Green Stormwater Infrastructure for New Jersey

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RUTGERS
New Jersey Agricultural Experiment Station

Green Infrastructure (GI or GSI)

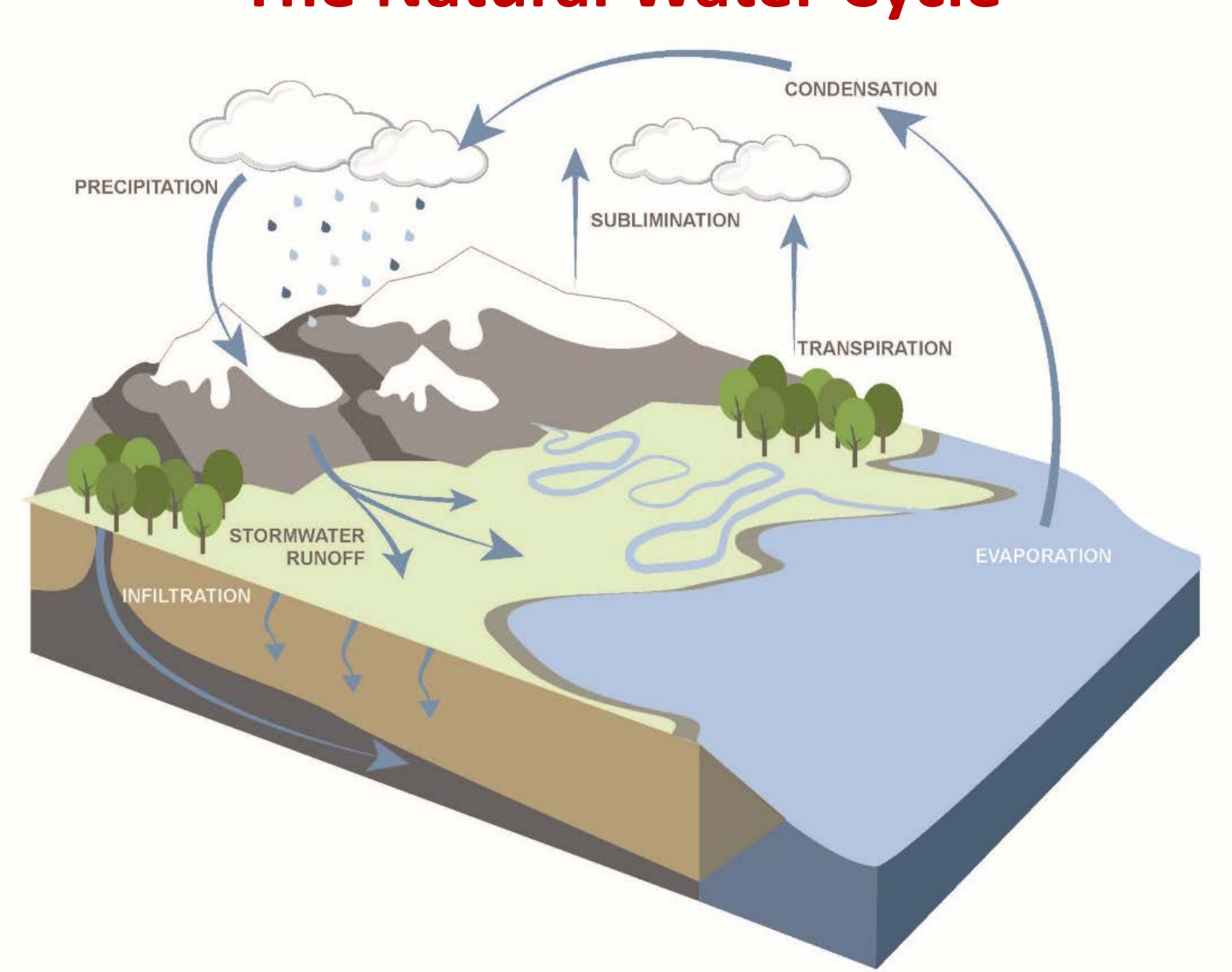
…an approach to stormwater management that is cost-effective, sustainable, and environmentally friendly.

Green Infrastructure projects:

- capture,
- filter,
- absorb, and
- reuse

stormwater to maintain or mimic natural systems and treat runoff as a resource.

The Natural Water Cycle



Impervious Surfaces

More development → *More impervious surfaces* → *More stormwater runoff*

The Urban Water Cycle

Green Infrastructure

Stormwater management practices that protect, restore, and mimic the native hydrologic condition by providing the following functions:

- Infiltration
- Filtration
- Storage
- Evaporation
- Transpiration

Green Infrastructure Practices

<u>Bioretention Systems</u>

- Rain Gardens
- Bioswales
- Stormwater Planters
- Curb Extensions
- Tree Filter Boxes

<u>Permeable Pavements</u>

<u>Rainwater Harvesting</u>

- Rain barrels
- Cisterns

<u>Dry Wells</u>

<u>Rooftop Systems</u>

- Green Roofs
- Blue Roofs








Parker Urban Greenscapes. 2009.

TYPES OF BIORETENTION

Bioretention Cells

- Single-family lots
- Commercial areas
- Parking lots

Rain Gardens

- Single-family lots
- Small commercial areas

Bioretention Swales/ Bioswales/Vegetated Swales

- Typically in right-of-way

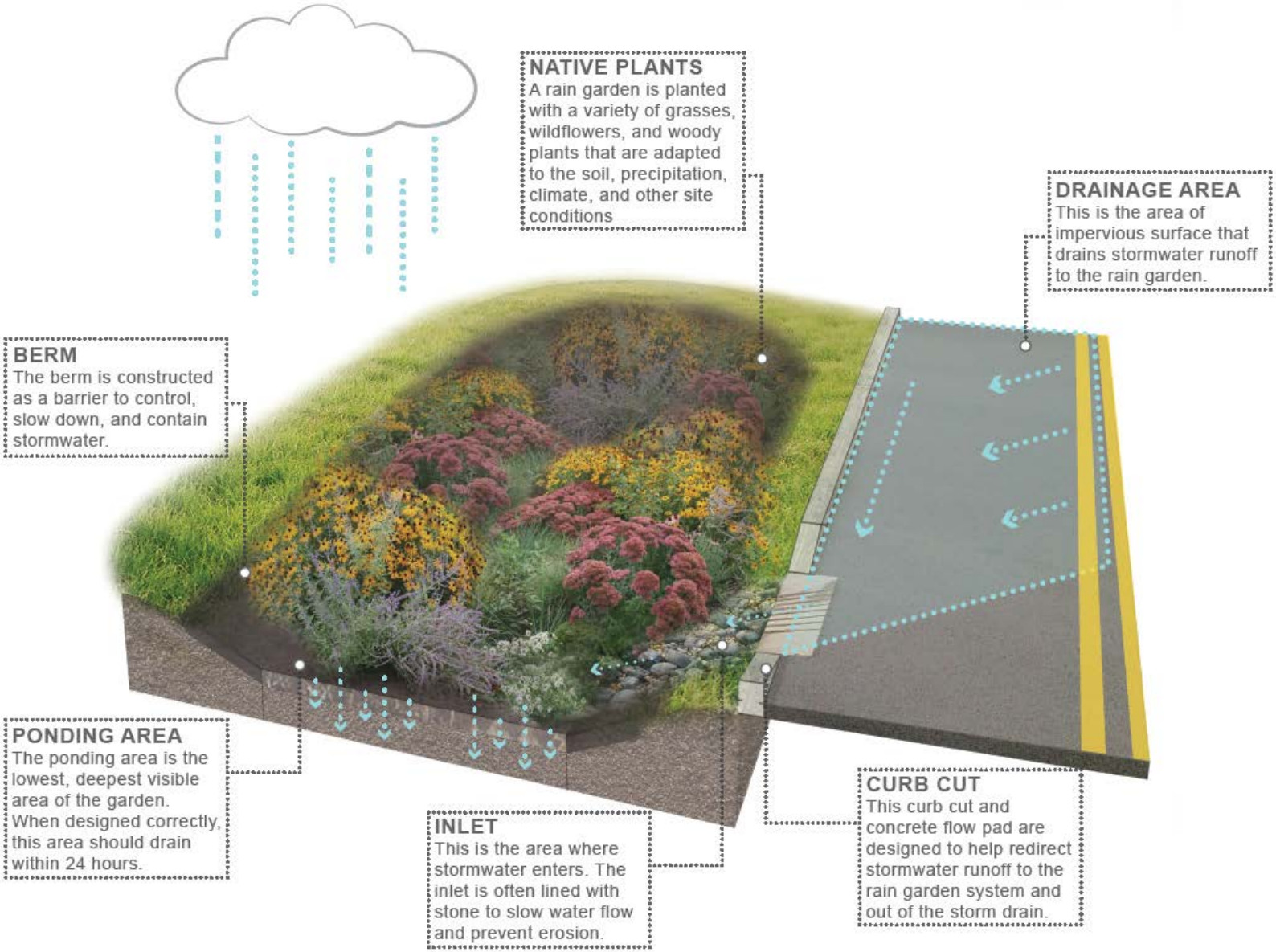
Planters & Planter Boxes

- Highly urban areas
- Right-of-way and adjacent to buildings

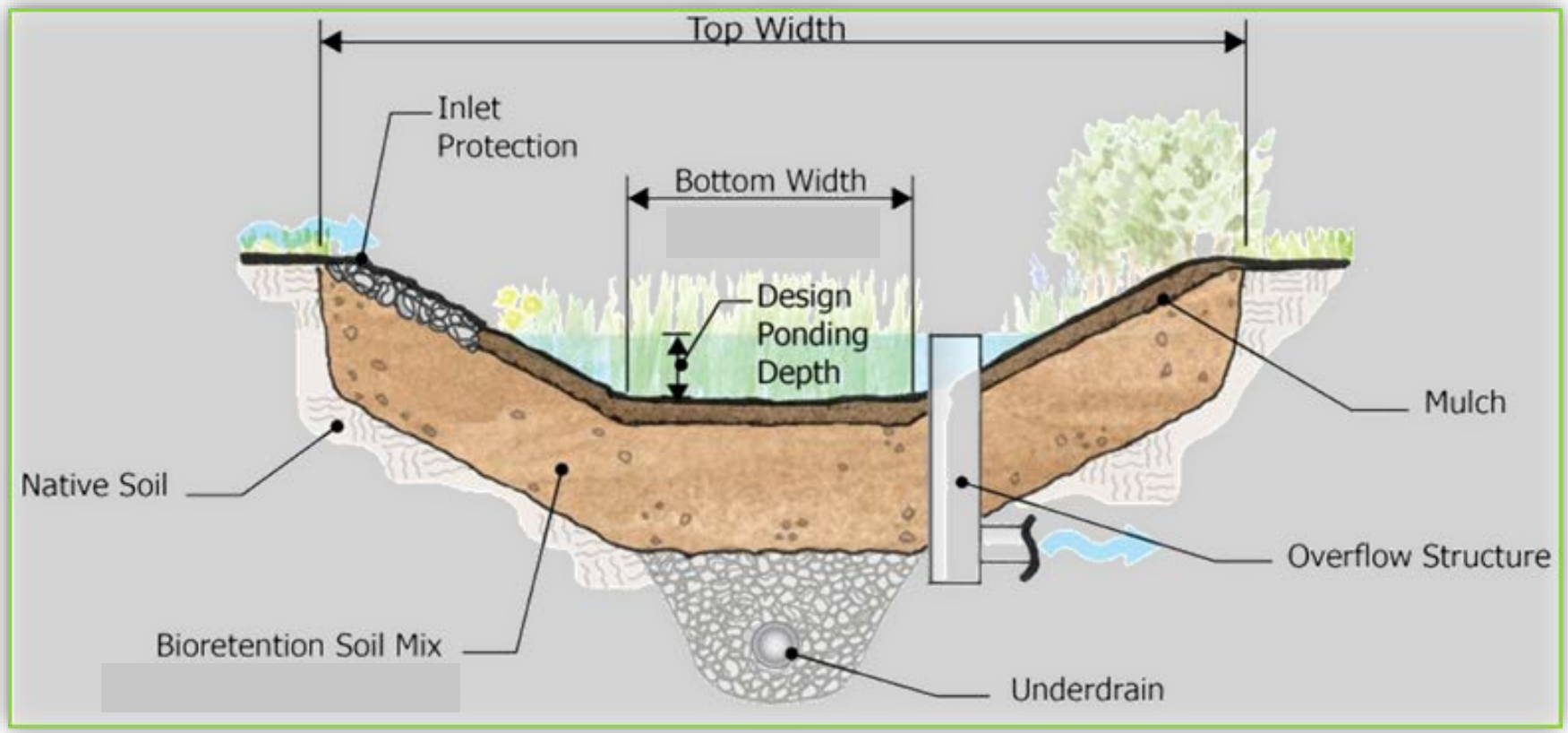
Vegetated Curb Extensions

- Bioretention incorporated into right-of-way in urban and suburban areas

Rain Gardens



Rain Garden Cross-Section

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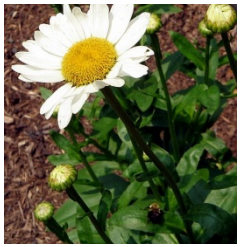
Lots of Rain Gardens

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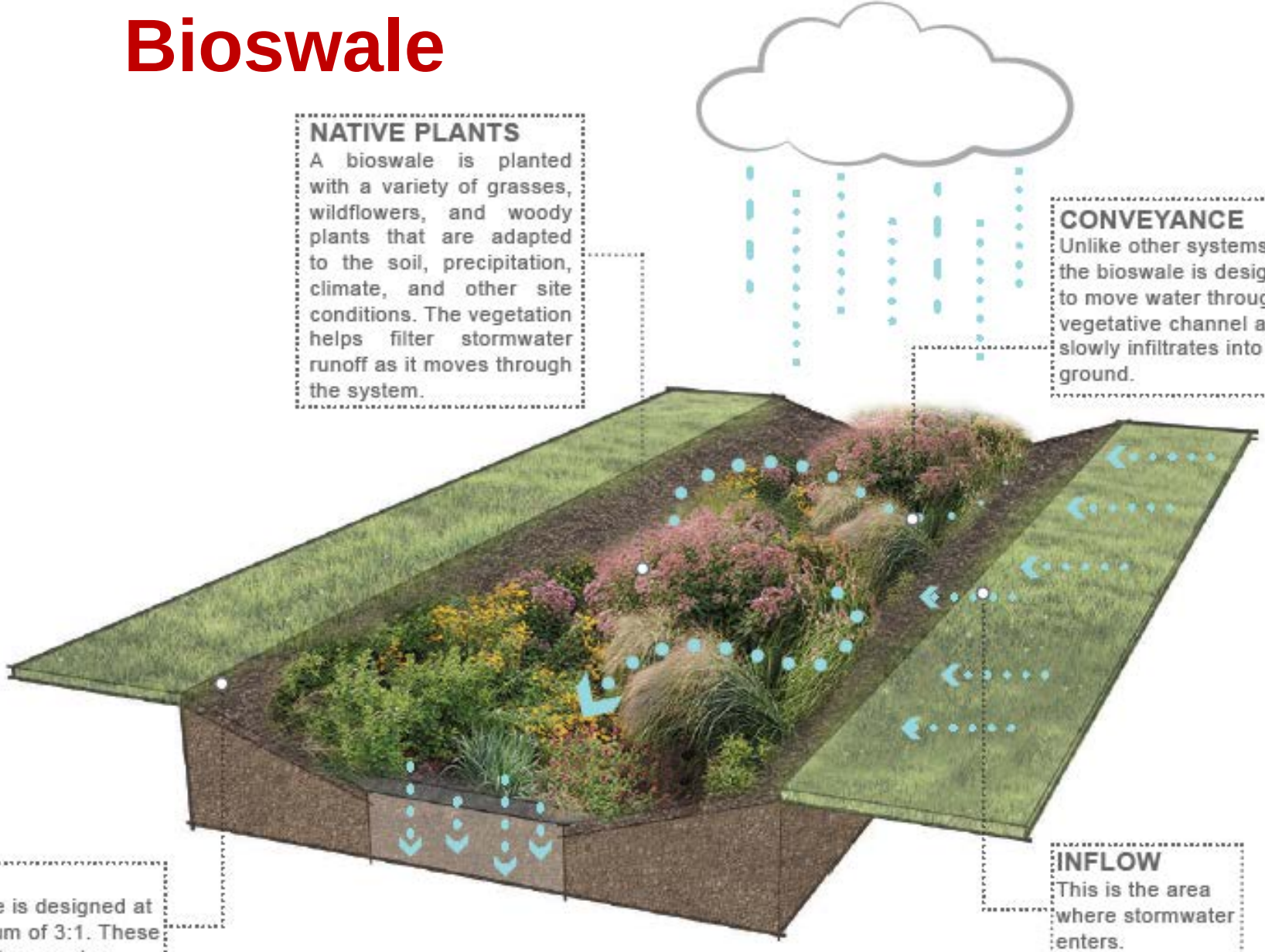
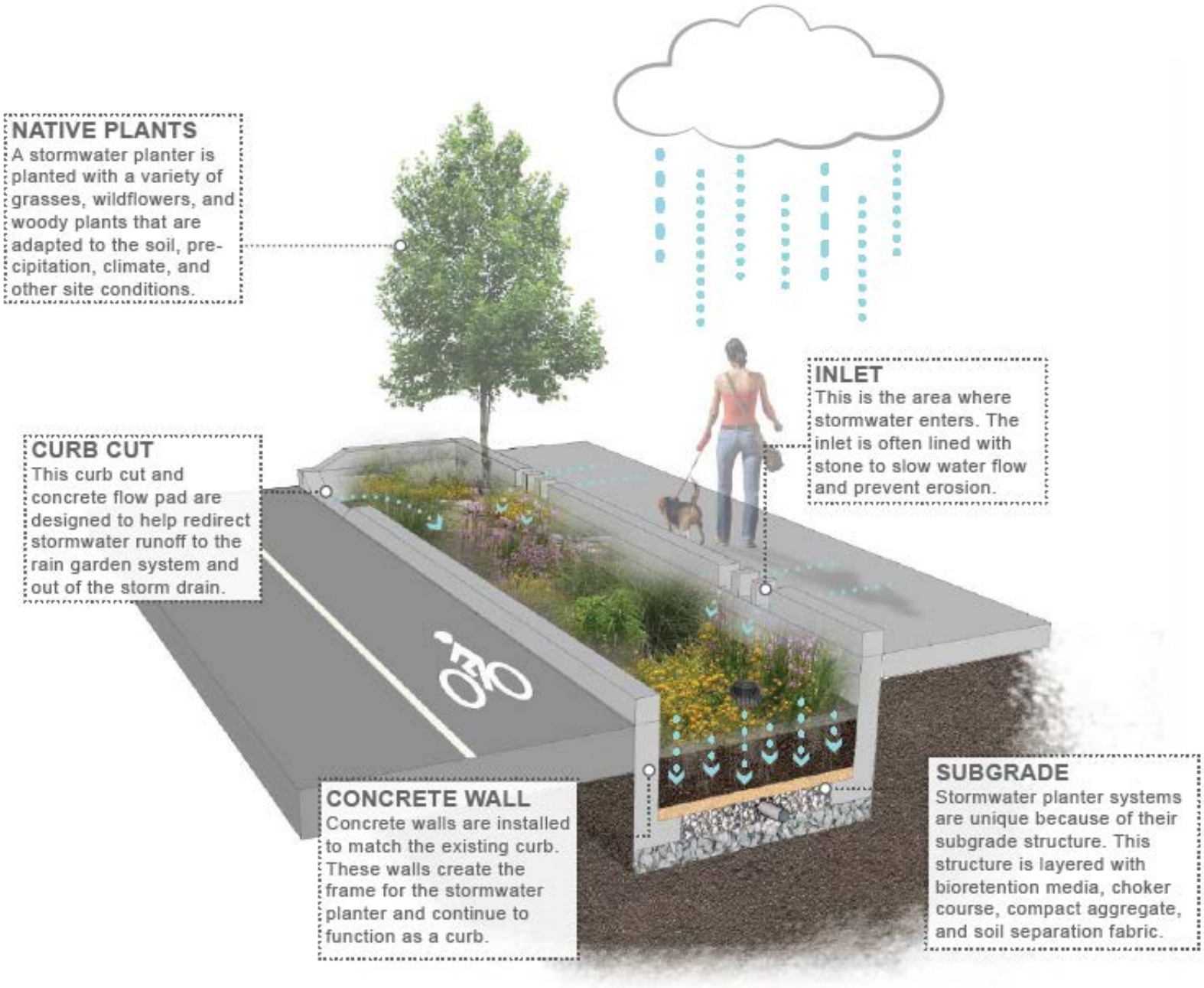
Bioswale


NATIVE PLANTS
A bioswale is planted with a variety of grasses, wildflowers, and woody plants that are adapted to the soil, precipitation, climate, and other site conditions. The vegetation helps filter stormwater runoff as it moves through the system.
CONVEYANCE
Unlike other systems, the bioswale is designed to move water through a vegetative channel as it slowly infiltrates into the ground.
SLOPE
The slope is designed at a maximum of 3:1. These slopes often require erosion control materials for stabilization.
INFLOW
This is the area where stormwater enters.

Stormwater Planters



OTES:

S AND OTHER
CTIONS (E.G. SCUPPER,
RUNNEL) FROM BUILDING
GN PONDING ELEVATION.
E SAN FRANCISCO DBI
NCE CONNECTION

F EXISTING SUBGRADE
INFILTRATION FACILITIES.

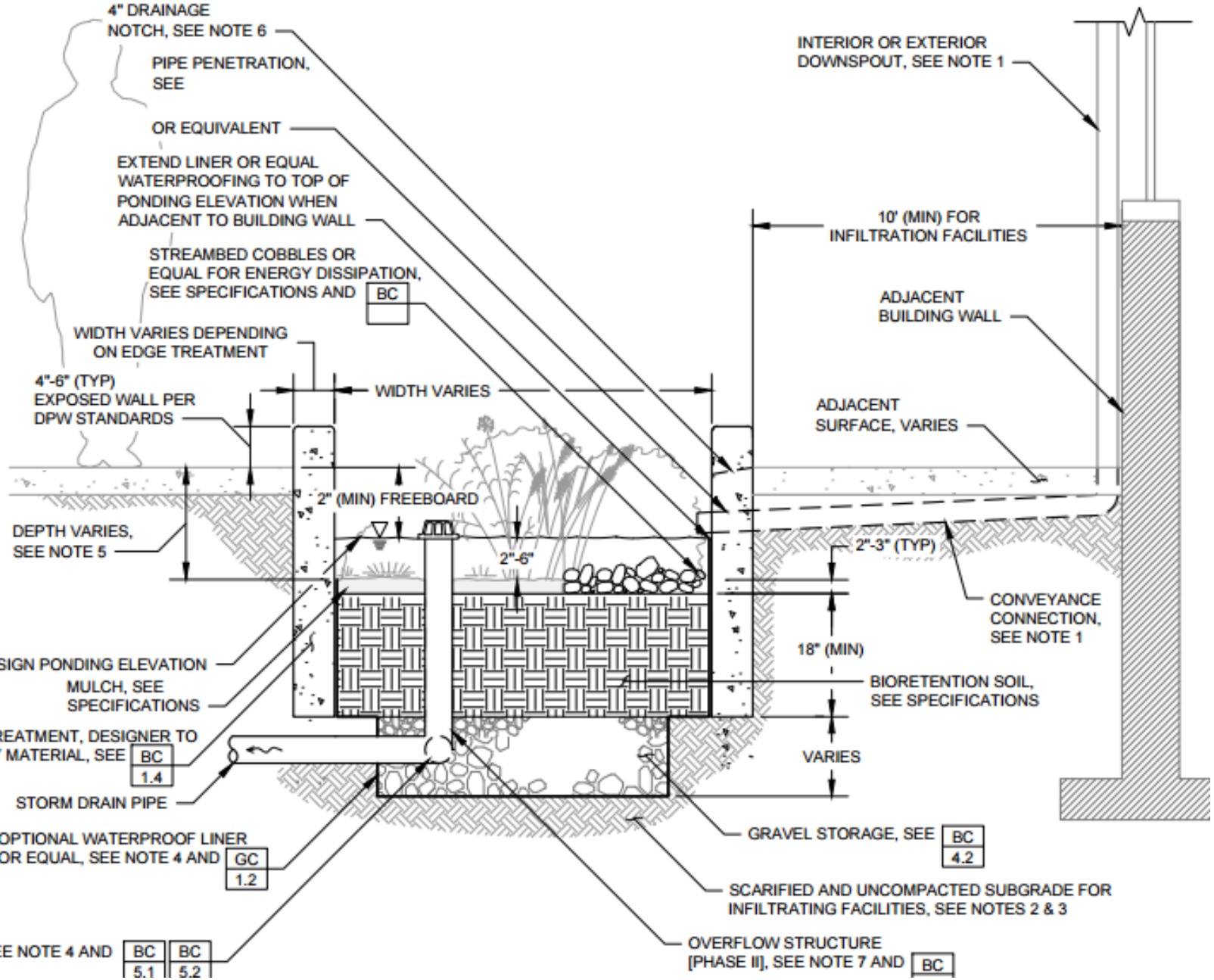
O A DEPTH OF 6 INCHES
IOR TO PLACEMENT OF
D BIORETENTION SOIL.

ER REQUIRED WITHIN 10
VELOPE UNLESS
INER NOTE 8 (SEE BP 5.1).

TOP OF WALKING
MULCH SHALL INCLUDE
E SOIL SETTLEMENT.
ISCO DBI CODES FOR
REQUIREMENTS.

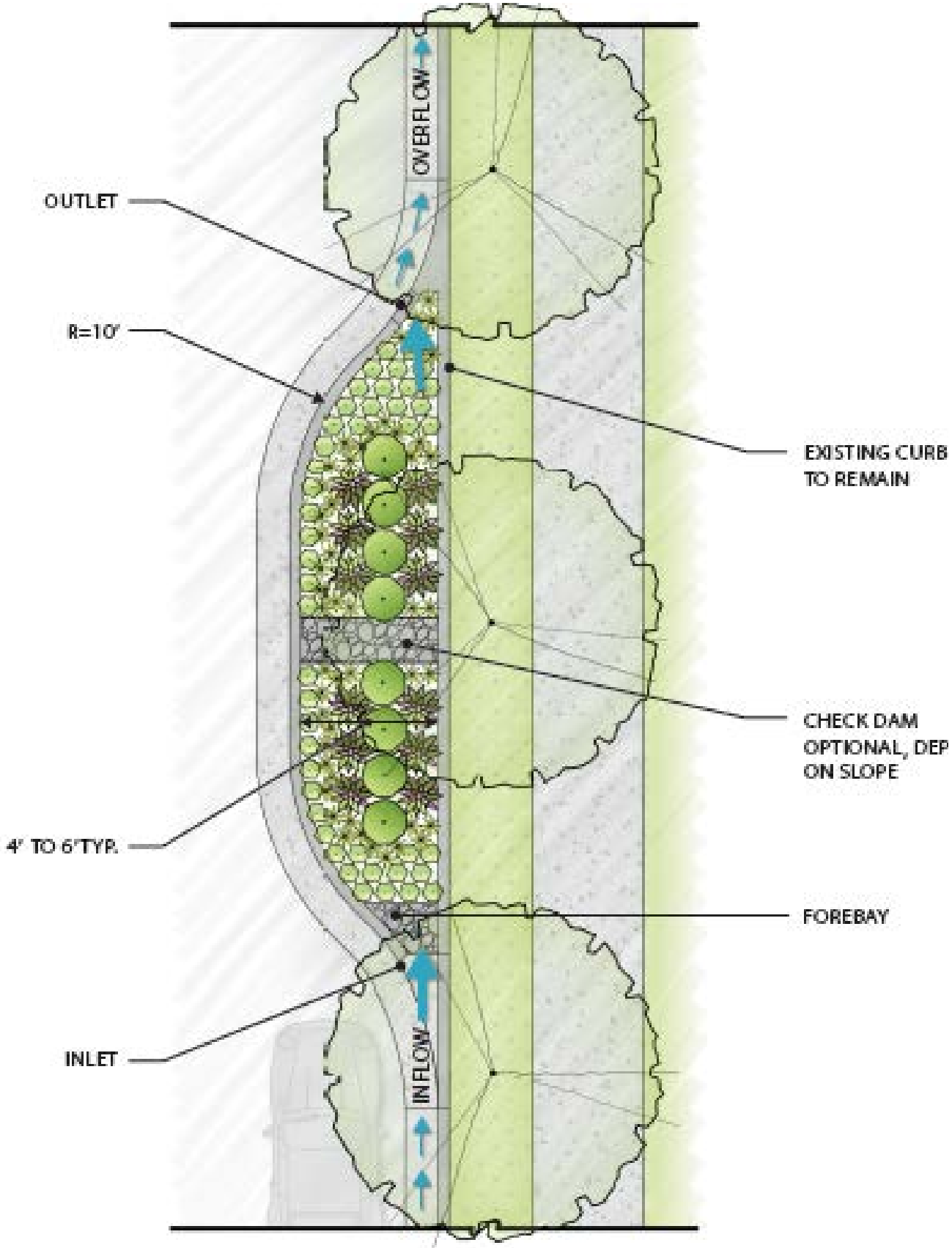
OTCHES TO PREVENT
NTER WALL. SLOPE
D PLANTER.

ORKMANSHIP FOR
RES SHALL CONFORM TO
NCISCO DBI CODES.

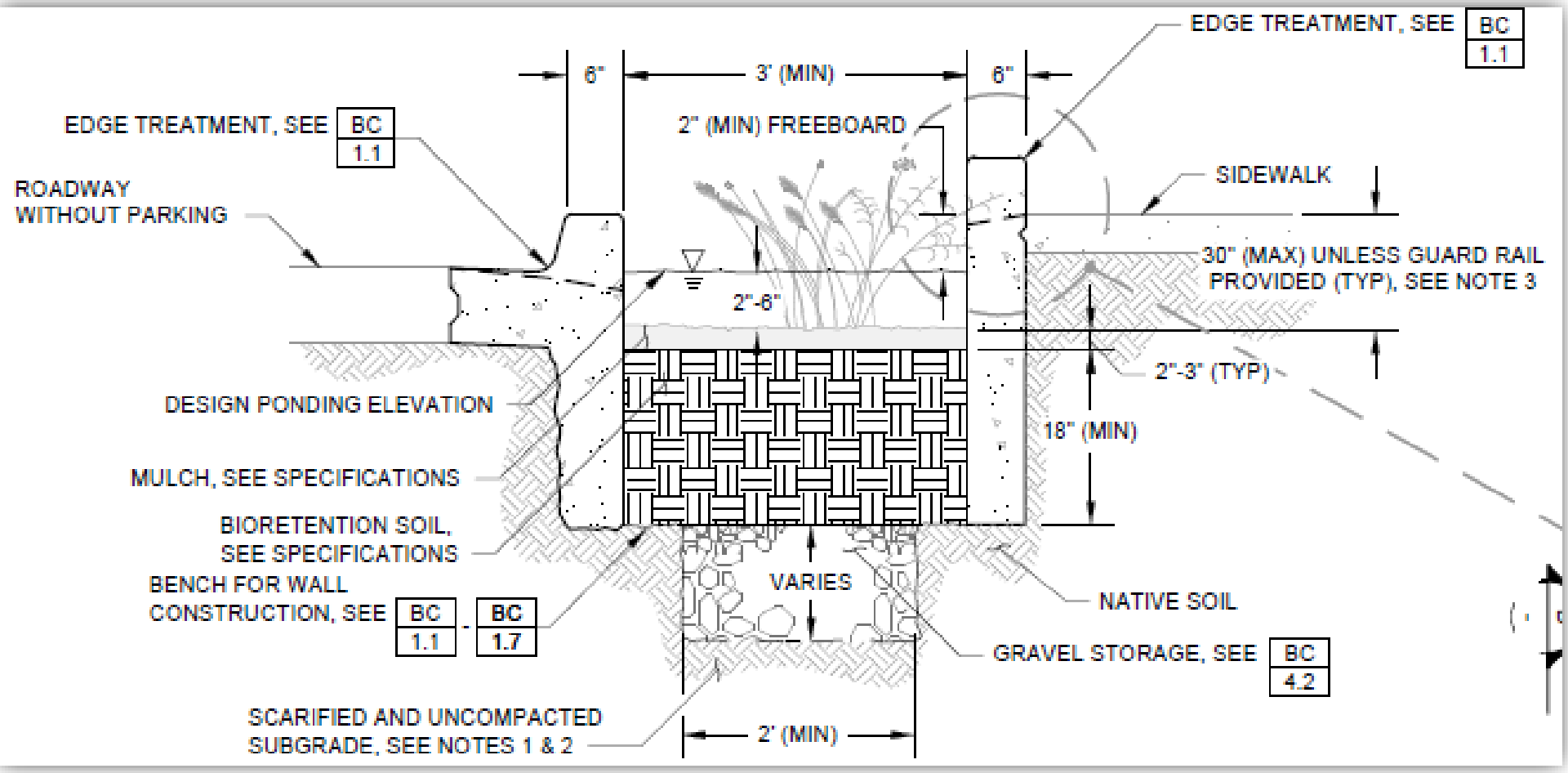


Stormwater Planter Cross-section

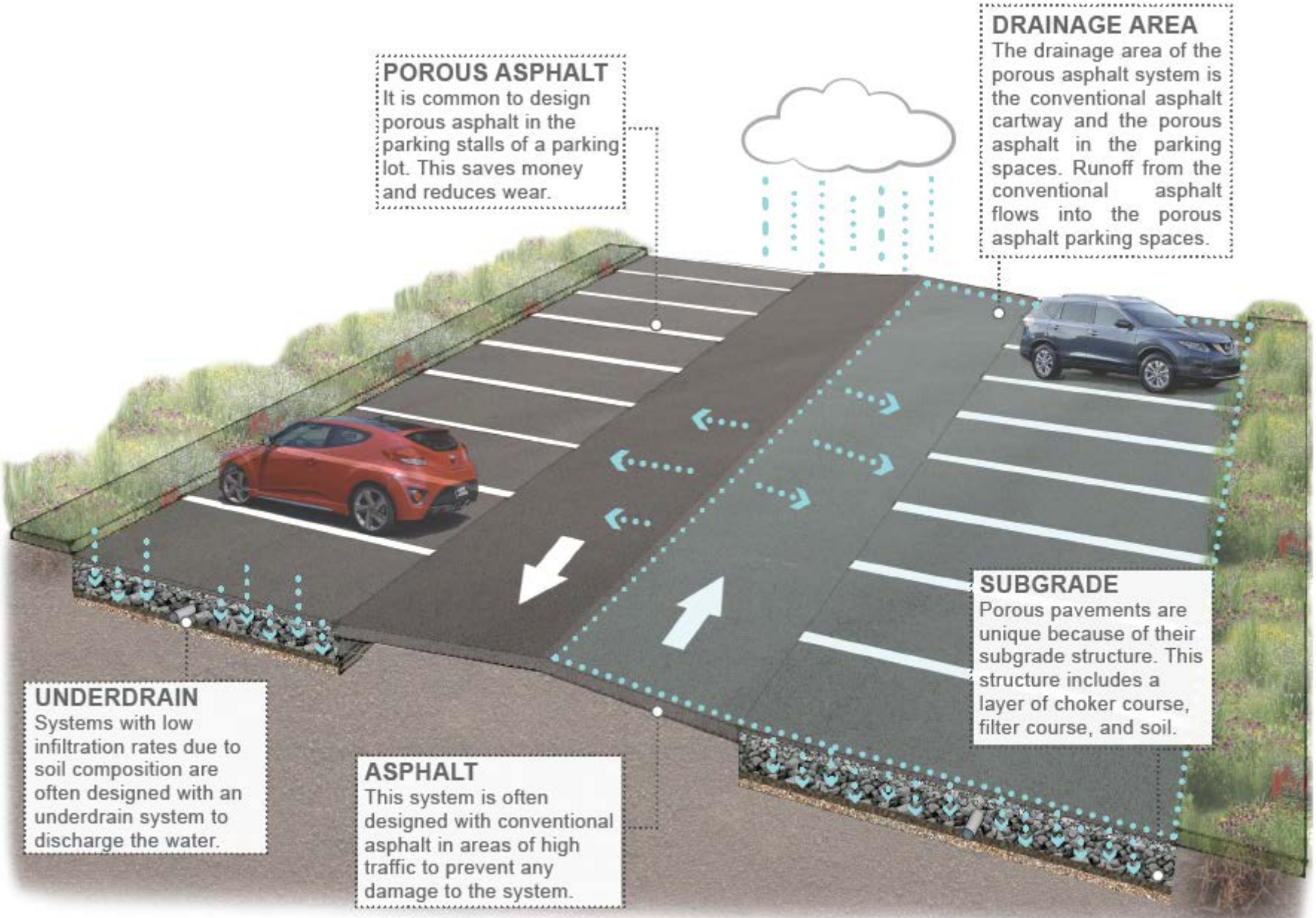
Curb Extensions



NOTE:
Graphic adapted fr
Portland, OR Storm
Manual Details

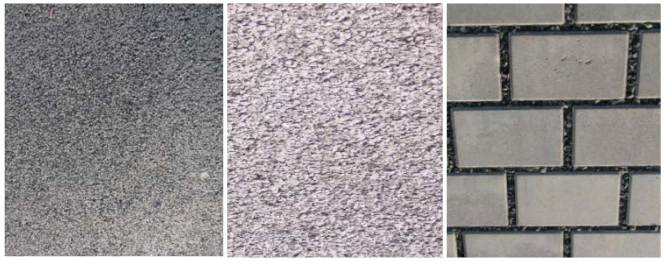

EDGE TREATMENT, SEE BC 1.1
6"
3' (MIN)
6"
EDGE TREATMENT, SEE BC 1.1
2" (MIN) FREEBOARD
SIDEWALK
ROADWAY
WITHOUT PARKING
30" (MAX) UNLESS GUARD RAIL
PROVIDED (TYP), SEE NOTE 3
2"-6"
2"-3" (TYP)
DESIGN PONDING ELEVATION
18" (MIN)
MULCH, SEE SPECIFICATIONS
BIORETENTION SOIL,
SEE SPECIFICATIONS
BENCH FOR WALL
CONSTRUCTION, SEE BC 1.1 - BC 1.7
VARIES
NATIVE SOIL
GRAVEL STORAGE, SEE BC 4.2
SCARIFIED AND UNCOMPACTED
SUBGRADE, SEE NOTES 1 & 2
2' (MIN)

Permeable Pavement



Permeable Pavements

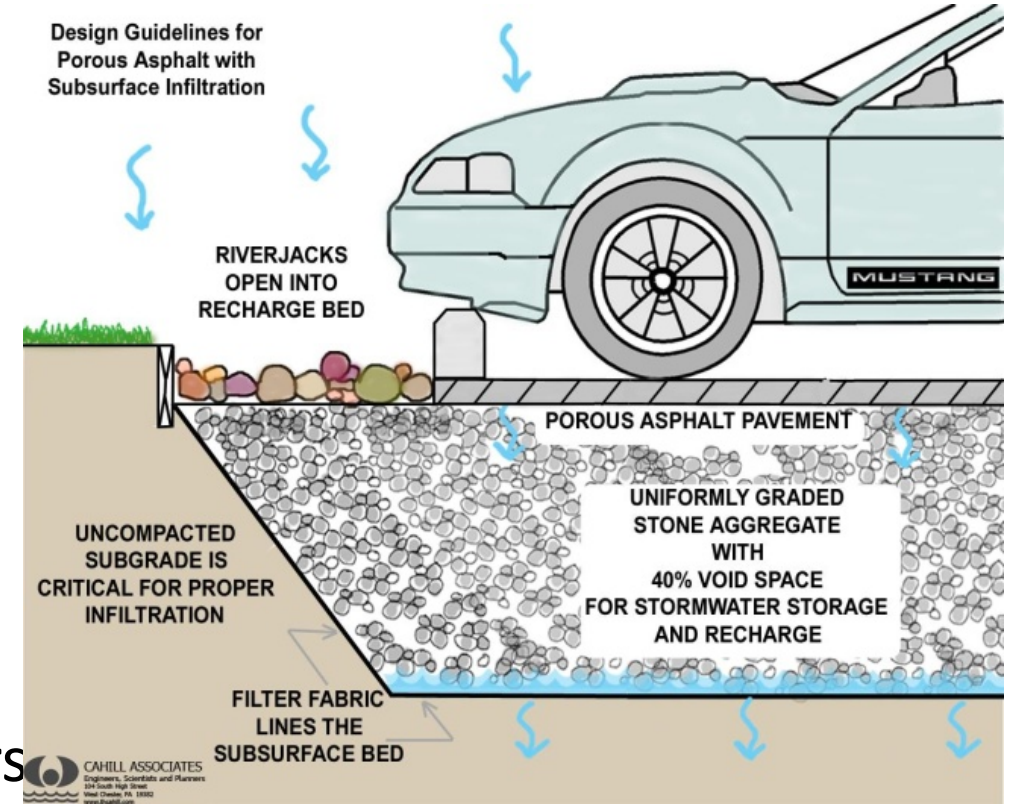
- Underlying stone reservoir
- Porous asphalt and pervious concrete are manufactured without "fine" materials to allow infiltration
- Grass pavers are concrete interlocking blocks with open areas to allow grass to grow
- Permeable pavers systems are concrete pavers with infiltration between the spaces of the pavers
- Ideal application for porous pavement is to treat a low traffic or overflow parking area



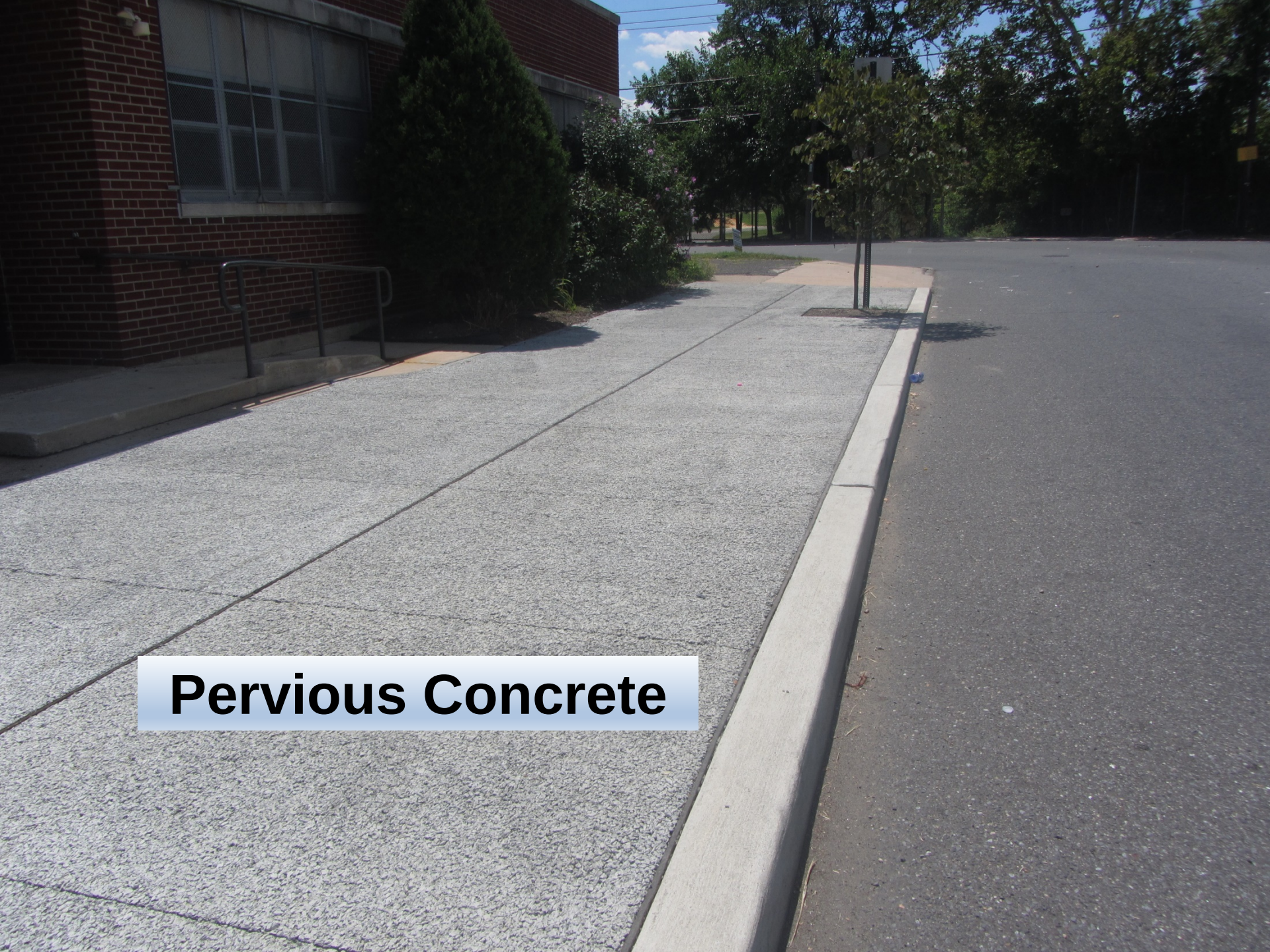
ADVANTAGES

- Manage stormwater runoff
- Minimize site disturbance
- Promote groundwater recharge
- Low life cycle costs, alternative to costly traditional stormwater management methods
- Mitigation of urban heat island effect
- Contaminant removal as water moves through layers of system

COMPONENTS



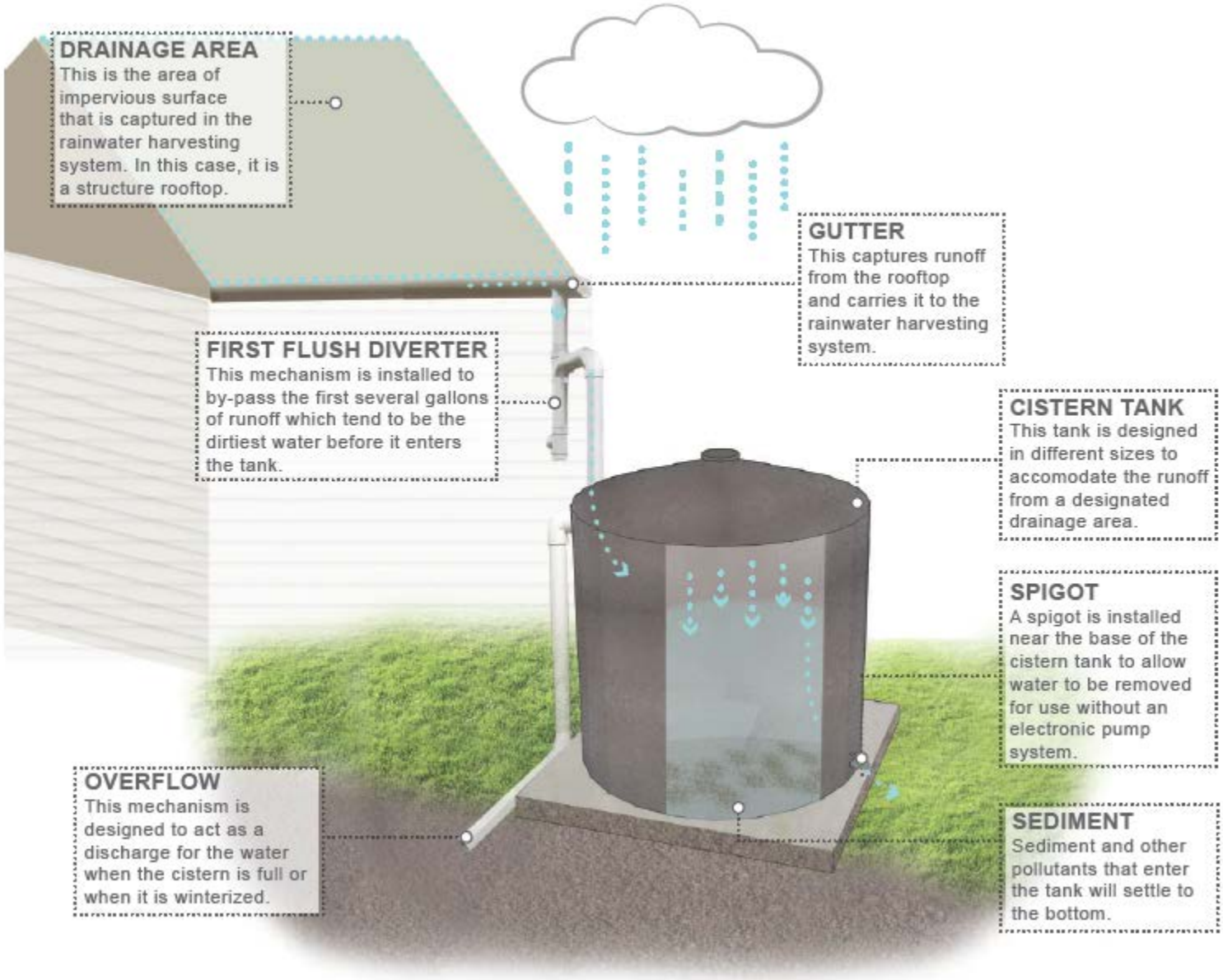
Porous Asphalt


Pervious Concrete


Permeable Pavers

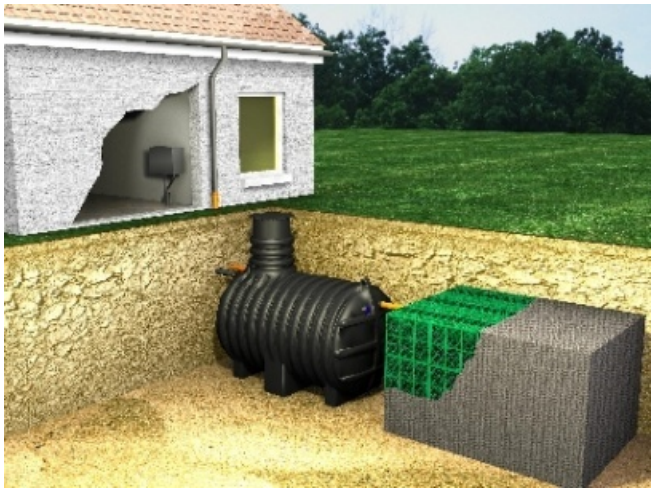

Grass Pavers

Rainwater Harvesting Systems

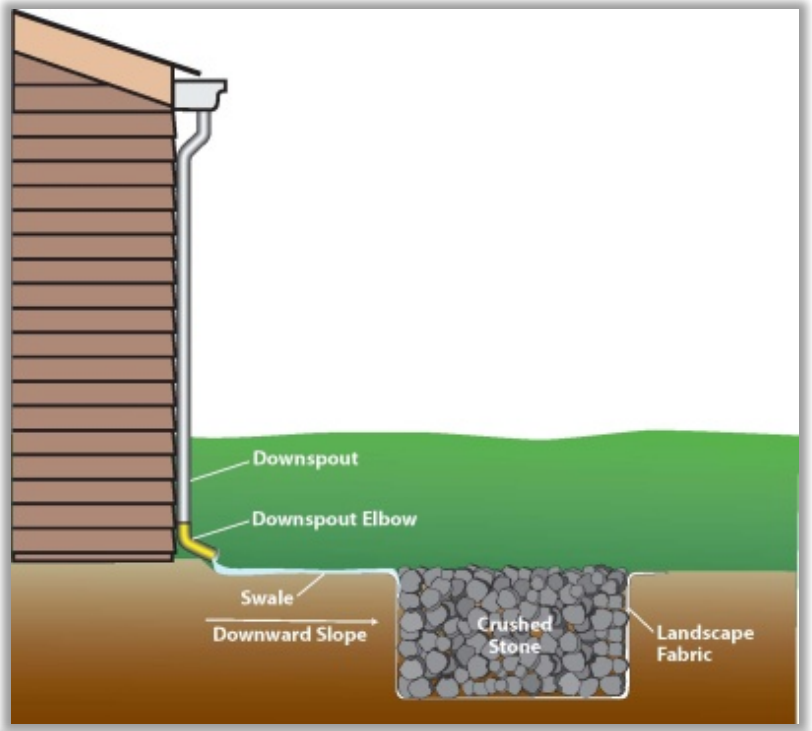


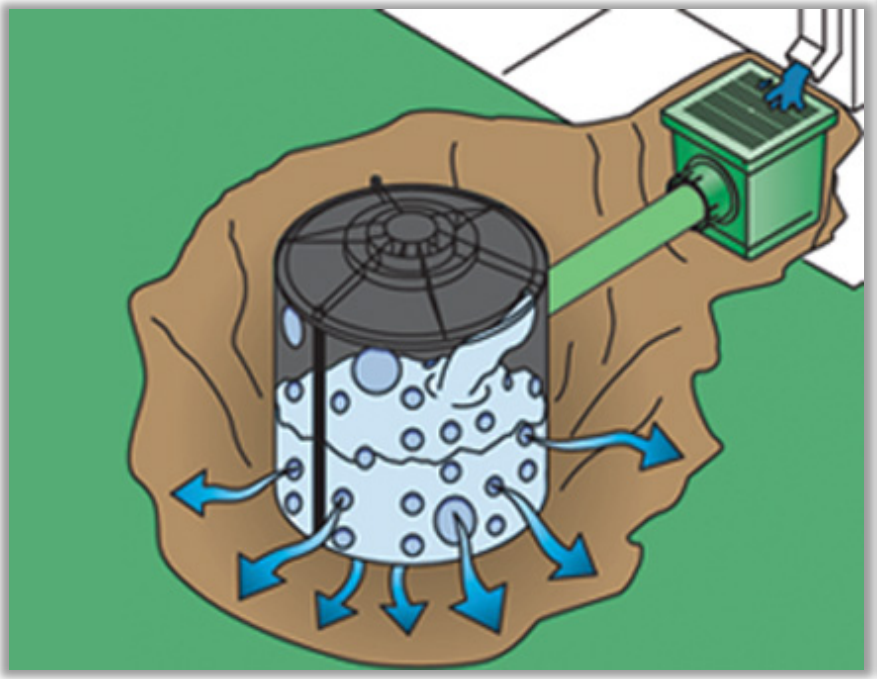
Rain Barrels

Cisterns

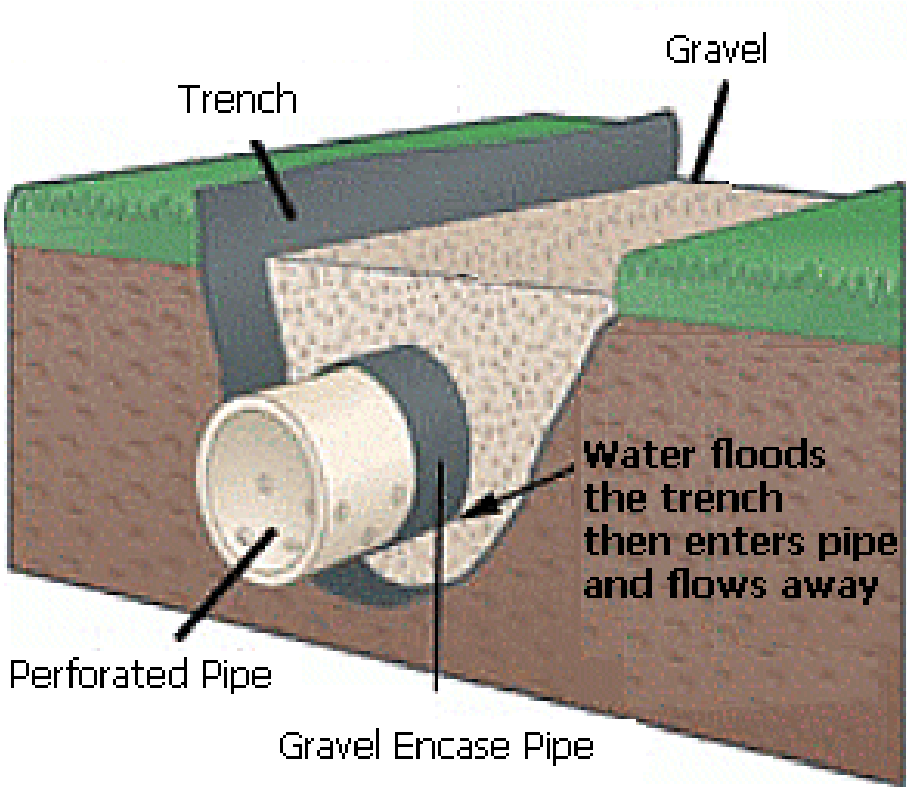


Dry Wells


Downspout
Downspout Elbow
Swale
Downward Slope
Crushed Stone
Landscape Fabric



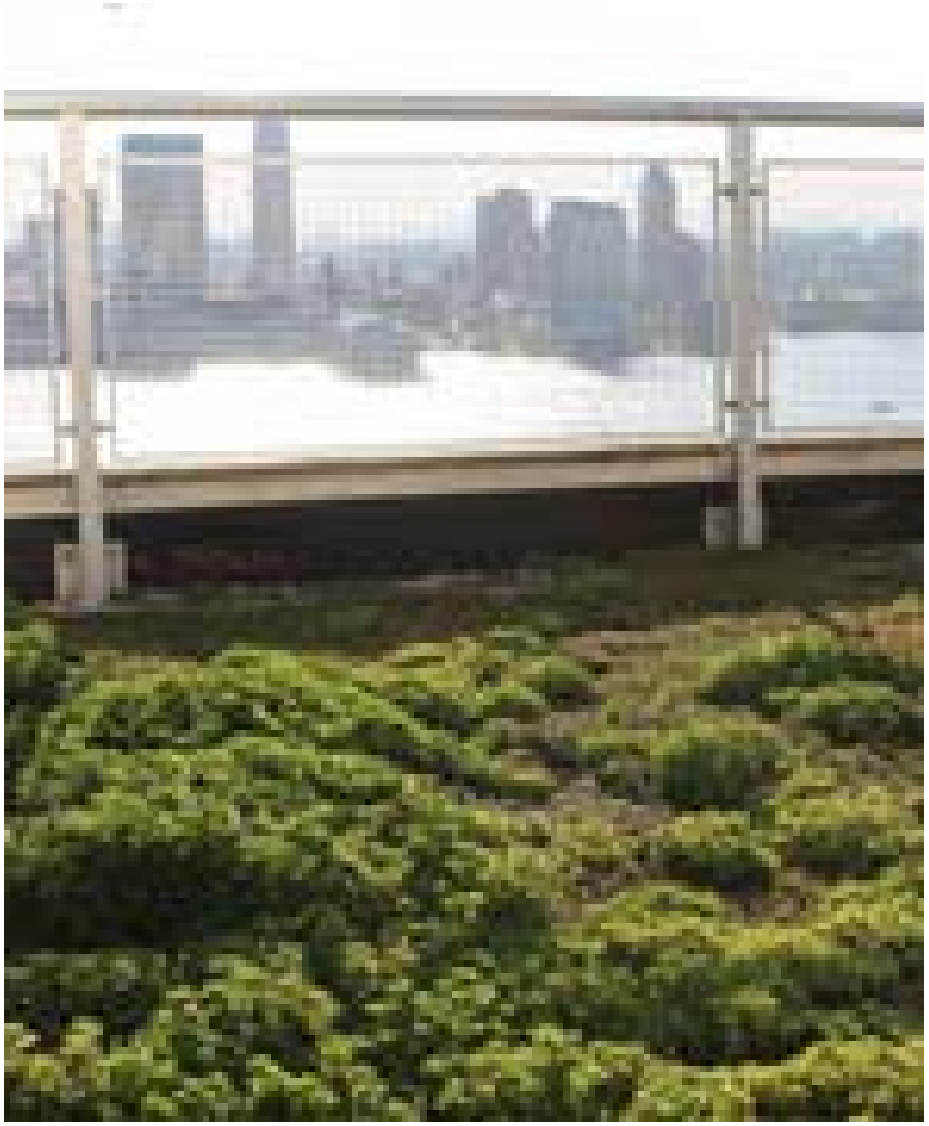
Infiltration Trench



Rooftop Practices – Green Roof

Types of Green Roofs

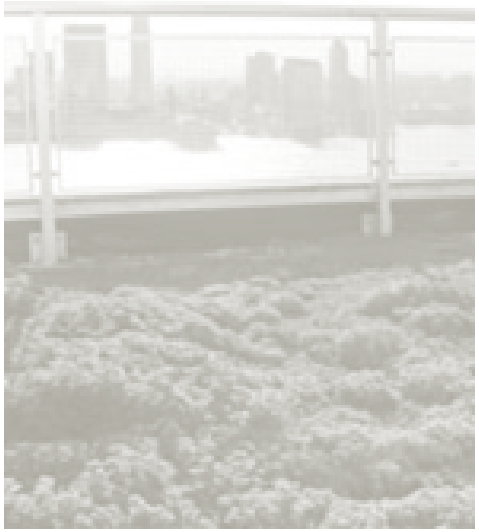
Extensive



Intensive

Types of Green Roofs

Extensive



Soil depth up to 6 inches

Lightweight

Limited plant species options

Lower maintenance, nutrient, and irrigation requirements

Intensive

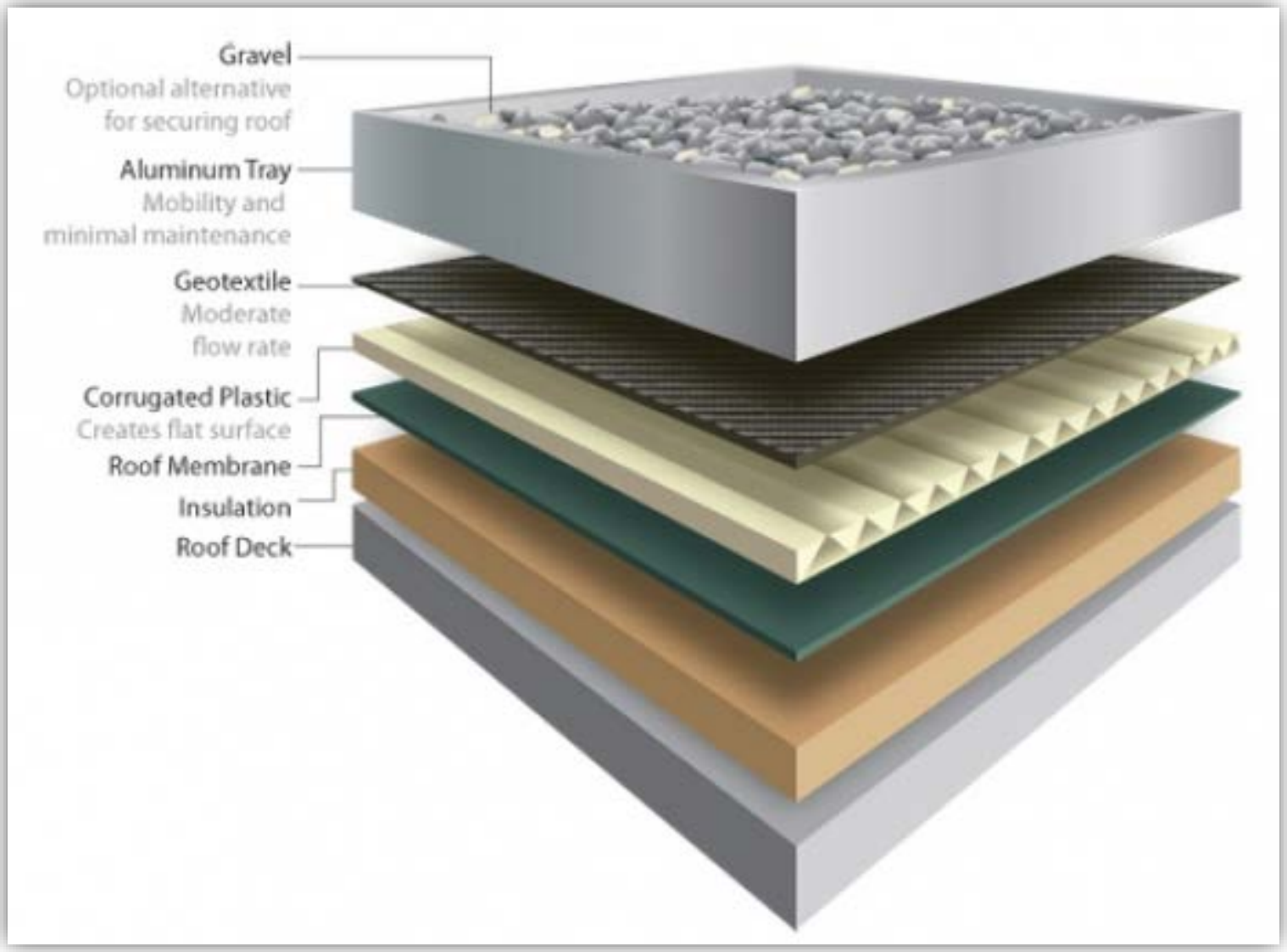
Soil depth typically 6 inches or greater

Heavier weight load on roof

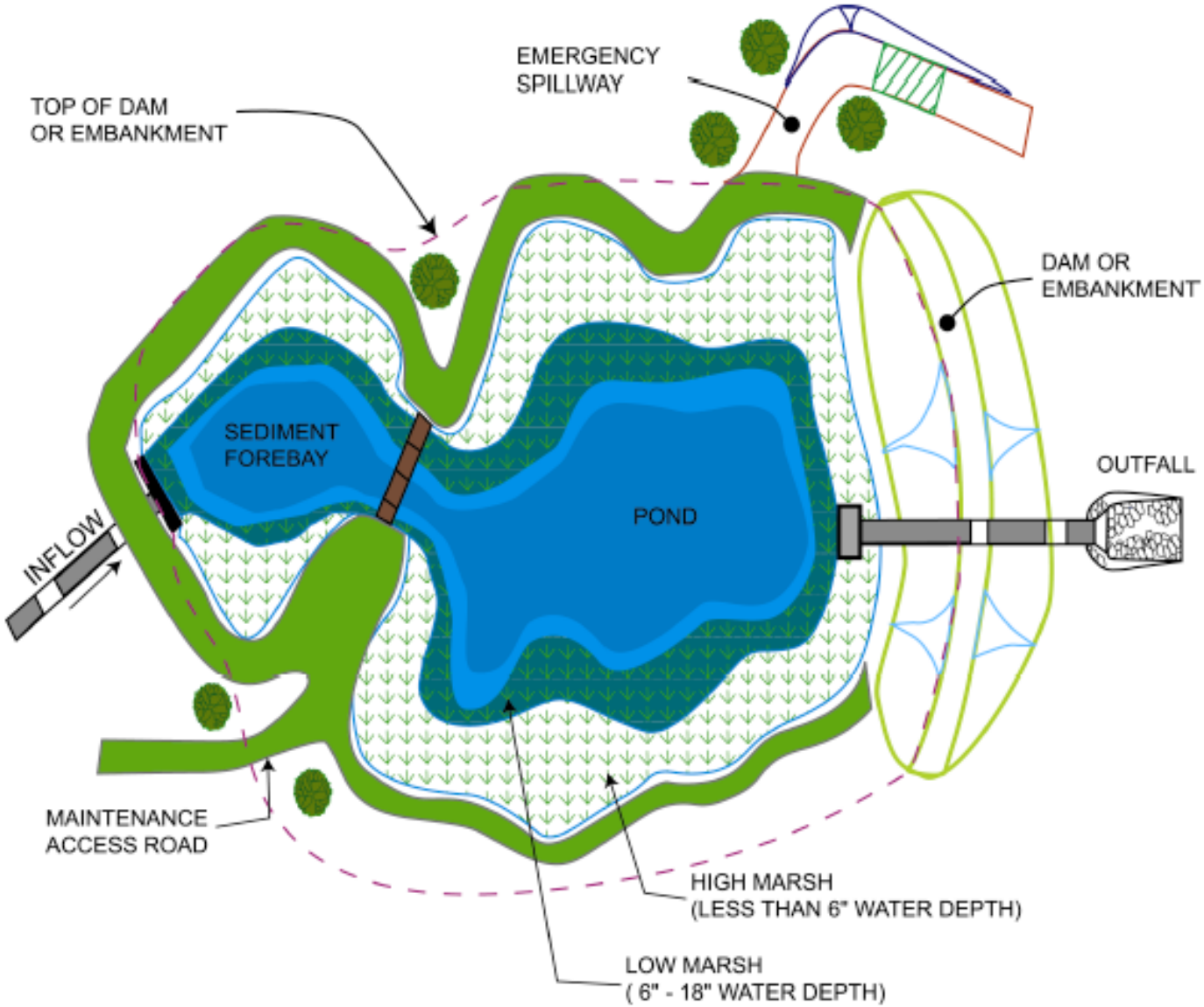
Many more plant options, including trees and shrubs

Requires irrigation, fertilization, and maintenance

Rooftop Practices – Blue Roof

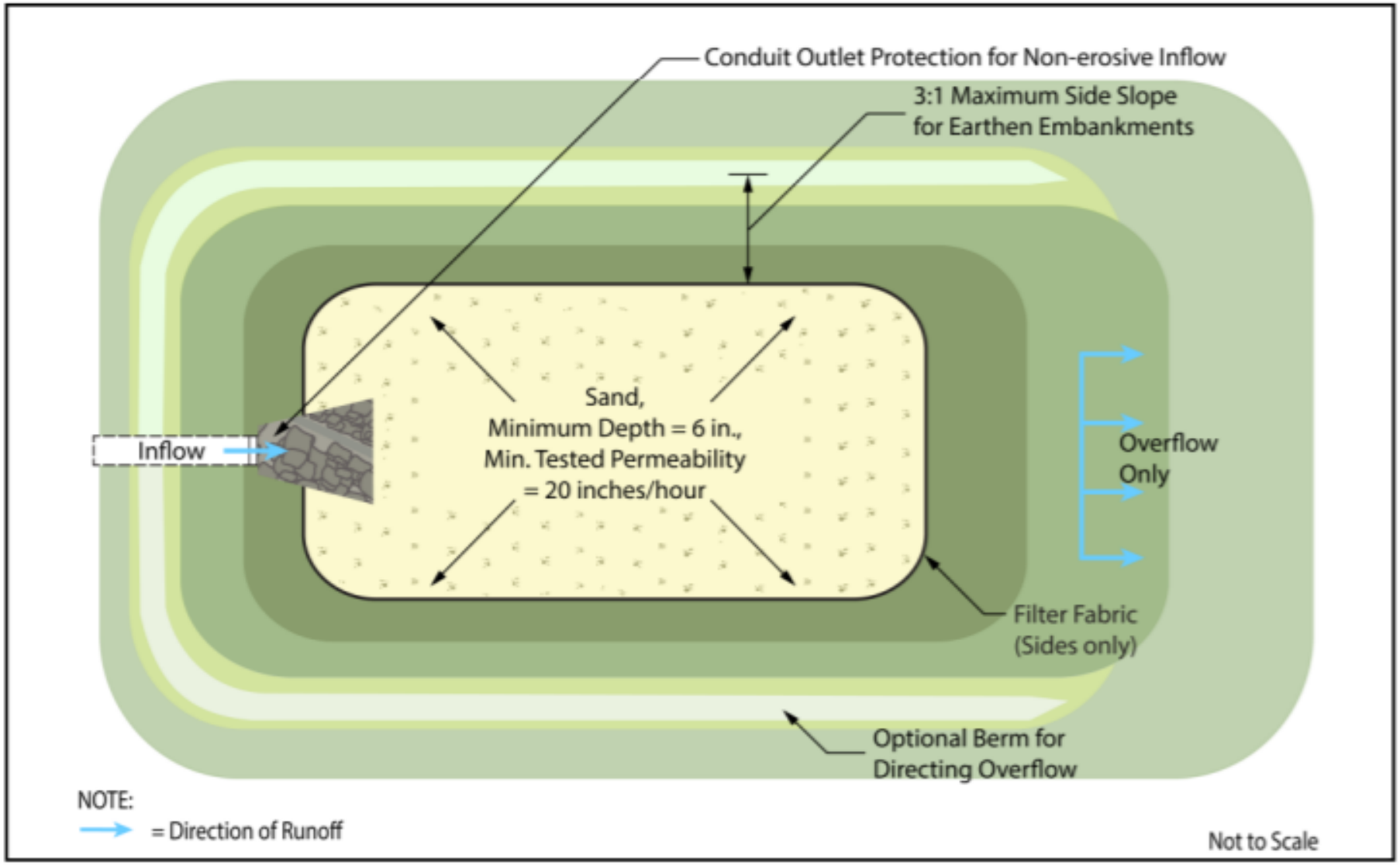


Stormwater Wetlands

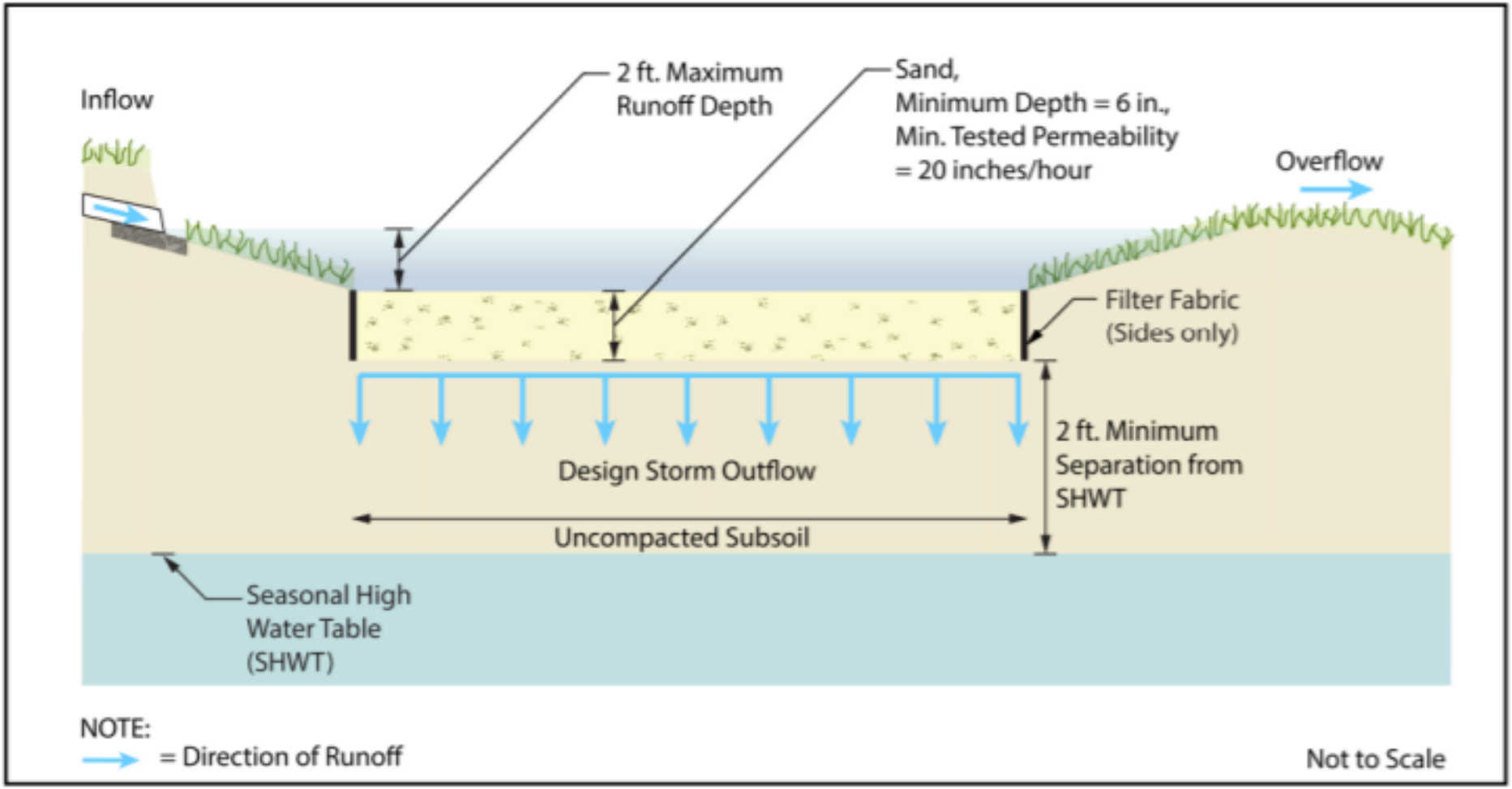

EMERGENCY
SPILLWAY
TOP OF DAM
OR EMBANKMENT
DAM OR
EMBANKMENT
SEDIMENT
FOREBAY
OUTFALL
POND
INFLOW
MAINTENANCE
ACCESS ROAD
HIGH MARSH
(LESS THAN 6" WATER DEPTH)
LOW MARSH
(6" - 18" WATER DEPTH)

Small-Scale Infiltration Systems

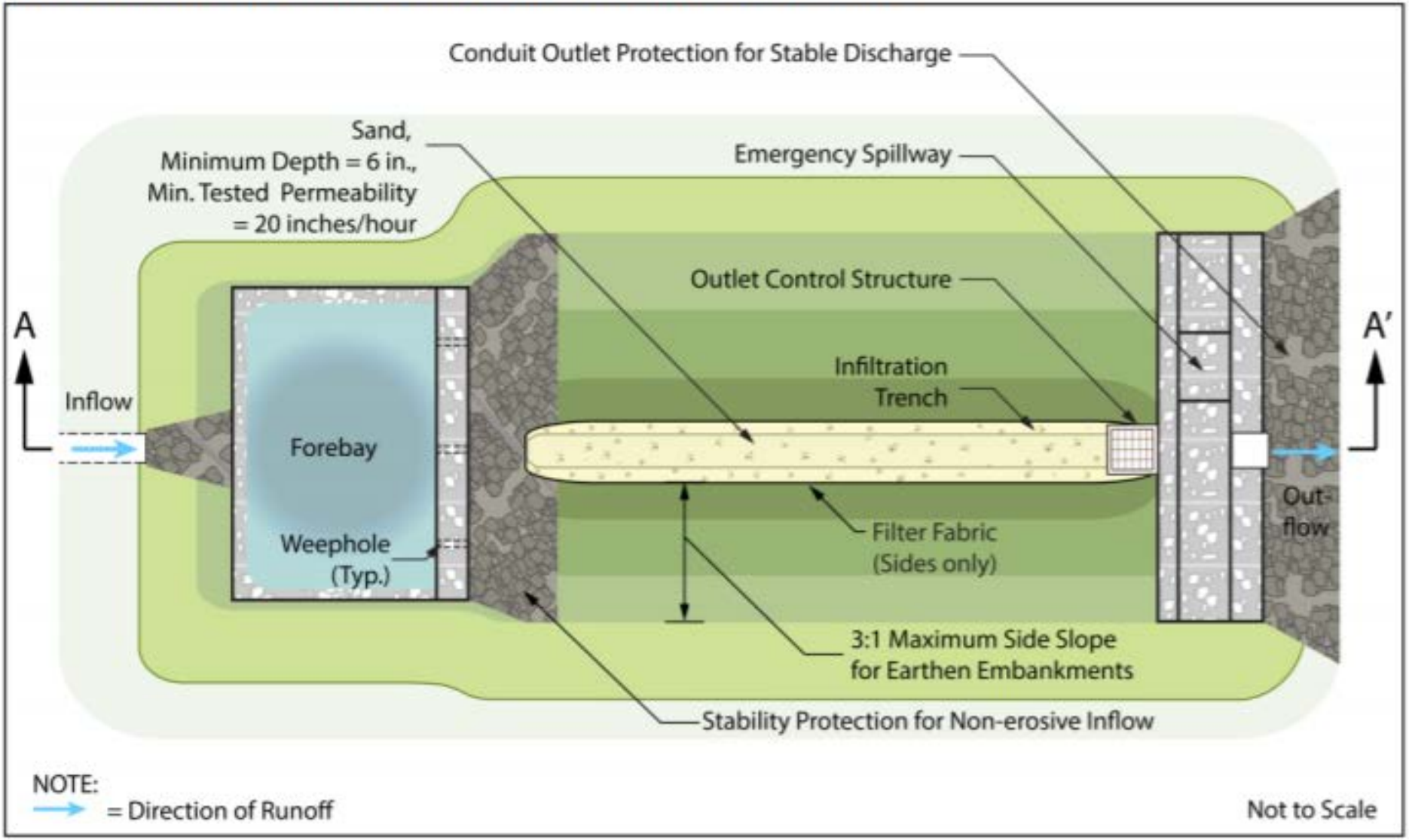
Surface Infiltration Basin – Plan View



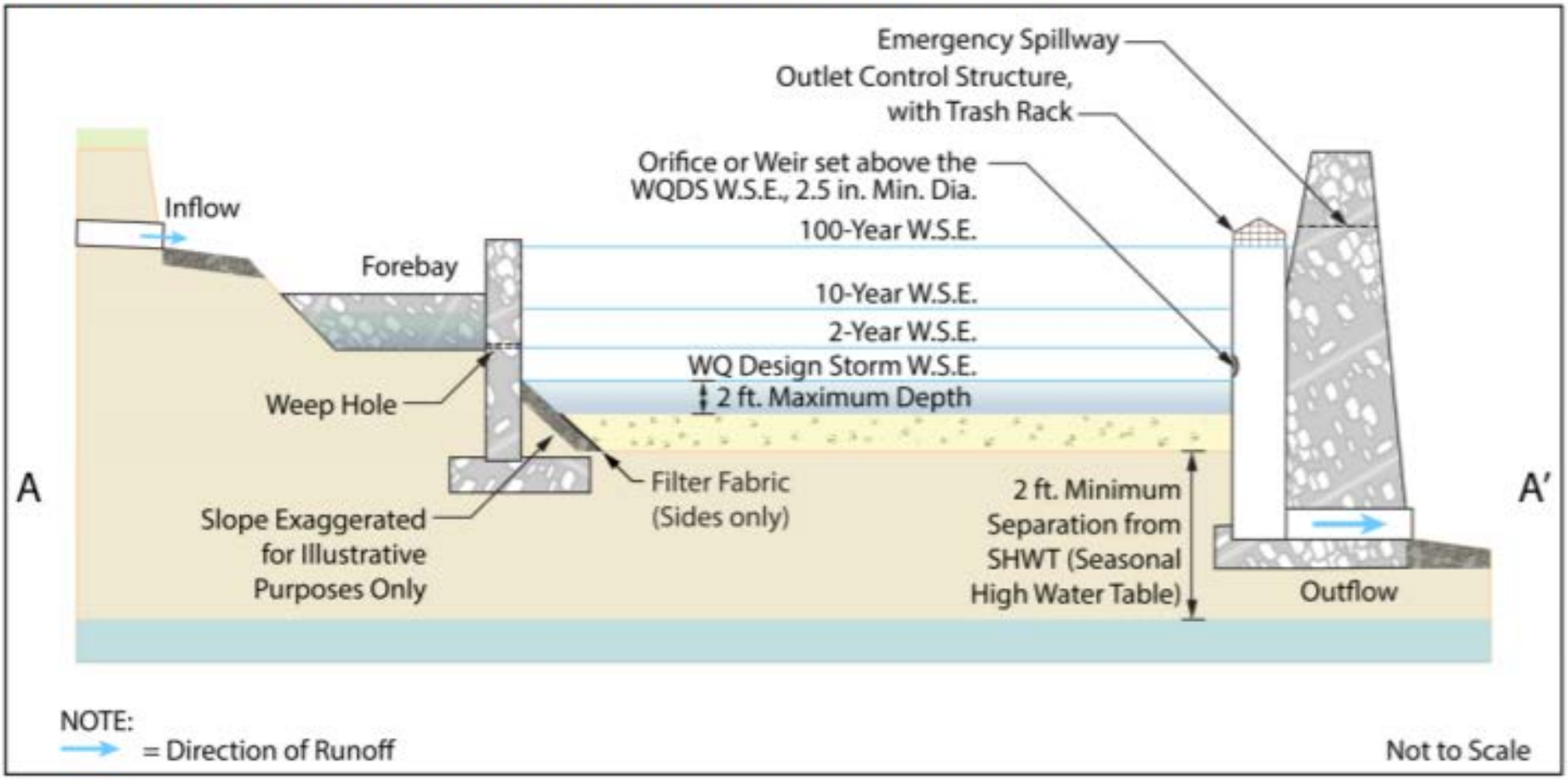
Surface Infiltration Basin – Profile View



Infiltration - Extended Detention Basin: Plan View

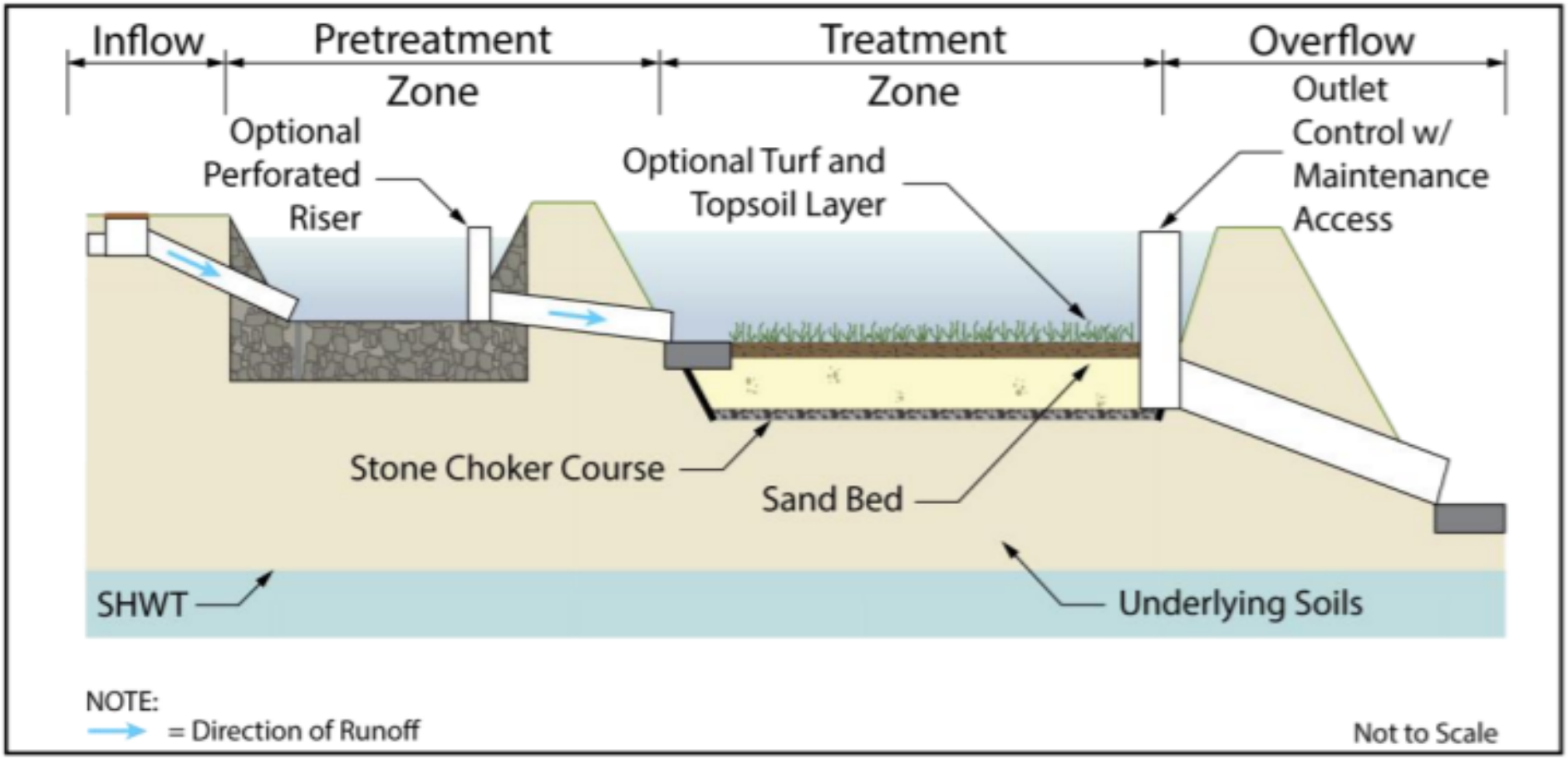


Infiltration – Extended Detention Basin: Profile View

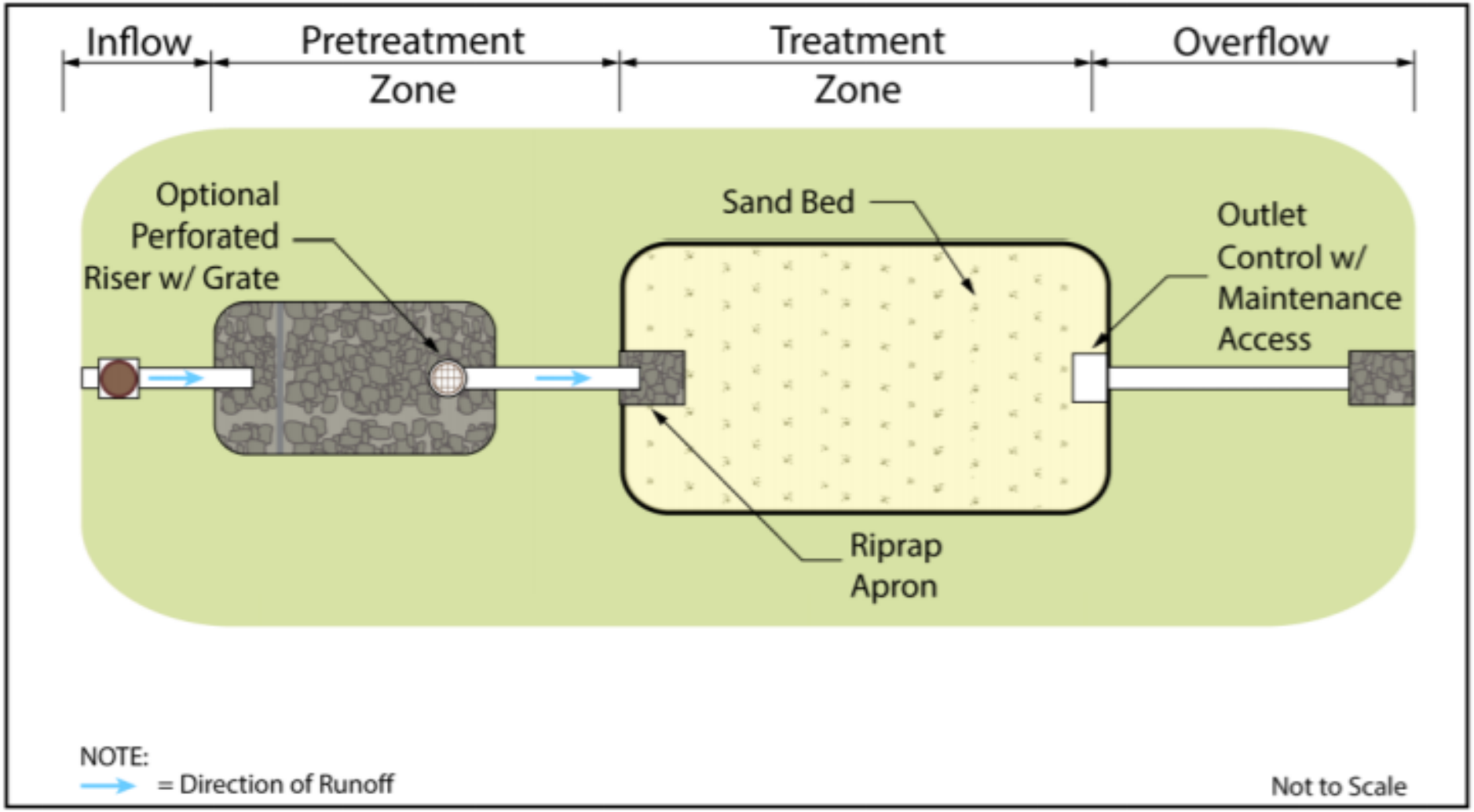


Small-Scale Sand Filter

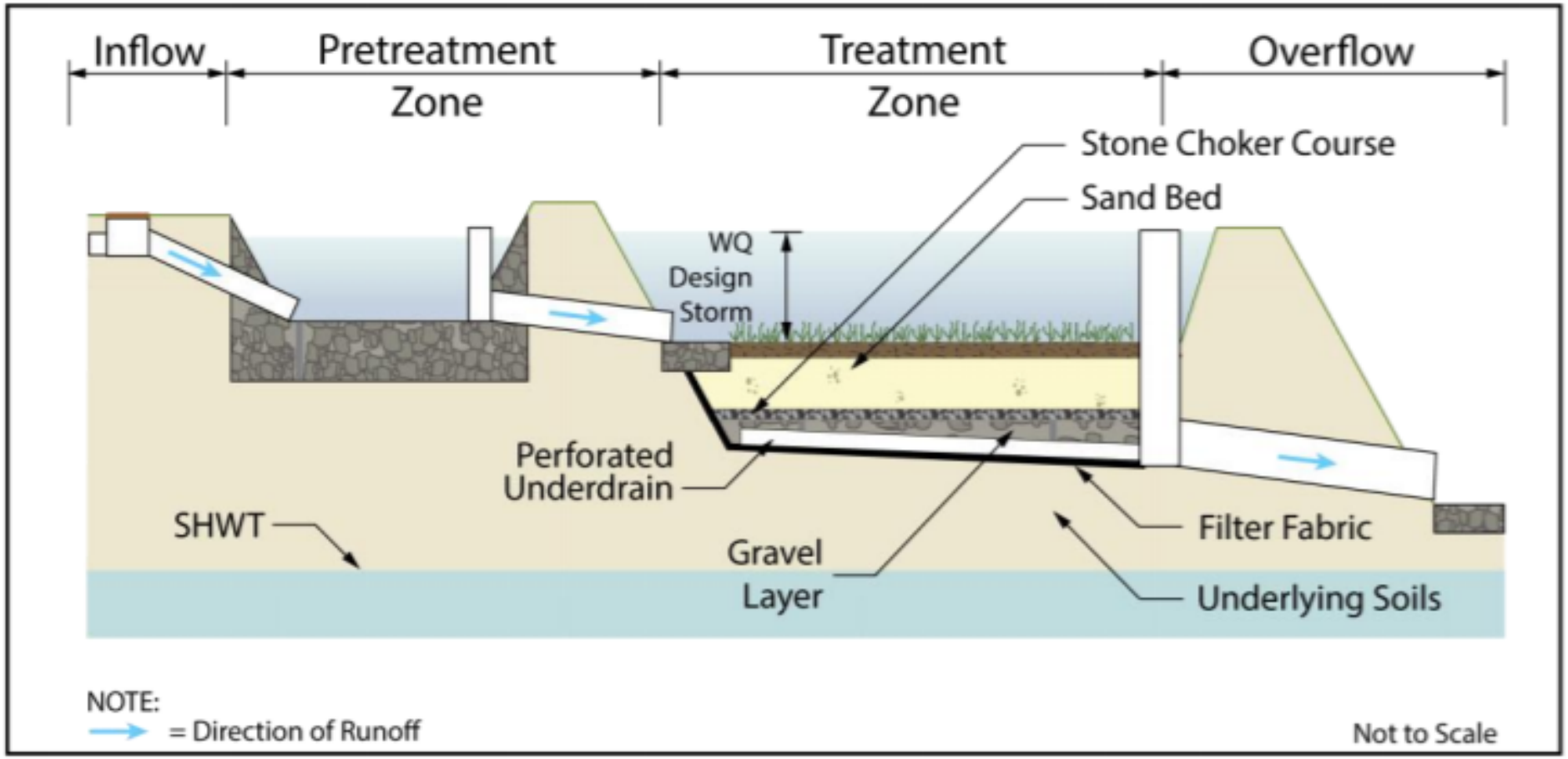
Profile View – Sand Filter Basics



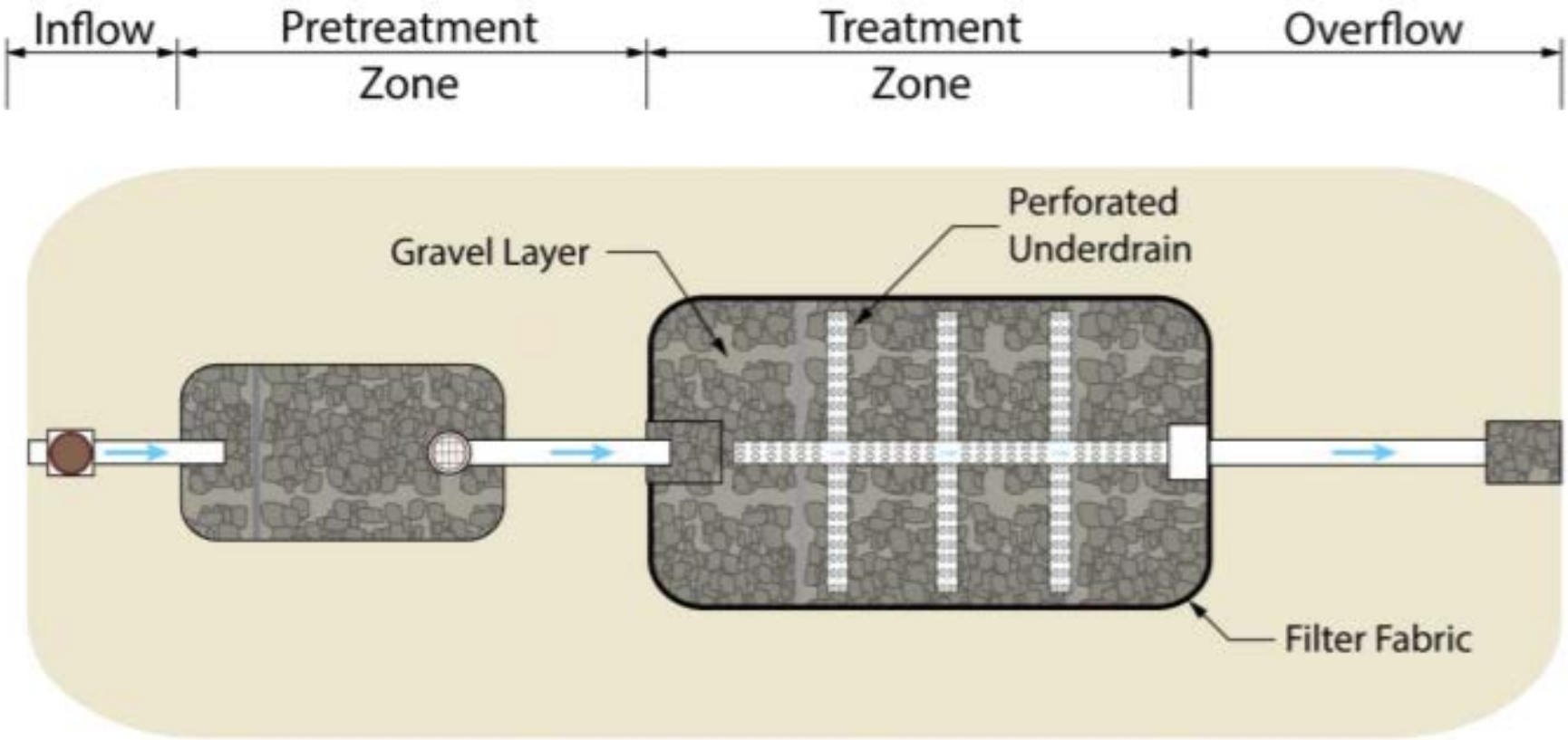
Plan View – Sand Filter Basics



Profile View – Sand Filter with Underdrain



Plan View – Sand Filter with Underdrain



NOTE:
→ = Direction of Runoff
Surface Vegetation, Topsoil, Sand Layer & Stone Choker Course Not Shown

Not to Scale

March 2021 – Major Development will mostly use these GI Practices

- Pervious Paving Systems
- Small-Scale Bioretention Systems
- Small-Scale Infiltration Basins
- Small-Scale Sand Filters

To satisfy groundwater recharge, stormwater quantity, and stormwater quality requirements.

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