Lessons Learned from SEA Streets to High Point – Designing Swales and Other “Natural Drainage System” Projects

Try to make this… …function like this

Opportunities within the watershed

Detention Vaults

Cannot reduce total volume of stormwater – no infiltration
Does not serve multiple functions

Why Natural Drainage Systems?

• Bioretention design parameters
• NDS/LID Case Studies
• Key people to have involved
• ROW policy issues

Tracy Tackett, PE
Low Impact Development Program Manager
Patricia Cortez-Quinones
NDS Design Engineer
Seattle Public Utilities
Bioretention - Technical Things to Keep in Mind

Primary Components:
- Vegetation
- Surface Storage and Infiltration area
- Soil Storage
- Subsurface pipe (optional)
- Native Soil and design infiltration rates

Vegetation

Helps maintain (or enhance) infiltration rates.

UW monitoring of SEA Street found decrease runoff with time.

Surface Storage

Dead storage depth set by culvert overflow

Dead storage depth set by weir

Bottom Swale Area
Surface Storage – Design note

Leave room for grading
Native Soil

Broadview Green Grid
Sub-basin drainage area = 32 acres

Native Soil Infiltration Rates
Modified Full Scale Field Testing (PIT)

Subsurface Pipe

Soil Storage – Imported soil specs key element

NDS/LID Case Studies
Right of Way
Residential SF- NDS Grids
Residential high density – High Point
Commercial - SLU Swale on Yale
Private Property
Private Property – Northgate Parking lot
Private Redevelopment – Rainwise strategies
SEA St: 2nd Ave NW between 117th & 120th Streets, aerial looking north

Before After

Curvilinear Template

Pinehurst Project Area

- Kramer drainage = 134 acres
- Pinehurst project = 49 acres
- 30 potential blocks (330 ft./block)
- Site flows to SE

Before

After

Broadview Green
Grid
sidewalk adjacent
street

November 11?, 2004
Block Scale Template Cost/Benefit Comparison

Offset Template

Pinehurst – Offset Template

Construction Costs

Offset with Cascade Design

$280,000 for 660’ block
42% Stormwater elements (including soil)
45% Street improvements (road, curb, sidewalk)
13% Landscaping
Note: correlates to approximate $200/ LF for stormwater elements
Street Design Guideline for Venema Natural Drainage – Draft
Revised from Pinehurst Guideline. October 2005

Roadway:
Minimum 2-foot road shoulder on each side of the road, with 2% maximum slope toward swales. Shoulder material shall be soil or rock material compacted and capable of supporting vehicle loading and passengers to access the vehicle. Acceptable road shoulder materials should meet the performance criteria in standard specifications. Alternative materials can be considered. Where repaving a full roadway width, cross slope range is between 2% and 4%. The cross slope shall be toward the curb and/or swale. The roadway that slopes toward the swale may not need curb to allow sheet flow unto the swale.
Swale Cross Sections

- Vegetated swale
- 10” ponding
- 18” deep

- Grass-lined swale
- 2” ponding
- 8” deep

High Point Neighborhood

Utility Negotiations – Electrical Vaults!

Porous Concrete Roadway Demonstration

Who to work with – Permitting and enforcement procedures in place prior to construction
Private Property: Parking Lots

Bellevue Parks Site

Private Property: parking lots

http://www.ci.seattle.wa.us/dpd/Sustainable_Building