Expanding the Toolbox: Increasing GSI Feasibility and Improving Life-Cycle Performance in the City of Seattle

Increasing the reach and effectiveness of GSI through technical innovation is a long-standing practice at SPU.

SPU GSI Expansion Initiative

Expanding the possible locations for Green Stormwater Infrastructure (GSI) and increasing performance outcomes through innovative applications of available technologies is one of Seattle Public Utilities' (SPU's) key focus areas for the GSI Expansion Initiative. Growing the opportunities and impact for GSI helps ensures that SPU can equitably implement GSI across the city, and also provide the highest amount of environmental benefit. This document summarizes some of the accomplishments to date, currently ongoing efforts, and planned future activities around expanding feasible locations and enhancing life-cycle performance of GSI in Seattle.

Since the early 2000s, SPU's GSI program has been a leader in the national conversation on green stormwater technology. Many innovations that were first pioneered in Seattle have become standard practice across the country. Early innovations showed that it was possible to create high-performing, maintainable, attractive, and cost-effective natural drainage systems in an urban setting. SPU's current focus is on increasing the feasibility of GSI in difficult conditions and forging opportunities for new partnerships.

High Point's innovative design used one fifth of the space of traditional detention ponds.

Innovation Timeline

2000

Bioretention Design Standards – SEA Street

The "Street Edge Alternatives" (SEA Street) project was the first GSI project in the nation to be implemented in the public right-of-way (ROW). During the SEA Street project, SPU formalized bioretention design guidance, creating an international model for natural drainage projects.

2009

Underdrains – High Point

Although underdrains are considered to be a standard GSI practice now, SPU was one of the first utilities to implement this technology. By using underdrains, SPU was able to provide the water quality benefits of GSI despite poor soil conditions.

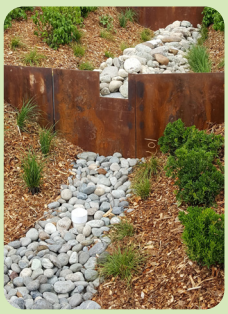
Revised Stormwater Code

Updates to the Stormwater Code clarified City of Seattle requirements for GSI, defined levels of service, and established the need for implementing GSI to the maximum extent possible. The associated Seattle Stormwater Manual provided guidance and streamlined the design and review process.

2012

Metal Weirs – Mercer Street

Metal weirs provide an aesthetic benefit while also increasing the amount of water that can be stored. Using weirs allows SPU to expand GSI practices to areas like Troll Avenue, which would otherwise be too steep.



Work in Progress

Currently, SPU is working to:

Develop new planting palettes, partnership programs, water retention technologies, and maintenance agreements as part of the Urban Villages Program. These innovations will allow for new partnering opportunities throughout the city.

What's Next

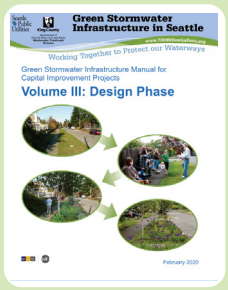
SPU plans on focusing future technological innovation efforts on:

Supporting the development of a locally manufactured, sustainable, and aesthetically pleasing cisterns for rainwater harvesting in the Puget Sound.

Partnering with research institutions and third-party accelerators to develop real-time controls technology for rainwater harvesting cisterns.

2014

GSI Manuals



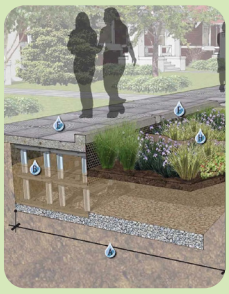
Manuals on Project Initiation, Options Analysis, Design, Construction, and Operations and Maintenance, formalized the process for GSI and captured lessons learned from past projects.

2015

Vertical Walled Bioretention

Many sites in the public ROW lack adequate width for traditional sloped bioretenton systems. SPU was able to use Vertical Walled Bioretention to site GSI in locations that would otherwise be too confined for GSI.

Structural Soil Cells – Ballard Phase 2



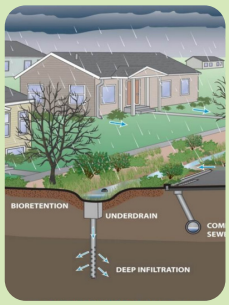
This innovative technology has allowed SPU to provide sidewalks and GSI in narrow sections of ROW.

Walled Bioretention – Delridge NDS

The Delridge NDS project pioneered using walled bioretenton cells, allowing for the implementaton of GSI in sites with limited space.

2016

UIC Wells – Venema NDS



Underground Injection Control (UIC) wells allow water to infiltrate into deeper soil layers in areas where soil conditions prevent shallow infiltration. The use of UIC wells has greatly increased the number of locations where GSI can be used to address flooding issues without burdening the downstream system.

2019

Polishing Layer – Swale on Yale

The Swale on Yale project manages stormwater runoff from 435 acres of streets and sidewalks. As part of this project SPU developed an innovative polishing layer that uses sand, iron filings, and activated alumina to remove phosphorus, nitrogen, copper, and other pollutants from stormwater.

2023

Continuous Innovation

Design elements such as the polishing layer, bioretenton soil mix, inlets, and underdrains are continuously refined to increase the performance of GSI in Seattle. Currently, a new bioretention soil mix is being piloted as part of the Longfellow Creek NDS project. The new soil mix uses no compost and is specifically designed for sites where nutrient leaching is a concern.