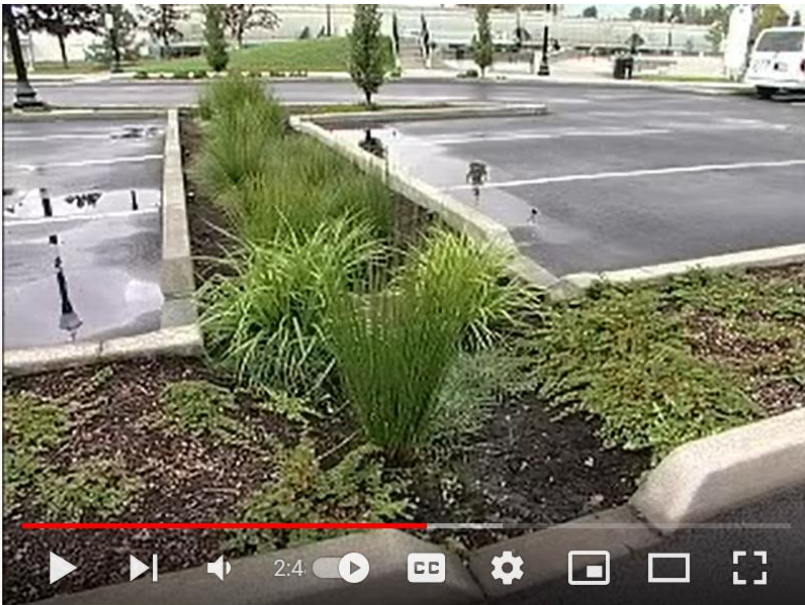


Green Stormwater Infrastructure or GSI is also known as Low Impact Development or LID

GSI:

- Replicates Nature's own systems
- Is really about Water Conservation - not just Stormwater Management
- Is a Decentralized system!! Treat it where it falls



This video from nearby Clark County is good overview

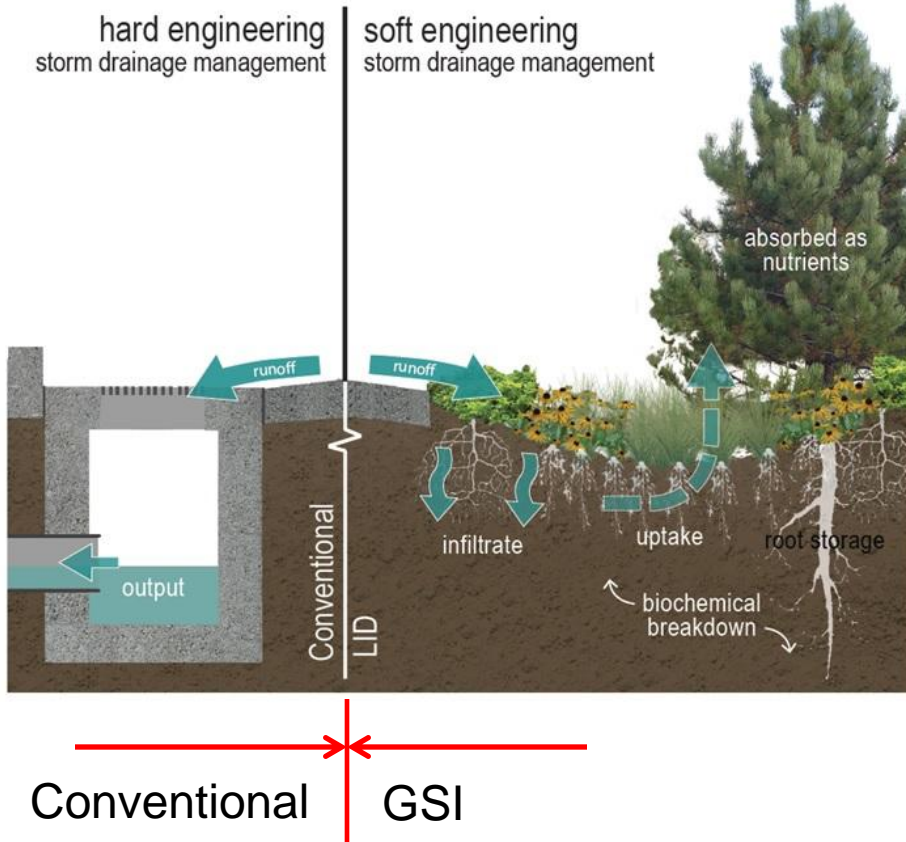
<https://www.youtube.com/watch?v=0FpkWjEmRm0>

Innovative ways to manage stormwater

GSI Overview

Green Stormwater Infrastructure

Advantages



Advantages are:

- Stormwater recharges aquifers
- Treat it where it falls - save on infrastructure
- Cleanses stormwater of pollutants naturally before it enters our rivers
- Reduces run off volume (flooding) – there's less to treat
- Improves & provides habitat
- Aesthetics - Green is good for business
- Reduce heat island, save on electricity
- Human health results from planted areas
- Improves air quality
- Stores more carbon in the ground
- Slows traffic
- Win-win: social, environmental & economic

GSI Overview

Green Stormwater Infrastructure *Strategies*



Photo from portland.gov website

<https://www.portland.gov/bes/stormwater/about-green-streets>

Strategies are:

- Minimize impervious surfaces
- Narrow road sections
- Rain Gardens
- Curb-cuts to planted right-of-way
- Bioretention
- Filter strips
- Vegetated buffers
- Bioswale/grassed swale
- Urban Tree Canopy
- Rain barrels
- Cisterns
- Green roofs
- Porous/permeable pavement
- And more!

Green Stormwater Infrastructure comes in a variety of shapes & types

It can be complex or simple



Rain garden



Green roof



Permeable pavement



Infiltration trench



Landscape water body



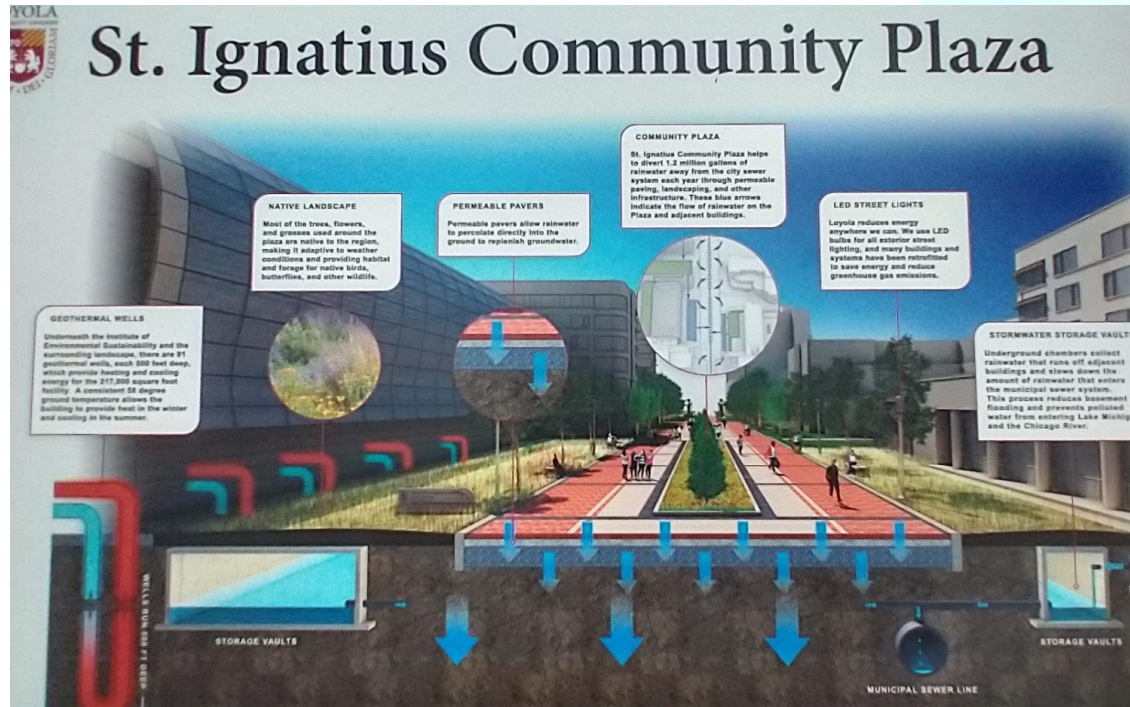
Grassed swale

Image source: Research Gate

GSI Overview

Green Stormwater Infrastructure comes in a variety of shapes & types

It can be a highly engineered...



GSI Overview

Green Infrastructure comes in a variety of shapes sizes types...
...Or as simple as a back yard rain barrel



Hood River rain chain and pervious paving

GSI Overview

GSI in other cities
Everyone's doing it!



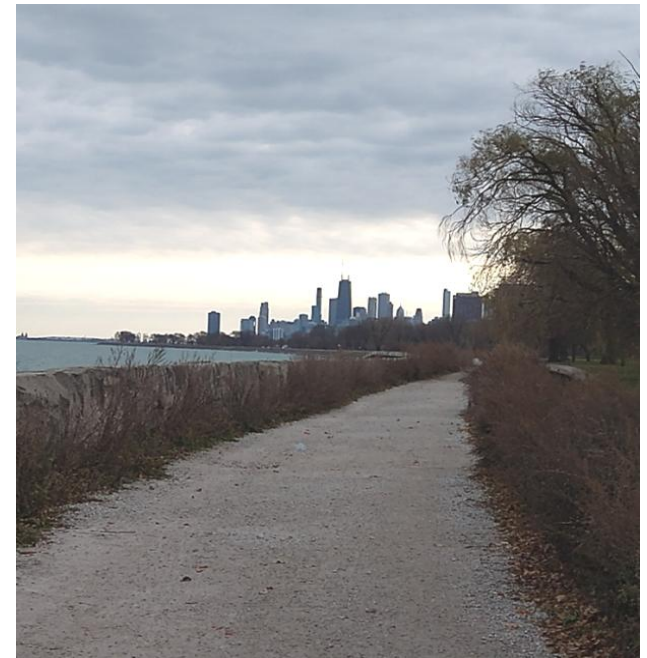
Bainbridge Island housing



Chicago planted round-about



Curb cut to planter Portland OR



ADA compliant pervious walkway Chicago

GSI Overview

Curb-cuts to planted right-of-way

Curb cuts to the right-of-way are one of the most common methods of directing stormwater to where it will do its good work



High Point, SEATTLE, WA
Credit: Seattle Public Utilities

Rain Gardens

This Rain Garden is supplied from rainwater catchment off the building's roof



Oregon Convention Center Portland



Rain Gardens & Bioswales

Rain gardens and bio-swales are landscaping features used to slow, collect, infiltrate, and filter stormwater.



12th Street Businesses, Hood River

So nice to park in the shade!

Curb-cuts & Bioswales

A **bioswale** is a linear trench that contains plantings, mulch, or stones to slow down rainwater and filter out pollutants like motor oil.

A **rain garden** is a bowl depression in the landscape planted with vegetation and designed to collect rainwater, filter out pollutants, and soak the water into the ground.

Both help reduce flooding, erosion and filter and clean the water while providing habitat and often, shade.



Water's Edge Wellness Center, The Dalles LEED Gold

Curb-cuts & Bioswales



May Street Elementary parking lot Hood River

Curb-cuts to planted area



One Community Health parking lot Hood River



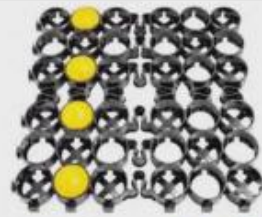
Curb-cuts to planted right-of-way



Stella Lane Housing Hood River

Pervious Pavement

Plastic Permeable Grid Pavers



Rollout Plastic Permeable Pavers



Permeable Interlocking Concrete Pavers



Concrete Grid Pavers



Porous Concrete (and Asphalt)



Code approved lawn parking spots
Using plastic grid



Plastic Grid pavers hold gravel in place

GSI Overview

Pervious Pavement



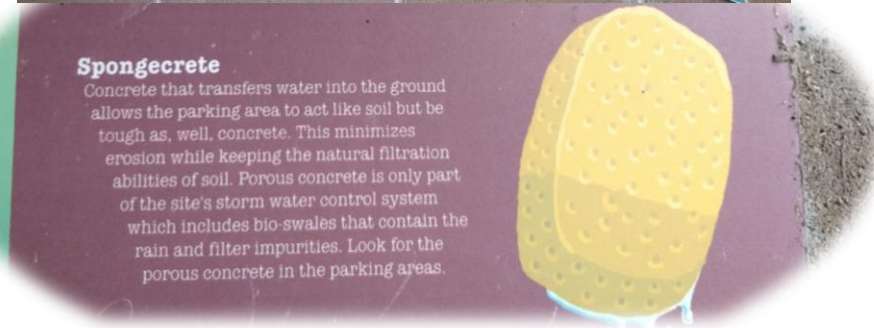
Code approved driveways Hood River

Pervious Pavements





Permeable Driveway options Hood River

Pervious Pavement



Pervious concrete & solar shingles at Drano Lake parking & shelter, green roof nearby

Bioswales

 **Bioswales** 

WHAT IS A BIOSWALE?

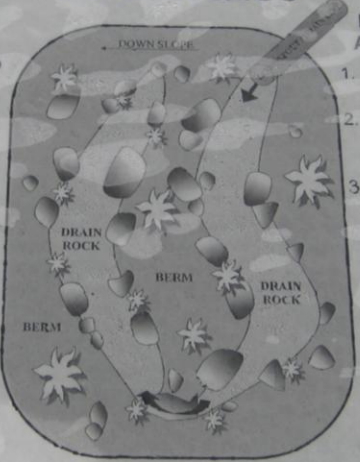
A landscaped feature designed to collect stormwater from roofs or driveways and allow it to absorb into the plants and soil.

WHY BUILD A BIOSWALE?

- ♦ Allows rainwater to soak into soil, reducing runoff and replenishing groundwater
- ♦ Prevents soil and other pollutants from moving into area streams
- ♦ Enables plants to absorb and remove pollutants from water
- ♦ Helps protect communities from flooding problems

HOW TO DESIGN AND BUILD A BIOSWALE

1. Choose a location—a low spot at least 10 feet from the house.
2. Calculate capacity—usually 40 to 60 cubic feet for a residential bioswale.
3. Dig the hole—line out the boundary with string or hose. Dig a shallow depression 6-12 inches deep with sloped sides. Use the removed soil to create a berm on the low side of the swale. Put 2-4 inch drain rock in bottom to improve infiltration.
4. Connect your downspout(s) to the swale by ditch or pipe.
5. Plant with grasses, sedges and other water-tolerant plants.



Bioswale at OSU Extension Service Master Gardeners Hood River

Green Roofs

Green roofs manage storm water and reduce energy costs of cooling. They also provide habitat and are a good choice in urban areas where land is expensive and heat island an issue.

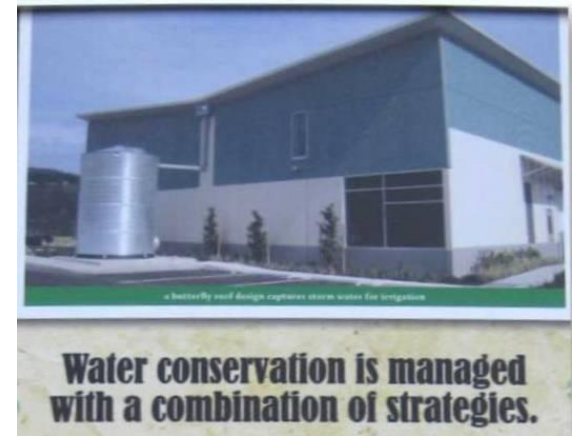


Tofurkey Plant LEED, Platinum Hood River

Rainwater catchment

- Water efficient landscaping
- Low maintenance plant species
- Stormwater runoff cistern
- Parking lot run-off catchment

A 10,000 gallon cistern collects storm water runoff from the roof and dispenses in a landscape irrigation system to water plants



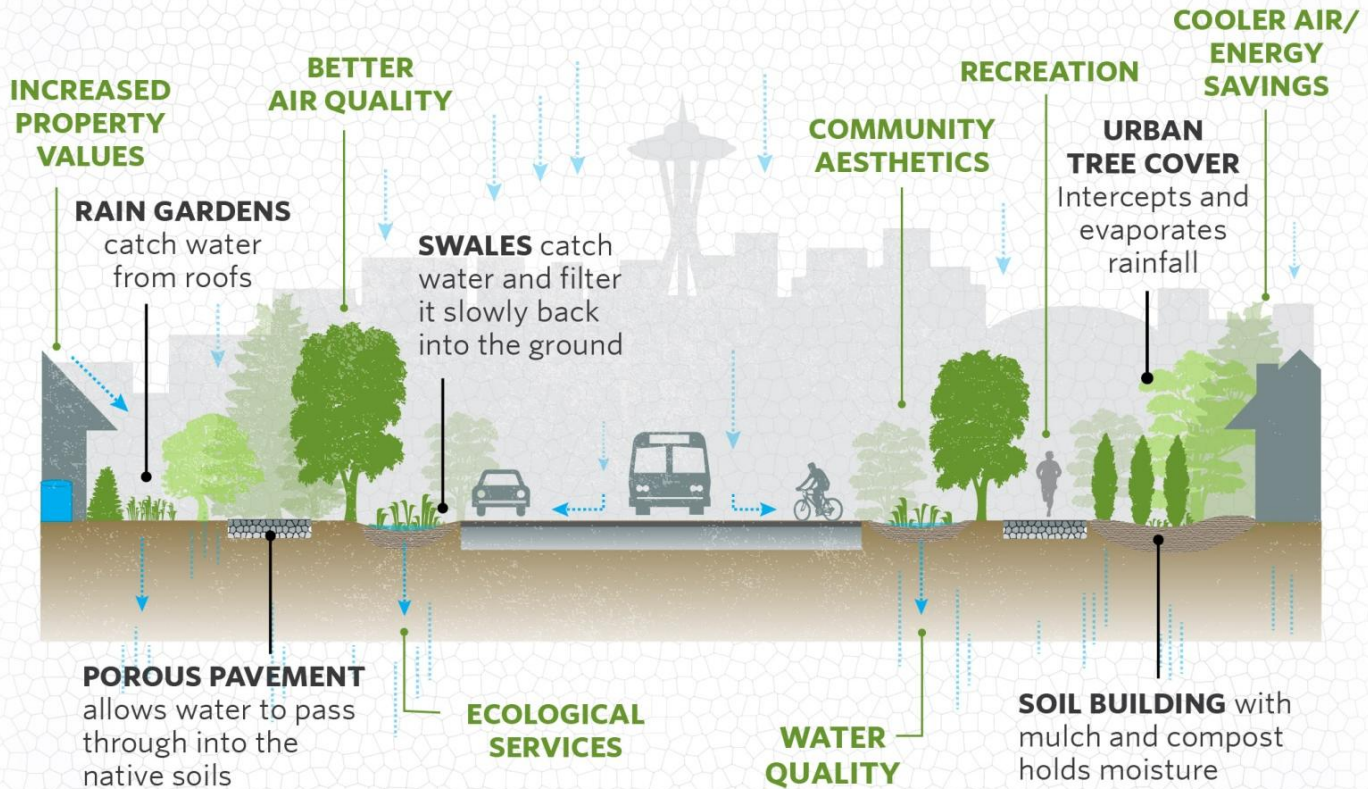
The Halyard Building, LEED Silver Hood River Waterfront Park

ReThink

Cities to Function like Forests

HOW ARE WE RETHINKING THE PROBLEM?

Re-envisioning and re-designing cities to function more like forests so water is absorbed back into the ground, in addition to treating stormwater through traditional means, will solve our region-wide stormwater problem.



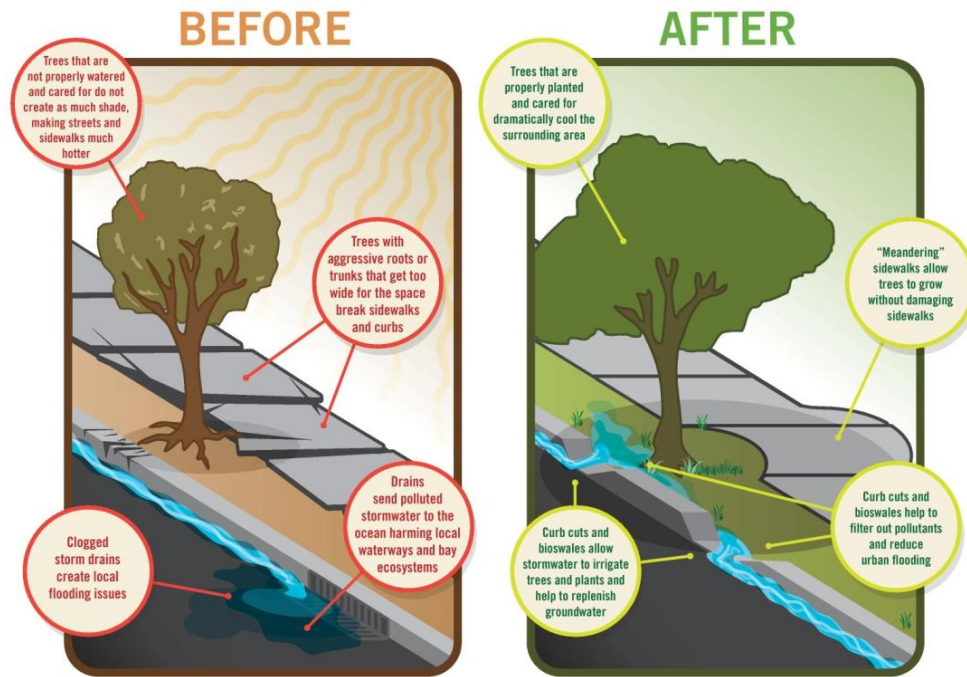
Trees



Photo by Elliot Ross

Los Angeles trees are on the list of historic monuments

Invest in LA's Trees, Water AND Sidewalks



<https://sdotblog.seattle.gov/2011/04/07/trees-and-sidewalks-creative-solutions/>

GSI Overview

Trees

- Retain natural capital on site – all healthy trees were saved
- Divert rain water to planted areas

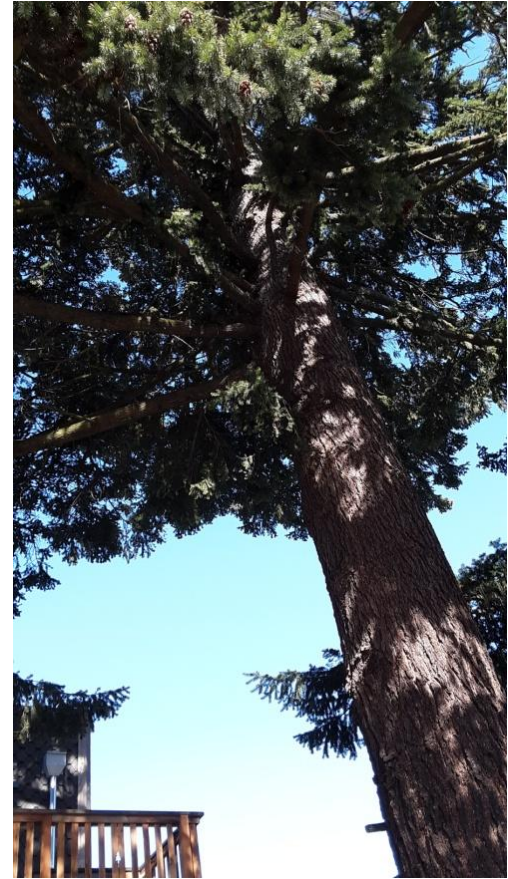


Wyer's End, White Salmon Ross Chapin Architects



<https://rosschapin.com/projects/pocket-neighborhoods/wyers-end/>

Trees



The developer had to fight to save this tree in Hood River – he succeeded!
Imagine the shade, habitat, and carbon sequestration provided by this 100 year old tree.

Trees



Big Oak at the Bridge in White Salmon



Trees clean the air, provide shade & habitat and much more.
It takes 100 years to replace trees like these. We need to value and protect them.

Plants benefit all



Would you rather this?



Or this?

Plants benefit all
What could be...



Why couldn't this
look like this?

GSI Local

Green Stormwater Infrastructure

What's not to Love?

GSI is about **water quality, water conservation** and **land conservation**.

GSI fights climate change, is good for your health and saves dollars.

GSI is good for Community, Ecology, & Economy

- Improves property values
- Creates community pride & social cohesion
- Physical, emotional & cognitive health
- Air quality improvement
- Creates biodiversity
- Reduces heat island temperatures
- Greenhouse gas reduction
- Energy use reduction
- Water quality improvement
- Flooding & ponding control

Resources

<https://www.epa.gov/green-infrastructure/what-green-infrastructure>

<https://extension.wsu.edu/raingarden/>

<https://www.portlandoregon.gov/bes/article/119476>

<https://www.seattle.gov/utilities/your-services/sewer-and-drainage/green-stormwater-infrastructure>

GSI Overview