



The Low Impact
Development Center, Inc.

*Balancing Growth and
Environmental Integrity*

- **Mission:** Stormwater Management Technology
- Pilot Projects, Monitoring, Modeling, Manuals, Training, Education

**LID Design and
Management Practices**

2003

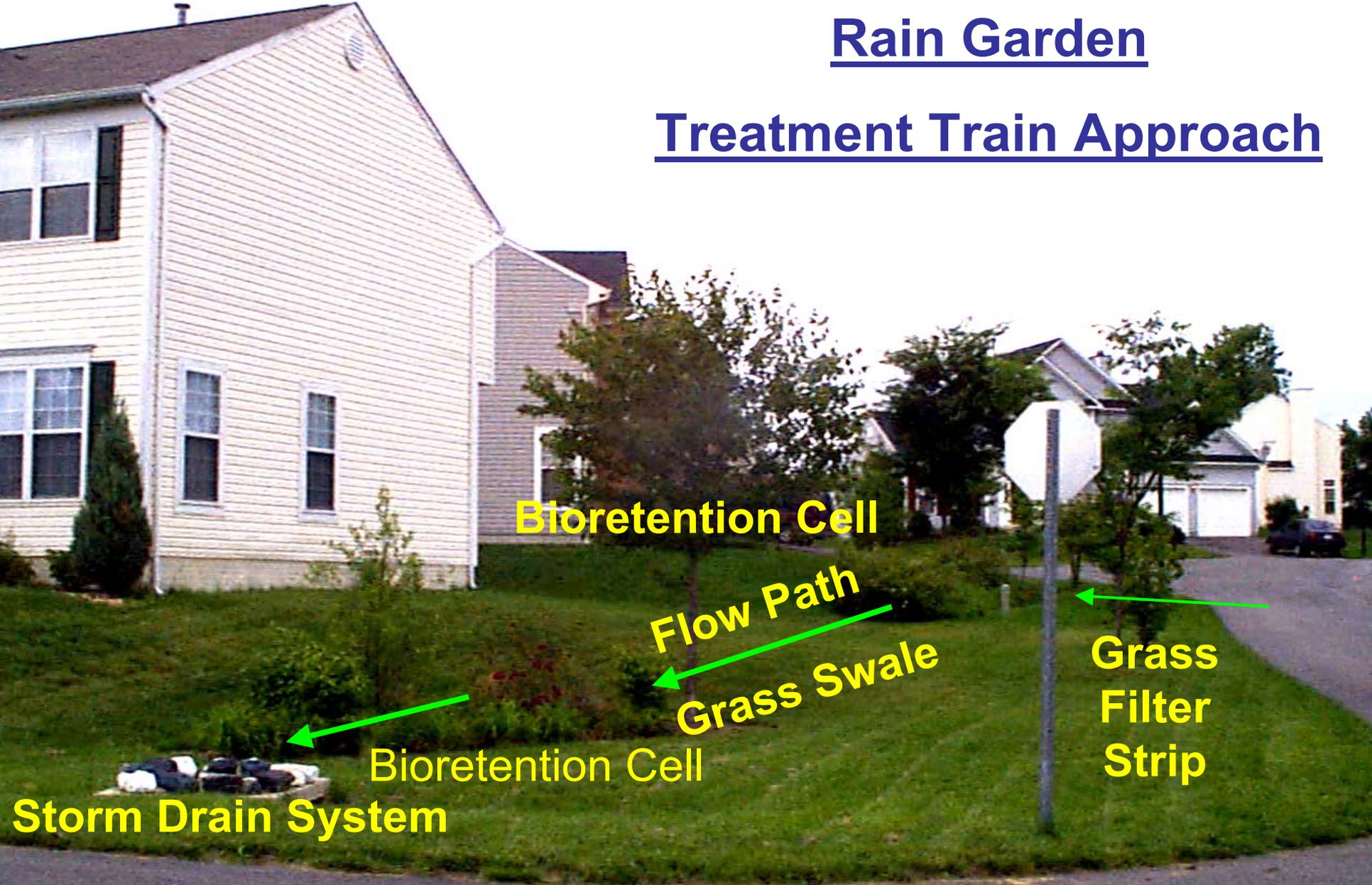
Defining LID Technology

Major Components

1. Conservation (Watershed and Site Level)
2. Minimization (Site Level)
3. Strategic Timing (Watershed and Site Level)
4. Integrated Management Practices (Site Level)
Retain / Detain / Filter / Recharge / Use
5. Pollution Prevention
Traditional Approaches

Rain Garden

Treatment Train Approach



Bioretention Cell

Flow Path

Grass Swale

Grass Filter Strip

Bioretention Cell

Storm Drain System

BIELINSKI

DEVELOPMENT

**Perspectives on
Implementing
Low-Impact
Developments
Waukesha, Wisconsin**

1998

**Bielinski Development
Embraces
New Concepts of
Conservation and Low
Impact Development**

**Eighteen
General Planning
Guidelines
for
Bielinski
Conservation Development**

1. Use small lots and clustered development layouts
2. Use traditional neighborhood design strategies for planning
3. Develop energy efficient housing
4. Design and develop for clean stormwater quality and reduce the quantity of water and contaminants and nutrients generated by a project
5. Restore ecological systems within a development
6. Integrate natural resource systems in a development
7. Develop ecological/natural resources educational materials for homeowner and business owner use and provide educational opportunities
8. Create affordable housing
9. Consider building material life cycle costs

10. Minimize and localize soil disturbance during construction
11. Use Best Management Practices for erosion/sedimentation control
12. Reduce the volume of stormwater generated by a development
13. Use native plant species in landscaping in a development
14. Minimize landform changes and protect natural features
15. Integrate passive and active open space as formal and informal space in a development
16. Provide for transportation efficiency
17. Provide natural resource buffer to protect natural resources
18. Provide internal trails and external greenways

Planning Guideline: Natural Resources

- **Restoration Emphasized**
(Preservation of High Quality
Natural Resources is a Given)



Integrate Natural Resources with the Built Environment



Use Native Species in Restoring Open Spaces and in Lot Landscaping



Buffer Natural Resources with Restored Native Landscapes



Planning Guideline: Stormwater Management

- Water Quality Emphasized



GOOD water



BAD water

Planning Guideline: Construction Practices



Home and Lot Sales

Village of Jackson

Lot Size: 7,000 – 8,000 sq. ft

Price: low-mid \$40,000

Prairie Meadows

in West Bend

Lot Size: 7,000 – 8,000 sq. ft

Price: mid-high \$50,000

Sales Experience

Increased Sales Velocity
Increased Sales Volume

results in

Reduced Debt Service

**Biggest Obstacle
to
Conservation
Development?

ORDINANCES!**

Important Audiences

- Elected Officials
- Planning and Zoning Staff
 - Engineers
- Local Developers

Tough to Educate about Low-Impact Development:

- 1. Skeptics who don't trust
developers**
- 2. Those who are simply set
in their ways**

Good News!

**Most Regulatory/Engineering
Professionals and Officials
Today are Quite Open to
Low-Impact Development**

**(This conference, and others like it,
help educate the important
decision-makers)**

Public Education – Important But Not So Hard (People Love Nature!)



Lessons Learned?

Nature Sells!



Lessons Learned?

**Additional Design Work
Adds Up-front Cost**

**Infrastructure Reduction
Offsets This Expense**

Lessons Learned?

**Approvals Add Time, and
Time is Money, But...**

**Some Communities Are
Embracing the Concept
and Working Toward
Streamlining Approvals**

Lessons Learned?

Leadership Matters!

from

- **Elected Officials**
- **Planning/Zoning Boards**
 - **Municipal Staff**
 - **Developers/Teams**
 - **State of Wisconsin**

What is Low Impact Development (LID)?

Ever wish you could simultaneously lower your site infrastructure costs, protect the environment, and increase your project's marketability? With LID techniques, you can. LID is an ecologically friendly approach to site development and storm water management that aims to mitigate development impacts to land, water, and air. The approach emphasizes the integration of site design and planning techniques that conserve the natural systems and hydrologic functions of a site.



Source: Prince George's County, MD

Residential Lot with Bioretention
Somerset Development
Prince George's County, MD

LID Benefits

In addition to the practice just making good sense, LID techniques can offer many benefits to a variety of stakeholders.

Developers

- Reduce land clearing and grading costs
- Potentially reduce infrastructure costs (streets, curbs, gutters, sidewalks)
- Reduce storm water management costs
- Potentially reduce impact fees and increase lot yield
- Increase lot and community marketability

Municipalities

- Protect regional flora and fauna
- Balance growth needs with environmental protection
- Reduces municipal infrastructure and utility maintenance costs (streets, curbs, gutters, sidewalks, storm sewer)
- Increase collaborative public/private partnerships

Environment

- Preserve integrity of ecological and biological systems
- Protect site and regional water quality by reducing sediment, nutrient, and toxic loads to water bodies
- Reduce impacts to local terrestrial and aquatic plants and animals
- Preserve trees and natural vegetation

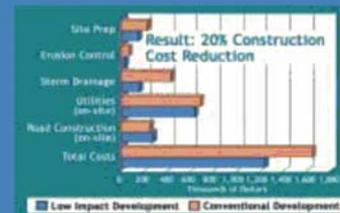
Cover Photo: R. Alenick

Case Study

Kensington Estates is a conventional development on 24 acres consisting of 103 single-family homes in Pierce County, WA. A study was conducted to redesign the site using a new state storm water model and to illustrate the full range of LID practices and technologies available to developers.

Overall, the redesigned LID site could have:

- Resulted in construction cost savings of over 20%;
- Preserved 62% of the site in open space;
- Maintained the project density of 103 lots;
- Reduced the size of storm pond structures and eliminated catchments and piped storm conveyances; and
- Achieved "zero" effective impervious surfaces.



Cost Comparison: LID vs. Conventional Development

For More Information

- Low Impact Development Center
<http://www.lowimpactdevelopment.org>
- Prince George's County, Maryland
<http://www.goprincegeorgescounty.com>
- NAHB Research Center Toolbase Services
<http://www.toolbase.org>
- U.S. EPA
<http://www.epa.gov/owow/nps/urban.html>



*Includes parking costs of \$15/eq. sq. Printed on recycled paper with soy ink.



Builder's Guide to Low Impact Development

Would you be interested in saving upwards of \$70,000* per mile in street infrastructure costs by eliminating one lane of on-street parking on residential streets?

Did you know that communities designed to maximize open space and preserve mature vegetation are highly marketable and command higher lot prices?

Are you aware that most homeowners perceive Low Impact Development practices, such as bioretention, as favorable since such practices are viewed as additional builder landscaping?

Did you know that by reducing impervious surfaces, disconnecting runoff pathways, and using on-site infiltration techniques, you can reduce or eliminate the need for costly storm water ponds?

Pilot Projects

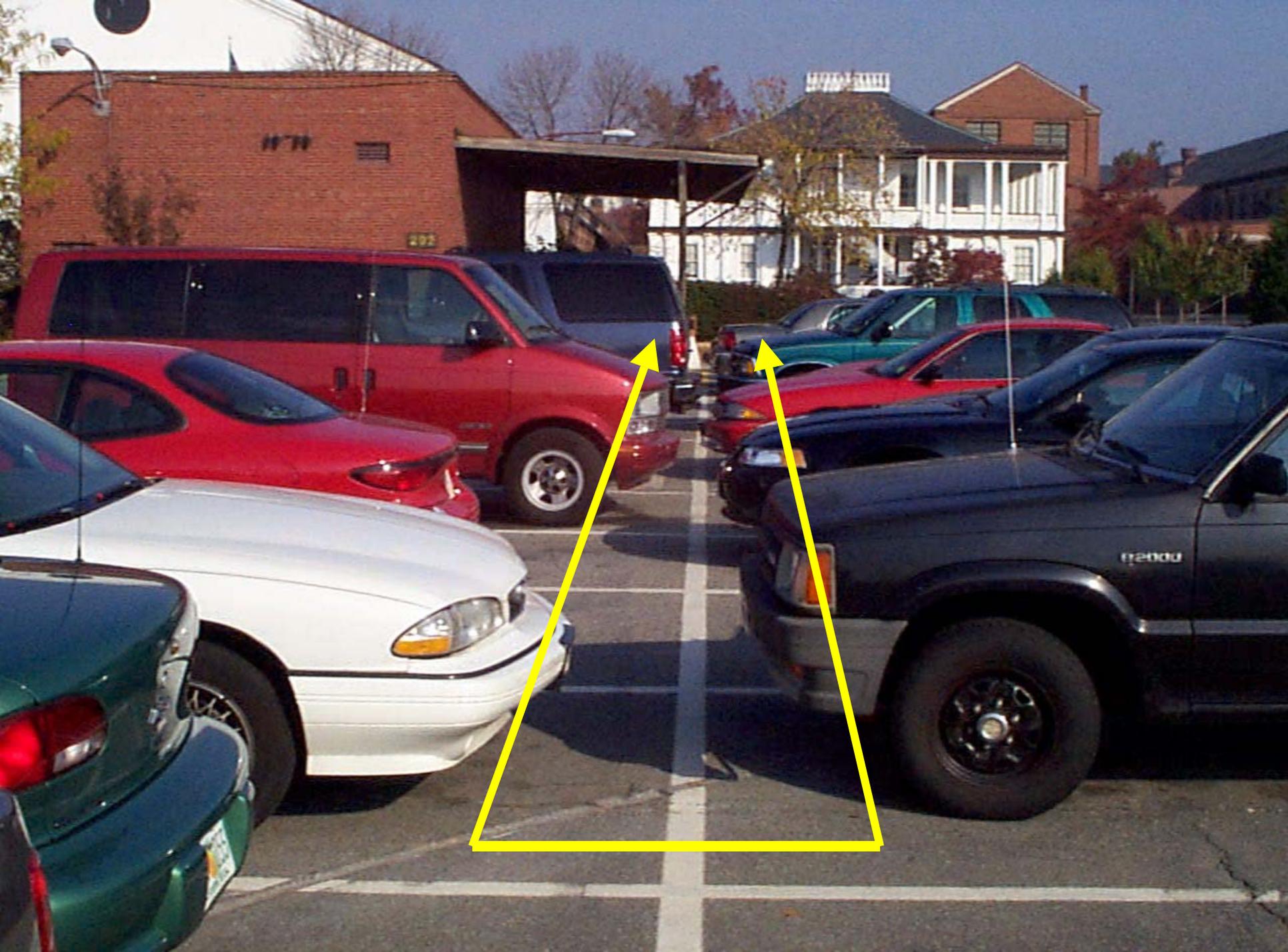
- Willard Park Parking Area
- Power Plant Parking Lot
- Street Tree Filters
- Street Sweeping Demonstration
- Roof Leader Disconnect
- Museum Bioretention Retrofit
- Inlet Floatables Removal
- Inlet Timing Project
- Inlet Ponding Modification
- Permeable Pavers Installation



Navy Yard LID Retrofits

Don't Feed the Regulators!!







United States Navy Yard





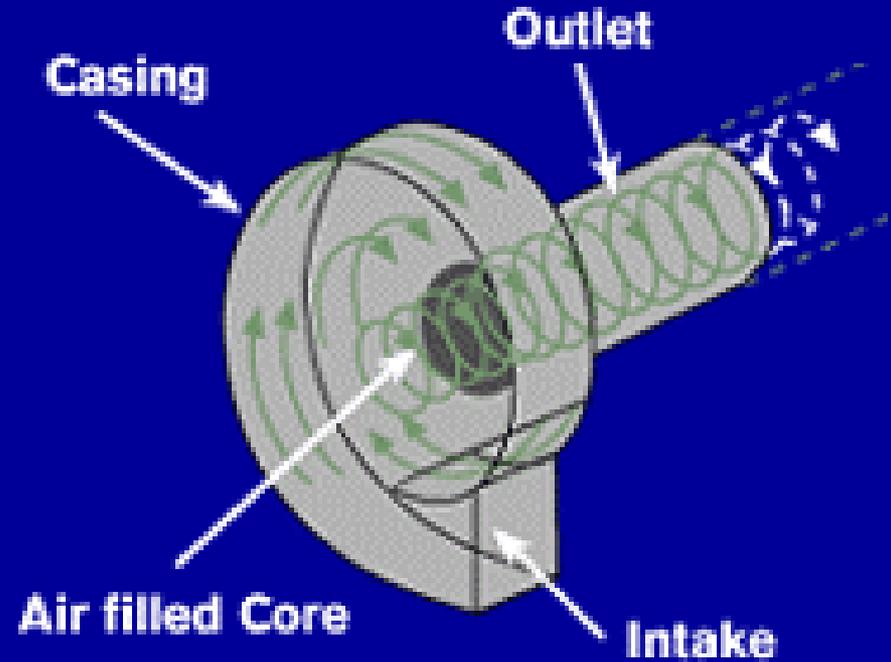






Floatables Removal

This prevents oils, grease, and trash from entering the storm drain system.



HIL-tech

Vortex Flow Control

The restricted opening reduces the peak flow rate, and eliminates debris from entering the system.







Building 166 Permeable Pavement





Building 166 Permeable Pavement



Alternative Surfaces

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Develop New Technologies



Filterra by Americast





10 Happy Returns Daylily
(Hemerocallis 'Happy Returns')
Height: 18 inches
Space: 12 inches
Blooms : June to frost



1 Blue Flag Iris
(Iris versicolor)
Height: 2 feet
Space: 1 foot
Blooms: May - June



2 Johnson's Blue Geranium
(Geranium x 'Johnson's Blue')
Height: 15-18 inches
Space: 12 inches
Blooms: May to frost

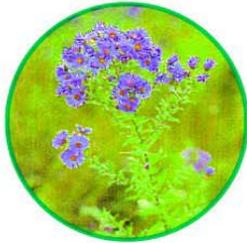


3 White Coneflower
(Echinacea purpurea alba)
Height: 2-3 ft
Space: 18 inches
Blooms: June to frost

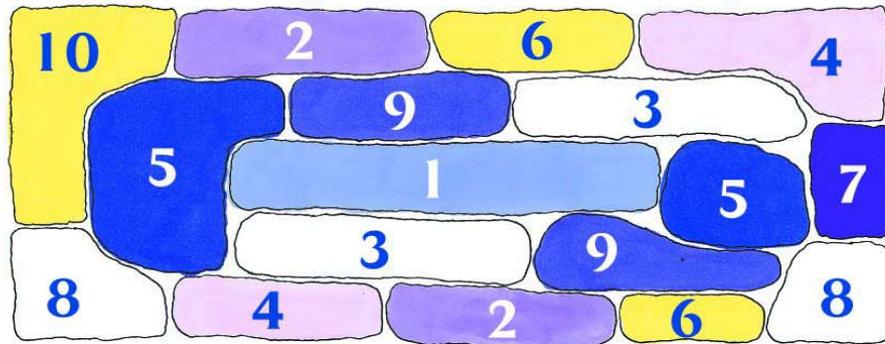


**Bonestroo
Rosene
Anderlik &
Associates**
Engineers & Architects
Garden & Brochure Design

9 New England Aster
(Aster Novae-Angliae)
Height: 4-5 Feet
Space: 2 Feet
Blooms: Midsummer to frost



The Sunny Border Garden Layout



4 Purple Leaf Sedum
(sedum x 'vera Jameson')
Height: 12 inches
Space: 12 inches
Blooms: June to frost



8 Lambs Ears
(Stachys lanata)
Height: 12 inches
Space: 12 inches
Blooms: May to June with
interesting foliage all Summer



7 Little Grapette Daylily
(Hemerocallis 'Little Grapette')
Height: 18 inches
Space: 12 inches
Blooms: June to frost



6 Moonbeam Coreopsis
(Coreopsis verticillata 'Moonbeam')
Height: 12 inches
Space: 12 inches
Blooms: All Summer



5 Great Blue Lobelia
(Lobelia siphilitica)
Height: 2 feet
Space: 1 foot
Blooms: August - September

MAPLEWOOD
Together We Can



Maplewood, Minnesota (Met Council)



Reduced Impervious Area

- 11% less impervious area than standard street improvement



SEA Streets - After Construction
2nd Ave NW - NW 117th St to NW 120th St



Fat Street

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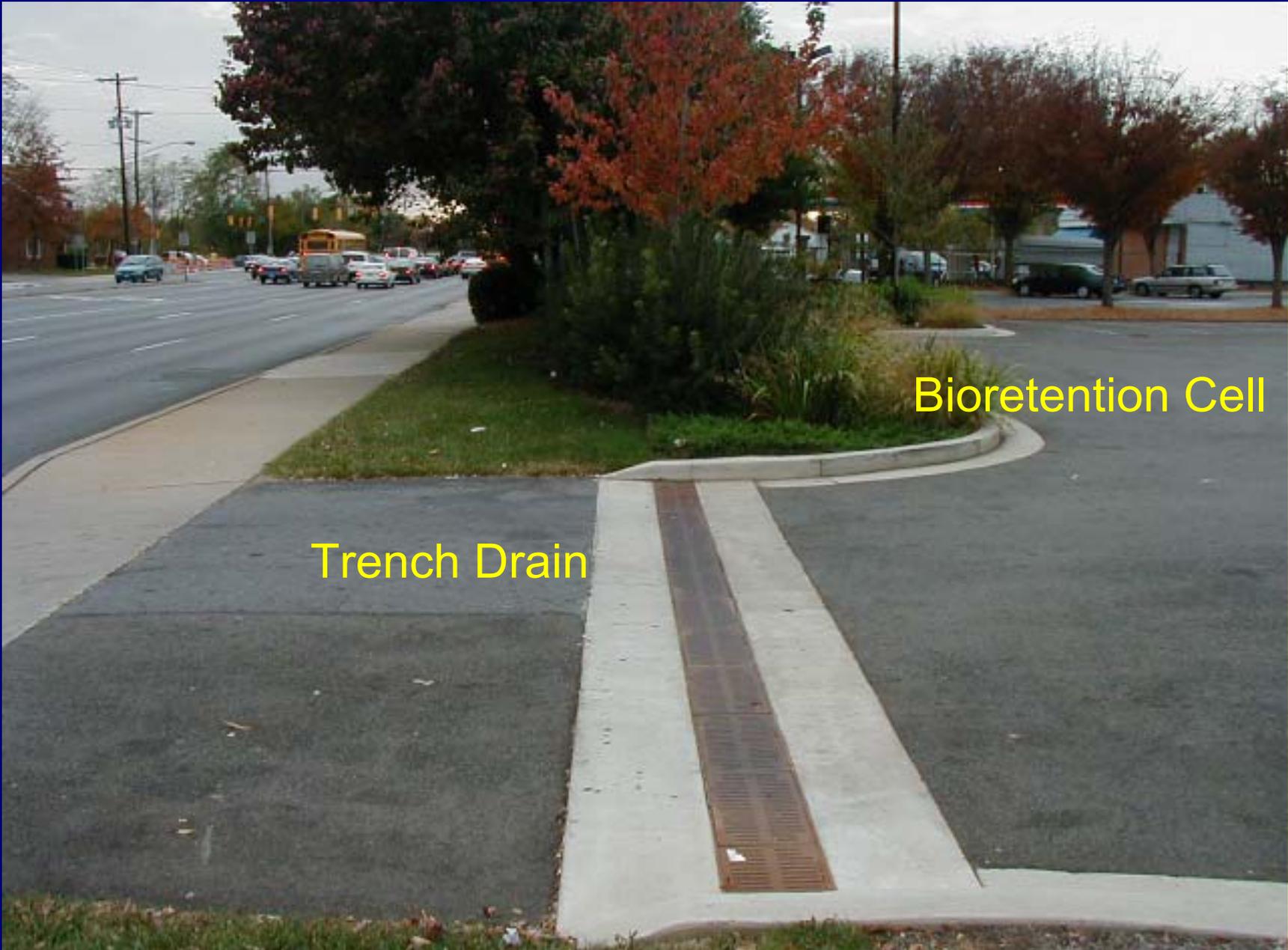
Skinny Street with Fat Person



After Completion - January 2001

“SEA” Street





Bioretention Cell

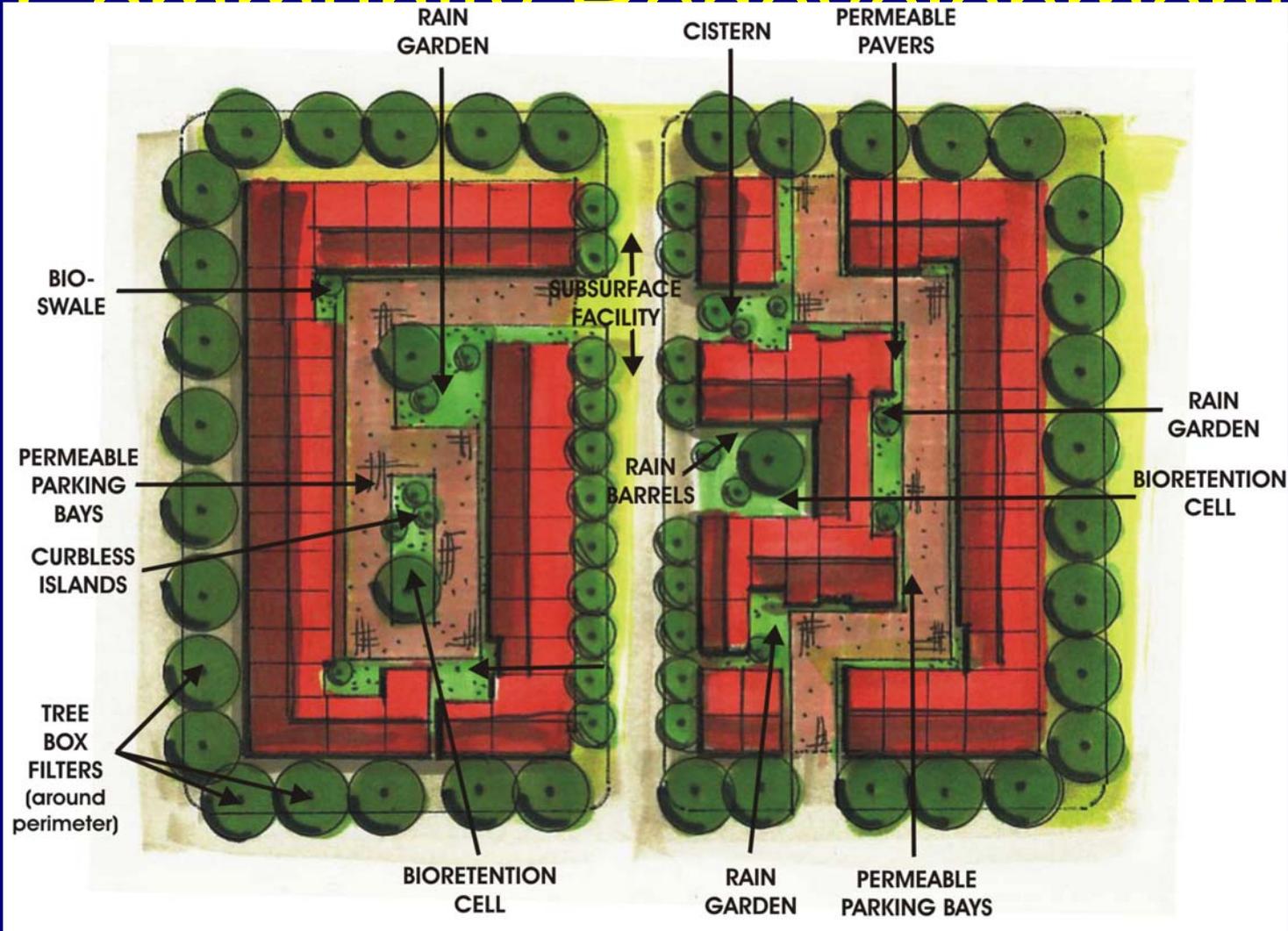
Trench Drain

Entrance to State Highway – Montgomery County



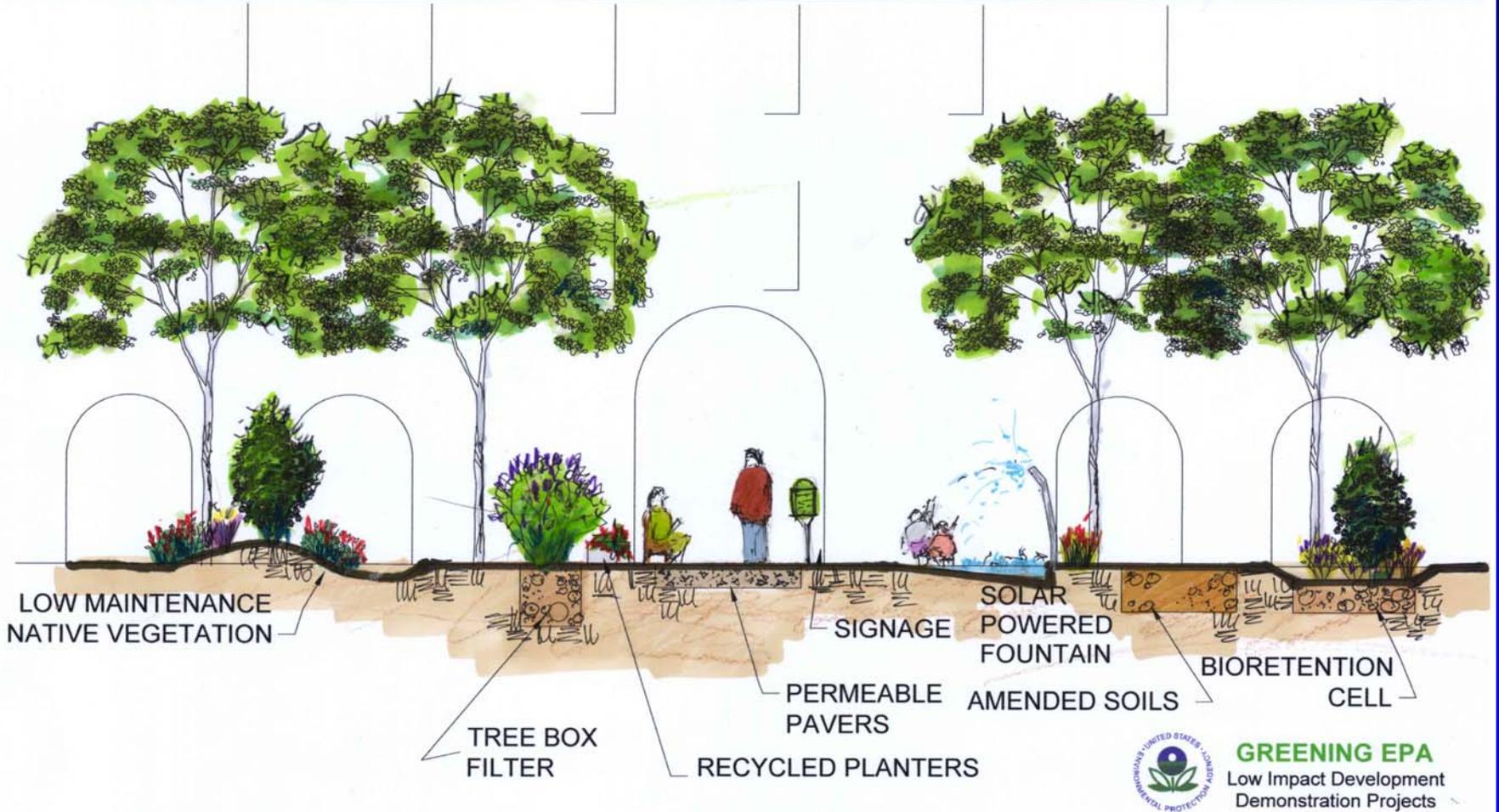


Community Redevelopment





FRANKLIN CIRCLE: SECTION VIEW



Greening EPA-LID



- Green Roofs
- Bioretention
- Cisterns
- Permeable Pavers
- Storage Cells
- Native and Sustainable Vegetation
- Solar and Wind Energy
- Recyclable Benches



Maryland State Highway Administration - Mount Ranier Demonstration Project

Program Highlights

- Multi-site/Multi year monitoring, construction, modeling
- Pilot projects
- Cost and effectiveness analysis
- Linear Projects
- Regulatory Driven: TMDL's, NPDES, Chesapeake Bay Agreement

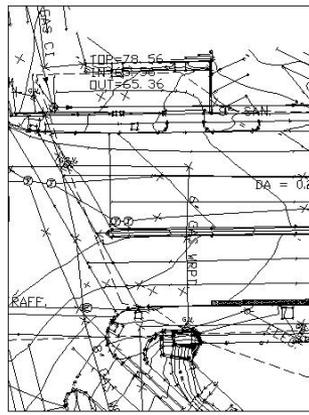
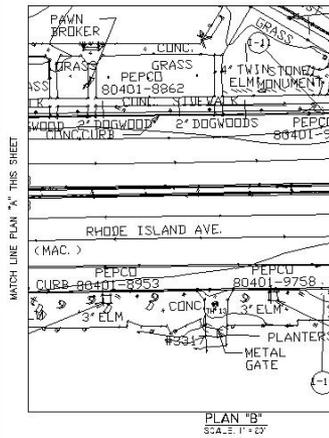
Project Features

- 1 Year Monitoring Data Pre-Construction
- First Phase
 - Street Tree Filters
 - Modified Gutter Drains
- Post Construction Monitoring





Neil Weinstein, Low Impact Development Center 5/20/2002 11:32 AM Concept_plan_vf.dwg



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Construction and Temporary Uses



TxDOT Compost Sock

FEB 14 2003



Proposed Storm Drain

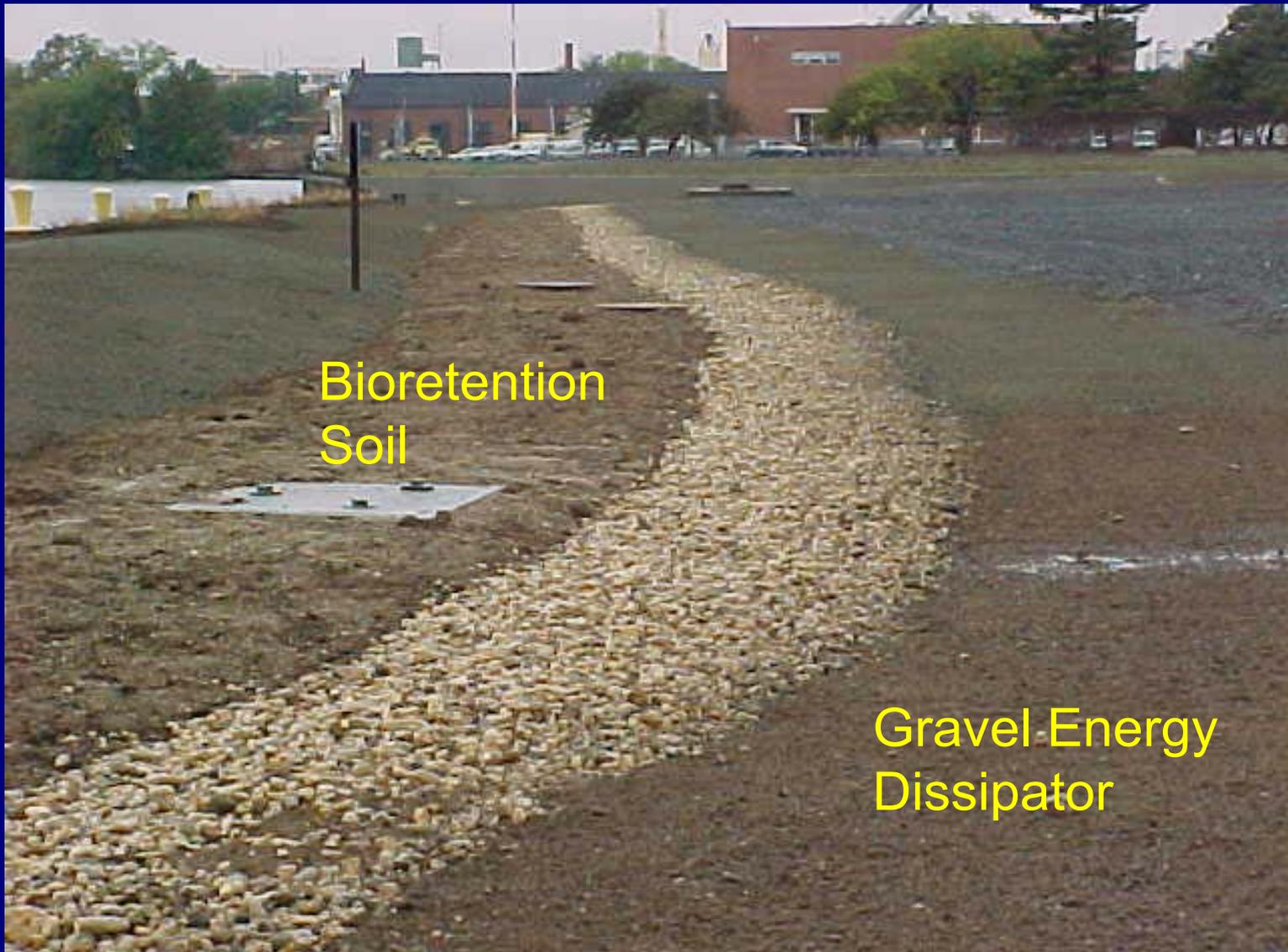
Anacostia River

Biofiltration Strip

Southeast Federal Center Seawall Project



GSA - SEFC BULKHEAD SOILS PROJECT



Bioretention
Soil

Gravel Energy
Dissipator