3rd Annual Puget Sound Green Infrastructure Summit

Salmon-Safe Certification
Seattle Children’s Hospital

Tad Deshler
Coho Environmental/Salmon-Safe
WHY SALMON-SAFE: ELEVATING ECOLOGY IN SUSTAINABILITY

Regenerative Design

Sustainable Design

Low Input Design

Energy
Water
Community
Materials
Ecology

From Building an Arc: Architecture, Biodiversity, and the City (Muller, Cerra and McGinley, 2015)
CERTIFYING TO INSPIRE RESTORATION

- Corporate & university campuses
- Municipal operations & park systems
- Urban development
- Airports, light industrial
- Vineyards, farms
<table>
<thead>
<tr>
<th>#</th>
<th>Category</th>
<th>CONTEXT</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.1</td>
<td>Stormwater Management</td>
<td>X</td>
</tr>
<tr>
<td>U.2</td>
<td>Water Use Management</td>
<td>X</td>
</tr>
<tr>
<td>U.3</td>
<td>Erosion Prevention and Sediment Control</td>
<td>X</td>
</tr>
<tr>
<td>U.4</td>
<td>Chemical and Pesticide Reduction and Water Quality Protection</td>
<td>X</td>
</tr>
<tr>
<td>U.5</td>
<td>Enhancement of Urban Ecological Function</td>
<td>X</td>
</tr>
<tr>
<td>U.6</td>
<td>Instream Habitat Protection and restoration</td>
<td></td>
</tr>
<tr>
<td>U.7</td>
<td>Riparian, Wetland and Locally Significant Vegetation Protection and Restoration</td>
<td>*</td>
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</tbody>
</table>

**SALMON-SAFE URBAN CERTIFICATION STANDARDS**
PROJECT BASICS:
Seattle Children's
COMMENDABLE PRACTICES

- Large rain garden effectively manages stormwater from large parking lot
- Sustainability goals include reducing potable water usage and using green roofs
- Extensive landscaping (2000 plant species) fosters healing environment
- Landscaping prioritizes use of natural mulch and compost
OVERVIEW OF CONDITIONS

- Create stormwater management plan
- Develop quantitative water use reduction goals and identify additional opportunities for water use reduction
- Document landscape management practices related to water use
- Develop Integrated Pest Management plan
- Create additional wetland habitat
- Provide additional information on metal siding
Shaping Belltown with Green Stormwater Solutions
DISTRICT STORMWATER GOAL

Manage the combination of stormwater and potable water use to 50% below the District baseline
STORMWATER DISTRICT BASELINE

- Based on long term modeling of precipitation in Seattle and how much runoff from District
- 50% is about 228 million gallons
GREENER BELTOWN = BLUER SOUND

- Promoting GSI on a neighborhood scale
- Goal to develop plan to meet District goal; also helps City, County, community goals
- Build community support for GSI due to many co-benefits
WHY HERE? WHY NOW?

UPCOMING PROJECTS/PROGRAMS
- Waterfront Redevelopment
- SPU Capital Project on Vine Street CSO
- Downtown RainWise Basin
- Battery Street tunnel decommissioning
- City Habitats coalition
- Seattle 2030 District GSI Initiative

COMMUNITY ENERGY AND ACTION
- Increased growth
- Growing Vine Street
- Project Belltown
- Market to MOHAI
- Lake to Bay

OPPORTUNITY
COLLABORATION WITH THE CITY: Vine Street CSO Basin
Overlaps with Belltown neighborhood

Vine Street CSO Basin

Overlaps with Belltown neighborhood
COLLABORATION WITH THE CITY: RainWise Program
New Downtown Basin overlaps with Belltown
COLLABORATION WITH OTHER NON-PROFITS: Valuation for GSI in Waterfront Project
GREENER BELTOWN = BLUER SOUND

Main Themes from charrette:

- Keep stormwater on-site
- Reuse water in buildings
- Incorporate water into streetscape and parks
- Potential “green corridor” through Belltown
DESIGN IDEAS FOR GSI IN VINE STREET BASIN: Collaboration with District Member, MKA

- Implementation of Stormwater Code/Green Roofs
- Rainwater Harvesting in Residential Buildings
- Bioretention in Public Spaces
- Treatment and Use of Combined Wastewater and Stormwater
GSI IDEAS FROM AT DIFFERENT SCALES

❖ BUILDING SCALE
- Green Roof – in new or existing buildings
- Rainwater Harvesting – in new buildings

❖ STREET/RIGHT OF WAY SCALE
- Bioretention – at “Opportunity Sites”, Post Alley
- Incorporate into street planning (Street Trees/Planters)
- Stormwater Treatment Park – visible stormwater treatment in public space

❖ NEIGHBORHOOD SCALE
- RW Harvesting on All New Buildings – community “purple pipe”
- Battery Street Tunnel as Storage or Treatment
- Wasterwater/stormwater treatment and reuse
For more information, contact:

Matthew Combe
Program and Operations Officer
Seattle 2030 District

matthewcombe@2030districts.org  (206)604-1413
2017 Studio Objectives

explore urban design strategies for climate adaptation and urban nature

working at various scales to cultivate social resilience, biodiversity, human health, and artfully integrate water into the cityscape for hydraulic function and human delight
2030 DISTRICT GOALS

Manage the combination of stormwater and potable water use to 50% below the District baseline

50% in Belltown is about 67 million gallons

GREENER BELTTOWN : BLUER SOUND
City / Nature for Climate Resilience
SPU Stormwater Storage Goals:

130,000 Gallons

Greener Belltown: Bluer Sound
City / Nature for Climate Resilience
Collect rain water from roof and pavement to re-use it.

STORMWATER TOOLBOX

PERVIOUS PAVEMENT
STRATA/STRATA CELLS
URBAN FOREST
BIOFILTERATION CELLS/PLANTERS
GRASSPAVE
GREEN FACADES
GREEN ROOFS
GREEN WALLS
SPLASH BOXX
CISTERNS
CONSTRUCTED WETLANDS

GREENER BELLTOWN : BLUER SOUND
City / Nature for Climate Resilience

Typical Green Wall Components
Waterproof Layer
Steel Structure
Irrigation
Growing Planters
Daylighted portions of the Battery Street Tunnel

1. Vertical Flow Constructed Wetland
2. Pedestrian access to interior of tunnel
3. Mycoremediation areas in portions remaining capped
4. Greywater collection basin for sidewalk planters
5. Bioretention sidewalk planter boxes
6. Permeable pavement
7. Greywater outflow
8. Blackwater inflow to lower levels of constructed wetland
9. Lowland riverine forest

WATER

DISTRICT FRAMEWORK

GREENER BELLTOWN : BLUER SOUND
City / Nature for Climate Resilience
MOBILITY

DISTRICT FRAMEWORK

GREENER BELTOWN : BLUER SOUND
City / Nature for Climate Resilience
ECOLOGY

SECTION
Garden Street

SECTION
Canopy Corridor

SECTION
Habitat Epicenter

LEGEND
- Belltown Study Area
- Areas of Potential
- Garden Street
- Canopy Corridor
- Habitat Epicenter

DISTRICT FRAMEWORK

GREENER BELTOWN : BLUER SOUND
City / Nature for Climate Resilience
Maximizing Wide Sidewalks:
Green walls on the neighborhoods building facades utilize and slow stormwater runoff from rooftops. The north-east side of the buildings supports healthy management of the vegetation due to the orientation to the sun and managed water access from rooftop cisterns. These wide sidewalks on the shadier side of the street allow for large and continuous bioretention cells to manage water from all surrounding impervious surfaces.
What if every historic building in Belltown had...

<table>
<thead>
<tr>
<th>A Blue Roof...</th>
<th>An External Cistern...</th>
<th>A Raingarden...</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://www.greenroofs.com/projects/cuartel_de_ballaja/cuartel_de_ballaja10.gif">Image</a></td>
<td><a href="https://i.pinimg.com/originals/c3/18/60/c3186075e-0a71b60v.jpg">Image</a></td>
<td><a href="http://www.landezine.com/wp-content/uploads/2012/10/Edinburgh-Gardens-Raingarden-by-GHD-Pty-Ltd-01.jpg">Image</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Historic Buildings</th>
<th>Potential Site Area</th>
<th>Historic Buildings</th>
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</thead>
<tbody>
<tr>
<td>Average Roof Area Per Building</td>
<td>7,000 sq. ft.</td>
<td>206,667 sq. ft.</td>
</tr>
<tr>
<td>Avg. Depth of Blue Roof</td>
<td>3&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>Volume of Water Per Building</td>
<td>13,090 gallons</td>
<td>68,900 cubic feet of water</td>
</tr>
<tr>
<td>Total Volume of Water</td>
<td>13,090 gallons</td>
<td>Total Storage In Potential Sites</td>
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<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>301,070 gallons</td>
<td>515,400 gallons</td>
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Using Frameworks to Support Arts, Culture, History, and Expression at the

**GREENER BELLTOWN : BLUER SOUND**
City / Nature for Climate Resilience
## STORMWATER METRICS

<table>
<thead>
<tr>
<th>POTENTIAL IF FRAMEWORKS IMPLEMENTED</th>
<th>TARGET</th>
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</thead>
<tbody>
<tr>
<td>2,338,670 GALLONS STORMWATER STORAGE</td>
<td>130,000 GALLONS STORMWATER STORAGE</td>
</tr>
<tr>
<td>894,413,635 GAL. STORMWATER MANAGED</td>
<td>67,000,000 GALLONS OF POTABLE WATER SAVED + STORMWATER MANAGED</td>
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<tr>
<td>468,819,140 GAL. POTABLE WATER SAVED</td>
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</tbody>
</table>
SITES: BELTOWN

1 Alleyways
2 Small-Scale Interventions
3 Battery Street Portal
4 Battery Street
5 Waterfront and Connections
6 P-Patch Parking Lot
A Strategy for Battery Street + Tunnel

A project by Dorothy Mulkern, Rachel Wells, and Sophie Krause
Battery Context

+ 120,000 square feet
+ $133 million
+ 12,840,000 gallon capacity

“Ideally situated between the city’s leading destinations, Battery holds promise to welcome millions of visitors to stop, linger, and recharge.”

Growing Vine Street + Project Belltown
Strategy: A Vertical Typology

+ Harness verticality
+ Capture and clean water at multiple stages
+ Increase visibility and performance of GSI
Above Ground Plaza Concept

+ Repurpose viaduct rubble as gabion architecture
+ Close off street to traffic to enhance pedestrian use
+ Glass art beacon starts water runnel which extends through site
+ “Runnel to Tunnel” water transfer to tunnel
Below Ground Concept

- Public Gallery
- Reservable Event Space
- Parking
Metrics and Savings

Just utilizing $\frac{1}{2}$ of the tunnel’s capacity

= 6,000,000 gallon potential for storage and treatment

+ Helps meet 2030 District Goals
+ Reduces runoff to nearby 069 Outfall
+ Encourages long-term planning
+ Preserves precious open downtown space
The Portal Park is named after its existing condition as the portal to a 4 lane tunnel for cars. The tunnels imminent decommission opens the door to a variety of uses for the interior of the tunnel as well as the place where the tunnel emerges above ground. Another group explored the tunnel as a space for social, cultural, and stormwater uses. Building on their work, our site reimagines the opening of the tunnel based on the premise that people and stormwater runoff will be conveyed through the tunnel onto our site.

In this design we layered cultural, historical and stormwater function. Stormwater infrastructure is present throughout, as well as small and large gathering circles, viewing decks, views of Mt. Rainier and Puget Sound, lushly plantings, and much-needed open space. The site to the East of Bell Street allows for formal educational and social programming while the rest of Portal Park is left dedicated to immersive experiences of plants, views, people, and water.
BIOFILTRATION CHANNEL

Biofiltration Channel:
A series of terraced biofiltration cells treat the lightly filtered stormwater from the tunnel as it descends toward the Puget Sound. As the water is cleaned, it is piped over to a cistern beneath the hill council ring and stored to be used for plant irrigation on site or potentially linked to the greywater system of the adjacent condominium building.

Excess water is expressed in a final round stepwell shape that people can see before it drains back into the sewer after being slowed and cleaned en route.
SECTON B: CISTERN & COUNCIL RING

Glass program space

Entrance from Western

Permeable paver plaza

Native planting hillside

SECTON C: PERVERIOUS PLAZA

Nicky Bloom

BATTERY STREET TUNNEL 14
This project was catalyzed by the planned removal of the waterfront trolley tracks running along Alaskan Way. Despite its prime waterfront location, this area is used as a conduit for transport and boat tourists. It is largely an impermeable, grey expanse.

Our vision is to fill this void in the city fabric, by growing and layering social, cultural, ecological, and hydrological networks across the site. We looked at a pre-development ecotone of beach to bluff, and overlaid it onto the contemporary urban condition, interpreting beach, deflation plain, backshore, bluff, and upland forest into our interventions. In addition, we looked to the Native Belltown Vision for guidance in this culturally rich area.

Our big moves are reclaiming much of Alaskan Way, adding new pedestrian zones and access, several expansive new habitat areas, and a GSI alternative to the CSO interceptor pipe.
subsurface wetland intercepts CSO, treats blackwater, and provides water for irrigation.

green roofs and walls detain and evaporate rain water

cisterns on rooftop store stormwater for gravity-fed irrigation during dry season

bioretention cells slow and treat stormwater

planted swale conveys storm water along pedestrian path to increase awareness of water cycle

bioretention strip treats street run-off

Structural glass overlook allows light for marine habitat

Bioretention strip treats street run-off.
UPLAND FOREST
WALKWAY
INTERCEPTOR WETLAND

A 45,000 square-foot wetland can fit in the space of the removed trolley tracks and two lanes of road on Alaskan Way between Bell and Wall Streets and provide a needed neighborhood green space and waterfront connection. To make a CSO-treating wetland at this location worthwhile, a new pipe is proposed along the existing Bell Street pedestrian bridge that connects to the city system on Western Ave and Bell Street. The proposed CSO pipe hugs the existing Bell Street pedestrian bridge before plunging into underground pre-treatment tanks (accessible for maintenance through decking). Treated water is used for irrigation in waterfront planting areas.
Subsurface Flow Wetland

This proposal calls for blackwater-treating green infrastructure with a capacity up to 850,000 gallons of water that could be collected from 12 blocks of southern Belltown would help prevent combined sewer overflows. Water is treated in a series of horizontal flow subsurface wetland cells without the risk of contact with people or pets. According to the EPA Wastewater Technology Fact Sheet on Subsurface Flow Wetlands, water quality improvement is due to physical, chemical and biochemical processes, especially microorganisms attached to submerged surfaces including the gravel itself.
DUNESCAPE DECKING AND HYDROLOGY

Bullrush (Scirpus spp.)

Pipe allows water to flow into impermeable, lined "box" that stores water for wetland plants

Dry, sandy soil for dunegrass

Impermeable liner contains water

Uncompacted subgrade

Gravel water table storage layer slopes 1-2%

Dunegrass (Elymus mollis)

Non-slip wood decking

All images: Margot Chalmers
Thank you!

Seafair Queen Iris Adams and Mayor Allan Pomeroy had something to laugh about Saturday as they bent every effort to cut the ribbon to open the Alaskan Way Viaduct.
GREENER BELLTOWN : BLUER SOUND
City / Nature for Climate Adaptation
Scan | Design Master Studio 2017
sign the petition!

7-Blocks in the Heart of Seattle Set to Disappear
By signing this petition you can help stop a landfill and conserve long-term opportunity for new uses for Battery Street Tunnel, in Seattle’s highest-density neighborhood.

Facebook.com/rechargethebattery  Instagram.com/rechargethebattery
Building Community
ref·u·gee : /ˌrefyooˈjē/  
A person with a well-founded fear of persecution and who has crossed an international border
persecution is based on

Race
Religion
Nationality
Membership in a social group
Political opinion
What refugees need most is a new sense of community.
Paradise Parking Plots

Proposed Community Garden Plan

Community Partners

Overflow Pond / Rain Garden

Retention Pond with drainage and overflow to existing storm drain

Honey Bees & Pollinator Garden

Existing ground water flow to be directed into pond

Cisterns to be filled with Hillside Church roof runoff

Water access from Hillside Church

Demonstration (d) Rain Garden to collect and filter parking lot runoff

Cistern for watering plots

Informational signage

Parking Plots Community Garden Spaces

Some parking lots be retained (42 spaces)

Orchard with irrigation channel from pond overflow

Vegetative buffer to be expanded - hazelnuts, mulberries, etc.

Raspberries, currants, evergreen huckleberries to be planted among existing trees

Large shade/wildlife trees - Birch, Maple, etc.

Walkway and surface water flow to be maintained

Concept Design - Stone Soup Gardens - Jake Harris and Marco Downs

SCALE: 0'  10'  20'  30'  40'  50'  60'  70'  80'  90'  100'  150'  200'  250'

N

MARTIN AVE
Community Partners

Hillside Church

World Relief SEATTLE

King Conservation District

Construction for Change

Turner Construction Company

King County

The 30/30 Project

Stone Soup Gardens

The Nature Conservancy
Community Planting Party

May 23, 2017
Hillside Paradise
Parking Plots Community Garden

Paint the Town Blue
June 23, 2017

Thank You!

Turner Construction Company
Date: July 7th, 2017

Hillside Paradise Plots

$75,000

Seventy-five Thousand Dollars

Dave Upthegrove
Volunteers Dave & Rodney
Stockpile 231 Yards of Clean Gravel

August 28, 2017
Building of ADA Beds and Composting Areas with Hermanson and LCL Construction

October 26, 2017
• **263 yards** of planting material
• **38 pallets** of 90 cinder blocks each for a total of 3,420 cinder blocks
• **77 cinder blocks** per planting plot
• **4 rebar stakes** at the corners
• **8 wheelbarrows** of gravel between plots
• **6 yards** of planting material in each plot
• **44 in ground 170sq ft plots**
• **6 ADA 4’ x 8’ beds**
572 unique volunteers helping... and counting!
Green Stormwater Infrastructure

• We plan to install (4) – 4,000 gallon cisterns to capture rainwater
• That is approximately 150,000 gallons of water per year
• Over 1,000 linear feet of 24” deep trenching to connect irrigation lines
• This will provide for 80% of the irrigation of the garden with rainwater
• De-paved over 12,000 sq. ft. of asphalt - improved permeability
• We will have 5 rain gardens on site
• Planning an engineered Bio Swale to reduce flooding