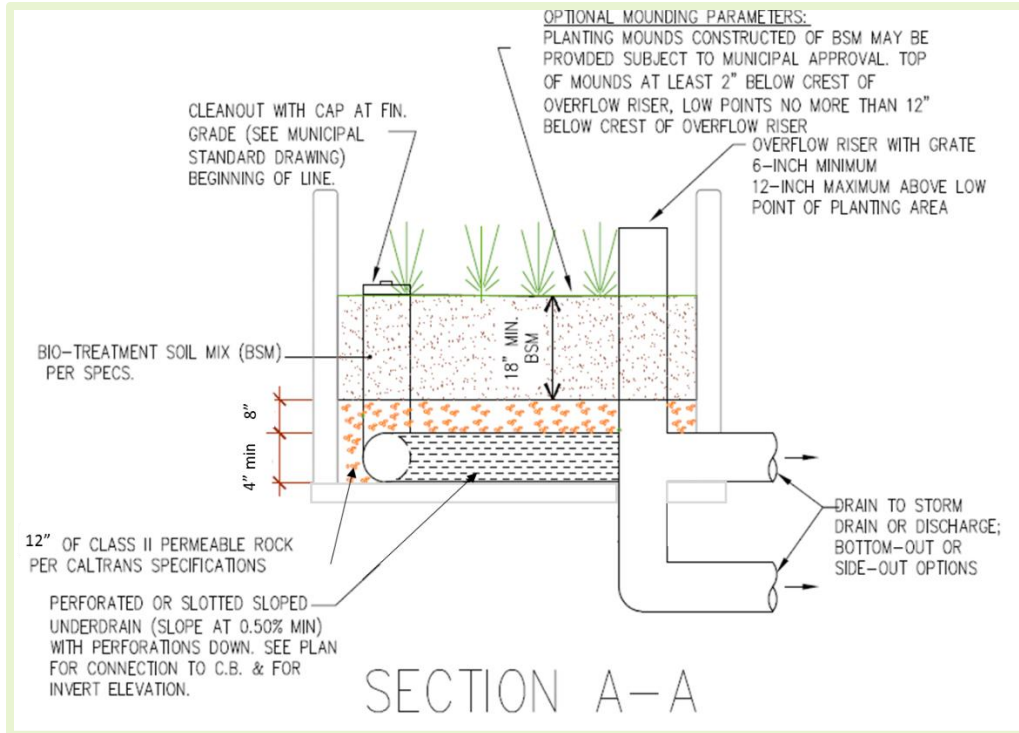


Figure 6-17: Cross section A-A of flow-through planter, shows side view of underdrain (Not to Scale)

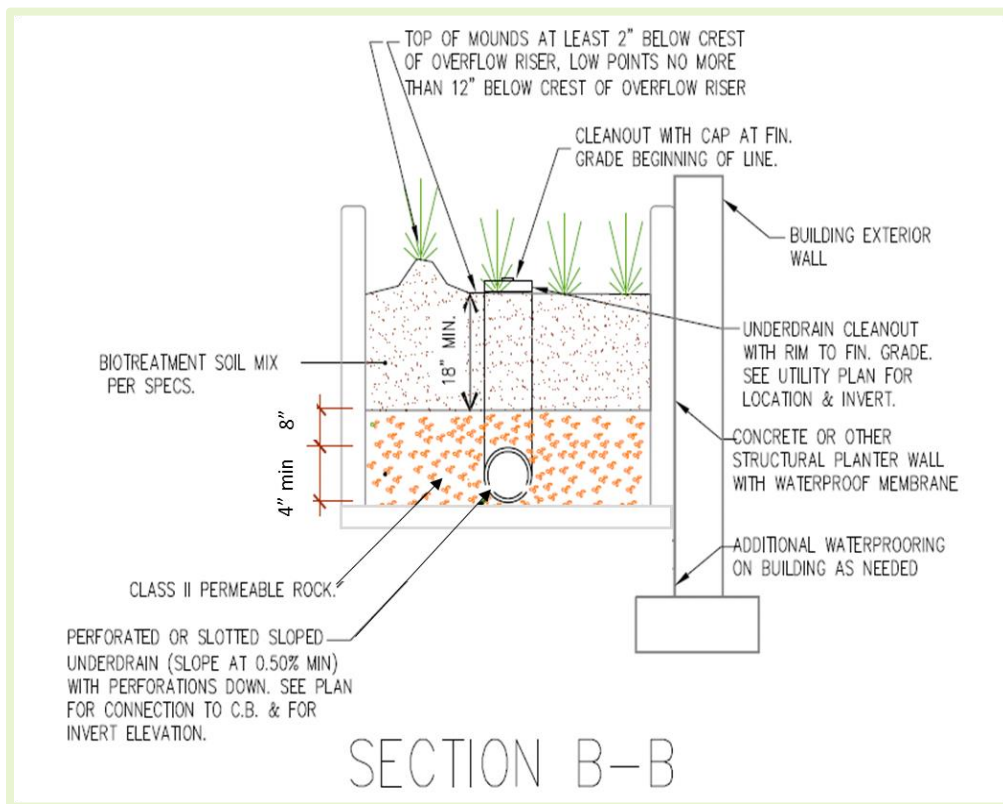


Figure 6-18: Cross section B-B of flow-through planter, shows cross section of underdrain