GREENER BELLTOWN : BLUER SOUND

City / Nature for Climate Adaptation

Scan | Design Master Studio 2017

GREENER BELLTOWN: BLUER SOUND

City / Nature for Urban Resilience

Urban Greening

Stormwater Mitigation

Social Amenity

GREENER BELLTOWN : BLUER SOUND
City / Nature for Climate Resilience

2017 Studio Objectives

explore urban design strategies for climate adaptation and urban nature

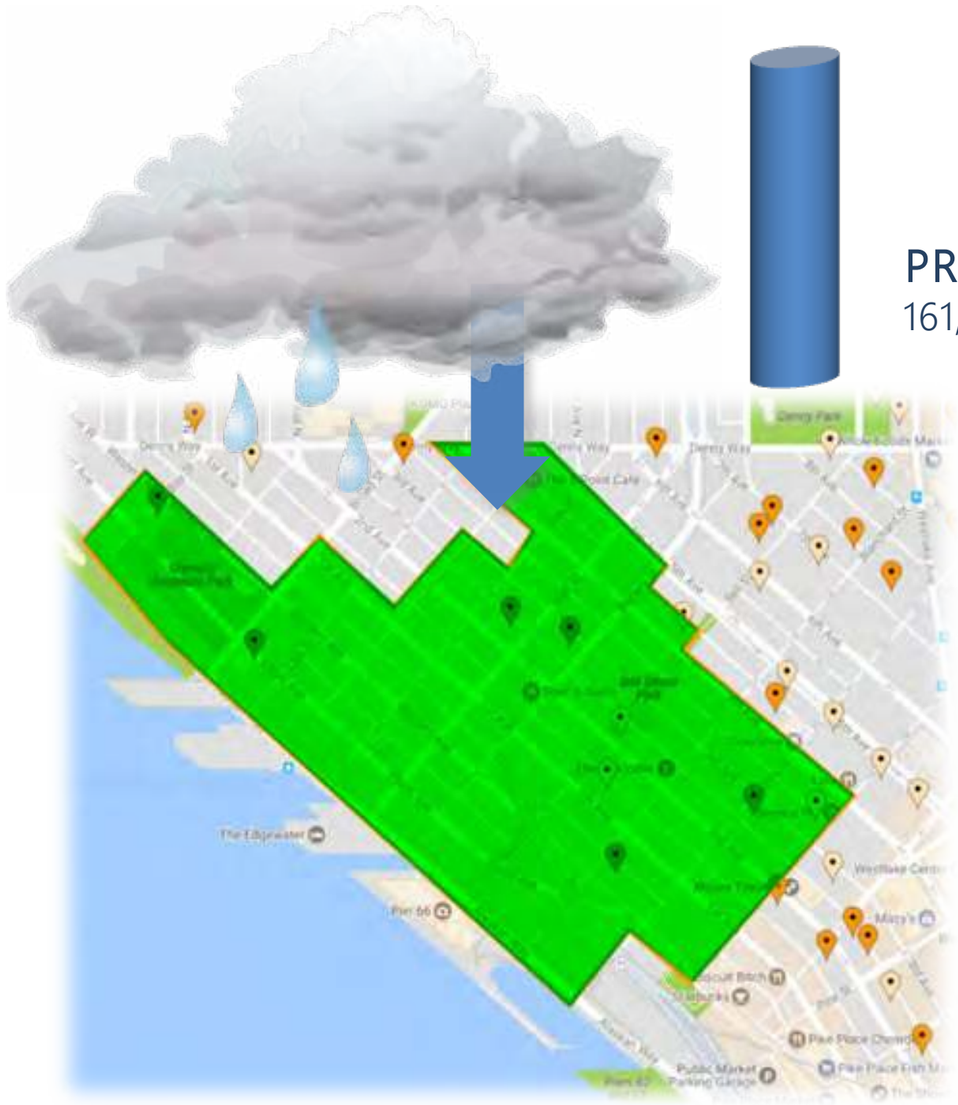
working at various scales to **cultivate social resilience**, **biodiversity, human health**, and artfully integrate water into the cityscape for **hydraulic function and human delight**

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



PRECIPITATION
161,300,000 GAL/YR

STORMWATER RUNOFF

124,500,000 GAL/YR
(22.8% Reduction;
5.8% additional
stormwater reduction)

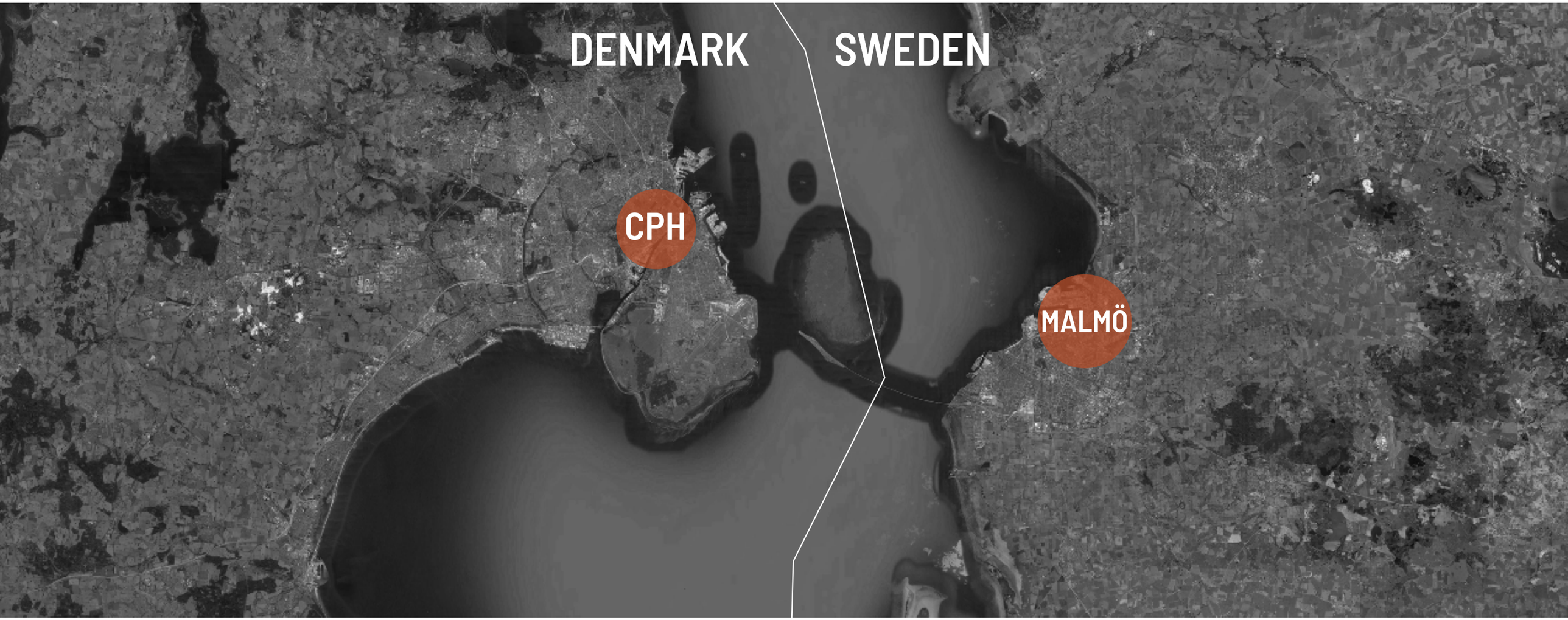
2030 DISTRICT GOALS

VINE STREET BASIN (165 ACRES)
80% GREEN ROOF
100% OF ALL NON-ROW PROPERTY

SPU STORMWATER STORAGE GOALS:

130,000 GALLONS

STUDY TOUR: 09/01 - 09/17



GREENER BELLTOWN : BLUER SOUND

City / Nature for Climate Resilience

The Trip: Copenhagen + Malmö

Cycling

Office Visits/Tours

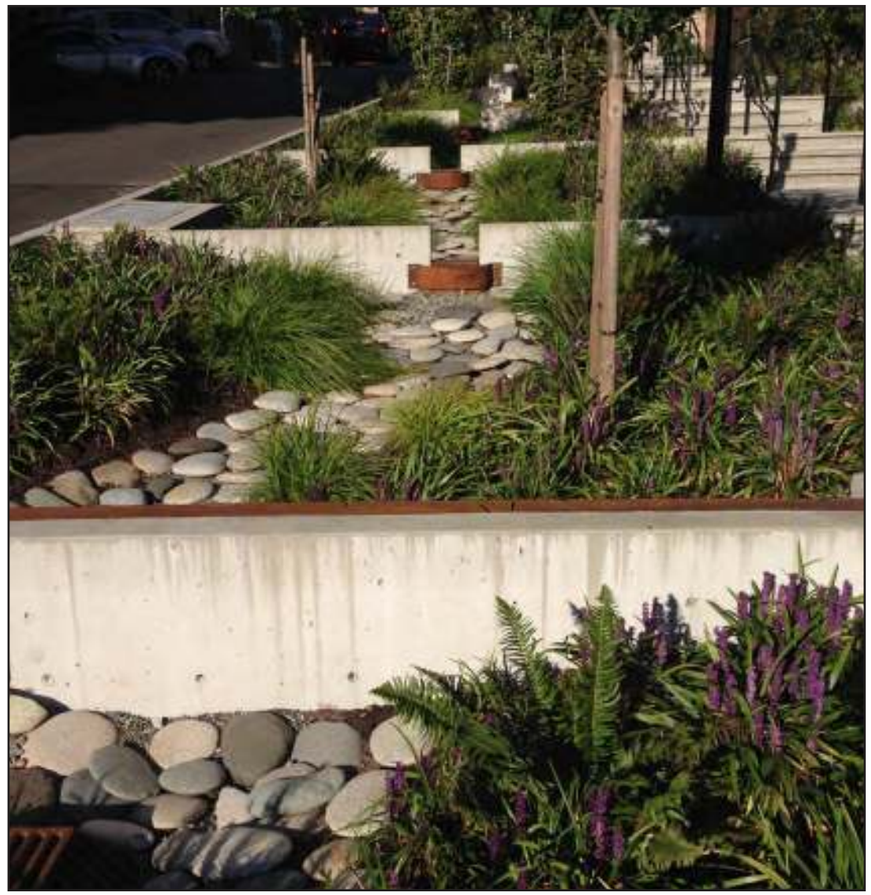
Lectures

DISTRICT ANALYSIS

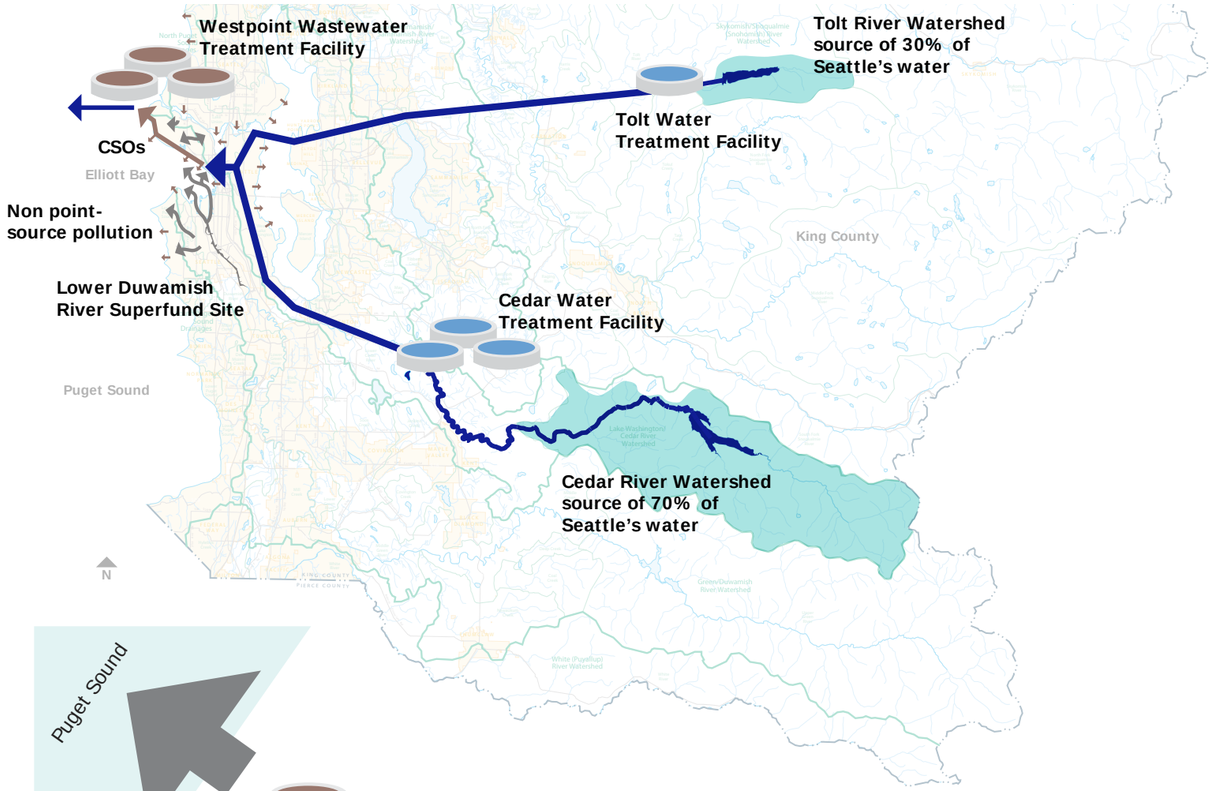
STUDY AREA: Belltown, Seattle

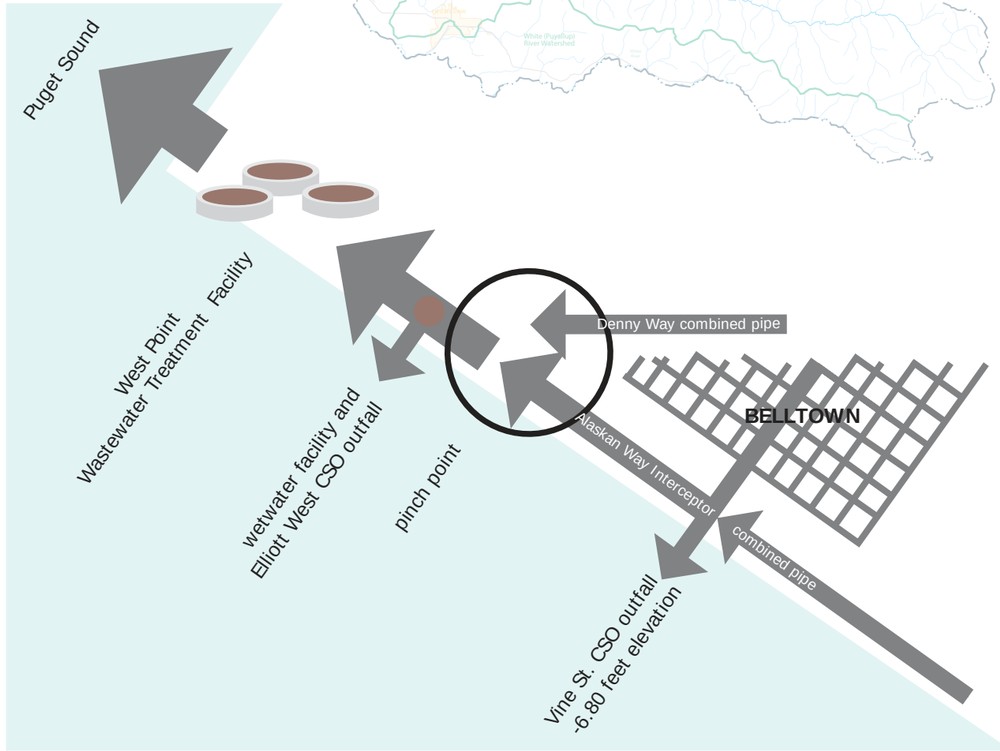
BELLTOWN

STUDY AREA: Belltown District

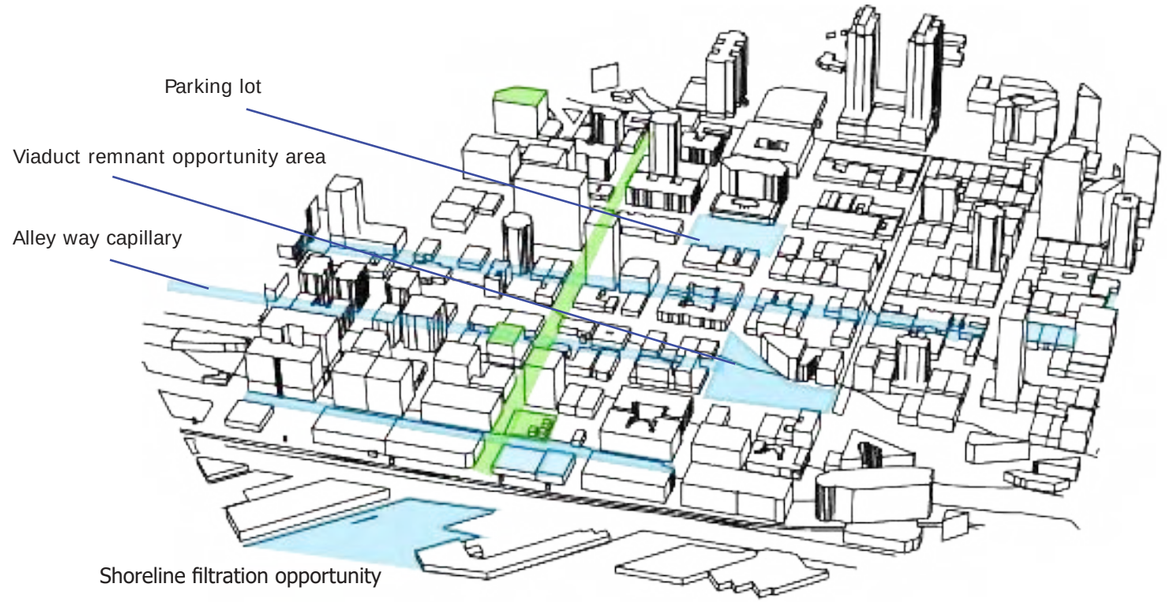


WATER





DISTRICT ANALYSIS

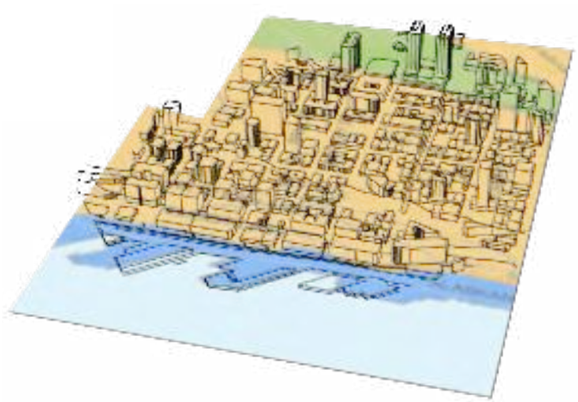


Infiltration Feasibility

Potentially suitable for infiltrating GSI

Suitable for non-infiltrating GSI

Soil Infiltration Potential



High

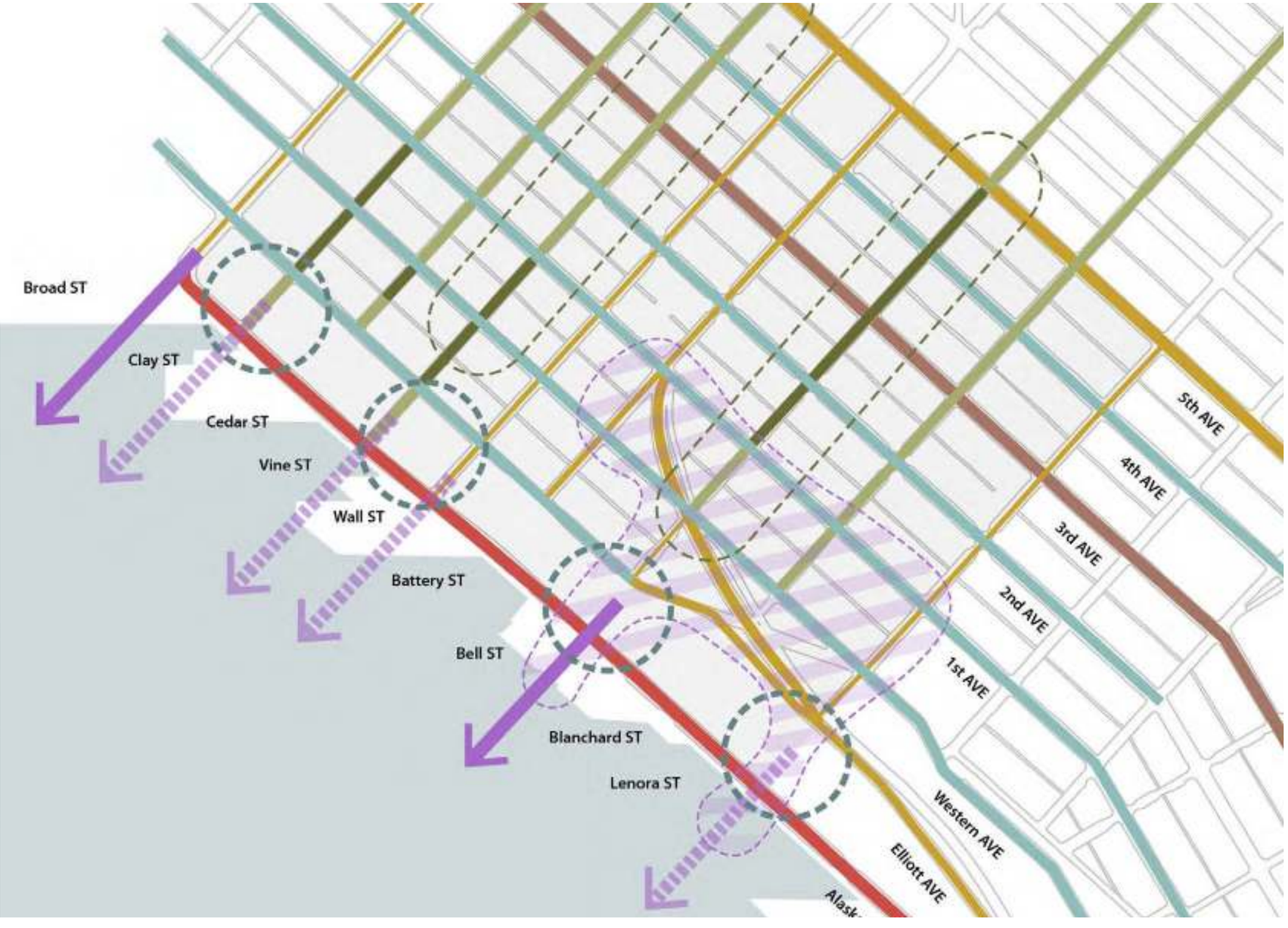
Medium

Groundwater table near surface

MOBILITY


Vine St


2nd Ave


Broad ST
Clay ST
Cedar ST
Vine ST
Wall ST
Battery ST
Bell ST
Blanchard ST
Lenora ST
5th AVE
4th AVE
3rd AVE
2nd AVE
1st AVE
Western AVE
Elliott AVE

ECOLOGY

Number of Trees by Species

Yearly Ecological Impact Of Trees In Belltown

1,528 trees

304,363.05 lbs of CO2 sequestered

816,826 gal of water conserved

38,095.23 kwh energy conserved

$28,244.51 saved

DISTRICT ANALYSIS

SOCIAL

DENSITY OF BELLTOWN:
19,025
/ square mile

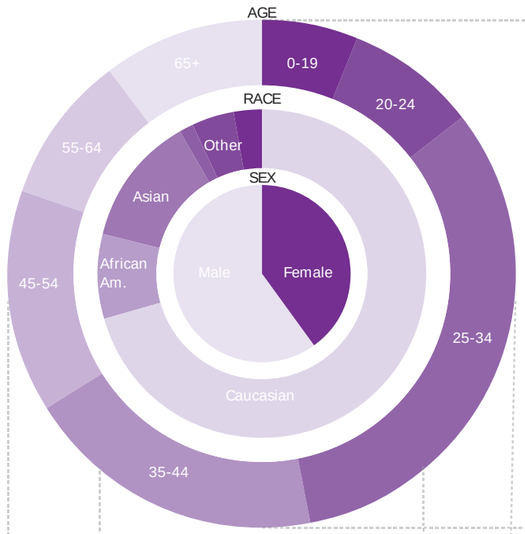
DENSITY OF SEATTLE:
8,161
/ square mile

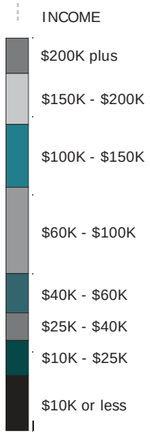
Belltown is the 6th fastest growing neighborhood in America

8,109
Households

100+
Restaurants, bars and Cafes

50+
Major employers

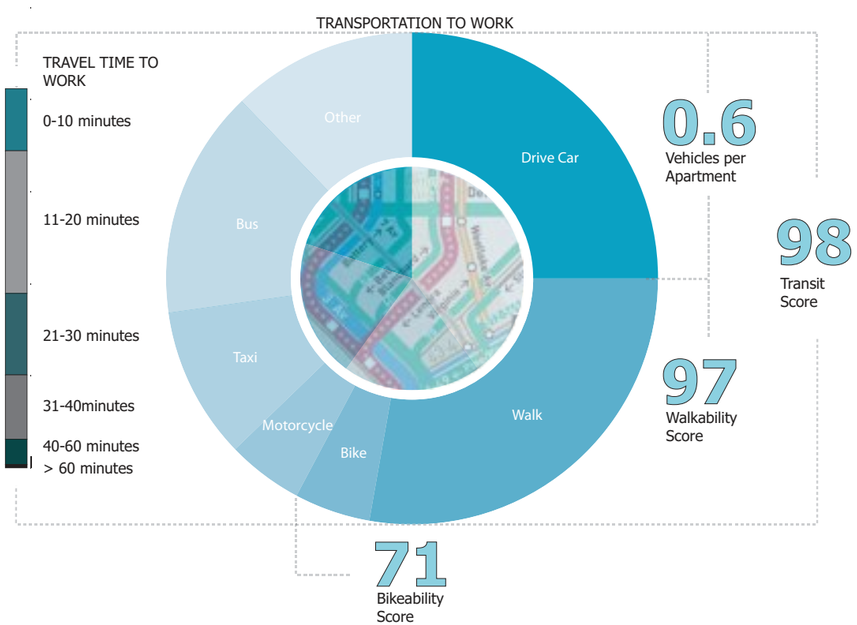




22.5% born in Washington
18.1% Non US Citizens

Total Population of Belltown ~ 12,000

16%
Family Households



0.6
Vehicles per Apartment

98
Transit Score

97
Walkability Score

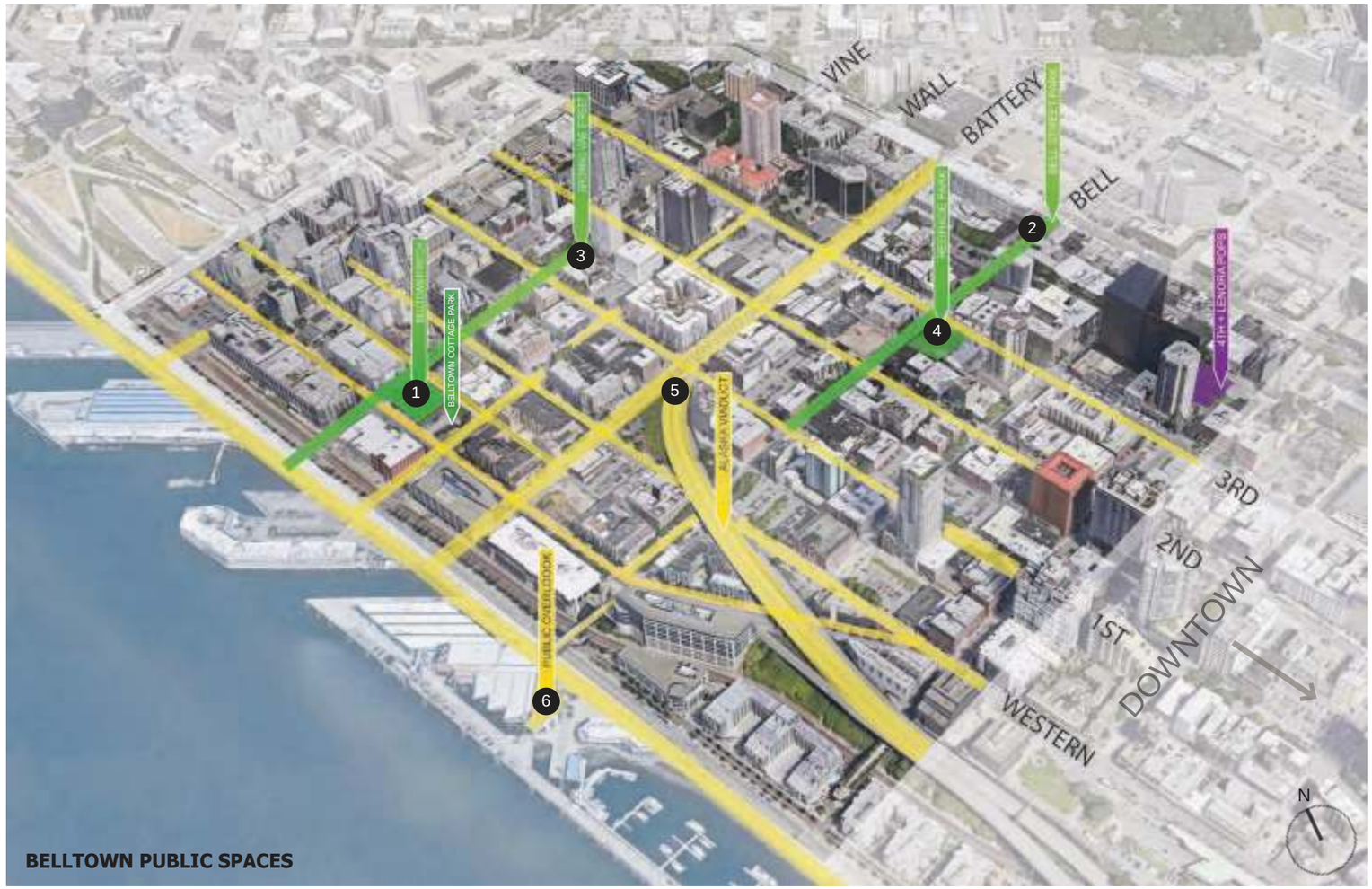
71
Bikeability Score

DISTRICT ANALYSIS

PUBLIC GREEN SPACE

PUBLIC RIGHT OF WAY

PRIVATELY OWNED PUBLIC SPACE



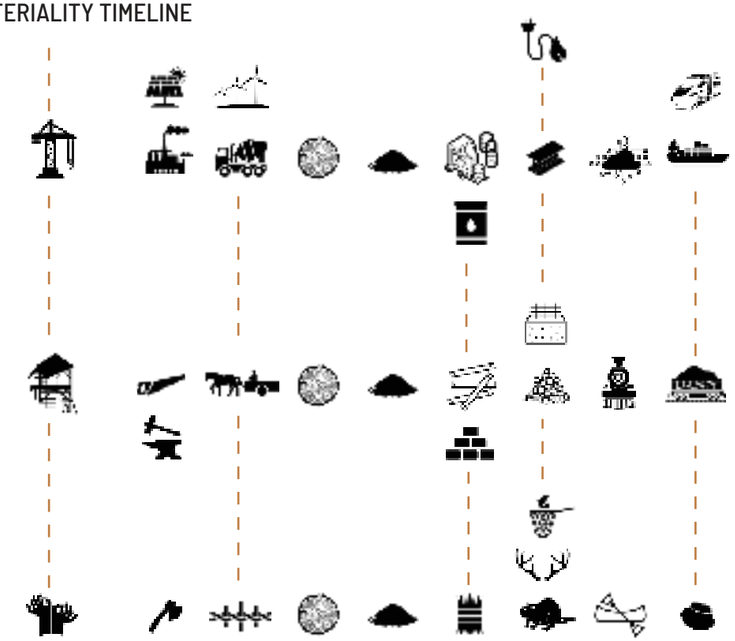
BELLTOWN PUBLIC SPACES

Drawings: Rachel Wells

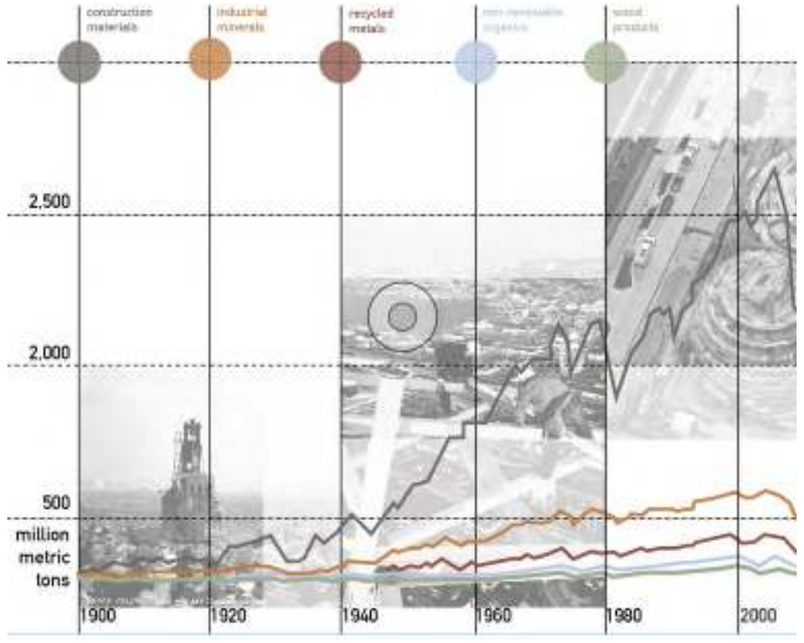
DEEP CONTEXT

DISTRICT ANALYSIS

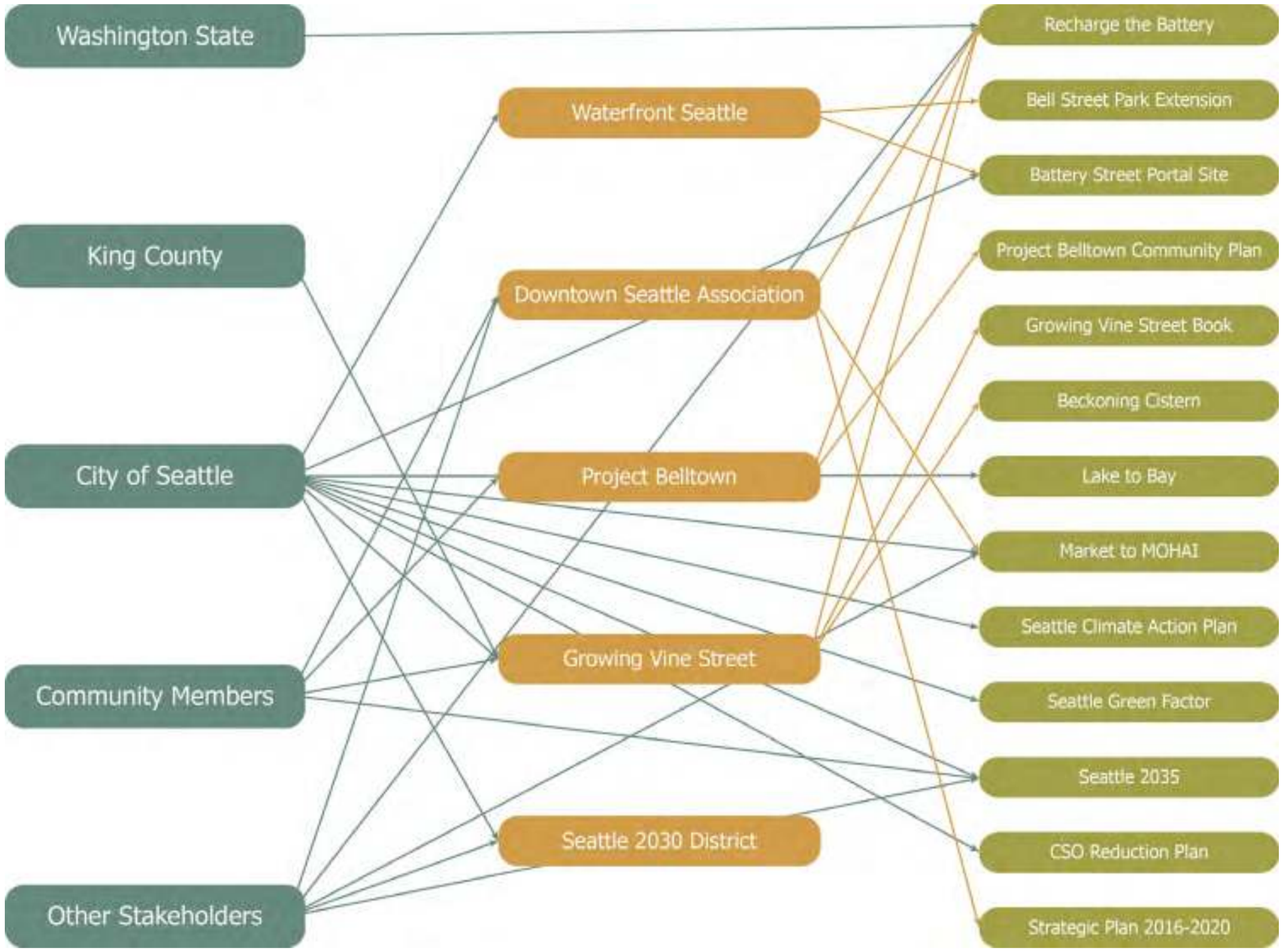
MATERIALITY TIMELINE



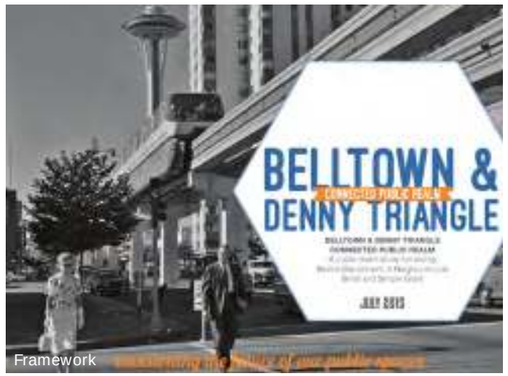
POPULATION GROWTH AND RESOURCE USE



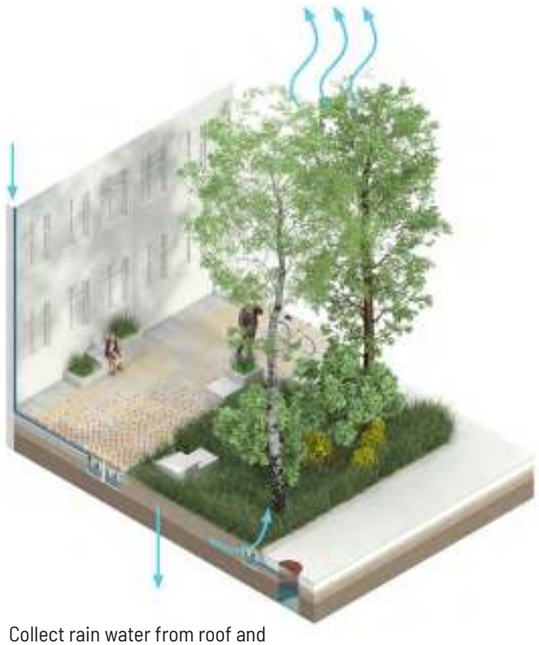
PLANS



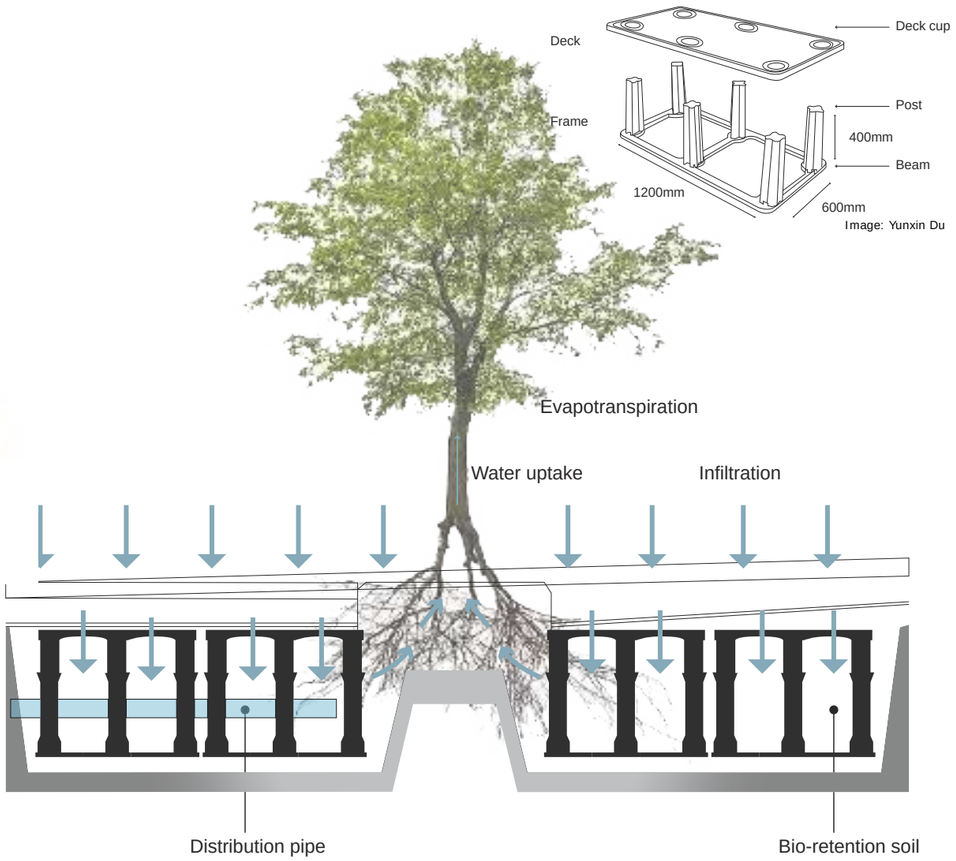
DISTRICT ANALYSIS



DISTRICT TOOLBOX



Collect rain water from roof and pavement to re-use it.



Typical Green Wall Components

Waterproof Layer

Steel Structure

Irrigation

Growing Planters

STORMWATER TOOLBOX

PERVIOUS PAVEMENT

STRATA/STRATA CELLS

URBAN FOREST

BIOFILTRATION CELLS/PLANTERS

GRASSPAVE

GREEN FACADES

GREEN ROOFS

GREEN WALLS

SPLASH BOXX

CISTERNS

CONSTRUCTED WETLANDS

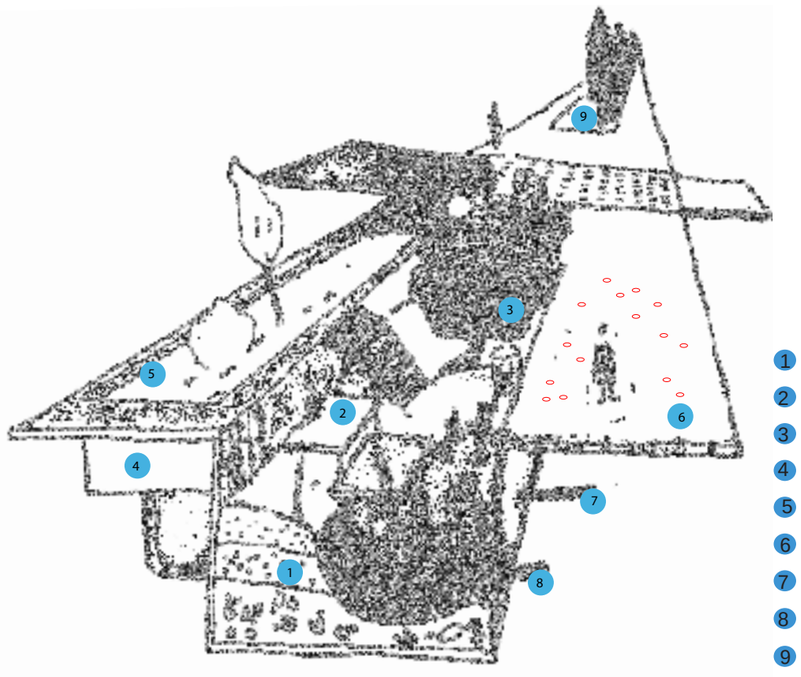
DISTRICT FRAMEWORKS

WATER

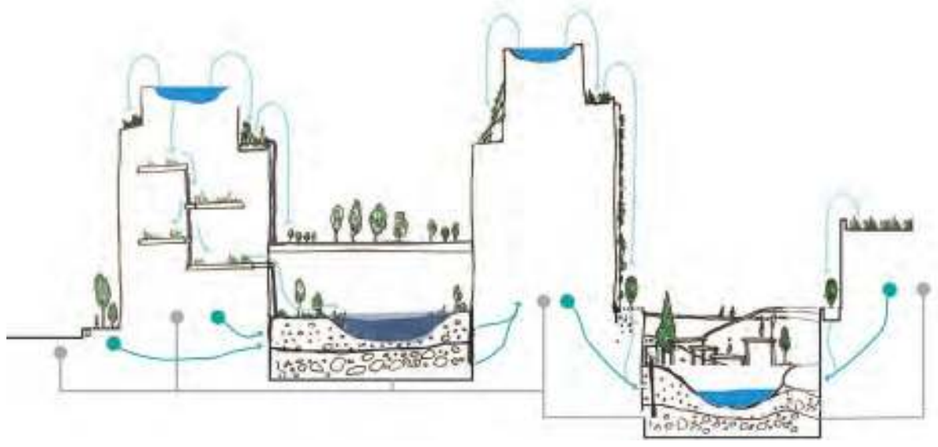
DISTRICT FRAMEWORK

Yutong Hu, GIS Base Files Resource

Daylighted portions of the Battery Street Tunnel

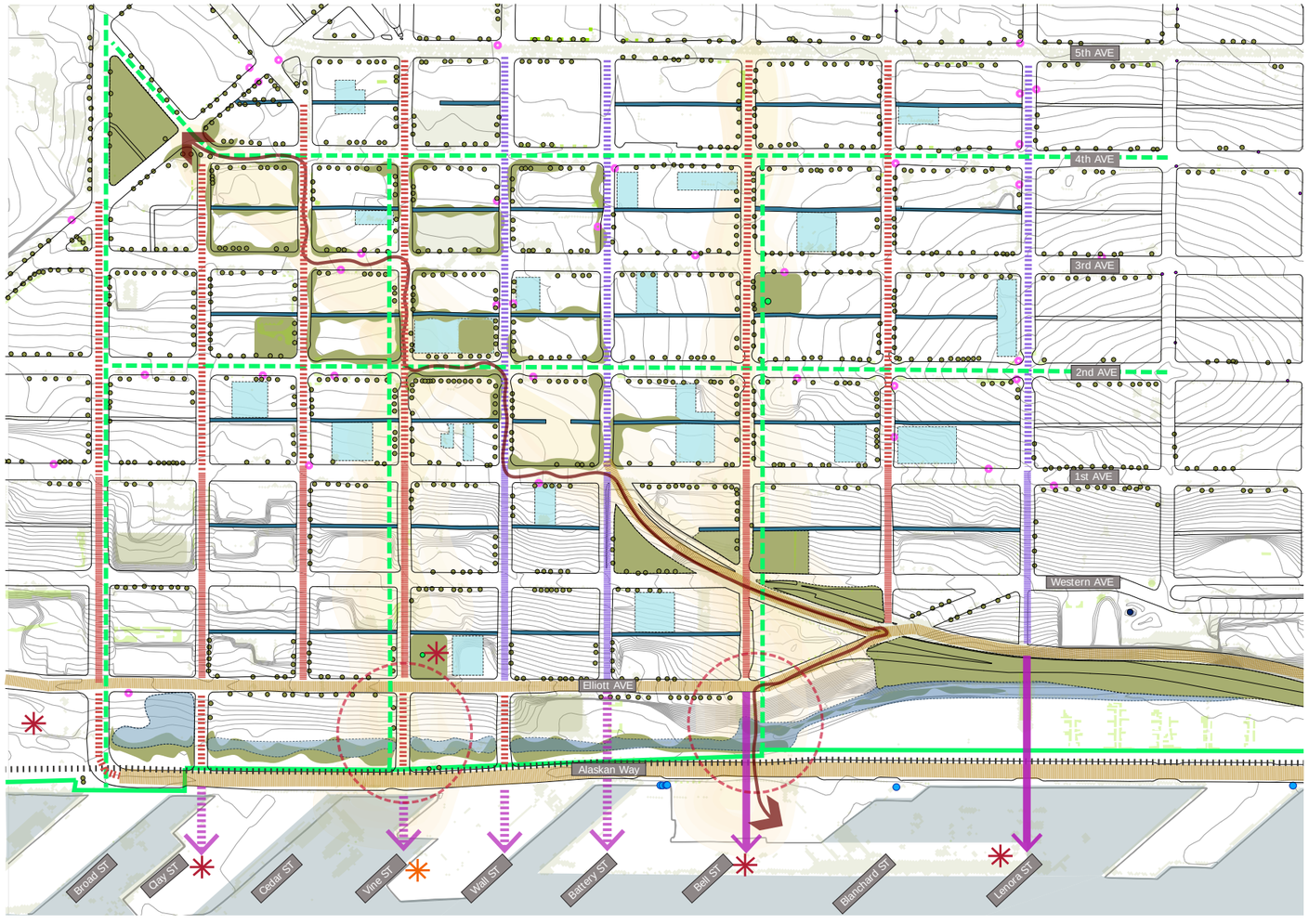


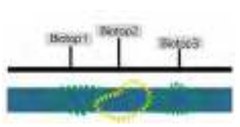
1. Vertical Flow Constructed Wetland
2. Pedestrian access to interior of tunnel
3. Mycoremediation areas in portions remaining capped
4. Greywater collection basin for sidewalk planters
5. Bioretention sidewalk planter boxes
6. Permeable pavement
7. Greywater outflow
8. Blackwater inflow to lower levels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

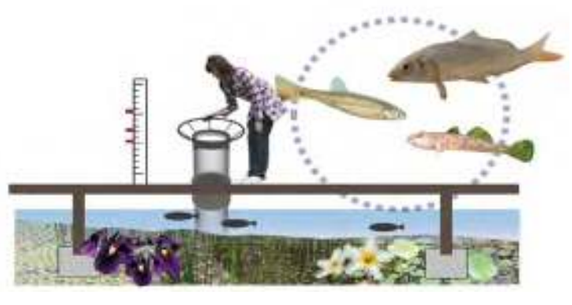


MOBILITY

DISTRICT FRAMEWORK







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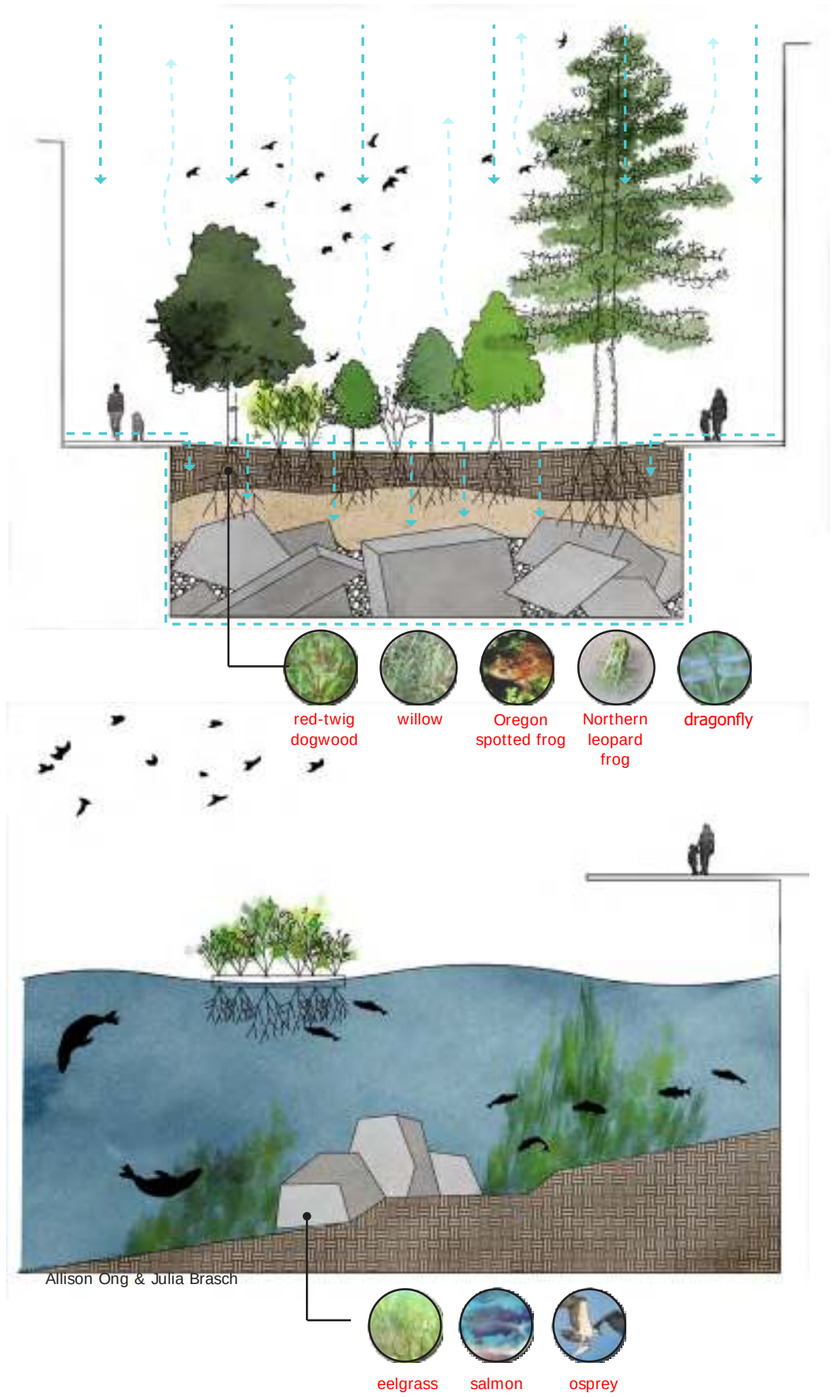
City / Nature for Climate Resilience

ECOLOGY

DISTRICT FRAMEWORK



SOCIAL

DISTRICT FRAMEWORK

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.

DEEP CONTEXT

DISTRICT FRAMEWORK

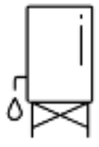
What if every historic building in Belltown had...

A Blue Roof...

Historic Buildings	23
Average Roof Area Per Building	7,000 sq. ft.
Avg. Depth of Blue Roof	3”
Volume of Water Per Building	13,090 gallons
Total Volume of Water	

301,070 gallons

An External Cistern...



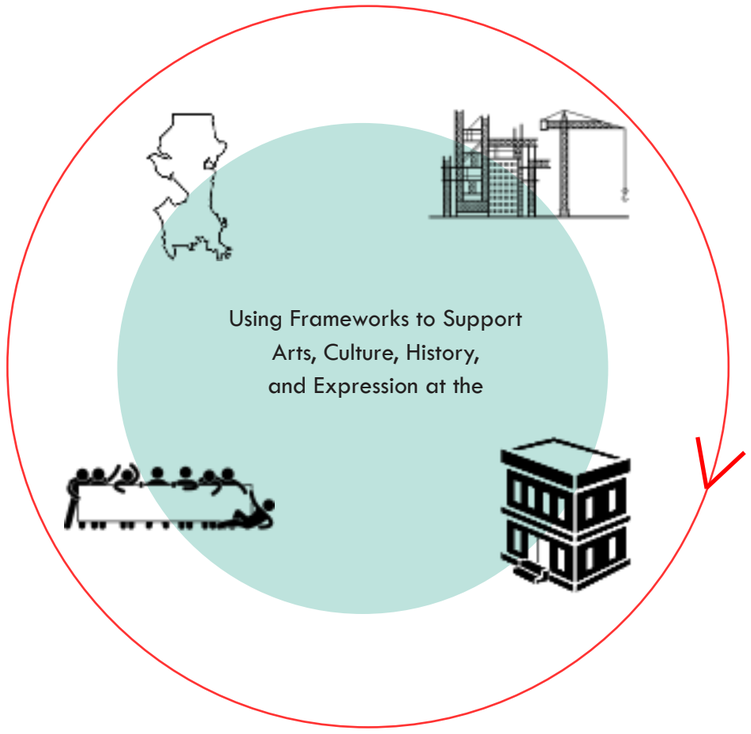
Potential Site Area	206,667 sq. ft.
Average Water Storage Depth	4”
Cubic Feet of Water	68,900
Volume of Water Per Building	13,090 gallons
Total Storage In Potential Sites	

515,400 gallons

A Raingarden...

Historic Buildings	23
Average Size Garden	30 sq. ft.
Avg. Depth	6”
Rainfall Captured in Rain Event	70 gallons
Total Volume of Water	

1,610 gallons



STORMWATER METRICS

POTENTIAL IF FRAMEWORKS IMPLEMENTED

2,338,670 GALLONS
STORMWATER STORAGE

894,413,635 GAL.
STORMWATER MANAGED

468,819,140 GAL.
POTABLE WATER SAVED

TARGET

130,000 GALLONS
STORMWATER STORAGE

67,000,000 GALLONS OF
POTABLE WATER SAVED +
STORMWATER MANAGED

SITES: BELLTOWN

1 Alleyways

2 Small-Scale Interventions

3 Battery Street Portal

4 Battery Street

5 Waterfront and Connections

6 P-Patch Parking Lot

Image: Aaron Parker

BEACH TO BLUFF

Aaron Parker, Margot Chalmers,
Nina Mross, Roxanne Glick

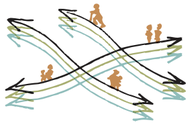
This project was catalyzed by the planned removal of the waterfront trolley tracks running along Alaskan Way. Despite its prime waterfront location, this area is used as a conduit for transport and boat tourists. It is largely an impermeable, grey expanse.

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.

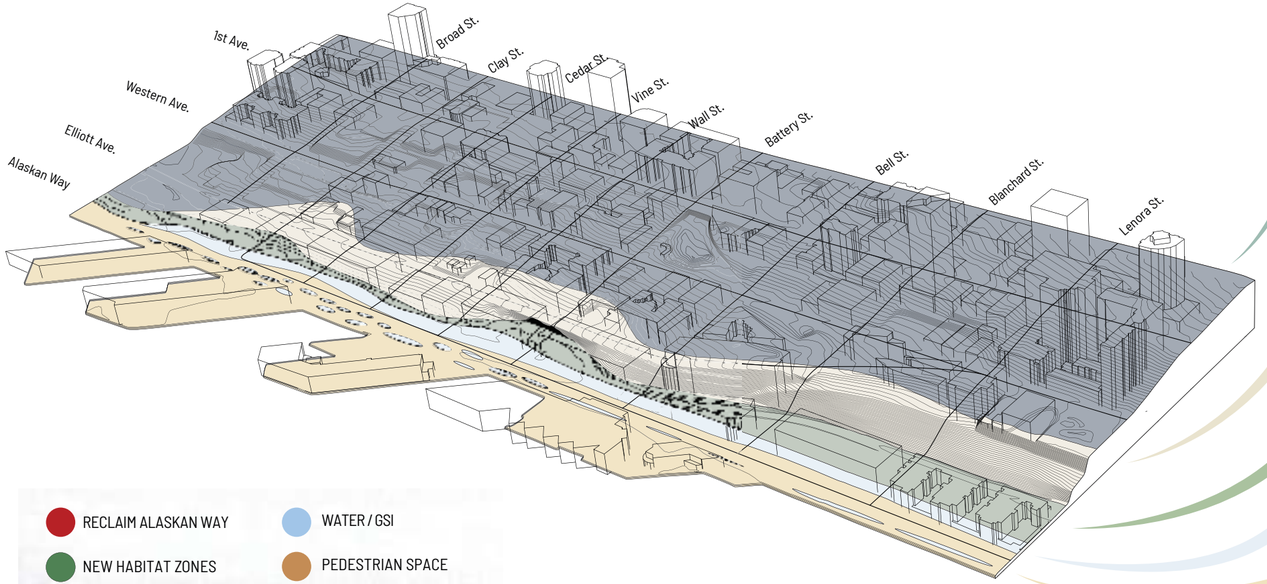
R. Glick

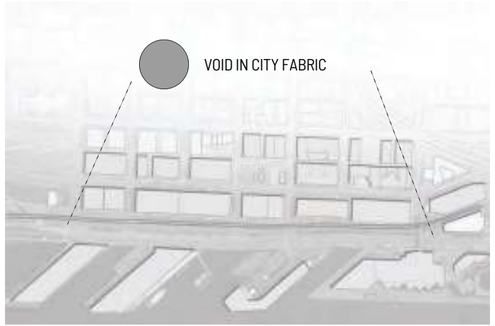
VIBRANT SOCIAL &
CULTURAL SPACES

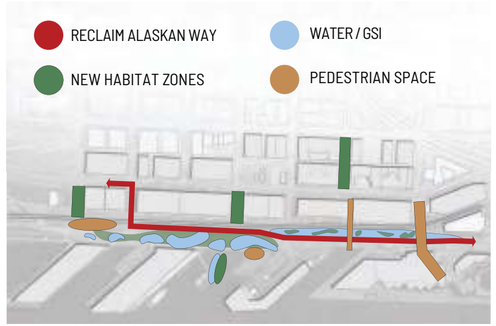


RECONNECT WEBS OF LIFE

SENSE OF PUGET SOUND







UPLAND FOREST EDGE

BLUFF

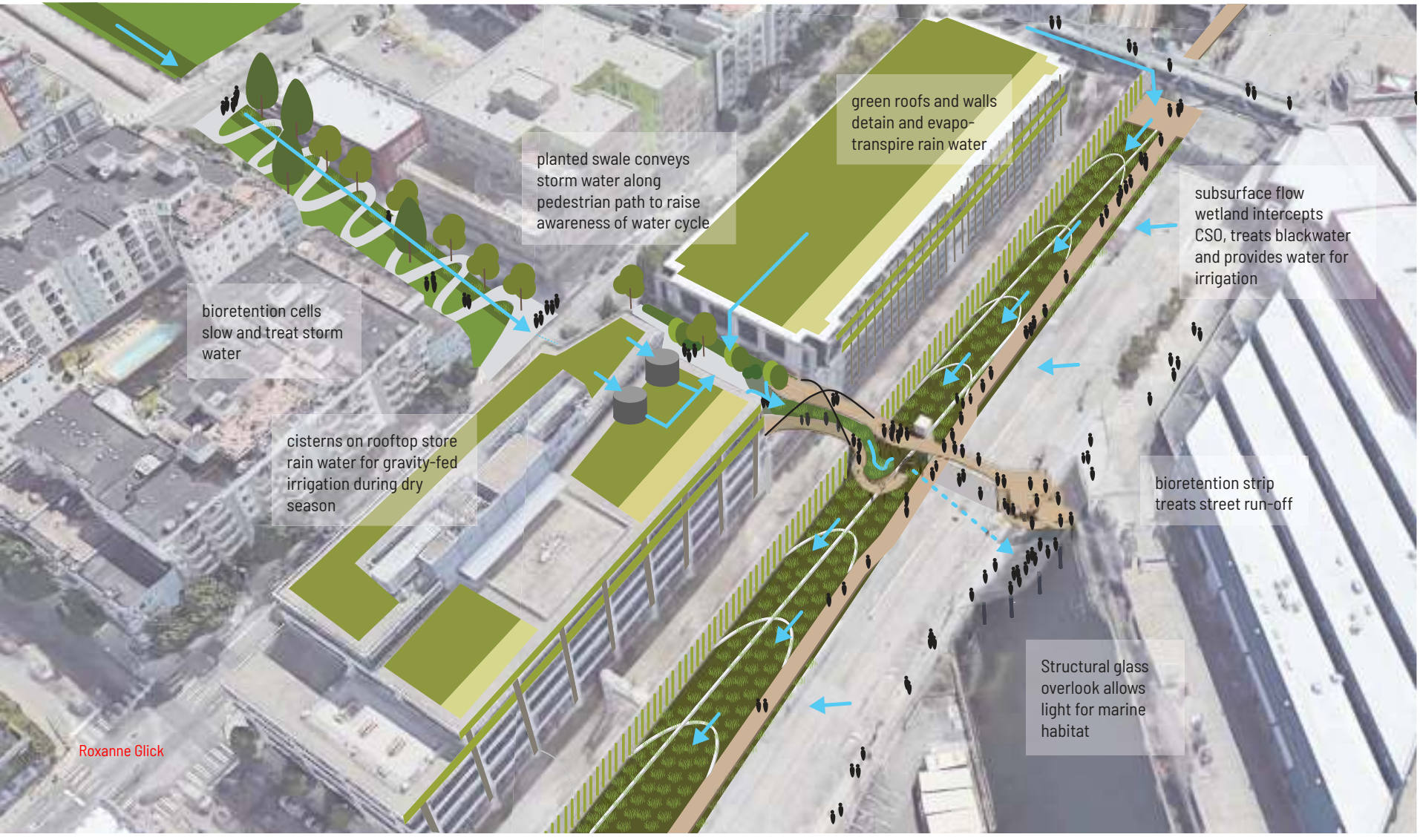
BACKSHORE

DEFLATION PLAIN / WETLAND

BEACH

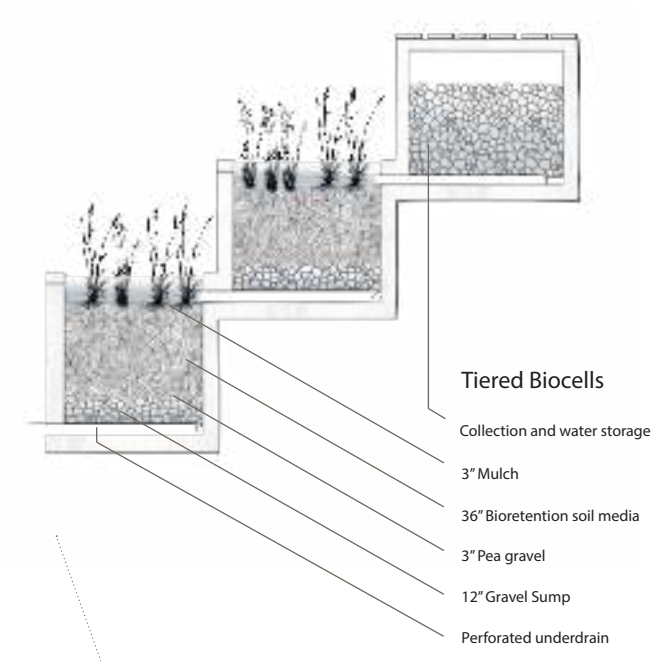
N. Mross

Water system overview diagram



UPLAND FOREST WALKWAY

Image: Aaron Parker



Street claiming typology:

Transferring streets from cars to usable pedestrian space.

Connections from the waterfront into Belltown offer a unique challenge; one must cross train tracks and navigate between uninviting buildings, there is very little attractive signage or wayfinding, and there is a substantial elevation change and steep grade.

This typology offers an ADA path smoothly winding between open flexable and durable turf area, seasonally colorful plantings, and a substantial green stormwater infrastructure to manage adjacent building stormwater runoff.

The stormwater infrastructure offers simple biocell technology gathering drainspout runoff and also provide extra storage during substantial rain events.

CLOUD BRIDGE

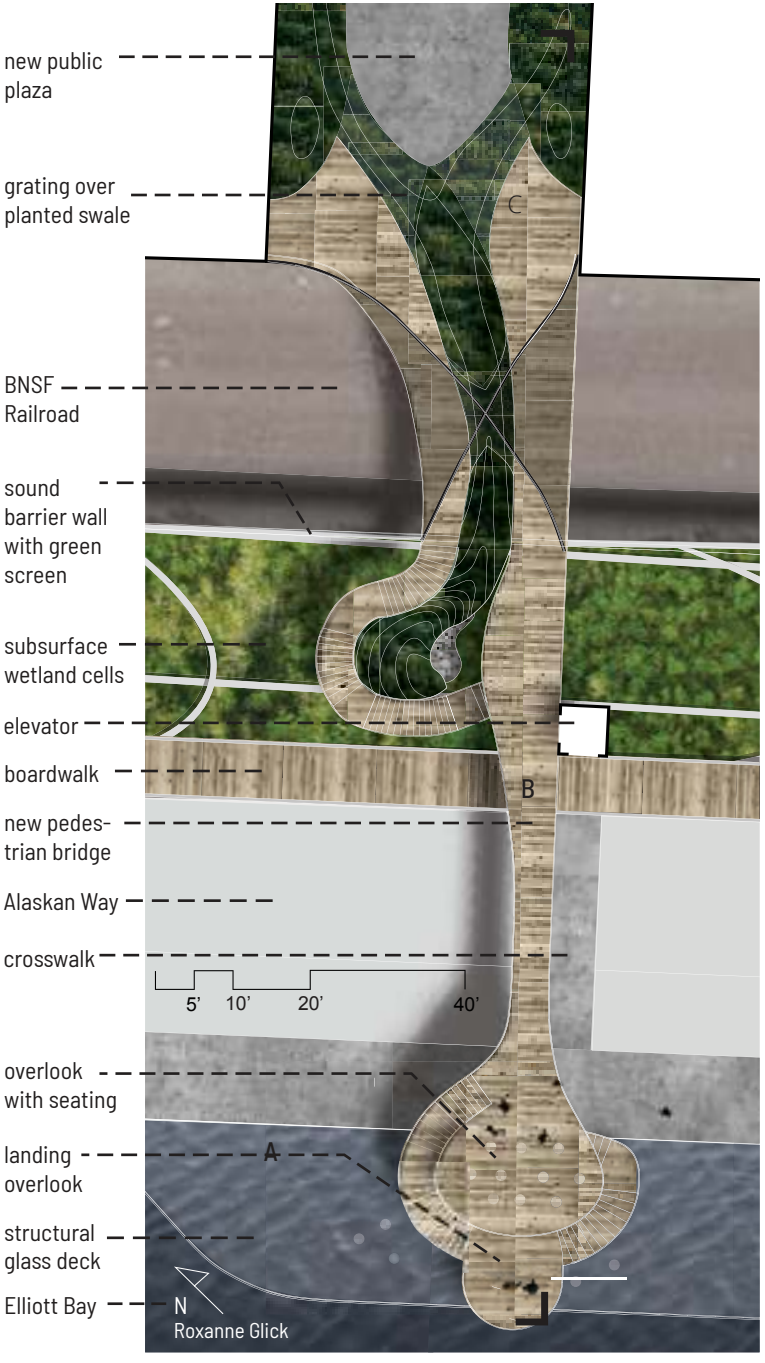
The existing Bell Street Bridge infrastructure is layered onto, thickening function and enhancing the experience. Cedar slats, green roofs, string lighting, and vines inhabit what was once a utilitarian space. Treated runoff and greywater is brought over the bridge and vaporized into clouds in the summer, cooling the sunny bridge. A new connection is made to the interceptor wetlands running along Alaskan Way. Black water is brought from the above neighborhoods into two large storage tanks underneath the new under-bridge plaza. At the upper entrance, a new Native Landing Portal welcomes visitors to Belltown, and the historic site of babáqwab, or Little Prairies, the Duwamish village that once stood here.

BATTERY STREET RAVINE

View C. Passage through time - Little Prairies Memorial

A new pedestrian connection between Elliott Ave and Alaskan Way at the base of Battery Street, draws formal inspiration from a ravine that use to exist in this area. The experience walking the bridge travels through history and the water cycle. View “C” shows an enclosure over the train tracks etched with historic photos of the same view beyond and could integrate other memorial elements to the burial ground in this area. In view “B” a native-planted seasonal stream (fed by roof runoff) is integrated with the bridge structure. In View “A” the pedestrian bridge terminates in a multilevel viewing deck with a structural glass ground level to maximize light for salmon habitat below.

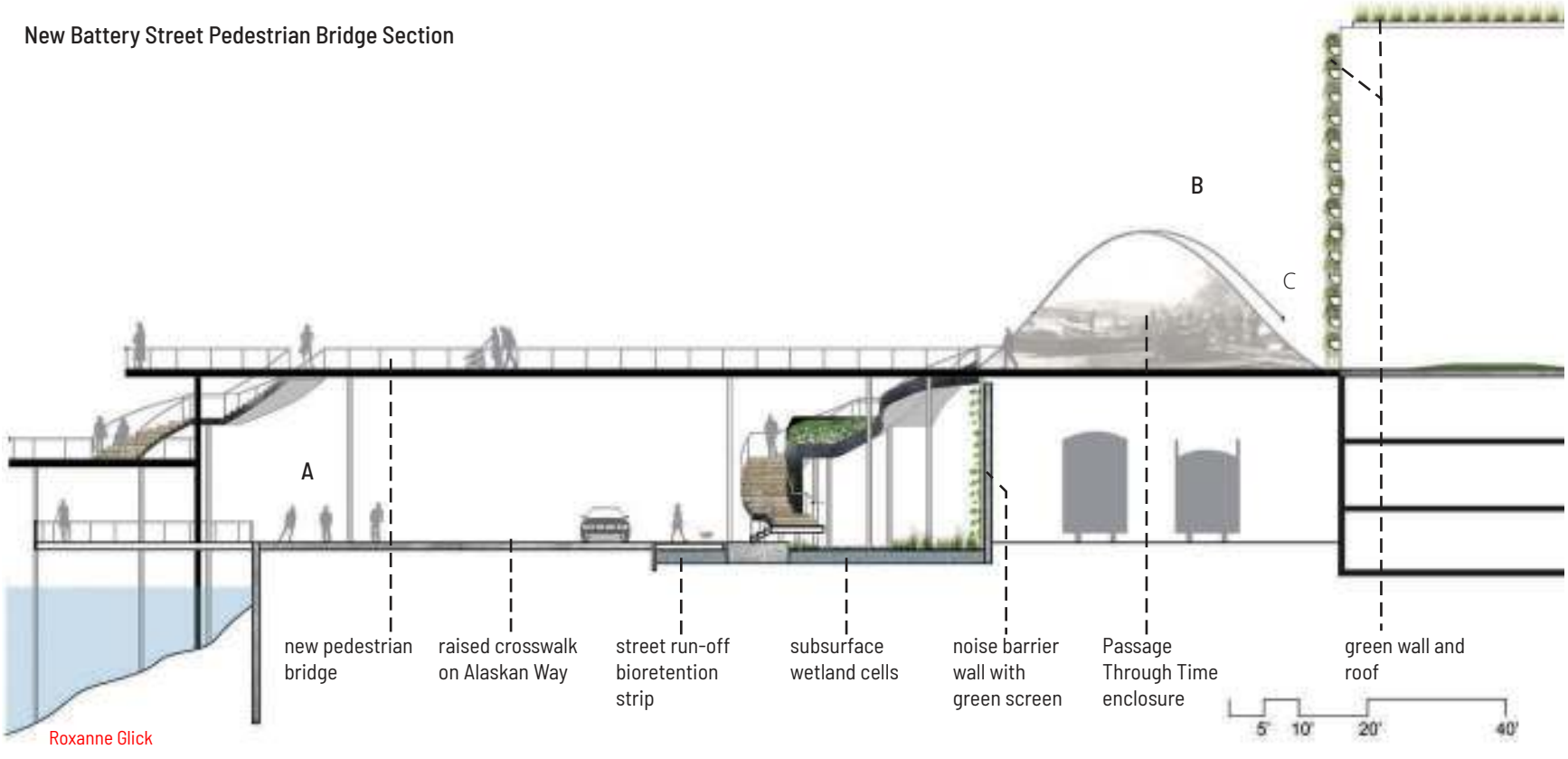
New Battery Street Pedestrian Bridge Plan



View B. Eco-revelatory swale-bridge

View A. Waterfront stair-shelter with glass deck

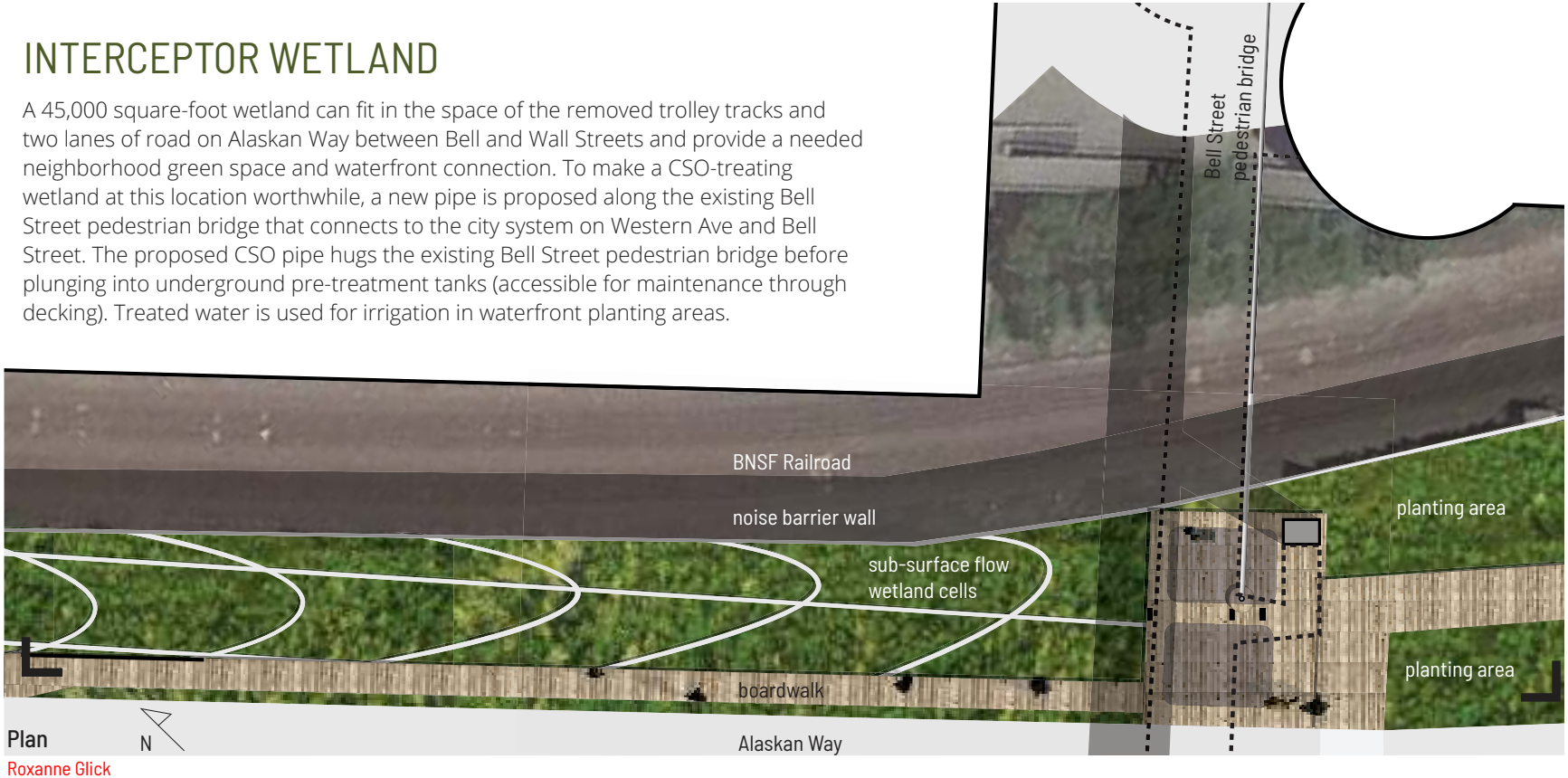
New Battery Street Pedestrian Bridge Section



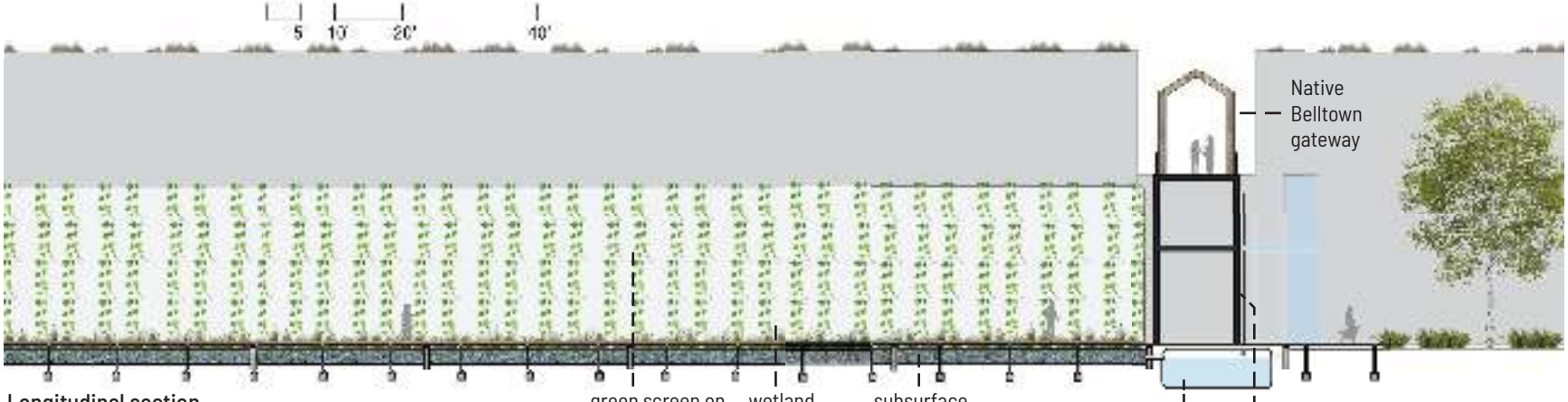
Roxanne Glick

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.



Plan
Roxanne Glick

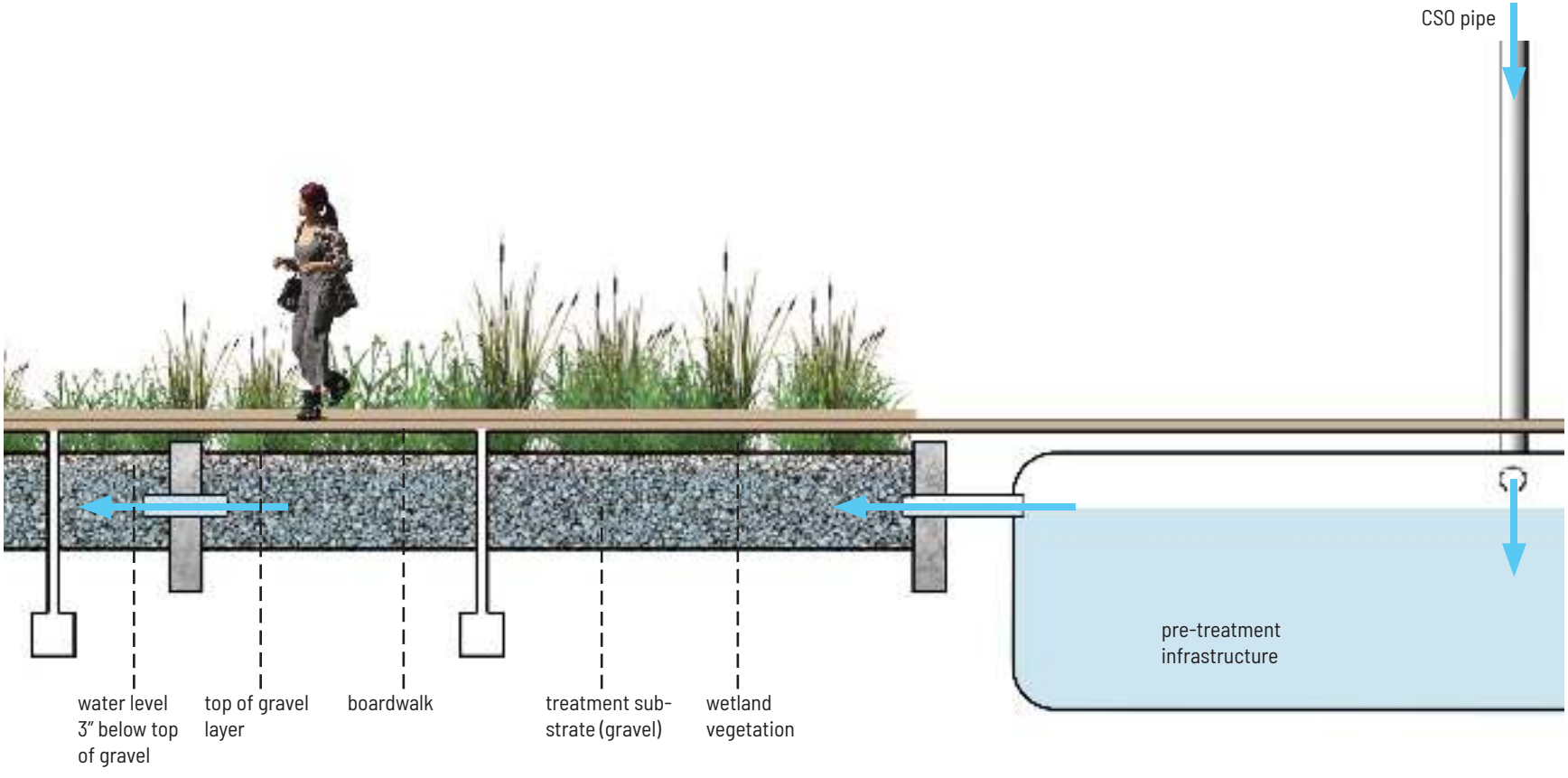


Longitudinal section
Roxanne Glick

Subsurface Flow Wetland

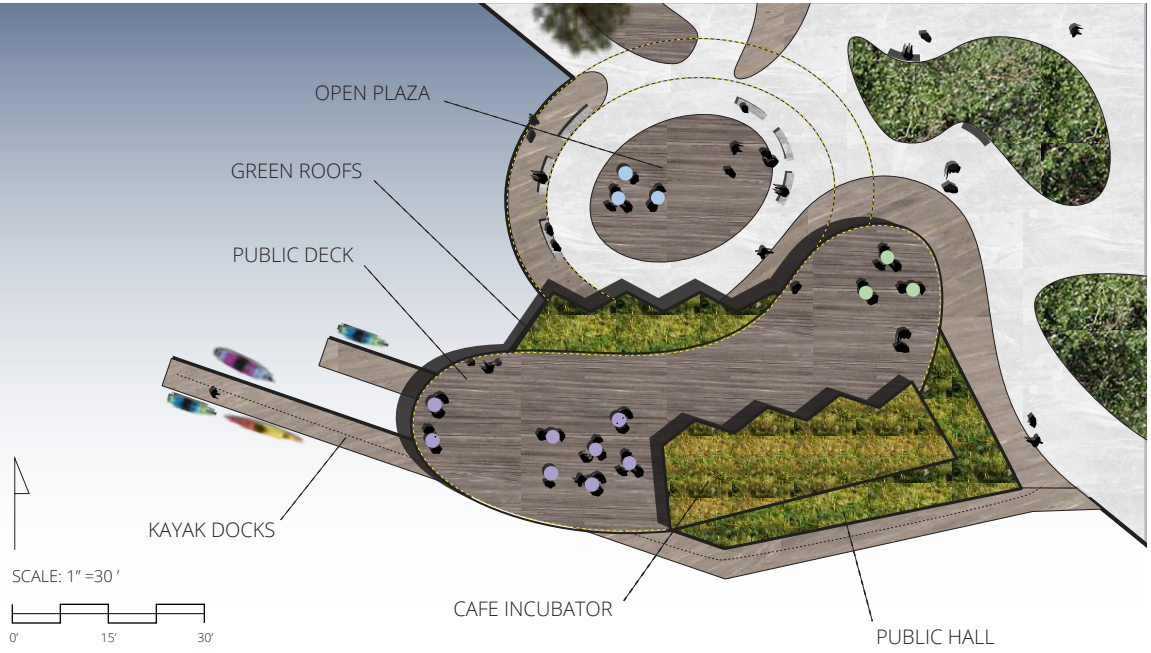
This proposal calls for blackwater-treating green infrastructure with a capacity up to 850,000 gallons of water that could be collected from 12 blocks of southern Belltown would help prevent combined sewer overflows. Water is treated in a series of horizontal flow subsurface wetland cells without the 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 its self.

Waitangi Park, Photo: Nancy Rottle

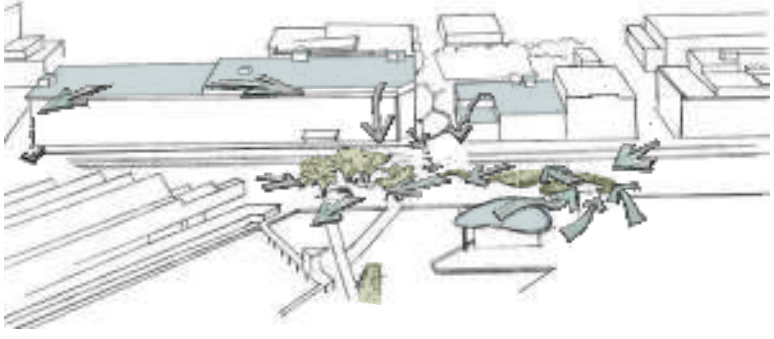


WATER'S EDGE COMMUNITY CENTER

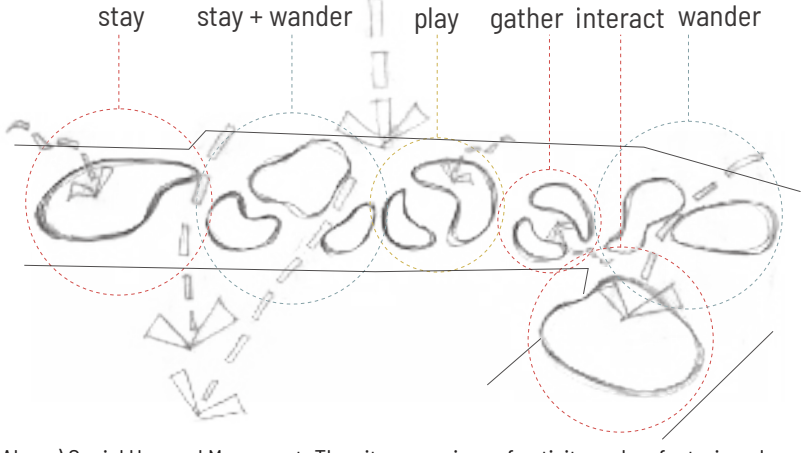
This center provides 4,000 ft^2 of public indoor space, plus a large plaza, performance space and roof deck. It has sports and educational capacity, restrooms and showers, a visitor's center, and a cafe incubator on the roof. Pop-up events can be held both inside and out. Summer camps and after school programs use the space. In summer, the building is open and airy - in winter, warm and inviting. Both upper and lower levels have green roofs, fed by greywater from the building. A kayak dock brings waterborne visitors up to the center and Alaskan Way. Locals and tourists alike come for the views, the programming, the food, and the conviviality.



(Above) Plan Detail: This segment of the plan depicts how the Dunescape connects and functions with the community center and boardwalk.



(Above) Site Hydrology: Arrows depict the movement of water throughout this area of the site. Water is collected from surrounding rooftops, parking lots, and streets. It then infiltrates the boardwalk and enters the underground water storage layer before being deposited to the sound.



(Above) Social Use and Movement: The site comprises of activity nodes, featuring places to play, gather, socialize, wander and relax. The site serves to connect people out onto the water as well as up into Belltown.

DUNESCAPE BOARDWALK

The waterfront dunescape is a series of rolling boardwalk decking and sunken wetlands that help bring and connect people to the waterfront, provide habitat for birds and wetland creatures, and contain stormwater runoff.

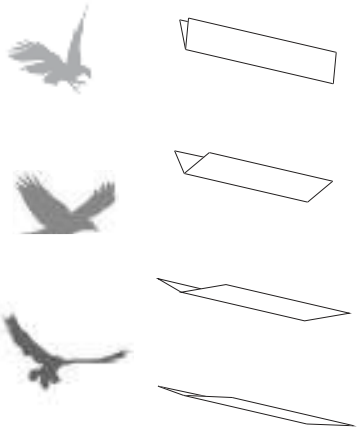
The re-designed boardwalk will serve as a dynamic, open-ended public amenity with areas for relaxing, socializing, strolling, playing + learning. Underneath the boardwalk is an water storage layer that collects water from surrounding streets + buildings. A series of meandering wetland, dunegrass and structural features provide habitat throughout the waterfront.

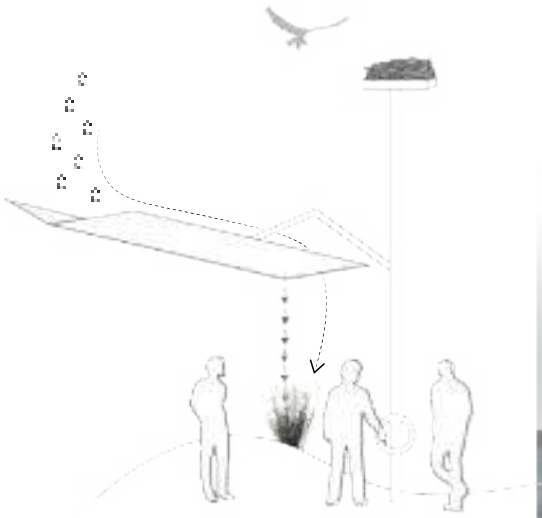
(Above) Concept: Flexible, adaptable "cells" respond to weather events and function as part of an integrated social and ecological system

The Dunescape at night

Soft, inviting pathway and overhead lighting allows the Dunescape to transform into a nighttime strolling + social gathering space. The lighting is designed for minimal interference with bird and wildlife habitat, as overhead structures block light from reaching the osprey nests above.

All images: Margot Chalmers

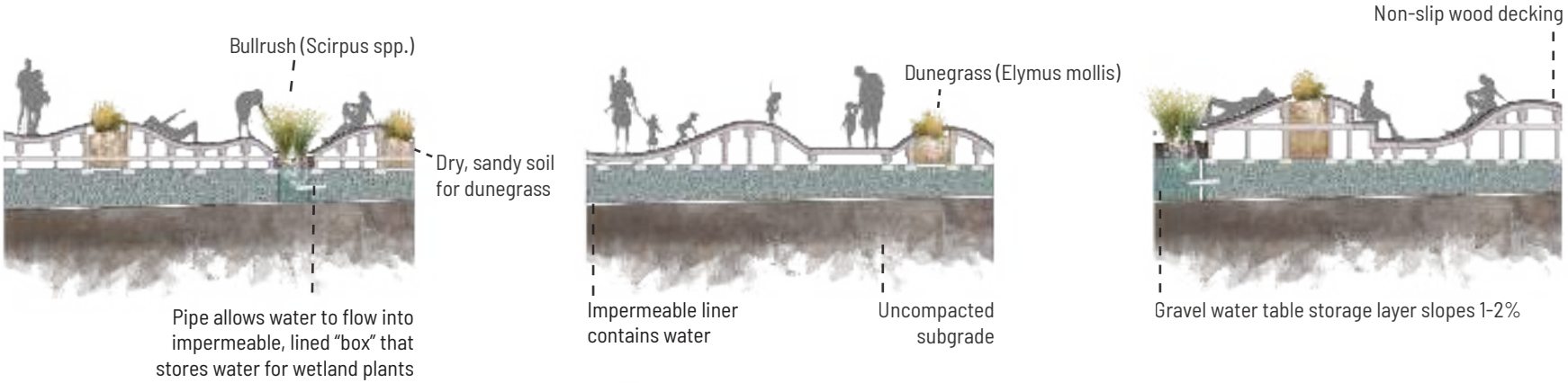




Inspired by the movement of avian wings, these multi-functional structures are found throughout the dunescape. These customizable shelters allow users turn the wheel to open and close the aluminum shelter flaps to their desired extent. The structures funnel water via rainchains into wetland grasses and transfer water to the underground water table storage layer. The structures support nests for ospreys, drawing the user's eye up and around the site.

All images: Margot Chalmers

DUNESCAPE DECKING AND HYDROLOGY

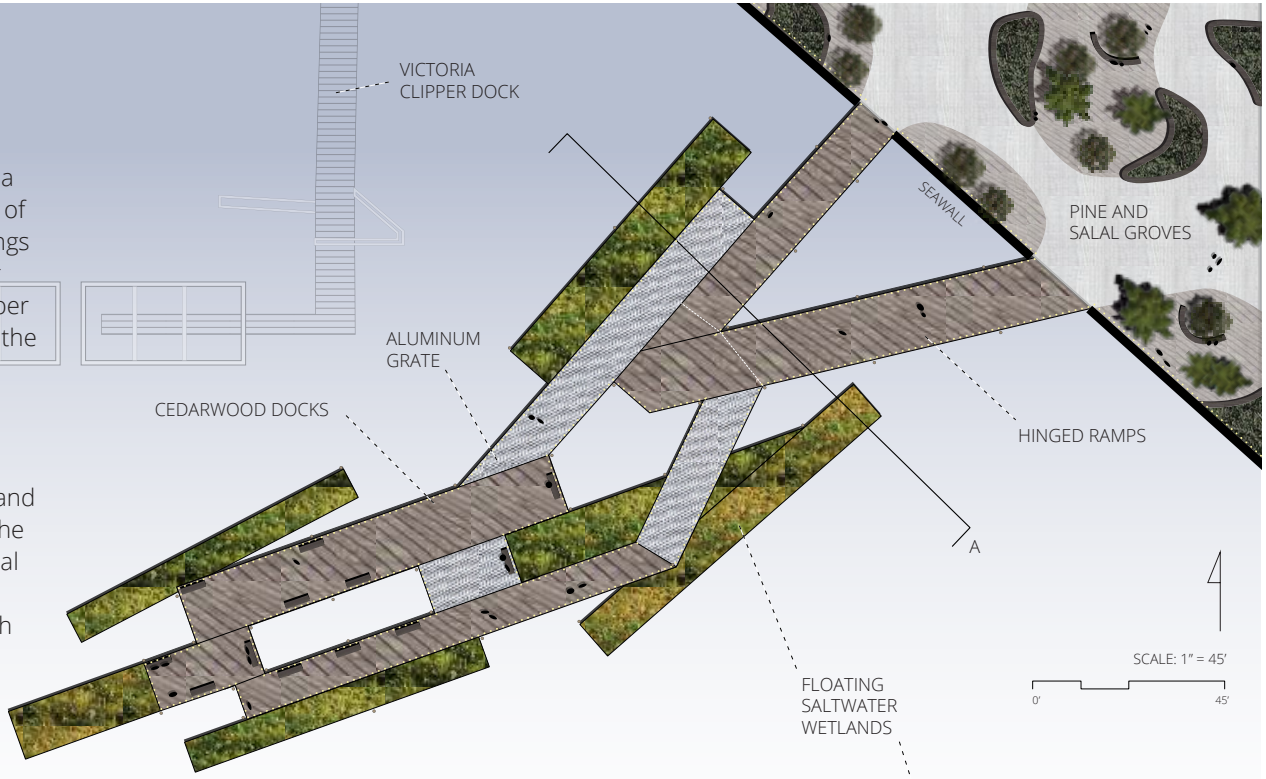


All images: Margot Chalmers

LOG JAM
FLOATING WETLANDS

At the foot of Vine St., between the Victoria Clipper and the Edgewater Hotel, a series of floating saltwater wetlands and docks brings visitors out into the water. Anchored near the seawall and allowed to float over deeper water, the docks move up and down with the tide thanks to hinged entrance ramps.

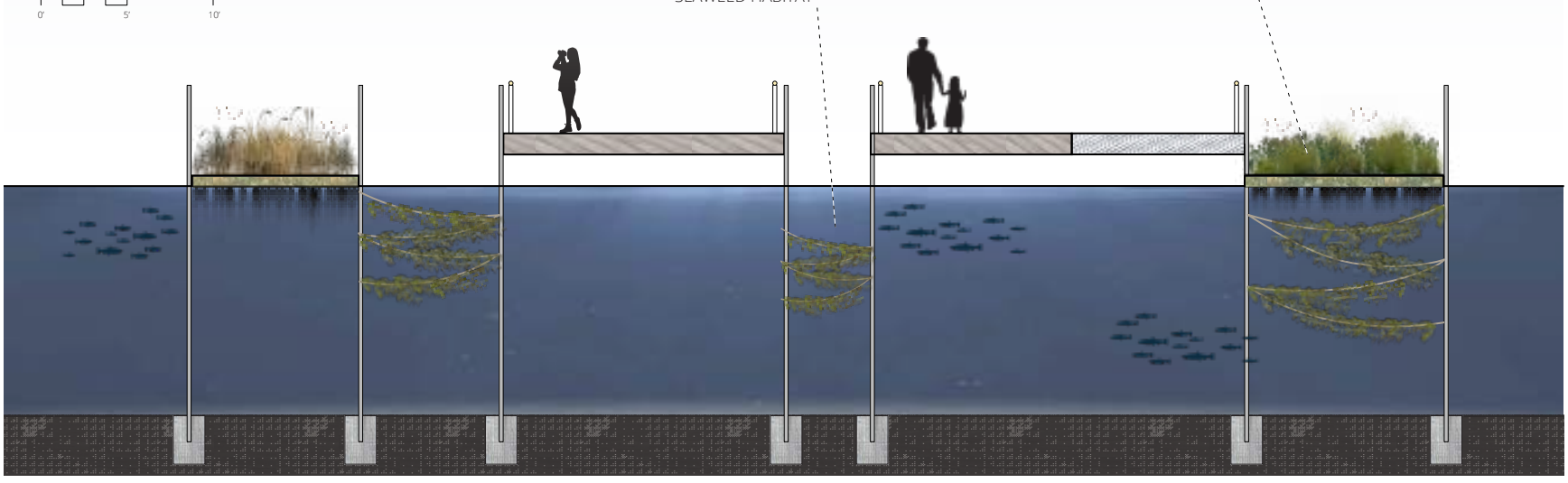
Positioned over CSO 069, these wetlands help clean the water in the event of an overflow, in addition to providing habitat and delight for people. Kayaks can pull up to the south edge of the docks. Inviting, ecological lighting activates the space at night, while protecting wildlife from too bright or harsh photonic disturbance.



SECTION A

SCALE: 1" = 10'

0' 5' 10'



N. Mross

View of the floating wetlands from one of the entrances on Alaskan Way.

LOG JAM: PAST AND PRESENT

Inspired by log jams along the coast, this design references both the natural environment and the history of timber, logging, and shipbuilding along Seattle's waterfront. Large trees growing on bluffs fall into waterways, eventually ending up as drift-wood logs. Loggers would use waterways to bring felled trees to the open harbor, where they could be shipped or processed.

Now, the shapes inspired by these histories bring new life and vital processes to the waterfront.

Image courtesy of the Seattle P.I.

Northwest Waterfront:

Rerouting Alaskan Way allows expansive pedestrian movement on the waterfront to connect existing public resources to future opportunities. Opening this large flexible space on the waterfront will allow for historic trolley cars to be used as incubator markets supporting local start-ups and small businesses. This area connects tourists through popular attractions as well as providing local event space utilizing an enlivining waterfront.

Existing car-centric right-of-way

Reclaiming pedestrian space

Image: Aaron Parker

TROLLEY PLAZA & UPLAND MEADOW

Image: Aaron Parker

Image: Aaron Parker

BEACH TO BLUFF

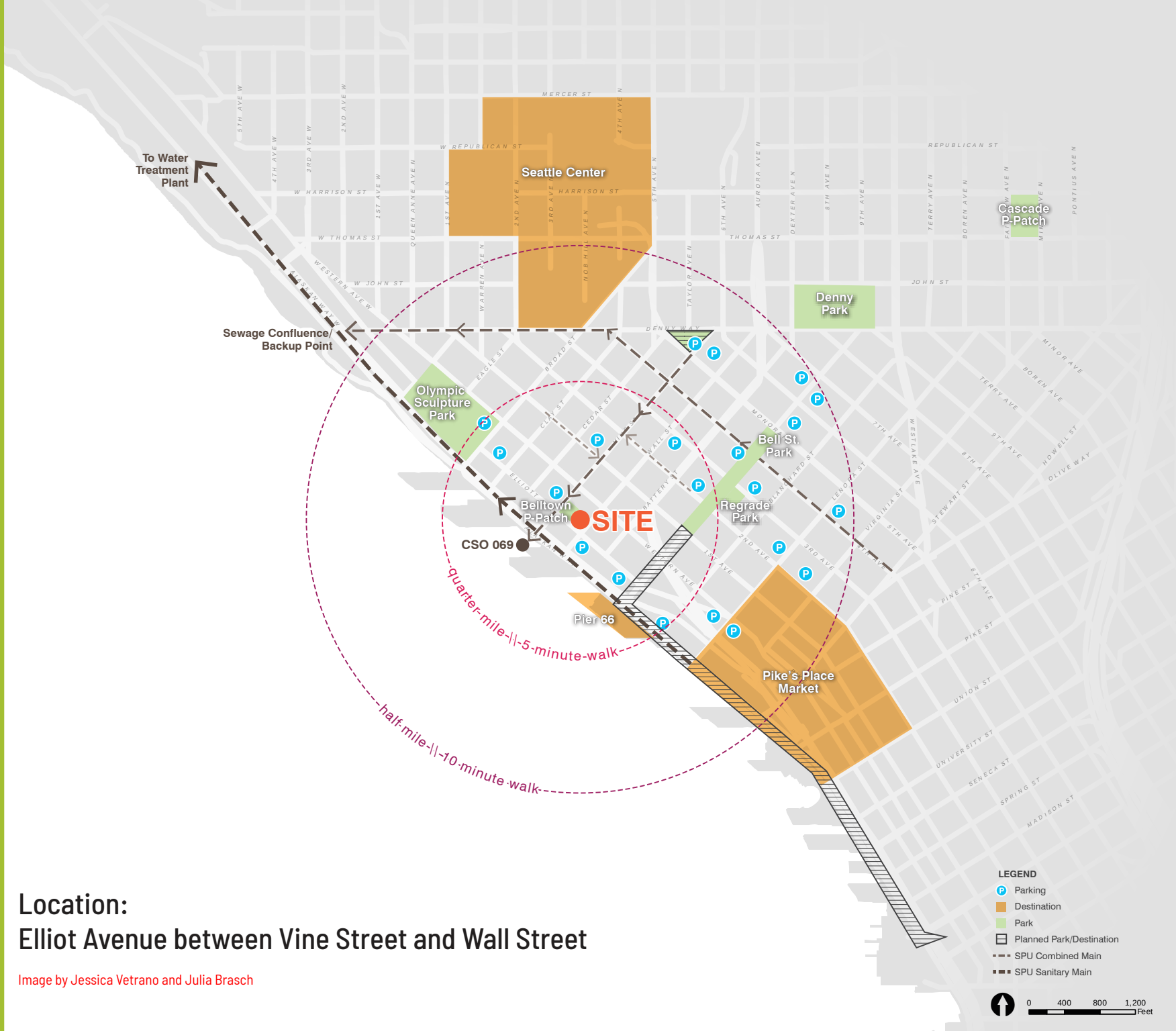
Aaron Parker, Margot Chalmers,
Nina Mross, Roxanne Glick

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.

A P-PATCH PARK FOR BELLTOWN



Location:
Elliot Avenue between Vine Street and Wall Street

Image by Jessica Vetrano and Julia Brasch

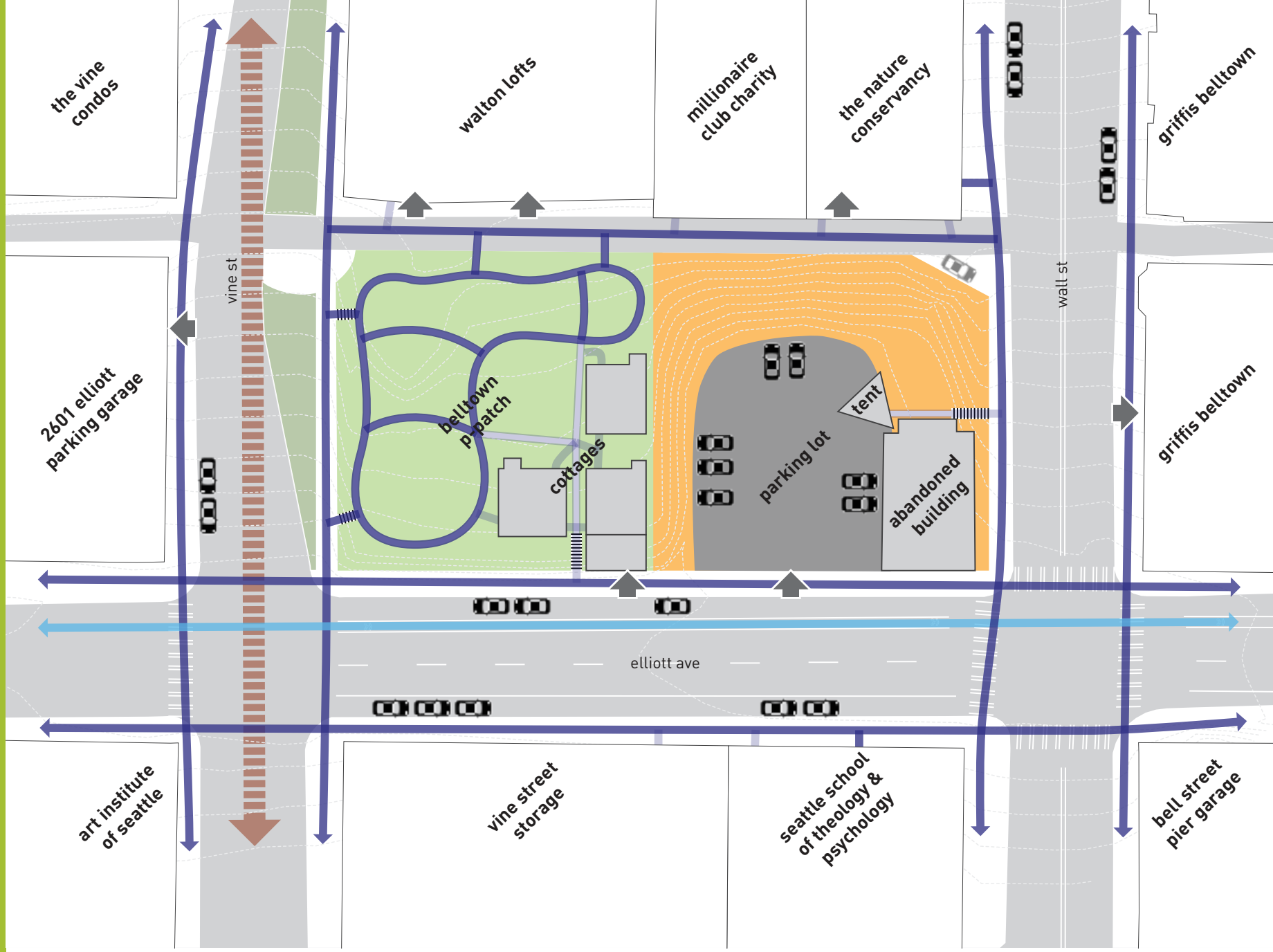
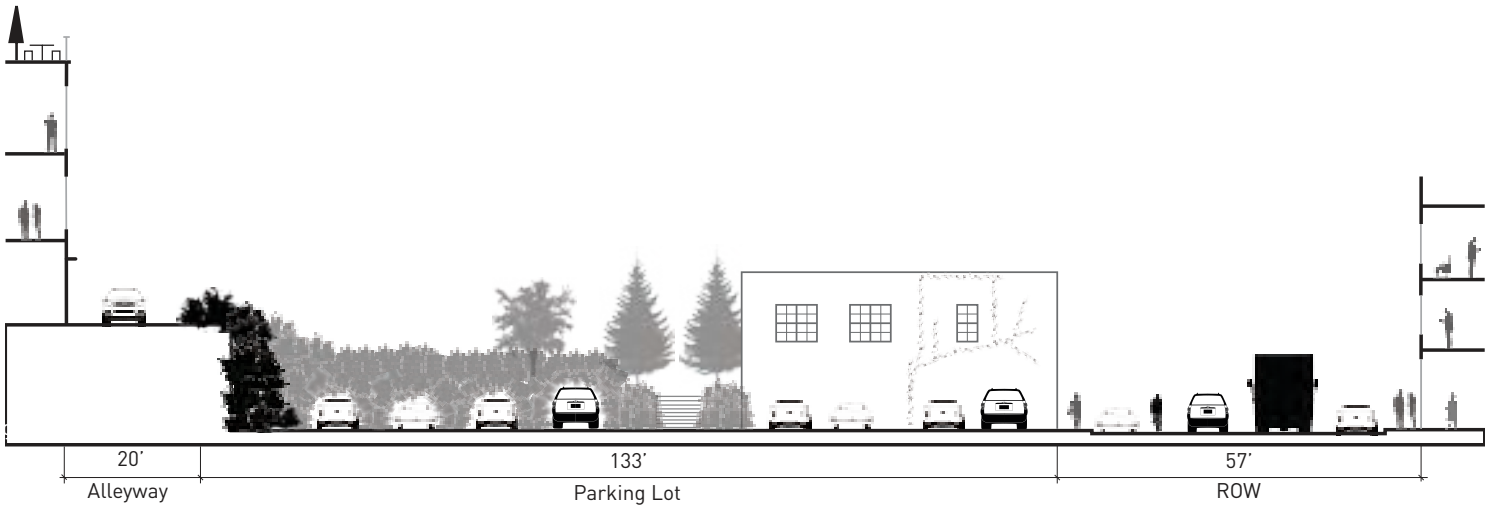
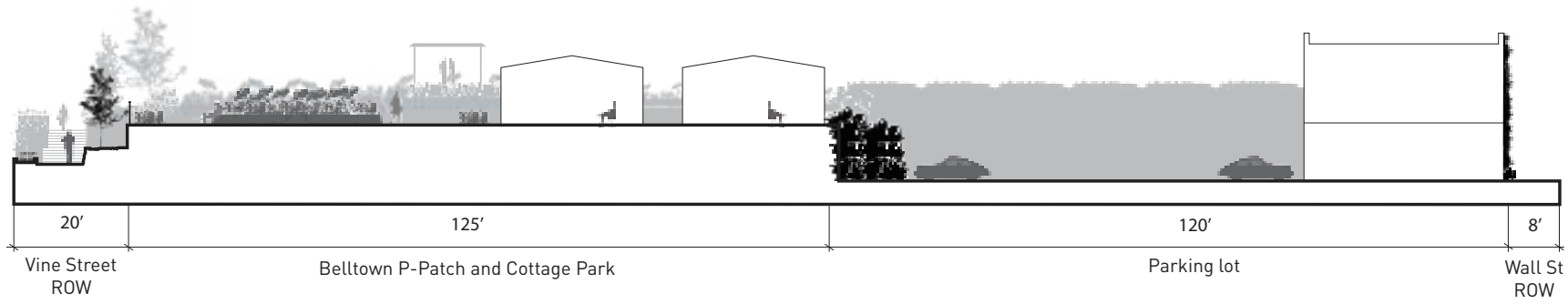


Image by Diana Settlemyer and Jessica Vetrano





Images by Kyle Cotchett

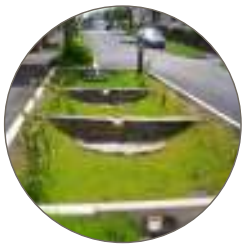
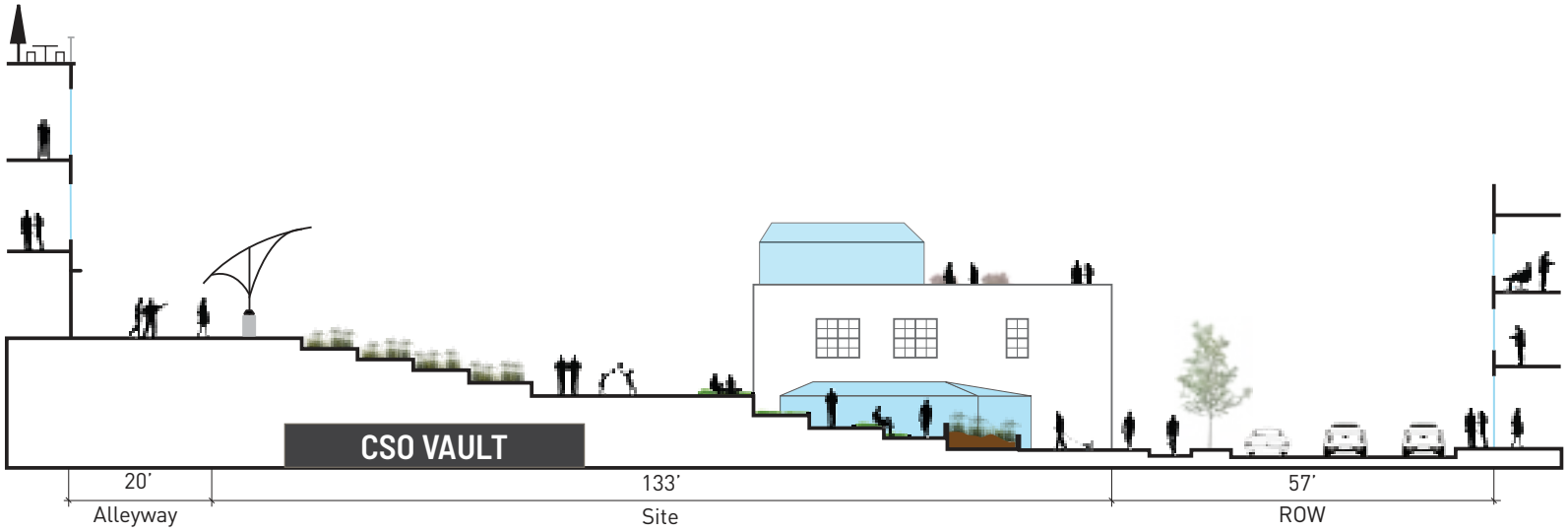
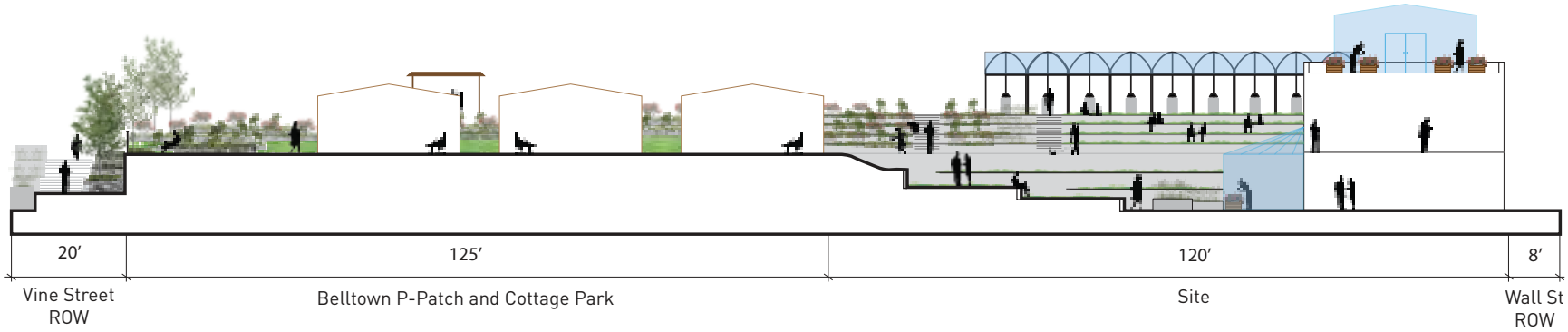
USERS	ISSUES & OPPORTUNITIES	INTERVENTIONS
COMMUNITY, STUDENTS, LOCAL EMPLOYEES	LACK OF PUBLIC SEATING, GATHERING SPACE	 Terraced Seating
		 Community Pavillion
		 Splash Pad
PEOPLE EXPERIENCING HOMELESSNESS, TOURISTS	LACK OF FACILITIES	 Revitalized Historic Building
		 Cafe Providing Transitional Jobs
		 Public Interpretive Art
GARDENERS	SHORTAGE OF PLOTS	 Terraced Garden Plots
		 Roof Top Garden
		 Pollinator Plants
POLLINATORS + BIRDS	LACK OF HABITAT	
WATER	POLLUTED RUNOFF	 Terraced Rain Gardens
		 Constructed Wetlands
		 Bioretention Planters

 Image by Julia Brasch

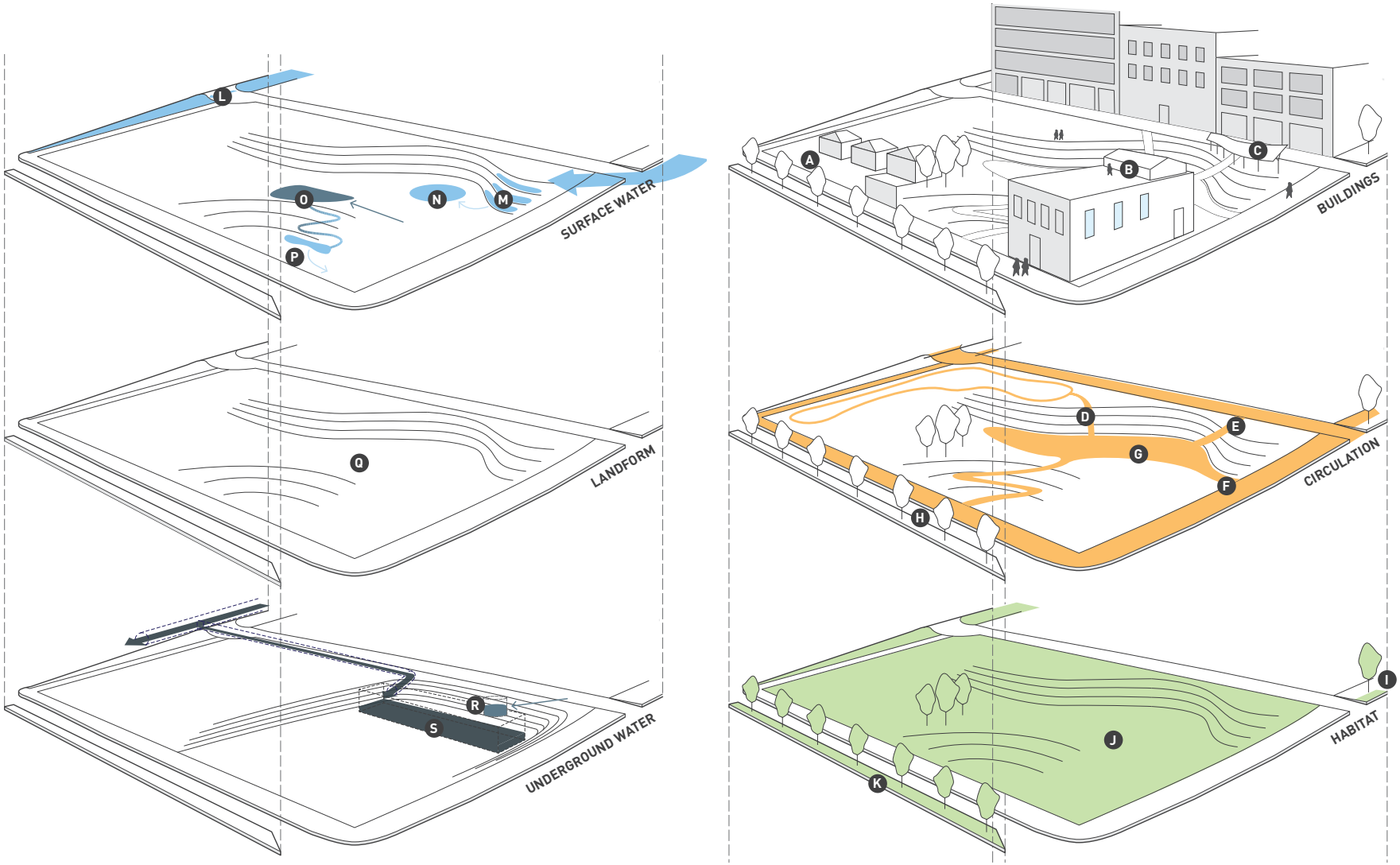
A. Existing Belltown P-Patch
B. Expanded P-Patch Plots
C. Rain Garden
D. Bioretention Street Planter
E. Terraced Seating Area
F. Grassy Slope
G. Community Pavilion
H. Splash Pad
I. Relocated Cottage
J. Constructed Wetland
K. ADA Accessible Path
L. Interpretive Fountain & Constructed Wetland
M. Building Expansion
N. Roof Greenhouse & Garden Plots
O. Plaza
P. Vegetated Bike Lane Buffer

 Image by Jessica Vetrano





Images by Kyle Cotchett



A. Relocated cottage
B. Expanded building footprint & new roof greenhouse & garden plots
C. Community Pavilion
D. Connection to existing p-patch
E. Connection to alley
F. Connection to wall street
G. Gathering area
H. Protected bike lane
I. Bioretention street planter with new vegetation
J. New green space
K. Vegetated bike lane buffer
L. Connection between existing vine street bioretention planters
M. Terraced rain gardens connected to wall street bioretention planter & adjacent building's roof runoff
N. Splash pad utilizing uv cleaned rainwater from terraced rain gardens
O. Constructed wetland connected to building graywater
P. Interpretive fountain into constructed wetland feeding clean water back into building
Q. Gently sloping terraced topography
R. Water cistern for surface water storage and p-patch irrigation with **6,000 gallon** capacity
S. CSO vault with **143,626 gallon** capacity

Image by Jessica Vetrano

Image by Julia Brasch

Image by Julia Brasch

Image by Jessica Vetrano

A Strategy for Battery Street + Tunnel

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

Battery Context

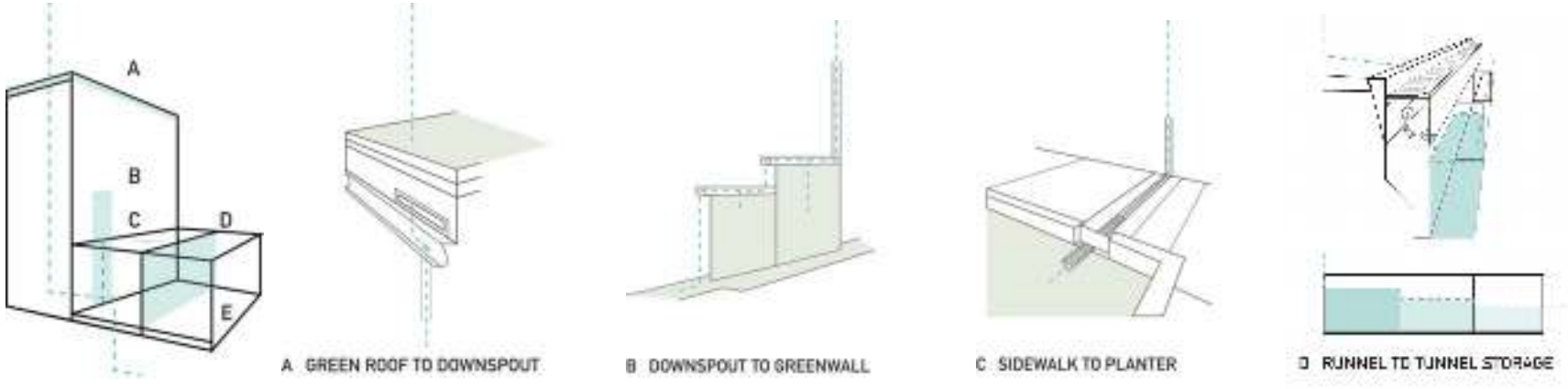
+ 120,000 square feet
+ $133 million
+ 12,840,000 gallon capacity

“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

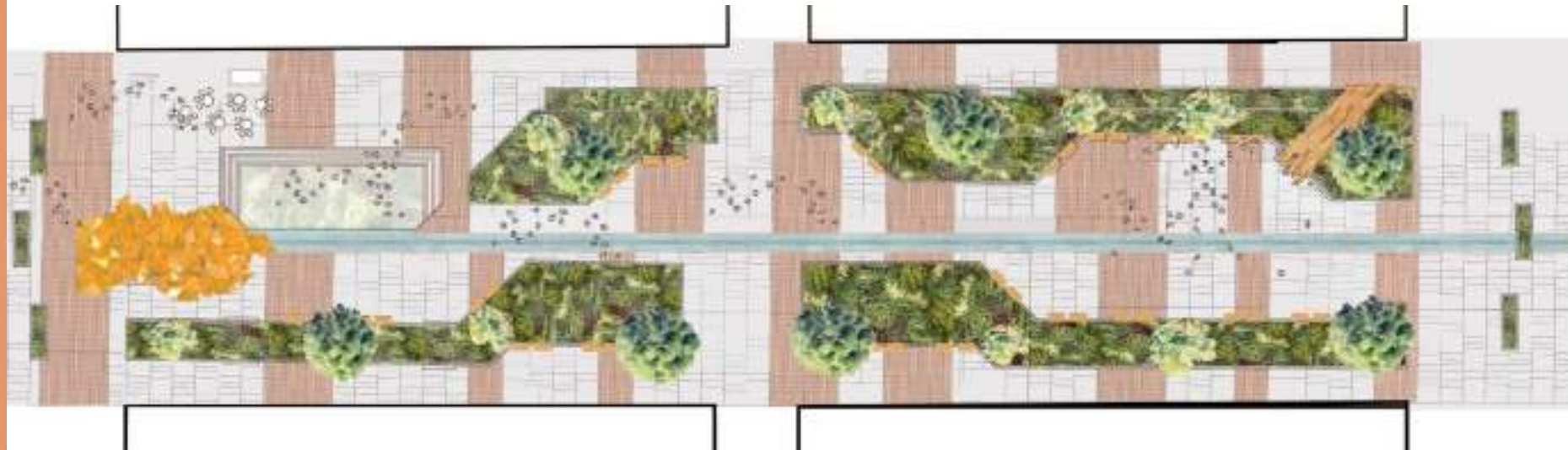
Strategy: A Vertical Typology

+ Harness verticality
+ Capture and clean water at multiple stages
+ Increase visibility and performance of GSI



Above Ground Plaza Concept

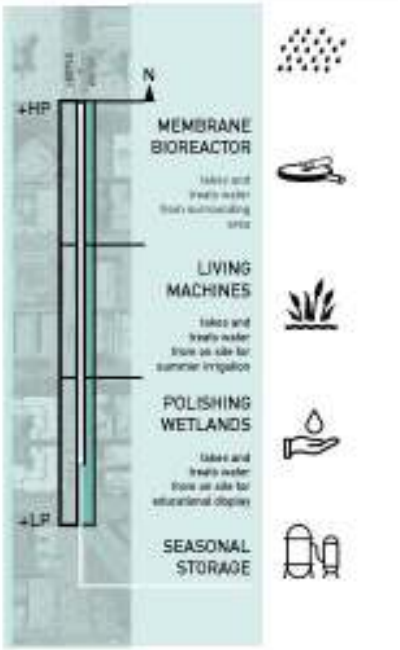
- Repurpose viaduct rubble as gabion architecture
- Close off street to traffic to enhance pedestrian use
- Glass art beacon starts water runnel which extends through site
- “Runnel to Tunnel” water transfer to tunnel



Above Ground Plaza Concept

- + Harness solar energy from adjacent roofs
- + Allow spaces for pop-up cafes
- + Keep the site open and publicly programmable
- + Preserve precious open space in Seattle's downtown

Below Ground Concept



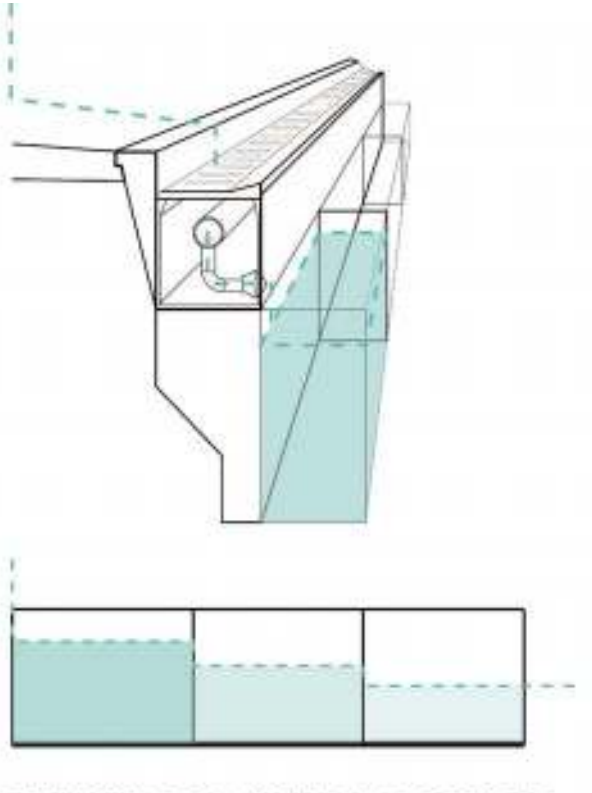
Public Gallery Reservable Event Space Parking

Metrics and Savings

Just utilizing ½ 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



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