

SUSTAINABLE STORMWATER SOLUTIONS: WHY DESIGN MATTERS

INFILTRATION

What is it?

The vertical movement of stormwater through plants and soil which can be used to recharge groundwater in systems without an under drain or liner.



Benefits

- Allows for greater filtration of stormwater runoff
- Increases potential for groundwater recharge
- Adds aesthetic benefits to residents and developments

Challenges

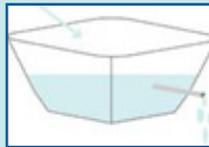
- Soils must be fairly permeable or underdrain systems are required and may require more evaluation and upkeep



DETENTION

What is it?

The temporary storage of stormwater runoff - in ponds, underground systems, or depressed areas - and eventual controlled release through an engineered outlet structure.



Benefits

- Adds stormwater inflow storage and erosion control
- Reduces downstream flooding
- Increases aesthetic and recreational benefits

Challenges

- May be infeasible to site or retrofit in dense urban areas due to spacing requirements



RETENTION

What is it?

The storage of stormwater runoff on site that is not released at a later time. While there is no outlet structure retained runoff can be used for additional purposes such as irrigation.



Benefits

- Retains stormwater locally
- Reduces downstream erosion and flooding
- Increases aesthetic appeal of downtown areas

Challenges

- Initial investment for infrastructure may be costly



SUSTAINABLE STORMWATER SOLUTIONS: DESIGNING FOR INFILTRATION

BIOSWALES OR VEGETATED SWALES

What are they?

Sloped, vegetated channels that convey stormwater and remove sediments and other pollutants through infiltration

Where do they work best?

- Low to moderately sloped areas
- Highway medians as an alternative to curb and gutter drainage
- As pretreatment sites for retention areas

Benefits

- Increases filtration of pollutants from stormwater runoff
- Increases stormwater inflow storage and erosion control

Challenges

- Pet waste and fertilizer often runs into swales in urban areas
- Channel formation can occur and cause erosion
- Not as feasible for higher density developments



VEGETATED FILTER STRIPS

What are they?

Flat, vegetated sections of land that allow shallow, dispersed water flow, and infiltration of water

Where do they work best?

- Roadways and small parking lots
- Medians and shoulders of roads
- On slopes of less than 20%

Benefits

- Can break up impermeable surfaces in developed areas
- Increases filtration of pollutants from stormwater runoff
- Increases stormwater inflow storage and erosion control

Challenges

- Difficult to maintain sheet flow
- Requires extra evaluation in the first few months for long-term viability



PERMEABLE PAVEMENTS

What are they?

Pervious forms of pavement that filter out pollutants and allow runoff to pass through and infiltrate soil

Where do they work best?

- Developed areas with little overhead tree cover
- Sidewalks, patios, parking areas, and lightly used roads

Benefits

- Can replace numerous forms of impermeable surfaces
- Pollution reduction and increased potential for groundwater recharge
- Less need for curbing/storm sewers

Challenges

- Periodic sweeping or pressure washing, biannual vacuuming, and yearly inspections are required for long-term viability
- Many pavement engineers and contractors lack expertise with this technology



SUSTAINABLE STORMWATER SOLUTIONS: DESIGNING FOR DETENTION

EXTENDED DETENTION BASINS

What are they?

Low-lying basins that capture and temporarily store stormwater runoff following a storm event

Where do they work best?

- Drainage areas greater than three acres
- With flood control detention facilities to provide additional water storage

Benefits

- Relatively easy and inexpensive to construct and operate
- Adaptable: useful in areas with thin soils, high evaporation rates, low-soil infiltration rates, and limited space
- Increased infiltration time lets solids in runoff settle rather than be flushed downstream, limiting downstream erosion

Challenges

- Difficult to correct design flaws in inlet/outlet structures
- Eventual dredging and replacement of structures will be required



CONSTRUCTED WETLANDS

What are they?

Shallow, manmade pools with or without open water elements that create growing conditions suitable for marsh plants and other vegetation

Where do they work best?

- Areas with a source of flow, such as where the water table is close to the ground surface

Benefits

- Increases stormwater inflow storage and erosion control
- Provides physical, chemical, and biological water quality treatment of stormwater runoff
- Mimics natural wetlands, increasing wildlife habitat

Challenges

- May be infeasible in dense urban areas due to sizing requirements
- High initial investment and upfront costs



WET PONDS

What are they?

Detention basins with a permanent volume of water and floating plants

Where do they work best?

- Regional tributary areas greater than 10 acres in size
- Sites with a water table close to the surface

Benefits

- Can be used for recreational purposes
- Increases stormwater inflow storage and erosion control
- Provides physical, chemical, and biological water quality treatment of stormwater runoff

Challenges

- May be infeasible to site or retrofit in dense urban areas
- Potential drowning hazard when sides are too steep or bulk-headed



SUSTAINABLE STORMWATER SOLUTIONS: DESIGNING FOR RETENTION

BIORETENTION FACILITIES

What are they?

Vegetated areas made up of a ponding area, filtration bed, engineered soils, organic or mulch layer, and plants to store stormwater runoff

Where do they work best?

- Anywhere they can be worked in with a site's landscaping
- Areas with slopes less than 20%

Benefits

- Versatile: can be used in any land use type and can cover large or small-scale drainage areas
- Can be designed with or without underdrains
- Enhances downstream water quality

Challenges

- Including large amounts of compost in the filter media can lead to increased nutrient release in discharge
- Routine maintenance is required



TREE AND STORMWATER PLANTER BOXES

What are they?

Flow-through planters that drain runoff from paved areas into underground units through storm drain inlet structures

Where do they work best?

- Along sidewalks and curbs and in urban, paved areas
- Under roof drain downspouts

Benefits

- Increases stormwater drainage and retention space
- Creates public safety buffer between sidewalks and roads
- Pre-manufactured systems exist and can be installed following manufacturer's instructions

Challenges

- Underdrain system and piping is necessary
- Routine maintenance is required



RAINWATER HARVESTING SYSTEMS

What are they?

Water storage units that capture rooftop runoff, which can then be slowly released or stored for later use

Where do they work best?

- Rooftops in residential areas, apartment complexes, parks, schools, commercial sites, and even parking lots

Benefits

- Water can be stored and used during times of drought
- Versatile: works well in large or small-scale environments on steep or flat terrain; collected water can be used indoors and outdoors
- Potential incentives and tax exemptions can offset equipment costs

Challenges

- Initial investment dependent on desired system
- Routine maintenance is required

