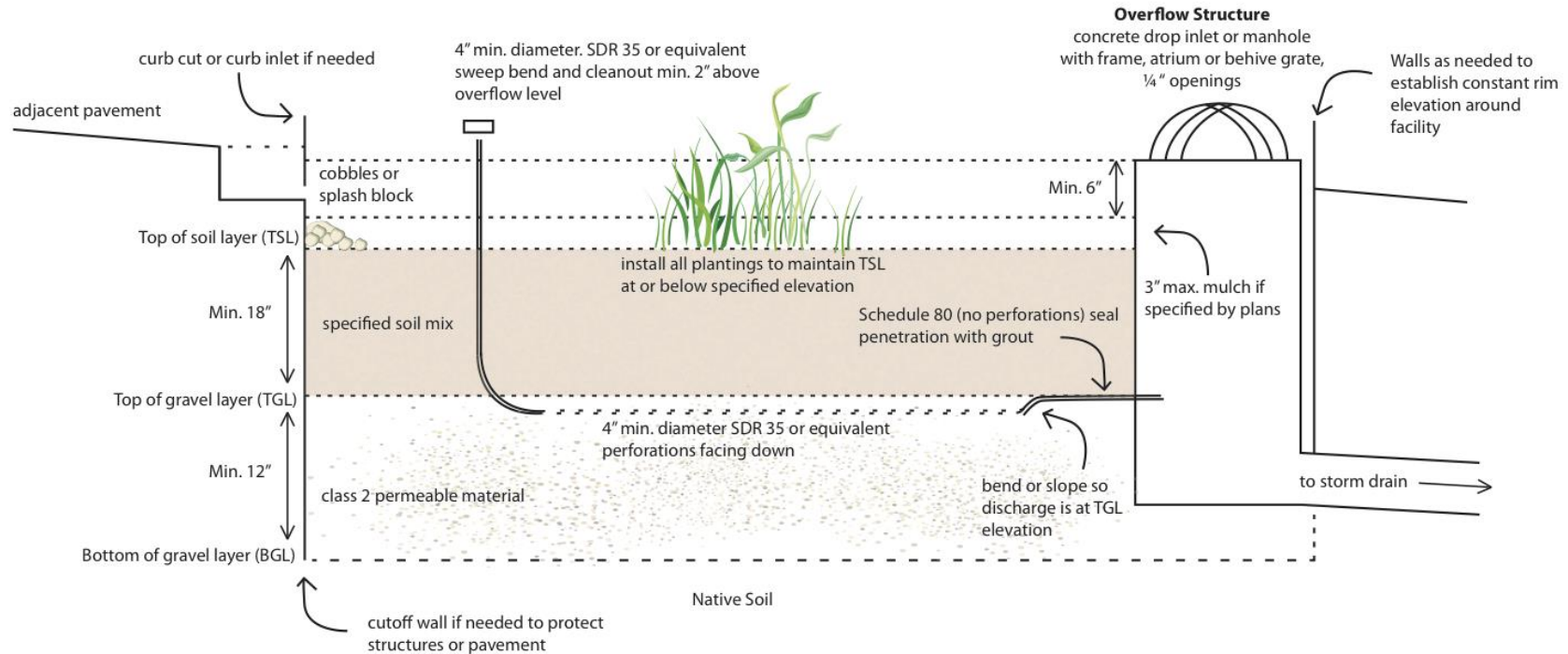


# APPENDIX 4

## Bioretention Specifications and Checklist



## Bioretention Facility not to scale



### Allowed variations for special site conditions:

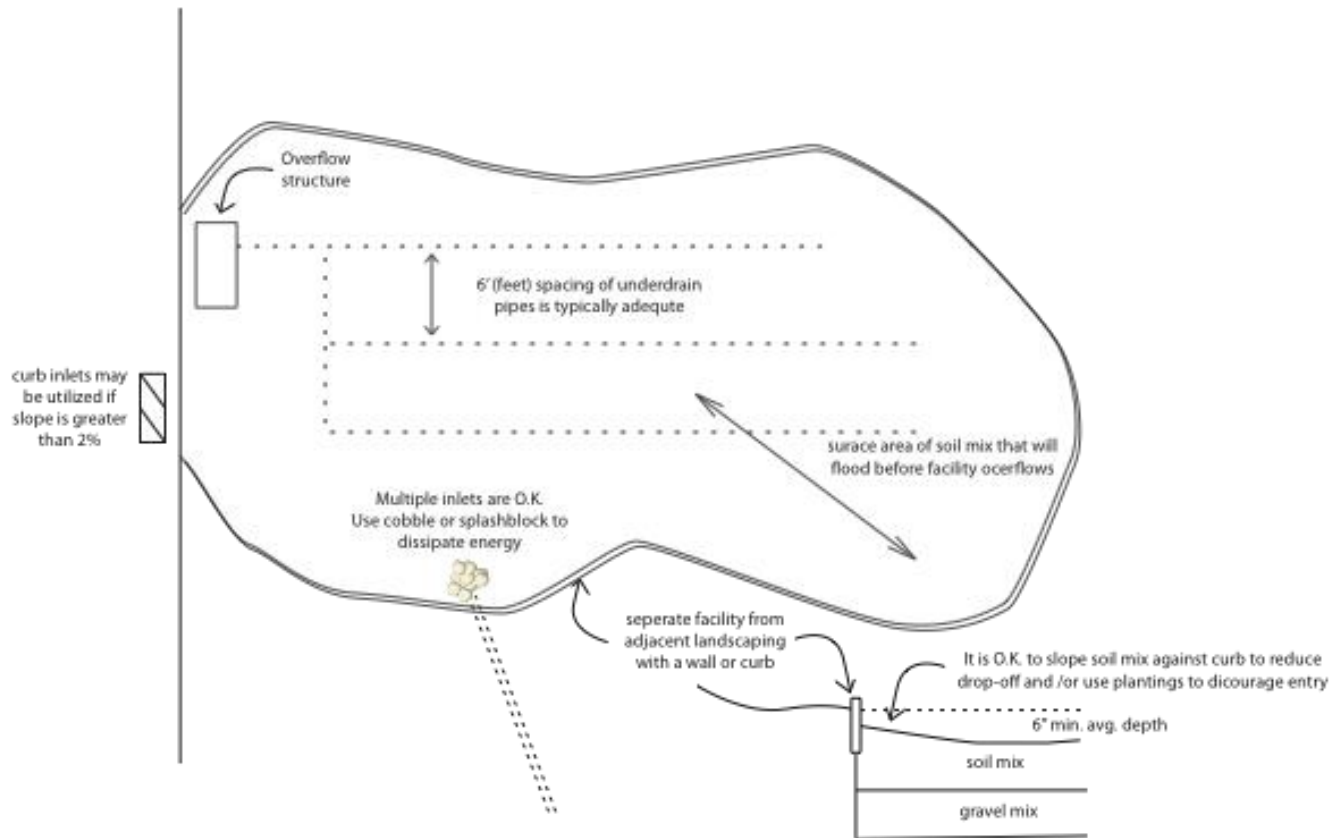
- Facilities located within 10 feet of structures or other potential geotechnical hazards may incorporate an impervious cutoff wall
- Facilities with documented high concentrations of pollutants in underlying soil or groundwater, facilities where infiltration could contribute to a geotechnical hazard, and facilities located on elevated plazas or other structures may incorporate an impervious liner between the native soil and the BGL and locate the underdrain discharge at the BGL (flow-through planter configuration)
- Facilities located in areas of high groundwater, highly infiltrative soils, or where connection of the underdrain to a surface drain or subsurface storm drain are infeasible may omit the underdrain

### Notes:

- No liner, no filter fabric, no landscape cloth.
- Maintain BGL, TGL, TSL throughout facility area at elevations to be specified in plan.
- Class 7 permeable layer may extend below and underneath drop inlet.
- Elevation or underdrain discharge is at top of gravel layer.
- See Section 6.3 for instructions on facility sizing and additional specifications

### Bioretention Facility - Overview

not to scale



**Note:**  
Show all elevations of curb, pavement, inlet, top of soil layer (TSL), top of gravel layer (TGL), and bottom of gravel layer (BGL) at all inlets and outlets and at key points along edge of facility.

## Soil/Compost and Gravel Specifications for Bioretention Facility

Compost shall be a well-decomposed, stable, weed-free organic matter source derived from waste materials including yard debris, wood wastes or other organic materials not including manure or biosolids, and shall meet the standards developed by the US Composting Council (USCC). The product shall be certified through the USCC Seal of Testing Assurance (STA) Program (a compost testing and information disclosure program).

### Compost Quality Analysis:

Before delivery of the soil, the supplier shall submit a copy of the lab analysis performed by a laboratory that is enrolled in the USCC’s Compost Analysis Proficiency (CAP) program and using approved Test Methods for the Evaluation of Composting and Compost (TMECC). The lab report shall verify that the compost parameters are within the limits specified below.

Parameter	Range	Reported as (units)
Organic Matter Content	35-75	%, dry weight basis
Carbon to Nitrogen Ratio	15:1 to 25:1	ratio
Maturity (Seed Emergence and Seedling Vigor)	>80	average % of control
Stability (CO <sub>2</sub> Evolution Rate)	<8	mg CO <sub>2</sub> -C/g unit OM/day
Soluble Salts (Salinity)	<6.0	mmhos/cm
pH	6.5 - 8.0 May vary with plant species	units
Heavy Metals Content	PASS	PASS/FAIL: US EPA Class A standard, 40 CFR § 503.13, tables 1 and 3.
<b>Pathogens</b>		
Fecal coliform	PASS	PASS/FAIL: US EPA Class A standard, 40 CFR § 503.32(a) levels
Salmonella	PASS	PASS/FAIL: US EPA Class A standard, 40 CFR § 503.32(a) levels
<b>Nutrient Content (provide analysis, including):</b>		
Total Nitrogen (N)	≥0.9	%
Boron (Total B)	<80	ppm
Calcium (Ca)	For information only	%
Sodium (Na)	For information only	%
Magnesium (Mg)	For information only	%
Sulfur (S)	For information only	%

## Soil/Compost and Gravel Specifications for Bioretention Facility

### Gravel Layer

The gravel layer used in the bioretention facility must consist of *Class 2 Permeable Material* as specified in the State of California’s Business, Transportation and Housing Agency, Department of Transportation; Standard Specifications 2010, manual ([http://www.dot.ca.gov/hq/esc/oe/construction\\_contract\\_standards/std\\_specs/2010\\_StdSpecs/2010\\_StdSpec s.pdf](http://www.dot.ca.gov/hq/esc/oe/construction_contract_standards/std_specs/2010_StdSpecs/2010_StdSpec s.pdf)).

The specific section, Subsurface Drains, Sec. 68, of the manual is used because it offers specific specifications for subsurface drains. In addition to the standardized permeable layer, a membrane layer of pea gravel or other intermediate-sized material is recommended at the top of the gravel layer to prevent fines from the soil/compost layer from moving downward into the gravel layer.

### 68-2.02F (1) General

Permeable material for use in backfilling trenches under, around, and over underdrains must consist of hard, durable, clean sand, gravel, or crushed stone and must be free from organic material, clay balls, or other deleterious substances.

Permeable material must have a durability index of not less than 40.

### 68-2.02F (3) Class 2 Permeable Material

The percentage composition by weight of Class 2 permeable material in place must comply with the grading requirements shown in the following table:

#### Class 2 Permeable Material\* Grading Requirements

Sieve sizes	Percentage passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

\*Class 2 permeable material must have a sand equivalent value of not less than 75.



## Bioretention Facility Construction Checklist

### Layout (to be confirmed prior to beginning excavation permit approval stage)

<input type="checkbox"/>	Square footage of the facility meets or exceeds minimum shown in Stormwater Control Plan
<input type="checkbox"/>	Site grading and grade breaks are consistent with the boundaries of the tributary Drainage Management Area(s) (DMAs) shown in the Stormwater Control Plan
<input type="checkbox"/>	Inlet elevation of the facility is low enough to receive drainage from the entire tributary DMA
<input type="checkbox"/>	Locations and elevations of overland flow or piping, including roof leaders, from impervious areas to the facility have been laid out and any conflicts resolved
<input type="checkbox"/>	Rim elevation of the facility is laid out to be level all the way around, or elevations are consistent with a detailed cross-section showing location and height of interior dams
<input type="checkbox"/>	Locations for vaults, utility boxes, and light standards have been identified so that they will not conflict with the facility
<input type="checkbox"/>	Facility is protected as needed from construction-phase runoff and sediment

### Excavation (to be confirmed prior to backfilling or pipe installation)

<input type="checkbox"/>	Excavation conducted with materials and techniques to minimize compaction of soils within the facility area
<input type="checkbox"/>	Excavation is to accurate area and depth
<input type="checkbox"/>	Slopes or side walls protect from sloughing of native soils into the facility
<input type="checkbox"/>	Moisture barrier, if specified, has been added to protect adjacent pavement or structures.
<input type="checkbox"/>	Native soils at bottom of excavation are ripped or loosened to promote infiltration

### Overflow or Surface Connection to Storm Drainage (to be confirmed prior to backfilling with any materials)

<input type="checkbox"/>	Grating excludes mulch and litter (beehive or atrium-style grates recommended)
<input type="checkbox"/>	Overflow is connected to storm drain via appropriately sized
<input type="checkbox"/>	No knockouts or side inlets are in overflow riser
<input type="checkbox"/>	Overflow is at specified elevation
<input type="checkbox"/>	Overflow location selected to minimize surface flow velocity (near, but offset from, inlet recommended)
<input type="checkbox"/>	Grating excludes mulch and litter (beehive or atrium-style grates recommended)
<input type="checkbox"/>	Overflow is connected to storm drain via appropriately sized



## Bioretention Facility Construction Checklist

### Underground connection to storm drain/outlet orifice

- Perforated pipe underdrain (PVC SDR 35 or approved equivalent) is installed with holes facing down
- Perforated pipe is connected to storm drain at specified elevation (typ. bottom of soil elevation)
- Cleanouts are in accessible locations and connected via sweep

### Drain Rock/Subdrain (to be confirmed prior to installation of soil mix)

- Rock is installed as specified, 12" min. depth. Class 2 permeable, Caltrans specification 68- 2.02F(3) recommended
- Rock is smoothed to a consistent top elevation. Depth and top elevation are as shown in plans
- Slopes or side walls protect from sloughing of native soils into the facility
- No filter fabric is placed between the subdrain and soil mix layers

### Soil Mix

- Soil mix is as specified.
- Mix installed in lifts not exceeding 12"
- Mix is not compacted during installation but may be thoroughly wetted to encourage consolidation
- Mix is smoothed to a consistent top elevation. Depth of mix (18" min.) and top elevation are as shown in plans, accounting for depth of mulch to follow and required reservoir depth

### Irrigation

- Irrigation system is installed so it can be controlled separately from other landscaped areas
- Smart irrigation controllers and drip emitters are recommended and may be required by local code or ordinance.
- Spray heads, if any, are positioned to avoid direct spray into outlet structures



## Bioretention Facility Construction Checklist

### Planting

- Plants are installed consistent with approved planting plan, consistent with site water allowance
- Any trees and large shrubs are staked securely
- No fertilizer is added; compost tea may be used
- No native soil or clayey material are imported into the facility with plantings
- 1"-2" mulch may be applied following planting; mulch selected to avoid floating
- Final elevation of soil mix maintained following planting
- Curb openings are free of obstructions

### Final Engineering Inspection

- Drainage Management Area(s) are free of construction sediment and landscaped areas are stabilized
- Inlets are installed to provide smooth entry of runoff from adjoining pavement, have sufficient reveal (drop from the adjoining pavement to the top of the mulch or soil mix, and are not blocked)
- Inflows from roof leaders and pipes are connected and operable
- Temporary flow diversions are removed
- Rock or other energy dissipation at piped or surface inlets is adequate
- Overflow outlets are configured to allow the facility to flood and fill to near rim before overflow
- Plantings are healthy and becoming established
- Irrigation is operable
- Facility drains rapidly; no surface ponding is evident
- Any accumulated construction debris, trash, or sediment is removed from facility
- Permanent signage is installed and is visible to site users and maintenance personnel

