High Point Neighborhood
Looking Back / Looking Forward
15 years of technical and social observations of the large scale
120 acres LID approach to redevelopment of 34 full city blocks

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Retrospective Discussion Points

▪ Planning, Partnering, Entitlements and Funding
▪ Drainage / Low Impact Development (LID) / Green Stormwater Infrastructure (GSI)
▪ Results
▪ Lessons Learned
  – Process
  – New policies and programs
▪ Maintenance
Background and Context
The Vision in 2000
Taking the Old …..

Housing & Transportation
1940’s to today
to New

- 120-acre mixed income housing redevelopment based on New Urbanist principles

- Neighborhood based natural drainage systems - GSI tools implemented at block scale and in the public right of way.

- 34 blocks of new streets, new utilities, street trees, sidewalks, parks and open space

- 1,600+ housing units, neighborhood center, library, and mixed-use complex

- Density ranges from 16 units/acre to 32 units/acre of ground-related housing

- Ground breaking regulations
Goal: Diversity of Housing Opportunities
1,600 +/- mixed-income households

- Market rate home ownership & rental units: 50%
- Rental units available to households earning 30% of median income or less: 29%
- Rental units available to households earning 60% of median income or less: 16%
- Homeownership units available to households earning 80% of median income or less: 5%
## Project Timeline

<table>
<thead>
<tr>
<th>Year/Phase</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2000</td>
<td>Funding Submittal</td>
</tr>
<tr>
<td>2001-2004</td>
<td>Design and Entitlements incl. MOA for Natural Drainage/GSI approach and cost sharing</td>
</tr>
<tr>
<td>July ’04</td>
<td>Begin Phase I Infrastructure, GSI and housing construction</td>
</tr>
<tr>
<td>April ’05</td>
<td>First residents move into units</td>
</tr>
<tr>
<td>Oct ’05</td>
<td>First for-sale homes completed</td>
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<tr>
<td>Summer ’07</td>
<td>Begin Phase II Infrastructure and housing construction</td>
</tr>
<tr>
<td>Summer ’08</td>
<td>First residents move into Phase II units</td>
</tr>
<tr>
<td>Spring ’09</td>
<td>Last rental home completed</td>
</tr>
<tr>
<td>2009</td>
<td>Economy impacts for-sale</td>
</tr>
<tr>
<td>2010</td>
<td>Ph II Infrastructure Construction Completed</td>
</tr>
<tr>
<td>2011- current</td>
<td>For-Sale Ph II housing (last of 1600 units)</td>
</tr>
</tbody>
</table>
2004 Early Construction
½ Site is demolished / old housing still occupied
High Point Redevelopment
Goal- Drainage 2000

try to make this…

develop like this and …

function like this
The Deal
A Win-Win Situation

City wins- 2002

- Chance to create a Natural Drainage System (GSI) at 14-32 DU per acre
- NDS/GSI for 8% of Longfellow Creek watershed
- NDS/GSI in traditional right of way applications can be city wide
- Partnership for alternative surface water treatment
The Deal
A Win-Win Situation

Developer Wins

– **25-ft wide streets with parking on both sides**
– Financial backing for delta of NDS/GSI construction cost
– Conventional streetscape design
– Support during entitlement process
– Streamlined permit process
– Permit to build
Process View in 2002
How to Implement LID

Low Impact Development

- Planning
- Policy
- Permitting
- Finance
- Construction
- Maintenance
Process View By 2005

Policy
Land Use, Zoning
Implementation
Codes
Financing

Permitting
Public/private
Certainty

Planning & Design
Involve, Collaborate, Share

Finance
Local / State/ Federal
Incentives
Private

Green Infrastructure LID

Operations & Maintenance
Public/Site based Crews
Commercial Crews
Stewards/Volunteers

Construction
New approaches
Industry changes

Involve, Collaborate, Share
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Green Infrastructure LID

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High Point 2003-2004
Establishing Maintenance Associations & Responsibility

1. Right of Way, Natural Drainage/GSI, Parks and Open Space – Maintenance (white & green)
2. Rental Housing (Lavender)
3. Market rate (Home Owners)-(Blue)
4. Community (all)
5. Other (gray)
6. Seattle Public Utilities- maintain the below grade natural drainage system including: engineered soils, structures, pipes
7. Seattle Transportation- roads
2009 ¾ of New Housing Units and Public Infrastructure Complete
Lets Talk Drainage

*because drainage finally meets trees and plants again*
Drainage Criteria

- Water quality treatment: 6 month storm
- NDS/GSI swales and site BMP’s combined with the stormwater pond detain and match duration up to the 2 year, 24-hour storm assuming pasture conditions
- Piped conveyance sizing for 25-year storm
- Drainage distributed at the block scale- GSI BMP’s
- Plat restricted impervious – NTE average 60%
  (Typical impervious for this density 65%-75%)
- Peak flow control for COS 100 year storm (0.5 cfs/ac)
- Conveyance of DOE dam safety flows downstream of storm water pond (5000-year storm event).

Note: Rainfall Precipitation for Seattle Design Storm Events:
  - 2 Year: 1.68 inches (4.27 cm); 10 Year: 2.74 inches (6.96 cm)
  - 25 Year: 3.125 inches (7.94 cm); 100 Year: 3.84 inches (9.75 cm)
Comparison of Flow Duration

Duration that 2-year peak flow rate, based on pasture conditions, is exceeded (hours/year)

- Forest
- Pasture
- Current
- Redeveloped, no NSS
- Redeveloped, with NSS

2002 Condition

2010

0
20
40
60
80
100
120
Results and Future
Integrated Design-LID
2000-2010 U Can Do It

- Vision- Pedestrian Friendly – Walkable-Traffic calming Neighborhood
- Healthy Homes – Breathe Easy
- City of Seattle-Surface Water Management Permit – LID/NDS

- Architect, Engineer, Landscape Architect, Green experts
- City provides $2.7 million-the “delta” for the natural drainage system
- Financial Incentives from the Federal, State and City
Results:
A Great Neighborhood

- 25 foot wide streets with Sidewalks both sides of street (34 blocks)
- Arterial as Complete Street +
- 2,500,000 gallons water saved by efficient appliances
- 7000 lf of GSI-grass swales
- 8000 lf of GSI-vegetated swales
- 13,000 lf of pervious sidewalks
- 600 lf of pervious public street
- 22 acre feet WQ pond
- Housing sites with LID layout and GSI BMP tools integrated
- 1600 housing units/4000 residents
- 1250 children under 19 years
- 12.5 acres of parks
- 180 public art elements
- 35 breathe easy homes
- 440 99 mature trees saved
- Over 3500 new trees planted
- 80,000 groundcovers
Lessons reaching out
(1,000,000 to 28,000,000 Google results depending on input)

Translated into 4 languages
More than 200 walking tours- from across the country and across the continents.
So many engineers and landscape architects observing, asking and sharing

**STORM:** Share (means exchange learning change) Test (innovate) Observe (watch effectiveness during storms) Revise (retrofit dynamic) Maintain (adapt)
Acceptance

- **Green Stormwater Infrastructure** (GSI) on way to being actually **considered infrastructure**

- **People are talking** about urban trees and plants in new ways

- New Stormwater **Regulations** national (NPDES) and state (Ecology) and local agencies **requiring Low Impact Development**
So – what have we learned ??
High Point Community tested many “Firsts” in sustainable development

- Testing new regulations in a mixed income community
- **Integrated site design and infrastructure**
- Large scale Low Impact Development (LID) with distributed green stormwater infrastructure (GSI);
- Innovation under public bid process
- Deconstruction
- Pervious public street
- Breathe easy homes
- **Extensive plantings in public right of way**
- New approaches to maintenance
Planning, Partnering, Entitlements and Funding

- **Focus on vision** for the neighborhood residents
- Robust Outreach
- **Partnering** brings co-benefits Win Win
- Entitlement using innovation adds difficulty to an already complex process- plan the conversations
- Cost sharing may mean MOA
- Success triggers new design manuals, details and code changes
- **Plan and budget for maintenance**
Regulatory

- **Vision first**
  - Policies
  - Technical codes
  - Plan Compliance
  - Models vs Monitoring
  - Enforcement
  - Design.. Design…Design

- **Practical**
  - Developers had trouble meeting intent of BMP’s
  - **Context sensitive design** (don’t rely on codes and regulations to achieve good design)
A few specifics
Bioretention Swales Monitoring To Date

- **2002** Concept Design Infiltration Rate
  2 inches per hour

- High Point Ph. 1 Block Scale Monitoring
  Date of Field Test: March 7, 2007
  Location High Point Drive SW
  4.216 inches per hour

- High Point Field Infiltration Test
  Date of Field Test: September 23, 2014
  Location 31st Ave. SW and SW Raymond St.
  **100.8 inches per hour** - vegetated
  Location 30th Ave. SW & SW Graham
  **43.2 inches per hour** – grass lined
6 months after planting-2006

30% canopy 9 years later-2014- on the way to City goal

Tree Canopy
they like GSI
Streets and GSI- Summer
Streets and GSI- Winter
Tree Preservation is GSI (100+ large trees)
look at the canopy and look at the space
People love to walk when plantings are varied.
Human aspect- performance metrics

– Trees and plants are not yet getting their full credit

– Advocacy for Funding Academic Based Research is critical. We must fund trees and vegetation performance benefits in urban areas if we want to achieve urban based integrated natural areas within our built environment.
Maintenance
it is circling back to influence codes and design
Seattle Public Utilities and King County Wastewater Treatment Division Partnered

- New GSI Design Manual
- New plant lists for right of way
- New Operations and Maintenance Manual for Right of Way GSI and Plant maintenance
- Others
  - SDOT has a new Street Tree Manual
  - SDOT has a new Right of Way Improvement Manual
  - Plant Amnesty is teaching new practices for landscape maintenance
  - And more
GSI Maintenance Manual:
Required – thankfully - part of Plat Approval in 2004

- Treat GSI first as infrastructure facilities-
- Define the maintenance concerns:
  - Safety
  - Drainage function
  - Aesthetics

- Be clear on Level of Service
  - Manage expectations
  - Acceptable / Unacceptable
  - Inform with images and words

- Training for Maintenance:
  - Train staff for the intended function
  - Staffing
  - Turnover
GSI Operations and Maintenance

- LID/GSI Maintenance: Is it different from conventional?
  - NDS…LID
    …ESD…GSI…BMP’s
  - The Plant Establishment period is critical
  - Operations- what do you plan and schedule?
  - Maintenance- what steps or actions do you take?
## GSI Level of Service

<table>
<thead>
<tr>
<th>Establishment</th>
<th>Acceptable</th>
<th>Unacceptable</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ No trash, pet waste. No contaminants.</td>
<td>□ Minimal trash, pet waste. No contaminants.</td>
<td>□ Trash, pet waste, heavy leaf litter and/or downed branches. No contaminants.</td>
</tr>
<tr>
<td>□ Little or no weeds (Less than 15% of the vegetation are weeds). No class A, B, C or non-regulated noxious weeds present.</td>
<td>□ Between 15% and 35% of the vegetation are weeds. Less than 2% noxious weeds present. Goal is for no noxious weeds.</td>
<td>□ Greater than 35% of the vegetation are weeds. Greater than 2% noxious weeds present. Goal is for no noxious weeds.</td>
</tr>
<tr>
<td>□ Swale bottom coverage by emergents, vegetation and mulch is 100%.</td>
<td>□ Swale bottom coverage by emergents, vegetation and mulch is between 75% and 100%.</td>
<td>□ Swale bottom coverage by emergents, vegetation and mulch is between 60% and 75%.</td>
</tr>
<tr>
<td>□ Mulch covers 100% of the swale side slopes and is approximately 3” to 4” deep.</td>
<td>□ Mulch covers at least 70% of the swale side slopes and is at least 2” deep.</td>
<td>□ Mulch covers at least 60% of the swale side slopes.</td>
</tr>
<tr>
<td>□ Vegetation at intersection is under 24 inches. Vegetation is clear from sidewalk, curbs and ramps. Visiblity through planter is good. Perennials and grasses are trimmed. □ Fire hydrant access clearly visible and accessible.</td>
<td>□ Vegetation is slightly over 24 inches at intersection and slightly over 36 inches along swale. Vegetation partially overhangs sidewalk, curbs and/or ramps. Visibility is partially impaired through planter. Perennials and grasses are not trimmed. □ Fire hydrant access clearly visible and accessible.</td>
<td>□ Vegetation at intersection is over 24 inches. Vegetation is overhangs sidewalk, curbs and/or ramps. Predominant vegetation along swale is over 36 inches and visibility is impaired through planter. Perennials and grasses are not trimmed. □ Fire hydrant access clearly visible and accessible.</td>
</tr>
<tr>
<td>□ Pruning: Branches meet clearance over sidewalk (8’) over road (14’). Accent shrubs pruned.</td>
<td>□ Pruning: Branches meet most clearances over sidewalk (8’) and road (14’). Accent shrubs need pruning.</td>
<td>□ Pruning: Branches do not meet clearance over sidewalk (8’) and road (14’). Accent shrubs need pruning.</td>
</tr>
<tr>
<td>□ Plants species are growing well together and not blocking drainage. Pruning is easy and not frequently required. No bare spots.</td>
<td>□ One plant species is overtaking other plants and/or pavement and plants are blocking drainage. Pruning for that species is frequently required. Consider removal of selective plants.</td>
<td>□ More than one plant species is overtaking other plants and/or pavement and plants are blocking drainage. Pruning is intense and frequently required. Consider plant species replacement.</td>
</tr>
<tr>
<td>□ At least 95% of planted vegetation is healthy and with a generally good appearance. Plants are healthy and growing, no wilting, no spotting or holes in leaves, no broken leaders or branches, trees are plumb.</td>
<td>□ Between 60%-95% of planted vegetation is healthy and with a generally good appearance. Plants exhibit signs of minor stress, wilting, spotting or holes in leaves, broken leaders or branches, leaning trees.</td>
<td>□ Less than 60% of planted vegetation is healthy and with a generally good appearance. Plants exhibit signs of significant stress, wilting, spotting or holes in leaves, broken leaders or branches, leaning trees.</td>
</tr>
<tr>
<td>□ Irrigation system is working, no broken heads, equipment or lines. Coverage is even.</td>
<td>□ Irrigation system is working, a few broken parts. Coverage is slightly uneven. Broken equipment or lines to be capped and hand water until system is repaired.</td>
<td>□ Irrigation system is not working. Coverage is uneven, areas unusually dry or wet. Soils washed out. System needs immediate repair.</td>
</tr>
</tbody>
</table>
Plant Zones - Inform Why or they may be changed or gone
Plant selection and layout is getting better, learning from early installations
Good infill- 3 yrs

Needs thinning 5-7 yrs
Winter-thinned at 10 years and adapted
Plant Zones: Treatments Moving Forward
Kids Grow Up
High Point
Collaborative Interdisciplinary

Owner:
Seattle Housing Authority

Other agencies:
US Dept of Housing and Urban Development
Washington State Department of Ecology
Seattle Department of Planning and Development
Seattle Department of Transportation
Seattle Public Utilities
Seattle City Light
Seattle Parks Department
Seattle School District
Seattle Fire Department
Seattle Office of Housing
Seattle Design Commission and Design Review

Citizen Groups
High Point Citizens Review Committee
West Seattle Chamber of commerce

Integrated Consultant Team:
Mithun Architects, Planners, Landscape Architects
Design Team Lead
SvR Design Company Civil Engineers & Landscape Architects
Infrastructure, Natural Systems, ROW Landscape and Site civil

Artist: Myersculpture

Resource consultants:
Shannon and Wilson- Geotechnical
McCoullough Hill PS- Land Use Attorney
Bush Roed Hitching - Survey
Stoneway Concrete
NW Chapter ACPA
Cedar Grove Composting
Concrete Specifications Council
Nakano Associates- Rental Landscape Design
Urban Forestry Resources
RW Beck- Hydrologic Modeling
Herrera-Hydrologic Modeling
PRR- Public Outreach
Fusion-Branding

Infrastructure Contractors:
Gary Merlino Construction Company – Ph I
T. Yorozu Gardening Co. – Phase I & II
TriState Construction – Phase II
More Information
It’s all good…Complete Streets +
(a case for patience)
Design in some added elements redundancy

From School: Before

To School: After
Block-level Drainage Design

- Surface dispersal
- Porous pavement
- Splash block
- Conveyance furrow
- Pop-up emitter
- East NDS – deep and shallow swales
- South NDS – deep and shallow swales
- North NDS – deep with weirs
- West NDS – SEA Street
Pervious parking and... the space is used for parking
Drain curb cuts - a little maintenance frequently OR
say what? pervious pavement maintenance?

Installed in 2005 – no routine maintenance.
Photo January 2015.

Installed in 2005 – no routine maintenance.
Photo May 2014.

*Designed to drain 100 inches per hour*
pervious parking and... probably not maintained since 2006
check system in the rain
and snow

- Avoid sanding since it will clog the system, except in cases of emergencies/ safety issues (vacuum sediment as soon as possible after melt).

- Avoid sanding adjacent streets since tires will track it onto the porous pavement.

- UNH reported up to 75% decrease in salt use but it will depend on site conditions (shade, location etc)

- Test the plow height to avoid scraping the pavement
Stormwater Pond

- Receives 130 acres (53 hectares) of run-off (106 acres from High Point redeveloped areas)
- Flow control for up to 100-year Storm Event
- Water Quality Treatment in combination w/upstream NDS swales
- Maximum Depth 15.5 feet (4.72 m)
- Volume 22+ acre-feet (27,619 m³)
- Pond within 3.5 acre Tract (1.42 hectares)

- Wet Pool for Additional Water Quality:
  - Storage: 4.2 acre-feet (5,178 m³)
  - Depth: 4.5 feet (1.37 m)
- Live Storage for Flow Control/Detention:
  - Volume: 11.8 acre-feet (14,546 m³)
- Remaining 3.2 acre-feet (freeboard and Dam Safety flow)
- Conveyance system out of pond designed for 5,000 year storm event for Dam Safety (Two 8-foot (2.44 m) diameter concrete risers below pier)
Pond Maintenance -

- Obstructions
- Trash/Litter
- Sediment
- Algae
- Invasive Plants
- Recirculation
- Mosquitoes
- Geese