Ballard Roadside Raingardens, Phase 1 – Lessons Learned
Natural Drainage Systems

- Initiated 1999 for creek restoration
- Provides conveyance / localized flooding reduction
- Pilot blocks
- Pilot catchments
- Pilot partnering
GSI Accomplishments
CSO GSI Right-of-Way Work Feasibility
Project Goals

• Develop design templates for future Roadside Raingardens
  – Planting strip design
  – Curb extension design
  – Full curb shift
• Refine construction costs
• Refine performance data
What Could Go Wrong?
Timeline

• Spring 2009 – began concept design
• Early July – likely to receive ARRA (Stimulus) funds
• Aug 17th – formally awarded ARRA loan
• Sept 17th – 90% Plans, Specs and Engineering Report required to be submitted
• November – Geotechnical Report finalized
• Feb. 16th 2010 – Required date for signed construction contract
Timeline, con’t

- Original completion date of November 2010.
- Sept 2010 – construction not complete, rains start
- Community very upset (signage, parking)
- Some cells not draining, but still in construction
- Dec. 2010 – construction substantially complete
- 33% of cells not draining, 33% draining too slowly, 33% working as designed
Raingarden Post-Construction Performance

- Infiltrating (drains in < 24 hours)
- Not infiltrating or infiltrating very slowly

Raingardens not exactly to scale.
<table>
<thead>
<tr>
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28th Ave NW between NW 65th & 67th St

Raingardens not exactly to scale.

- **TP-117**: 0.15 in/hr
- **TP-118**: 0.1 in/hr
- **TP-119**: 0.15 in/hr
Winter Pain!

- La Nina year
- Raingardens don’t drain!
- Community angry!
- Raingardengue blog appears
- February 2, 2011 – community meeting held – 80 people, brought their own powerpoint
Community Demands

- Drain promptly – less than 24 hours
- Don’t fill up with water for most of the winter
- No ponding – less than 2” of water
- Restore parking
- Get rid of signs
- Shallower cells
- Engagement on the solution
Spring Action!

- Vactor cells and drill holes in weirs
- Task Force formed to come up with solution for non-draining cells (3 months)
- Solutions include:
  - Removal
  - Retrofit for low performance (fill in with additional bioretention soil)
  - Retrofit for live storage with underdrain, achieve higher performance
Retrofits

- Fill, fill, fill
- Recountoured for shallower cells with less ponding, river rock added, relandscaped
- Returned some to planting strip
- Started evaluating underdrain design to increase confidence in cell function
- Fundamental design shift from ponding/ infiltration to no-ponding/detention (slow release)
29th Ave NW & NW 77th St

Original design

Retrofit design

- Infiltrating raingarden
- Remove and convert back to planting strip

Raingardens not exactly to scale.

Original design:
- TP-111 0.1 in/hr
- TP-109 0.15 in/hr

Retrofit design:
- TP-111 0.1 in/hr
- TP-109 0.15 in/hr
Osceola

TP-117
0.15 in/hr

TP-118
0.1 in/hr

TP-119
0.15 in/hr

28th Ave NW between
NW 65th & 67th St

Infiltrating raingarden

Low functioning
raingarden

Raingarden
converted to live
storage with
underdrain

Raingardens not exactly to scale.
Lessons Learned

– **Planning**

• Hasty planning & design means not enough time for thorough QA/QC

• Analyze risks of accelerating a schedule to meet a deadline and communicate them up

• Say no to unrealistic schedules even it means turning down money

• Community Engagement Plan and schedule

• Get management support of project policies
  – Acceptable impact to community (i.e., parking loss)
  – Community acceptance threshold related to site selection
Lessons Learned
– Community Engagement

• Get out into the community early and often
• Introduce the problem before presenting the solution
• Don’t rely just on the community meetings to engage the community and get feedback
• Written questionnaire on wet basements & soggy yards

• Projects with flexible siting require lots of rounds of community interface, because each meeting results in design changes that impact new people who haven’t been to the earlier meetings, and they too want to modify or eliminate the design
• Don’t be fooled that just because you have a lot of fans at the planning stage, doesn’t mean you won’t have a lot of critics at final design/construction
• Consider demonstration infiltration tests on evenings/weekends so skeptical neighbors can be eye witnesses.
Lessons Learned
– *Community Engagement*

- Understand the neighborhood “look”
  - Curb and Gutter creates different community ownership of frontage than ditch & culvert areas

- Be clear about:
  - Short term standing water and why it’s important. Puddles are good. Puddles may be present consistently for four months of winter
  - Loss of parking – impact to neighbor in front and other neighbors along the street.
  - Change in Aesthetics – during construction, end of construction, 1-yr later, 5-yrs later
  - Signs!!!
  - Staging has got to go in front of someone’s house
Technical Design

• Technical / Design Approach
  • Enthusiasm for trying to meet citizen traffic calming request took precedent over intended project scope (curb shift design and working on 28\textsuperscript{th} without survey)

• Unidentified Subsurface Geology Conditions
Lessons Learned – Geotechnical

- Consider ratio of sidewall to bottom area during test and try to limit horizontal flow.
- Consider potential for groundwater mounding on top of glacial till.
- If test pits find <0.5 in/hr, Monitor groundwater levels for a minimum of one winter.
- Ask community about evidence of groundwater springs, basement flooding, and other groundwater problems.
Lessons Learned

– Design

• Ensure adequate investigation of site low points
• Include formal geotech review during 30% circulation
• Design should consider backup system (underdrain) if design infiltration rate is less than 0.5 in/hr
• Contract documents should include a backup plan (underdrain) should native soil conditions vary from design assumption
• Include constructability review by CM at 60% circulation
Lessons Learned

– Design

• If “field directed” elements to be included work closely with construction management. Clearly articulate intent of “field directed” elements in the design.

• Review project design and function and critical project elements with CM

• Run off from roof & private driveway/ sidewalk is source of erosion

• Deliberately decide when the facility will be “turned on” to accept runoff

• Don’t be cheap with the plants – buy some larger stock
Lessons Learned – *Construction*

- Bring geotechs out during construction to verify soils
- If shallow utilities cross cell, avoid, relocate, or place sidewalks in those locations.
- Don’t under estimate the amount of water that can flow down a sidewalk into a planting strip or off of paved surfaces on adjacent private properties.
Questions?
Maintaining Your Rain Garden & Cistern

Craig Chatburn
Seattle Public Utilities
Installing Rain Gardens & Cisterns
Trainings for contractors, April 26, 2011
www.seattle.gov/util/rainwise
How-to guide for rain garden care

• **Water** your new plants regularly for the first 2-3 years, until they are well established.

• **Weed** in spring, summer, and fall until the plants close in. *Don’t use fertilizers or pesticides.*

• **Mulch** with arborist woodchips annually to feed the soil, conserve water, reduce weeds, until the plants close in to shade out weeds.

• **Watch** the inflow and overflow areas keep free of debris, and protected from erosion.
Gardening tasks that can wreck rain gardens!

1. Use of non-organic fertilizer
2. Use Herbicides, Fungicides, Insecticides
3. Rotor-tilling
4. Use of Weed barriers (fabric or plastic)
5. Repeated removal leaves, and plant debris
6. Mulches lacking diversity – beauty bark, lava rock, washed playchips, sawdust
Rototilling

Soil Biota Enhancement

Soil contains macroflora, microflora, macrofauna, mesofauna and microfauna. A cup of undisturbed native topsoil can contain:

- 200 billion Bacteria
- 100,000 meters of Fungi
- 20 million Protozoa
- 100,000 Nematodes
- Earthworms <1
- 50,000 Arthropods
Use of Weed blockers (fabric or plastic) prevents access to organic matter
Repeated removal of leaves, and plant debris
Mulches lacking diversity—beauty bark, lava rock, washed play-chips, sawdust
• Bioretention Maintenance
• Workers must know WHAT BELONGS and WHAT DOESN’T.
• Weed discriminately by HAND
• EDUCATE your client as to why you do things differently
Rain Gardens Success Depends on Your Client Understanding:

1. Healthy Soil = Healthy Plants
2. Do not use fertilizers or pesticides.
3. Feed the Soil, Not the Plant
4. Replenish arborist woodchip mulch annually