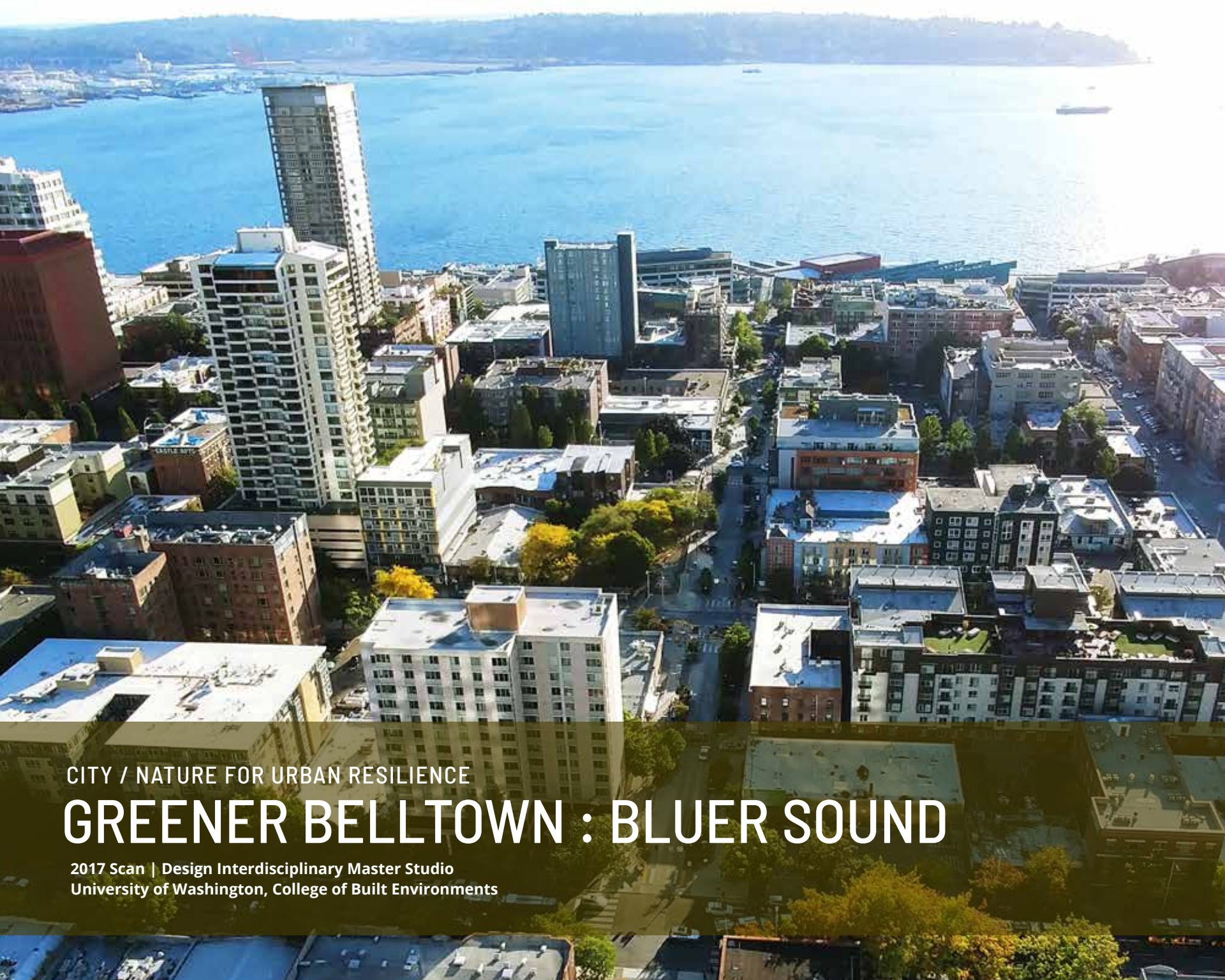

CITY / NATURE FOR URBAN RESILIENCE

GREENER BELLTOWN : BLUER SOUND

2017 Scan | Design Interdisciplinary Master Studio
University of Washington, College of Built Environments

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photo by: Kyle Cotchett

CITY / NATURE FOR URBAN RESILIENCE

GREENER BELLTOWN : BLUER SOUND

2017 Scan | Design Interdisciplinary Master Studio
University of Washington, College of Built Environments

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Seattle Office of the Waterfront
Seattle Public Utilities
Project Belltown
Recharge the Battery
The Nature Conservancy
Magnusson Klemencic Engineers

photo by: Yutong Hu

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photo by: Kyle Cotchett

Foreword

The 2017 Scan | Design Interdisciplinary Masters Studio focused on:

> integrating multi-functional natural processes to create a vibrant, healthful, climate-change resilient Belltown neighborhood while also helping to restore downstream environments;

> utilizing green infrastructure to eliminate combined sewer overflows into Elliott Bay in ways that also help to regenerate a healthy urban nature and equitably provide the renewing benefits that contact with nature can afford;

> developing design ideas and typologies that can inspire the retrofit of streets, urban spaces and buildings to meet the 2030 District's and Seattle Public Utility's stormwater storage and management goals.

Inspired by our experiences of Copenhagen's and Malmö's planning policies and design trials for sustainable and climate resilient cities, we integrated the design goals of the Seattle 2030 District, Seattle Public Utilities and the Belltown Community as we re-envisioned Belltown at the district, site and detail scales. Throughout the studio, we worked in tandem with people engaged in ongoing initiatives for Belltown, inviting them to the studio for guest lectures and soliciting their design critique and feedback at the mid-term workshop and final review. Both in Copenhagen and over two weeks in Seattle, Master Teacher Louise Grassov, partner at Schulze + Grassov, offered the studio invaluable insight into Danish public space design and engaged in generative design critique for each student and design project, prompting their work in Seattle to build upon lessons learned in Copenhagen and Malmö.

We have many people to thank for making this studio and study tour an extraordinary teaching and learning experience. The Scan | Design Foundation has continued to provide generous support for both the travel and studio components of this program. We are sincerely thankful for their continued support of this student learning experience. We are ever so appreciative of the insight and stamina that Louise Grassov brings to the studio through her teaching and design critique. We extend a heartfelt thank you to the community stakeholders and professionals, ranging from local residents to engineers and landscape architects for contributing their expertise and perspectives over the course of the studio. We thank the Seattle 2030 District for partnering with us and for incorporating the students' design processes into their own visioning for the District's potential. We thank Seattle Public Utilities for engaging with the studio to share their goals for the drainage district and for pushing student design ideas to investigate solutions to the Belltown basin's combined sewer overflows. We are also appreciative of the Nature Conservancy's willingness to host the mid-term community workshop in which the students presented and received feedback from a range of community and professional stakeholders. We thank you all, and hope the provocative ideas generated through this studio help make Belltown's potential as a vibrant and resilient neighborhood tangible and inspiring.

Nancy Rottle Professor, Landscape Architecture, University of Washington

2017 Scan | Design Interdisciplinary Master Studio
University of Washington, College of Built Environments

photo by: Kyle Cotchett

Studio Overview

GREENER BELLTOWN: BLUER SOUND

Opposite Page: Julieta Talavera, creative director of the Connector's Society, discusses the role of public green space in Malmö's city plan.

1 Students engage in an exercise that challenges them to explain their early designs to classmates unfamiliar with their projects and to integrate their design suggestions.

2 The Napkin Sketch project elicited a wide range of both conceptual and spatial design ideas that helped narrow down potential project site options.

3 Margot Chalmers diagrams and takes notes.

4 The class took a Saturday to visit IslandWood's environmental education campus on Bainbridge Island.

The Seattle 2030 District has set the ambitious goal of managing 67 million gallons of the Belltown district's stormwater and reducing potable water use by 50% below the district's baseline by 2030, titling this array of projects, *Greener Belltown: Bluer Sound*. At the same time, Seattle Public Utilities has singled out Belltown for a concerted investigation of potential solutions to the neighborhood's role in reducing its number of combined-sewer overflow events, exploring strategies to providing an additional 130,000 gallons of storm-water storage capacity. This convergence of urban stormwater management and climate resilience efforts in the Belltown neighborhood posed a fantastic opportunity for the Scan | Design Interdisciplinary studio to explore and demonstrate how these commendable goals might take shape in Belltown's public spaces and how they might enhance the quality of public space to support urban ecology, social amenity and ultimately urban resilience.

Having experienced and learned from Copenhagen and Malmö's pioneering work in managing and storing their stormwater through both urban scale projects and constellations of smaller interventions, the students explored both adventurous and implementable opportunities for applying those lessons in Belltown.

STUDIO SEQUENCE

1 GUIDED SITE VISIT

2 DISTRICT ANALYSIS + STORMWATER TOOLBOX

3 DISTRICT FRAMEWORK

4 SITE SELECTION + SCOPING

- 3 Napkin Sketch Exercise
- 12 Concept Diagrams Exercise
- Life-Space-Building Charrette

5 DISTRICT VISIONS + SITE DESIGNS

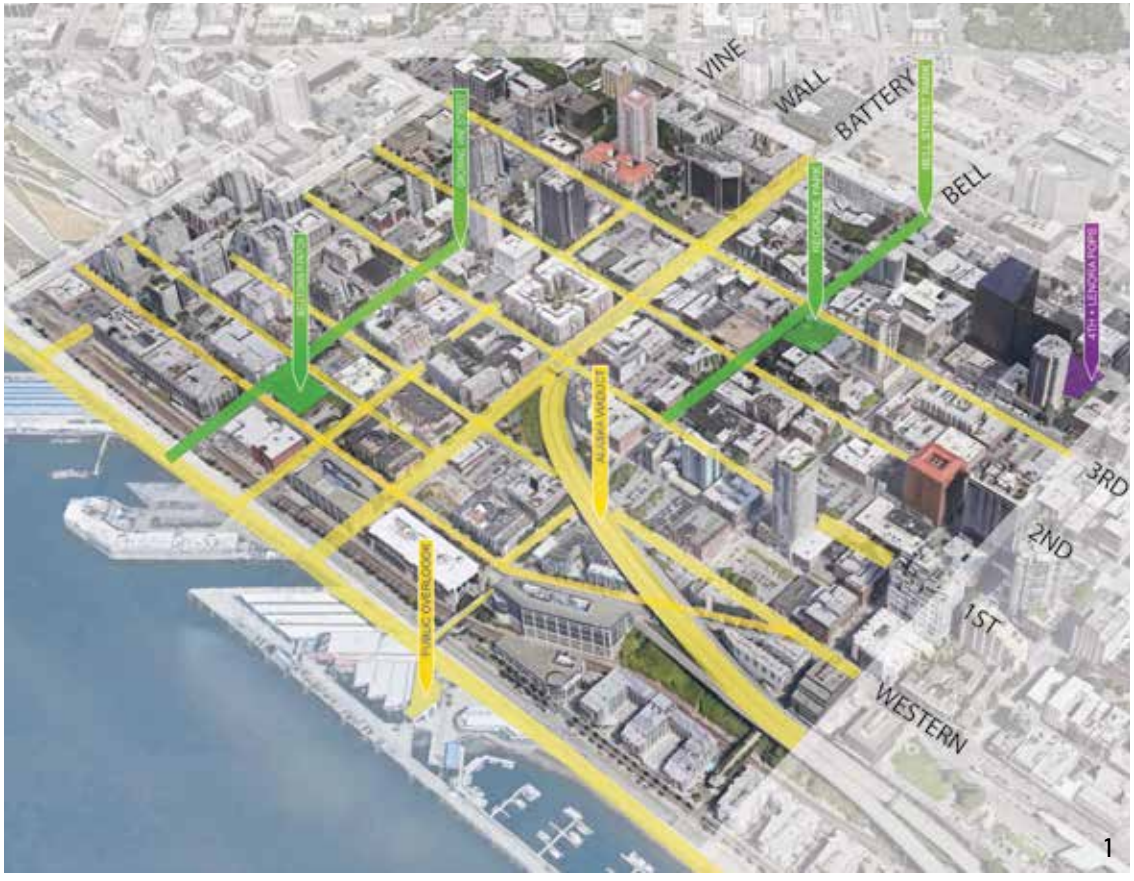
- Stakeholder Workshop
- Temporal Invitations Exercise
- Final Review

photo by: Kyle Cotchett 1

1 Nicky Bloom diagrams and sketches in the field.

2 The class reflects on their 12 Concepts project, providing a peer-review of each others' work.


photo by: Tatyana Vashchenko 2



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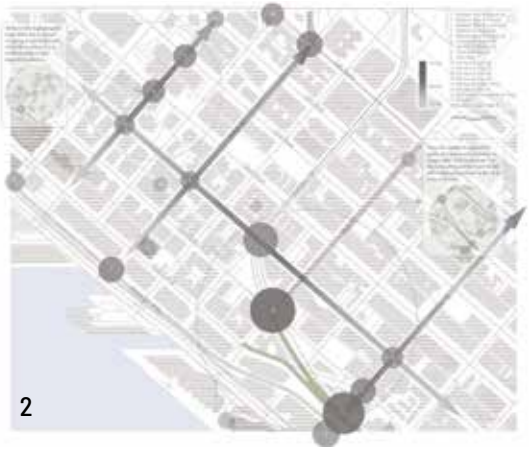
DISTRICT ANALYSIS+ STORMWATER TOOLBOX

Upon returning from Seattle and starting the studio, the students were introduced to the project district and asked to work in groups to collect information about the neighborhood's water, mobility and ecological systems. Three other groups looked at the district's deep context, social amenities and existing/ongoing plans for the future.

In order to collectively develop a working knowledge of existing "tools" for addressing urban stormwater challenges, students were also asked to each research and report on several stormwater storage and management technologies or approaches, contributing their findings to a "City/Nature Toolbox".

The documents produced through each of these exercises can be found on the Studio website: *http://courses.be.uw.edu/SDMasterStudio*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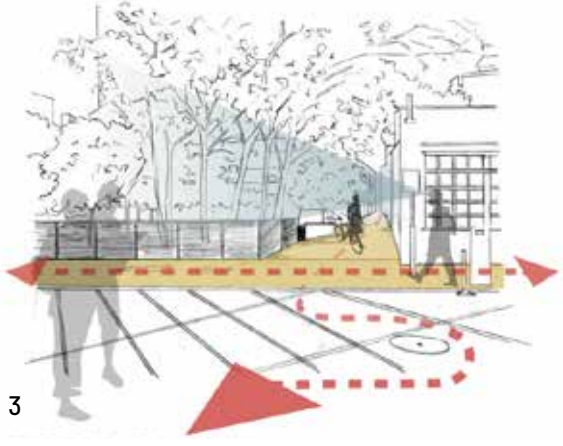
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1 The Social Amenities analysis group mapped key public spaces within the district.

2 As a part of the Deep Context analysis, Yang He mapped sound intensity levels at several sites across the district.

3 The Mobility analysis group analyzed and characterized the nature of alley ways throughout the neighborhood.

photo by: Kyle Cotchett

Opposite Page: Yutong Hu observes the soon-to-be demolished viaduct on a site visit to the Belltown study area. Both the tunnel portal and the tunnel were identified and explored as project opportunity sites within this studio.

DISTRICT FRAMEWORKS

Having completed initial district analyses centered on inventorying and analyzing a range of existing, planned and possible conditions within Belltown, students worked in groups to develop District Frameworks for the systems they had analyzed. Groups started by evaluating the opportunities and needs of the district as they relate to: water, mobility, deep context, social amenity, and ecology. Through these district frameworks, students practiced communicating district opportunities with regards to each system by developing cohesive, functional and poetic visions. Each framework responds to the 2030 District's and SPU's stormwater storage and management goals, quantifying the water stored or managed if this aspect of the design were to be maximized within the district.

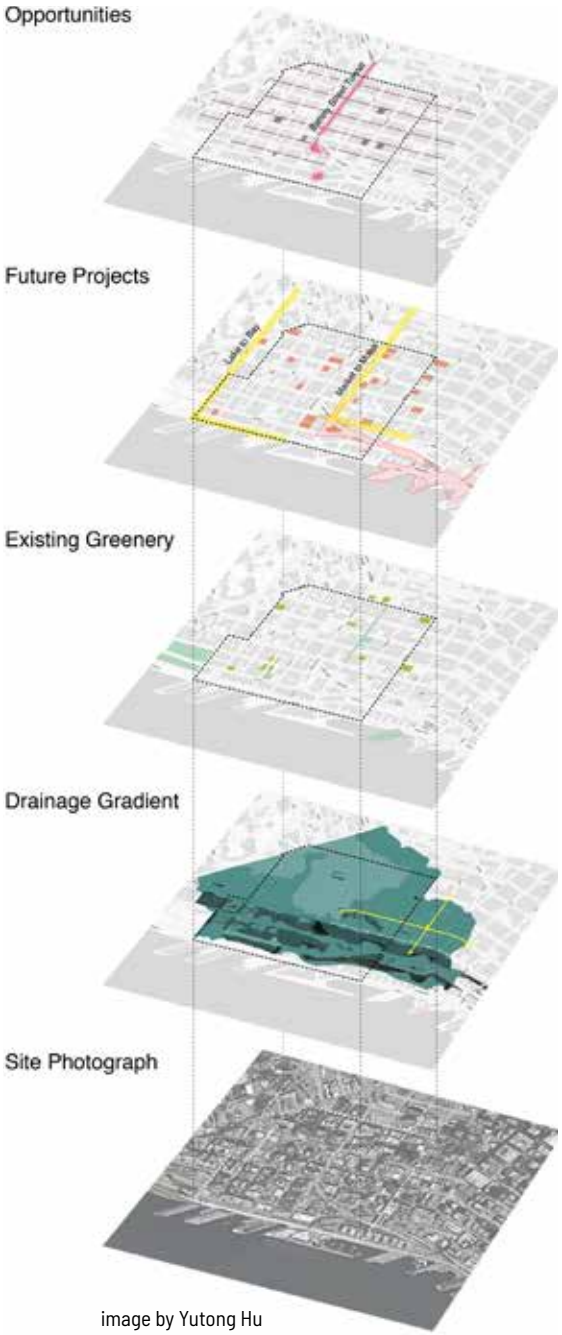


image by Yutong Hu

site of Little Prairie native village

parking lot cells

alley capillaries

Seattle Waterfront

planned pedestrian routes

potential green roof sites

existing parks

existing green roofs (GSI)

steep slope

medium slope

gentle slope

flat slope

ANALYSIS

Opportunity sites include underutilized and heavily paved regions in Belltown, as well as cultural sites highlighted by Friends of Belltown's plan for reflecting native history in the district's design.

New development and pedestrian routes that are planned and in process inform the pathway and chosen water reuse tactics. New construction and buildings constructed after 2010 are viable sites for intensive green roofs.

The neighborhood has limited and very scattered green spaces. A new framework would integrate existing projects into a network of social amenities with water reuse and ecosystem functions.

The street chosen as a spine, Battery St., receives water flowing down slope from the two nearest high points. Closing the Battery Street Tunnel provides additional opportunities for regrading and a suitable pedestrian corridor.

DISTRICT FRAMEWORK:

WATER

Roxanne Glick, Yutong Hu, Fatema Maswood and Hanna Tania

A Greener Belltown would emphasize neighborhood-scale resiliency, water reuse practices, and creating social amenities that integrate the layered identities of the site, from its native history to the remnants of 1950s infrastructure to its current and changing built environment.

This framework suggests a decentralized and multi-faceted approach to water in the built environment by creating many small, artful diversions for water reuse that invite the public to interact with water reuse through a primary spine or water collection corridor along Battery Street, and a social and educational hub at the original site of the Little Prairie village. A series of alley way capillaries are the site of other diversions, and water collected along the roofs and facades of existing buildings lead to a water detention, filtration, and storage pathway located in the Battery Street Tunnel.

Yutong Hu, GIS Base Files Resource

CONCEPT

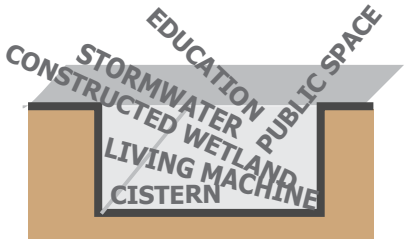
WATER REUSE

Filtration of greywater and blackwater from buildings, as well as collection and storage of rainwater for localized uses.

IDENTITY & WATER AWARENESS

Displaying water while providing amenity spaces such as trash cans, public restrooms, information boards and art installations.

TUNNEL REUSE



images by: Hanna Tania

Utilizing the Battery St. Tunnel to restore the soil, store and filter water, and serve the community.

SOCIAL & ECOLOGICAL SPACE

Elevating public right of way with landscape while providing places to pass, play and stay.

WATER TYPE	SOURCE	TREATMENT METHOD	RECYCLING USES
Roof Runoff	Roof Rainwater harvesting Sidewalks	No treatment UV or Filter	Irrigation, toilets Potable
Greywater	Building (sinks & shower)	Biofiltration VFCW (Vertical Flow Construction Wetland) MBR	Irrigation, toilets Washing Machine
Blackwater	Streets Toilets	Living Machine WWTP (Wastewater Treatment Plant)	Irrigation, toilets Puget Sound

TOOLS

Extensive Green Roofs

Intensive Green Roofs

Blue Roofs

Utilizing Balconies and Building Facades

Visible Water Transport and Filtration

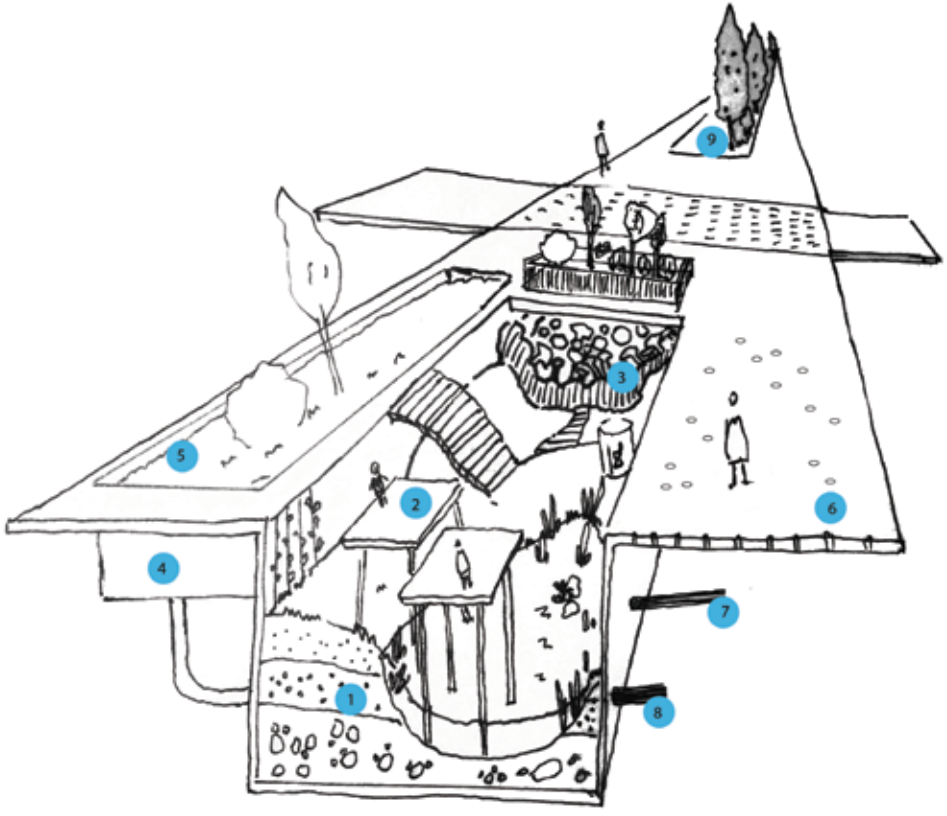
Constructed Wetlands and Living Systems

drawings by: Roxanne Glick

LAYERING USES AND HISTORIES

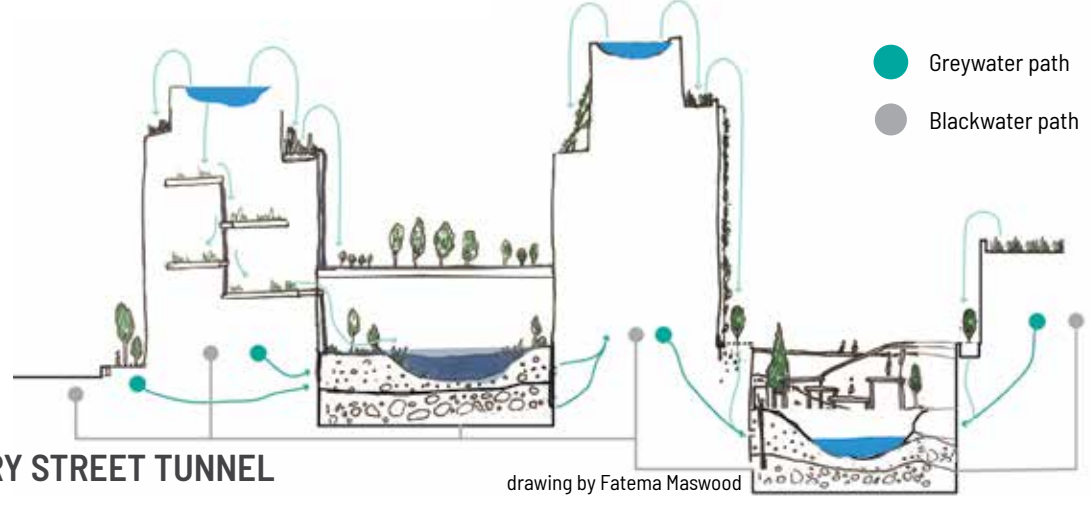
1. Vertical Flow Constructed Wetland
2. Pedestrian access to interior of tunnel
3. Mycoremediation areas in portions remaining capped
4. Greywater collection basin for sidewalk planters
5. Bioretention sidewalk planter boxes
6. Permeable pavement
7. Greywater outflow
8. Blackwater inflow to lower levels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

Daylighted portions of the Battery St. Tunnel would feature a series of storage, filtration, and ecological functions while serving as an educational pathway to the Little Prairie hub. Vertical layering of water filtration from rooftops to streets and sidewalks to the bottom of the tunnel connect greywater and blackwater systems to constructed wetland filtration systems.



drawing by Fatema Maswood

Possibilities for greywater and blackwater filtration and storage on a district scale. Constructed wetlands accept street runoff and building runoff storing and filtering water in spaces that also function as public throughfares and amenities.



drawing by Fatema Maswood

DAYLIGHTED PORTIONS OF THE BATTERY STREET TUNNEL

EXAMPLE PROJECTS AND CONNECTIONS

Little Prairies Landmark Community Park

Where Battery Street meets the viaduct remnant site, there is an opportunity to establish a Little Prairies Landmark Park on the approximate location of the lost village.

Blackwater collected in the Batter Street tunnel flows into a Living Machine™ beneath a lattice of pedestrian vistas. A cistern pond would further retain water before it is highlighted in park water features.

Buildings around the park retrofitted with blue and green roofs, green walls and green screens lead roof runoff to park landscaping and biofiltration cells.

Battery Street Tunnel and Recent Building Retrofit

The Belltown street grid directs treated greywater to capillary alleys which then lead to the green spine of Battery Street with a variety of non-infiltrating bioretention and constructed wetlands.

New buildings can build extra floors (above dashed line) for installing water saving features such as intensive green roofs and greywater recycling systems. Here a green balcony system treats water.

New Building on Historic Street

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Blue and Green Roofs continued

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RAINWATER CALCULATIONS

ROOF FOR RAINWATER HARVESTING

	Area (ft^2)	Holding Capacity (gallons)	Avg Annual Roof water (gallons)
BLUE Roof Area	11,906	28,576	243,613
EXTENSIVE	48,783	146,350	998,102
INTENSIVE	26,264	315,169	537,363
	86,954	**490,095**	**1,779,079**

100 YEAR STORM WATER MANAGED BY GREEN & BLUE ROOF

24 Hour Precipitation	6 Hour Precipitation
3,297,838 gallons	1,300,922.2 gallons

BELLTOWN WATER USE CALCULATION

BLACKWATER PRODUCED FROM BUILDING	630,014 gallons/day
GREYWATER PRODUCED FROM BUILDING	1,153,926 gallons/day
TOTAL PRODUCED FROM BUILDING	1,783,940 gallons/day

Membrane Bio Reaction (MBR)
-28%

POTABLE WATER REDUCTION POTENTIAL as a result of Greywater Recycling	1,284,437 gallons/day 468,819,432 gallons/year

SEATTLE PUBLIC UTILITIES GOAL

One Combined Sewer Overflow per year
130,000 gallons of water storage at peak events

Rainwater storage in green/blue roofs: 490,095 gallons
Reduction from greywater recycling: 1,284,436.8 gallons/day

Total CSO reduction : 1,774,531.4 gallons/day

SEATTLE 2030 DISTRICT GOAL

50% Water Reduction and Management from Baseline
Manage **228 million gallons/year**

Greywater production: **468,819,432** gallons/year
Average roof water holding capacity: **1,779,078.85** gallons/year

Potential Reduction : 470,598,511 gallons/year

RAINWATER CALCULATIONS

100 year storm water managed by green/blue roofs

24 Hour precipitation: 5.07 inches x 86,954.0 ft^2
: 440,856.7 ft^3
: 3,297,837.7 gallons
6 Hour precipitation : 2.00 inches x 86,954.0 ft^2
: 173,908.0 ft^3
: 1,300,922.2 gallons

Belltown annual harvesting

BLUE Roof Area : 14883.5 ft^2 x 80% = 11,906.8 ft^2
EXTENSIVE Roof Area : 60978.9 ft^2 x 80% = 48,783.12 ft^2
INTENSIVE Roof Area: 328,301.1 ft^2 x 80% = 26,264.08 ft^2
Total roof area for rainwater harvest : 86,954.0 ft^2

Rainwater harvesting

Gallons per inch of rain = Roof Area x 0.6 Maximum capacity.
BLUE Roof: 4 inch x 11,906.8 ft^2 x 0.6 = 28,576.32 gallons
EXTENSIVE Roof: 5 inch x 48,783.12 ft^2 x 0.6 = 146,349.36 gallons
INTENSIVE Roof: 20 inch x 26,264.08 ft^2 x 0.6 = 315,168.96 gallons
Total roof water Holding capacity: 490,094.64 gallons

Average Inches of Rain per Year in Seattle = 34.1 inches
BLUE Roof: 34.1 inches x 11,906.8 ft^2 x 0.6 = 243, 613.13 gallons
EXTENSIVE Roof: 34.1 inches x 48,783.12 ft^2 x 0.6 = 998,102.64 gallons
INTENSIVE Roof: 34.1 inches x 26,264.08 ft^2 x 0.6 = 537, 363.08 gallons
Average annual roof water holding capacity: 1,779,078.85 gallons

BELLTOWN WATER USE CALCULATION

Seattle water use Gallons/Person/Day: 52 gallons/day

Belltown population: 23,915 (2014 data)
(28,698 in 2030 assuming 20% growth)

Residential potable water use: 1,243,580 gallons/day

BLACKWATER TREATMENT

5 flushes/person/day
Average toilet flush: 2.75 gal
2 x 2.75 x 23,915 (residents) = 131,532.5 gallons/day
3 x 2.75 x 60,422 (workers) = 498,481.5 gallons/day
Blackwater produced = 630,014 gallons/day

GREYWATER RECYCLING

Assuming all buildings retrofitted with separated pipes and a neighborhood greywater recycling system.

Average greywater produced by office: 0.6 gallons/person/day
Workers in Belltown: 60,422
Office greywater Production: 39,878.5 gallons/day
Residential greywater production: 1,114,047.5 gallons/day

Potential shared residential and office greywater recycling (MBR: -28%
Total greywater Production from residential and office: 1,153,926.0
Total greywater produced from residential, office and blackwater: 1,783,940 gallons/day

Potable Water Reduction Potential as a result of Greywater Recycling: 1,284,436.8 gallons/day

MULTI-FUNCTIONAL STREET + SOCIAL PLACE

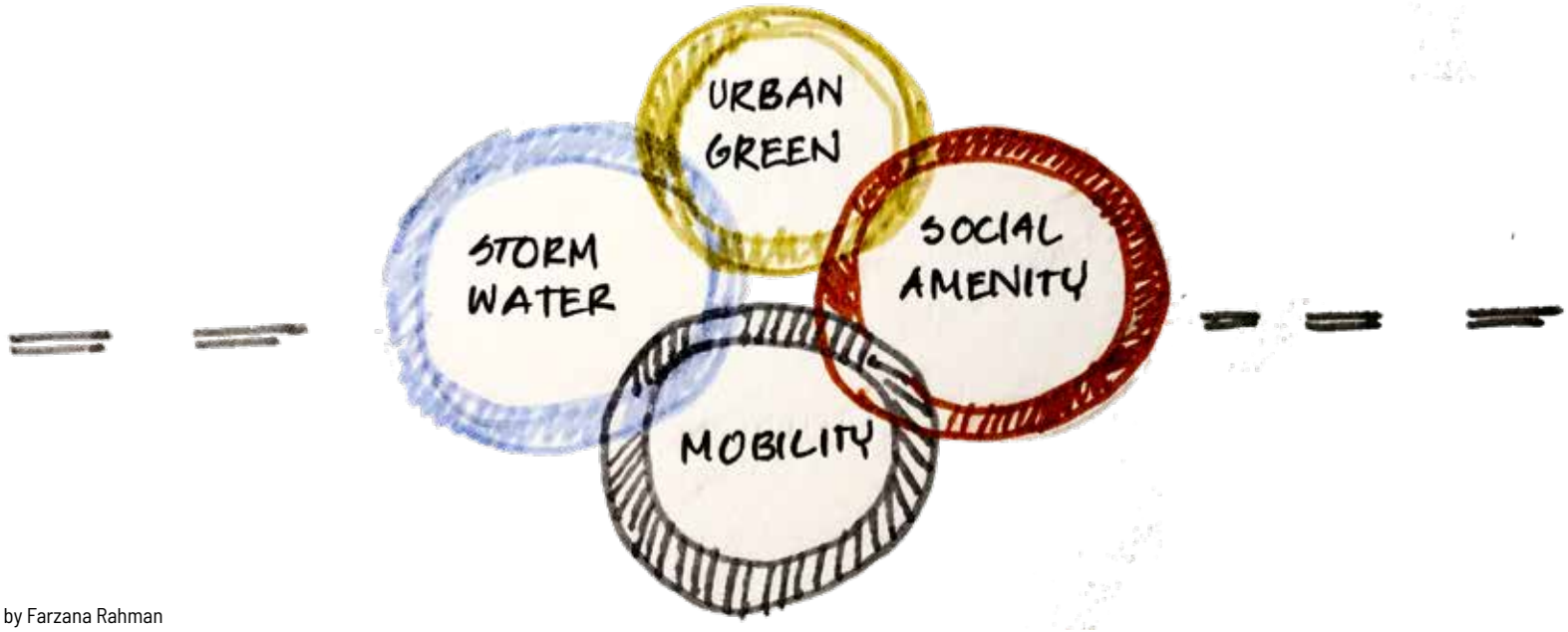


image by Farzana Rahman

Reflection:

Belltown presents boundless opportunities in addressing stormwater, urban greening, and multi-modal mobility. All of the proposed design elements that reflect these opportunities also contribute to the human health and livability of this rapidly densifying neighborhood. However, there are several constraints associated with the physical layout of this site.

Steep slopes make it difficult for bicyclists and pedestrians to easily access parts of Belltown, and slight re-grading is necessary if all of Belltown's streets are to be ADA accessible and inviting to pedestrian and bicycle use. These slopes provide ample opportunity to incorporate stepped wetland filtration systems and pedestrian walkways, however this will require large amounts of grading work and infrastructure.

MOBILITY

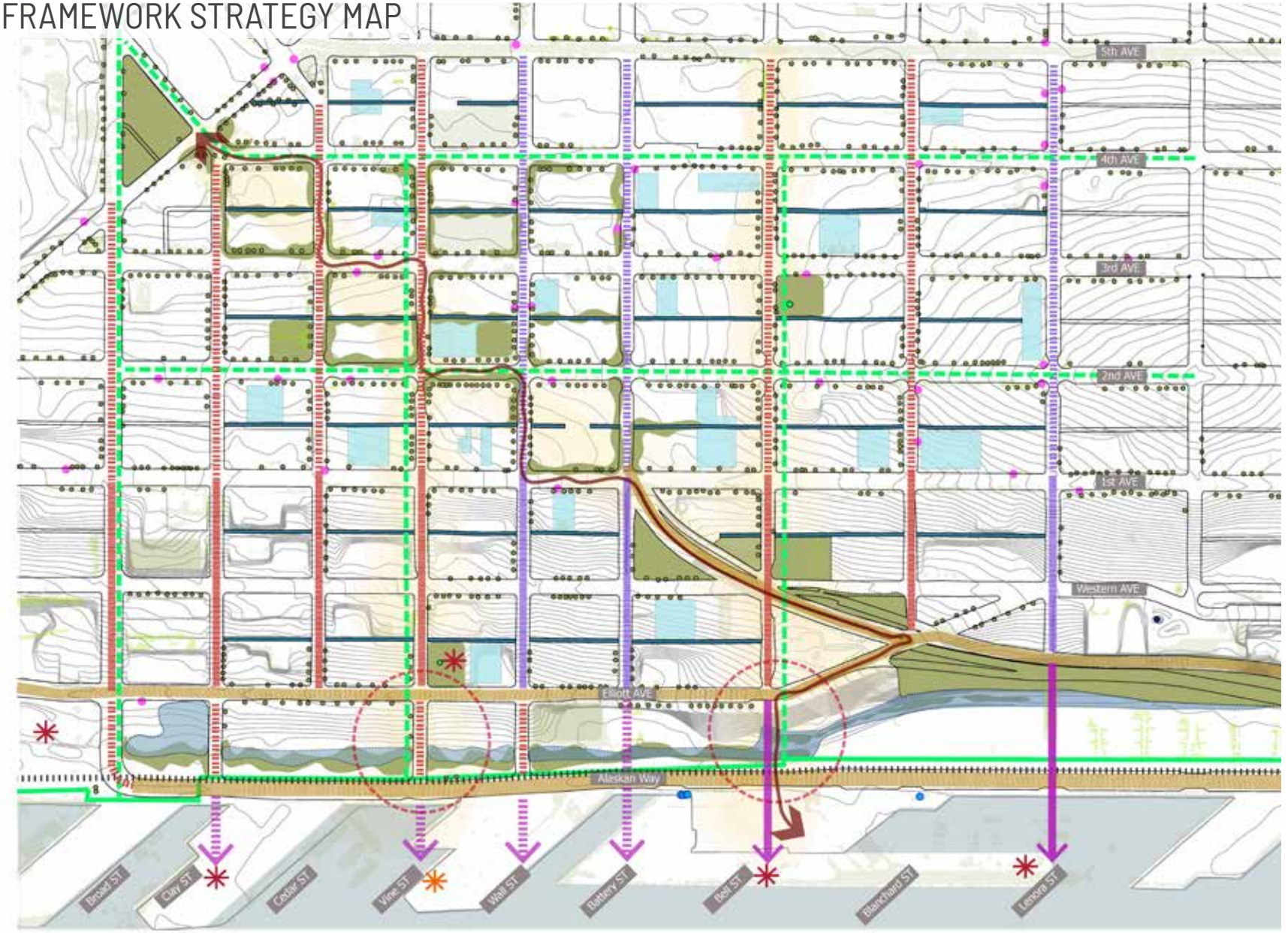
Farzana Rahman, Margot Chalmers, Yunxin Du, Jiyoung Park, Dorothy Mulkern

The public right-of-way presents a myriad of opportunities to not only improve movement through Belltown, but re-adapt the streets and alleys as social spaces. This mobility framework addresses multiple forms of movement patterns and simultaneously serves Belltown's ecological, hydrological, and social needs throughout the implementation of the following measures:

- Multi-functional streets that act as corridors and spaces for play, rest, and socializing.
- An integrated ecological and hydrological ribbon that connects the new waterfront design with the Space Needle/Seattle Center. This green ribbon acts as a habitat and pollinator corridor throughout Belltown
- Hydrological functions that are integrated throughout Belltown, aiding in stormwater retention and filtration
- Integrate stormwater catchment areas by the waterfront as water detention and filtration sites. These will serve social and educational functions as walkways will wind through and over the wetlands. The walkways will also serve to make Belltown's steeper streets ADA accessible.
- Multi-modal modes of transportation (in particular bicycling and pedestrian) that encourage users to wind through the connective green ribbon.
- Parking lots and alleys will be reconfigured to serve as more inviting social spaces, transforming them into green corridors. Permeable pavement will mitigate stormwater runoff through absorbing and filtering water, and green walls and plantings will serve as green corridors for pollinators, insects, birds and small mammals. Technology such as tree boxes and Silva cells will be implemented to encourage healthy canopy growth and aid in water detention and filtration.

image by Farzana Rahman

FRAMEWORK STRATEGY MAP



This comprehensive diagram illustrates the needs and opportunities of Belltown neighborhood regarding mobility choices, stormwater management, urban greening and social amenities

image by Farzana Rahman

MULTI-FUNCTIONAL STREETS + SOCIAL PLACE

Focus:
Stormwater Mitigation
Urban Greening
Multimodal Mobility
Social amenity

Address multiple issues on the site while providing various benefits for the neighborhood

Pedestrain Focused Improvements: CLAY, CEDAR, VINE, BELL (Play + Stay + Learn)

Opportunity:

- Pedestrian focused improvements
- Less traffic and residential uses create an opportunity for walkers and bikers. Also, steep slopes are good for workout, especially for joggers/ runners and bikers
- Offers nice view corridor of the waterfront
- Existing slopes also offers an opportunity on the sidewalks for improving pedestrian experiences by adding stormwater mitigation elements with creative grading and landscaping solutions. Adding these elements can serve more than one functions and will contribute to the neighborhoods health, environmental and social quality of living.

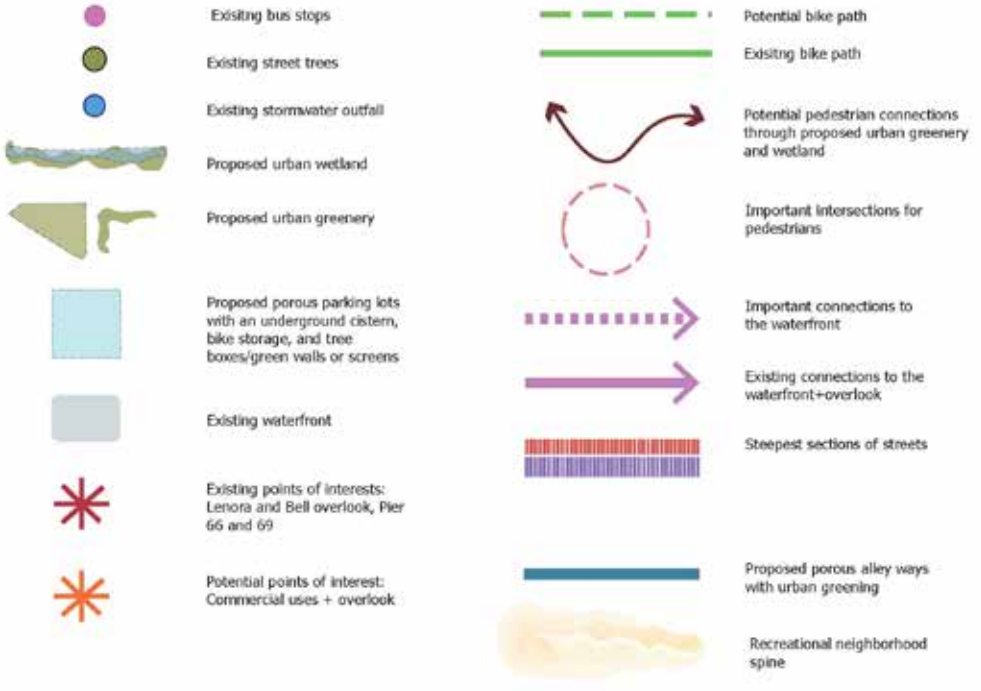
Constraints: Steepness of the slope in some section of these streets (especially from 1st AVE to Elliott Ave) can create difficulties for both pedestrian and bikers. But creative grading and landscaping solution can address this issue. Research on a comfortable slope ratio for walking and biking on various types of slopes would be helpful in this regard.

Activity Focused Improvements: Wall, Battery, Lenora

Opportunity:
Currently, Wall, Battery and Lenora Streets are receiving more vehicular traffic that other arterial streets on the site. Removal of Alaskan Way viaduct will create an opportunity for these streets to become more pedestrian friendly streets and a social place than just a movement corridor. These streets are lacking urban greenery and vibrant ground floor uses and facade interactions. Adding trees with nice landscaping and street furniture, allowing ground floor functions suitable for residential uses can turn these movement corridors into an active functional spine for the neighborhood.

Multi-modal Mobility: Alaskan, Elliott

Opportunity:
According to the new Seattle Waterfront plan, the Alaskan Way and Elliott Ave will be reorganized and rebuilt. The new organization will serve all modes of travel (Car+bike+Bus+Pedestrian Walkway) with clear and safe pedestrian crossings and signalized intersections.



URBAN GREENERY

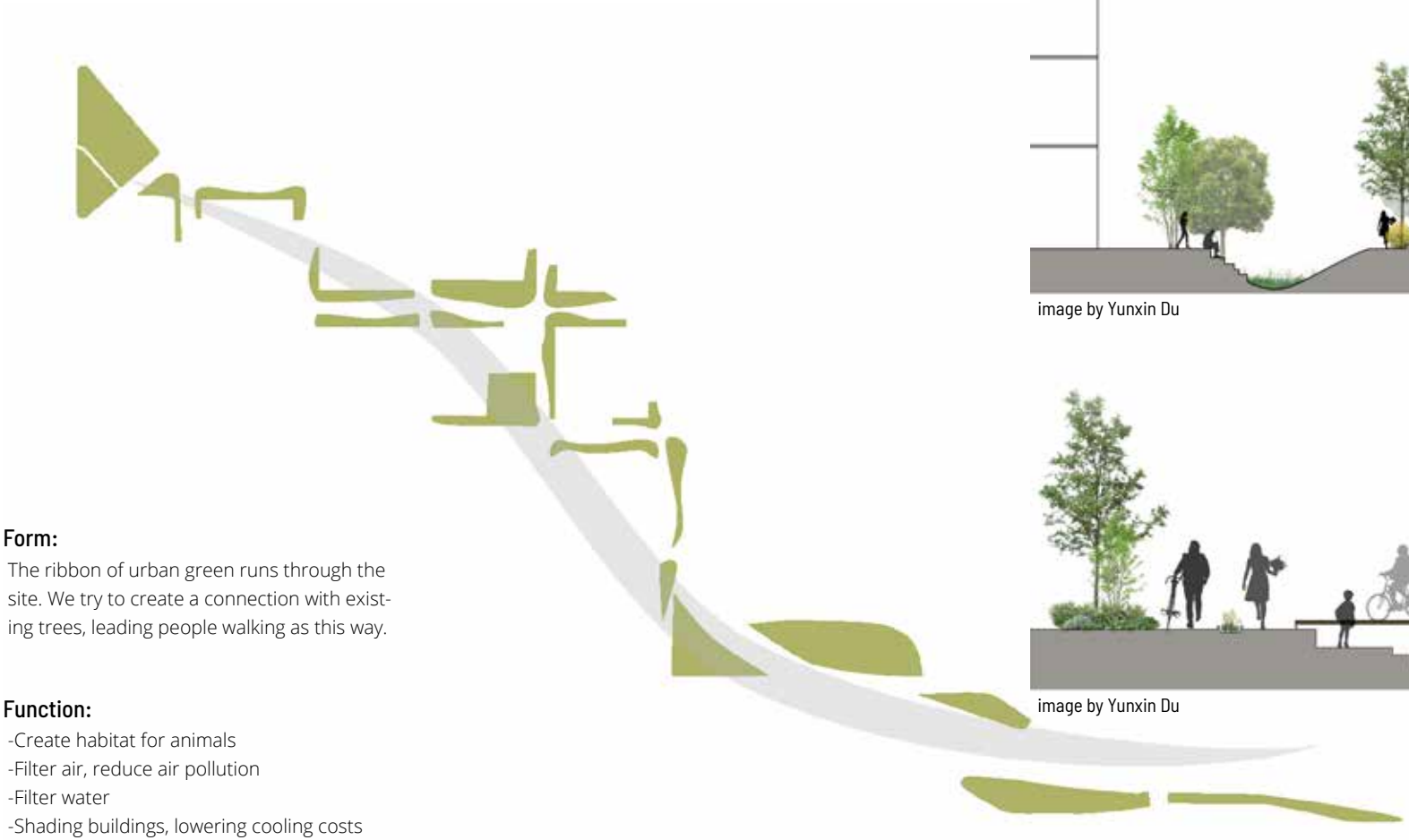


image by Yunxin Du

image by Yunxin Du

Form:

The ribbon of urban green runs through the site. We try to create a connection with existing trees, leading people walking as this way.

Function:

-Create habitat for animals
-Filter air, reduce air pollution
-Filter water
-Shading buildings, lowering cooling costs
-Reduces urban heat island effect
-Psychological benefits for city dwellers, stress reduction
-Increase property values

User Friendly:

Considering the slope of the street,
we choose the more gentle way for pedestrian to walk.
Along the walkway, we design lots of small sections as a part of our urban forestry plan.

Conceptual sections illustrate the idea of the green ribbon and its multi-functionality that could benefit the site in many different ways: stormwater, mitigation, and mobility.

Image by Yunxin Du

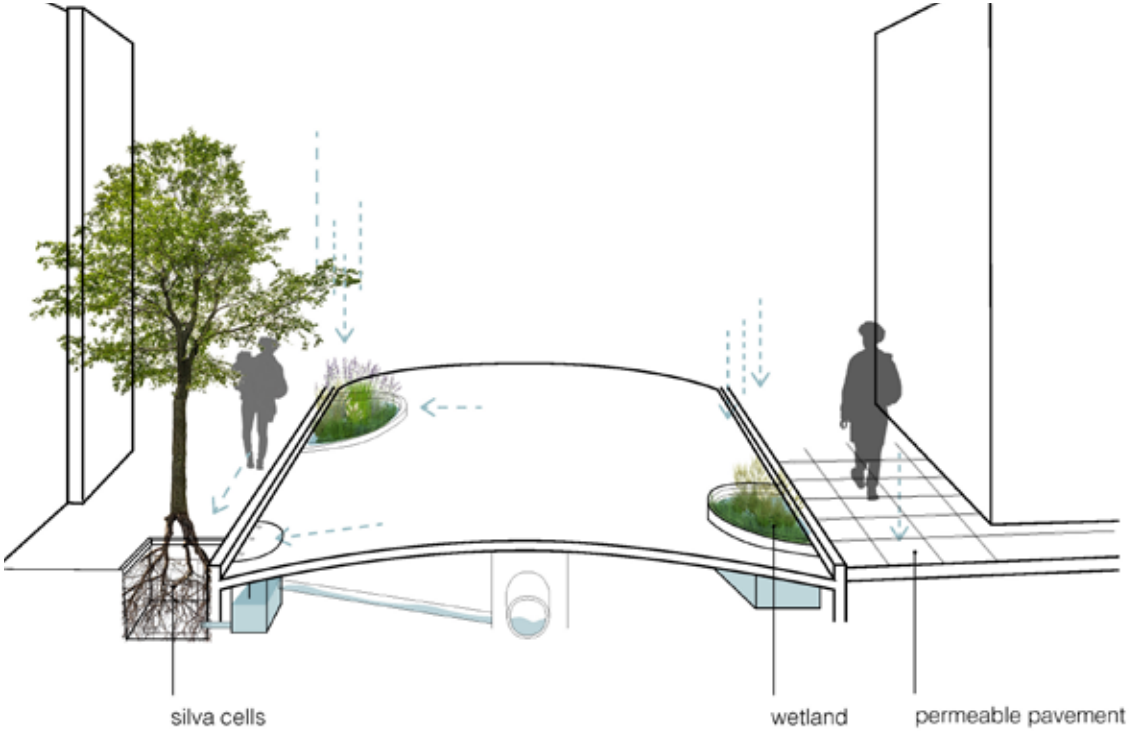


image by Yunxin Du

Conceptual sketch showing how to integrate Silva cells with wetlands to mitigate storm water runoff.

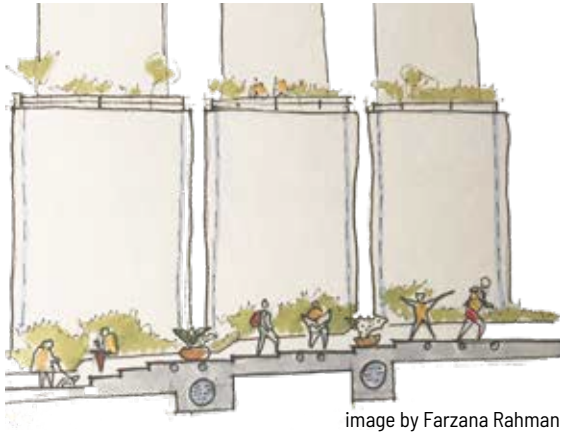


image by Farzana Rahman

Rain water collection from roof to the ground and re utilizing it for watering plants. Permeable pavement can receive more water and can send it to the underground storage to store, treat before infiltration to the soil. The grading and landscaping solution can create opportunities for pedestrian to stay, socialize or have a nice walk to their destinations.

Pedestrian Focused Improvements / Residential Streets:

Re imagining residential sidewalks with pervious pavement, native plants/ water absorbent vegetation, benches and wide sidewalks with subtle grading, that is comfortable for pedestrian to move, stay and play.

image by Farzana Rahman

URBAN WETLANDS

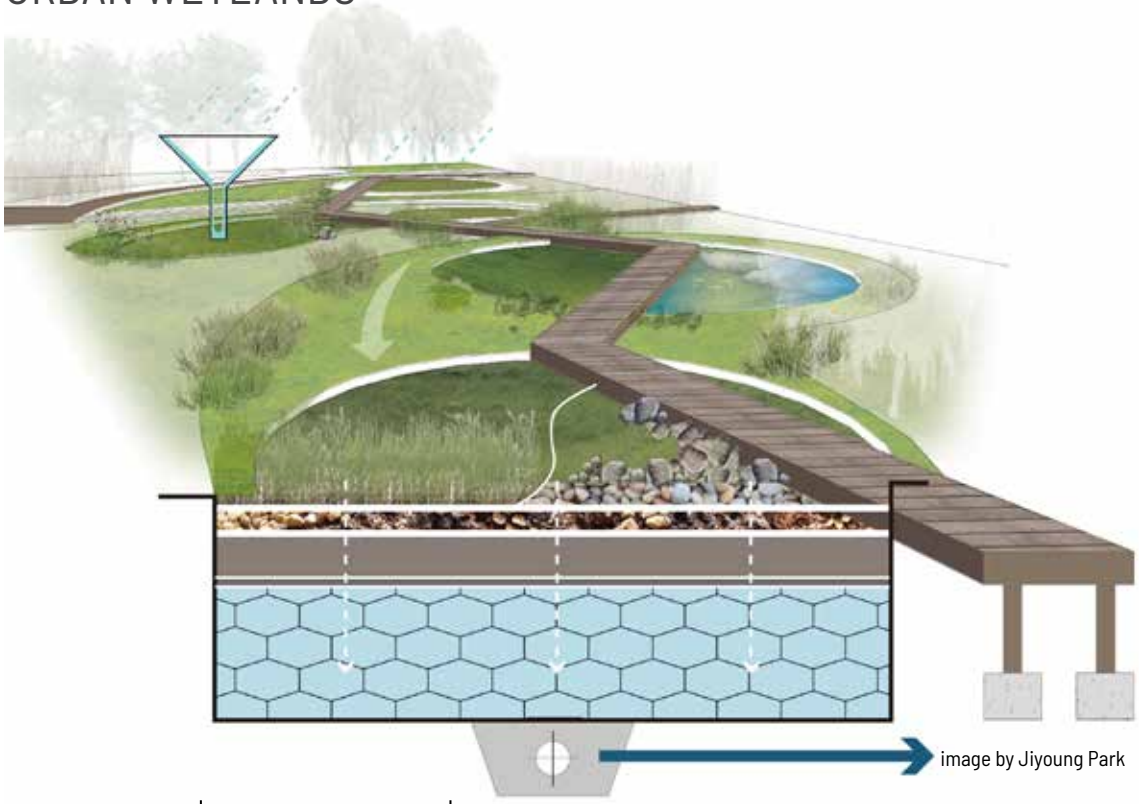


image by Jiyoung Park

Improvement of Pedestrian Access

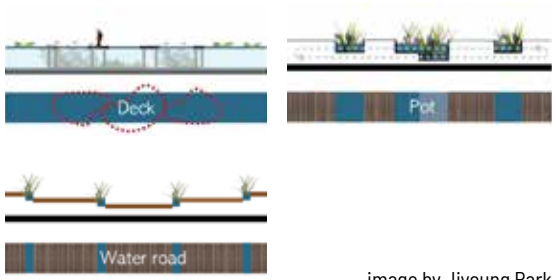


image by Jiyoung Park

These parts need to be improved for pedestrians since the pedestrian is not easily able to access the wetlands because of cars and bicycles.

Benefits of Habitats

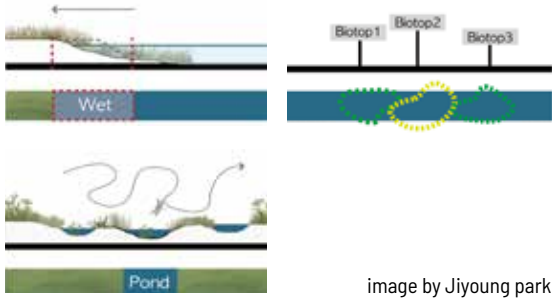


image by Jiyoung park

This wetland can create habitat for animals. Also, this eco-water filtering system can serve clear water to not only the animals but human.

Wetland Bridge

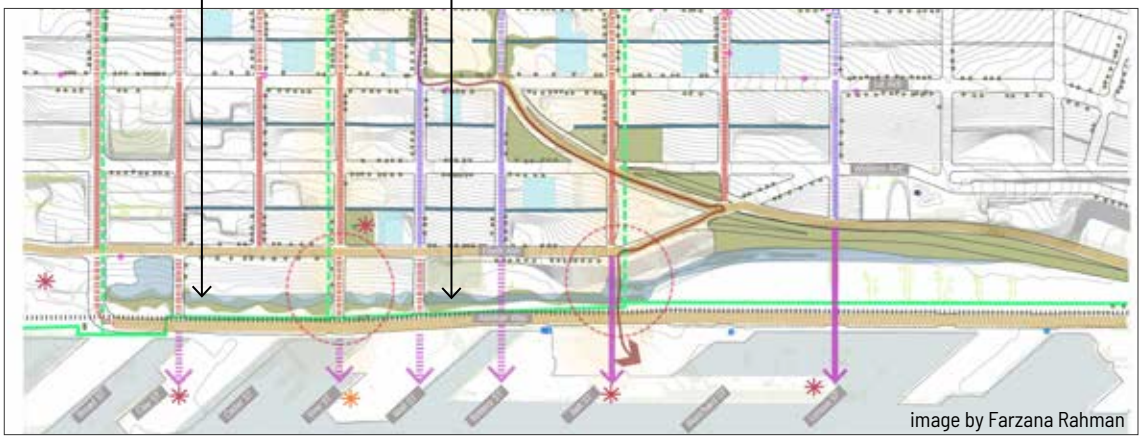


image by Farzana Rahman

The Wetland Bridge and the Form

The form of zig-zag wetland bridge can hold more water and serve more habitats spaces for the animal and insects than the straight form of the bridge. It can create the connection between the ecological element and pedestrian in the city.

Temporal Wetland Walkway

This walkway runs over a series of stepped wetlands, serving both ecological and social needs. This space will be temporal, and change as rain events happen. The wetlands will be located on hills going up from the waterfront, the pathway will zigzag to be an ADA accessible walkway. By being located close to the waterfront, the wetlands will be able to catch and treat water that is flowing down from the upper section of Belltown.

During rain events, the wetlands will fill up, spilling over into one another after the ground is saturated with water. Filtration material sits below each wetland, allowing cleansed water to seep back down into the ground. The vegetation will serve as a "green corridor" to help connect habitat for insects, birds, pollinators and small mammals throughout Belltown. Users will be able to peer down below the grated walkway into the temporal wetland spaces and enjoy an elevated boardwalk experience.

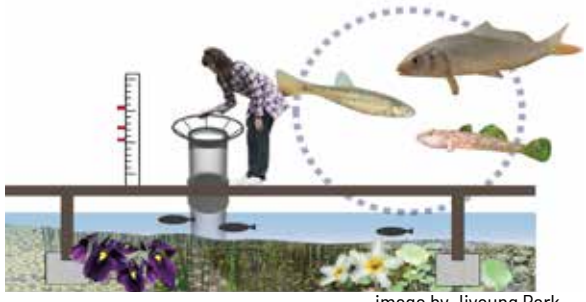


image by Jiyoung Park

Observation section

Considering the pedestrian on the bridge, we choose the idea of observation section. Along the bridge way, people can observe inside the wetlands and can educate themselves about the value of integrating ecological systems into urban areas.

Conceptual idea of integrating temporal wetland and pedestrian walkway

image by Margot Chalmers

BICYCLE FRAMEWORK FOR BELLTOWN

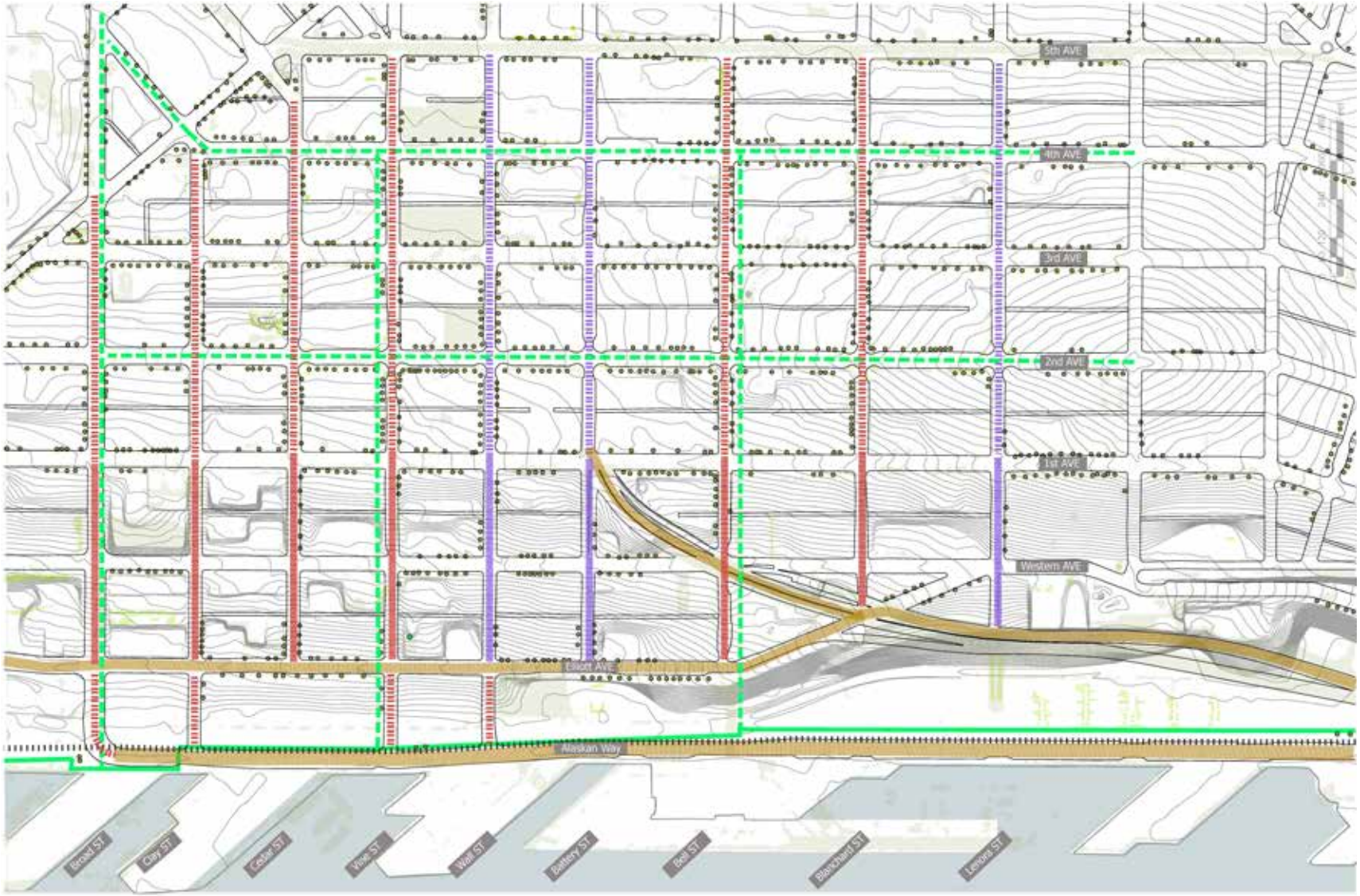


image by Farzana Rahman

Proposed bike routes in Belltown

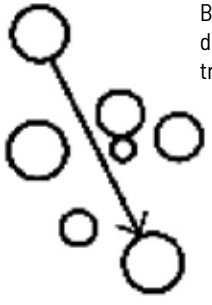
Belltown is a challenging Seattle neighborhood to bicycle through. Between harrowingly steep hills, rush hour traffic and construction that spans miles, bicyclists have much to navigate. This framework attempts to form a safe network for bicyclists with a focus of connectivity, directness, established green spaces and limiting extreme grade changes. Our hope is that everyone will have a safe, efficient and pleasant ride.

Broad Street & Alaskan Way

Vine & Bell Street

2nd & 4th Avenue

Direct



Broad Street promises the most direct access to the waterfront bike trail near Alaskan Way.

Less Steep

Belltown is full of sharp elevation changes but these routes along 2nd and 4th Avenue seek out the least extreme slopes available.

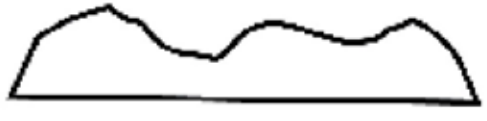
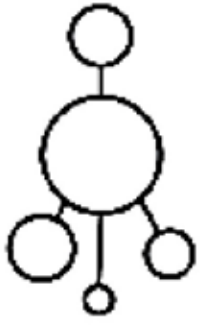


image by Dorothy Mulkern

Street Trees

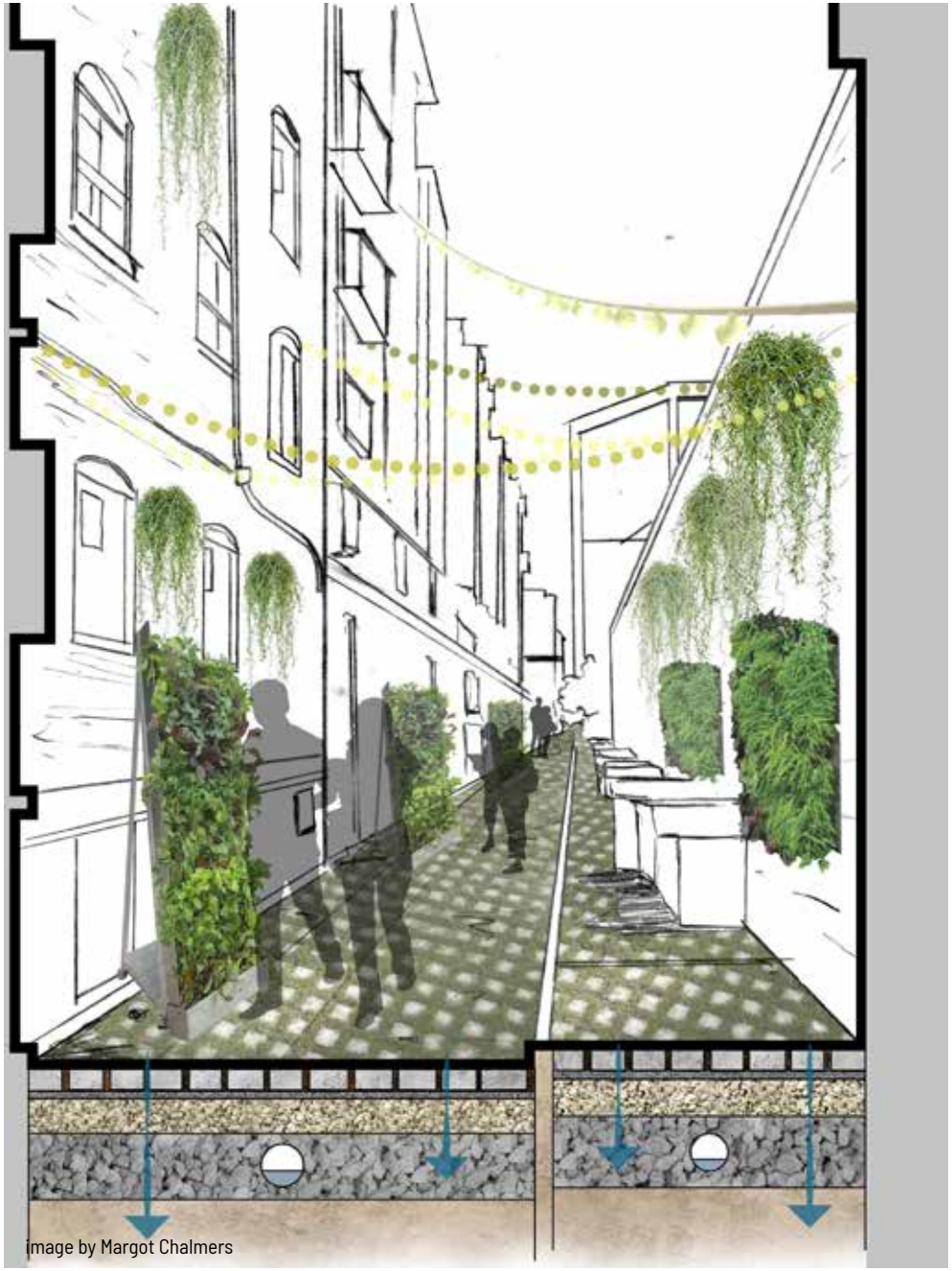
Proposed bike paths along 2nd and 4th Avenue correlate with established green areas.

Connection



Vine and Bell Street establish connection between recommended routes.

GREEN CORRIDOR ALLEYS



The alleys will serve as multi-functional green pedestrian corridors. They will provide stormwater collection and filtration services through the use of porous paving. Utilizing a series of filters, this paving will minimize stormwater runoff by allowing water to seep back into the ground. The series of filter materials underneath the surface of the alleys will remove pollutants such as Nitrogen, Phosphorus, and metals such as copper and lead. The alleys will also serve as habitat corridors, as they feature green walls that can provide habitat for insects, birds and pollinators. The green walls also serve as visual and textural delight for pedestrians wandering through, and will encourage people to utilize the alleyways, creating a safer environment by providing "eyes on the street".

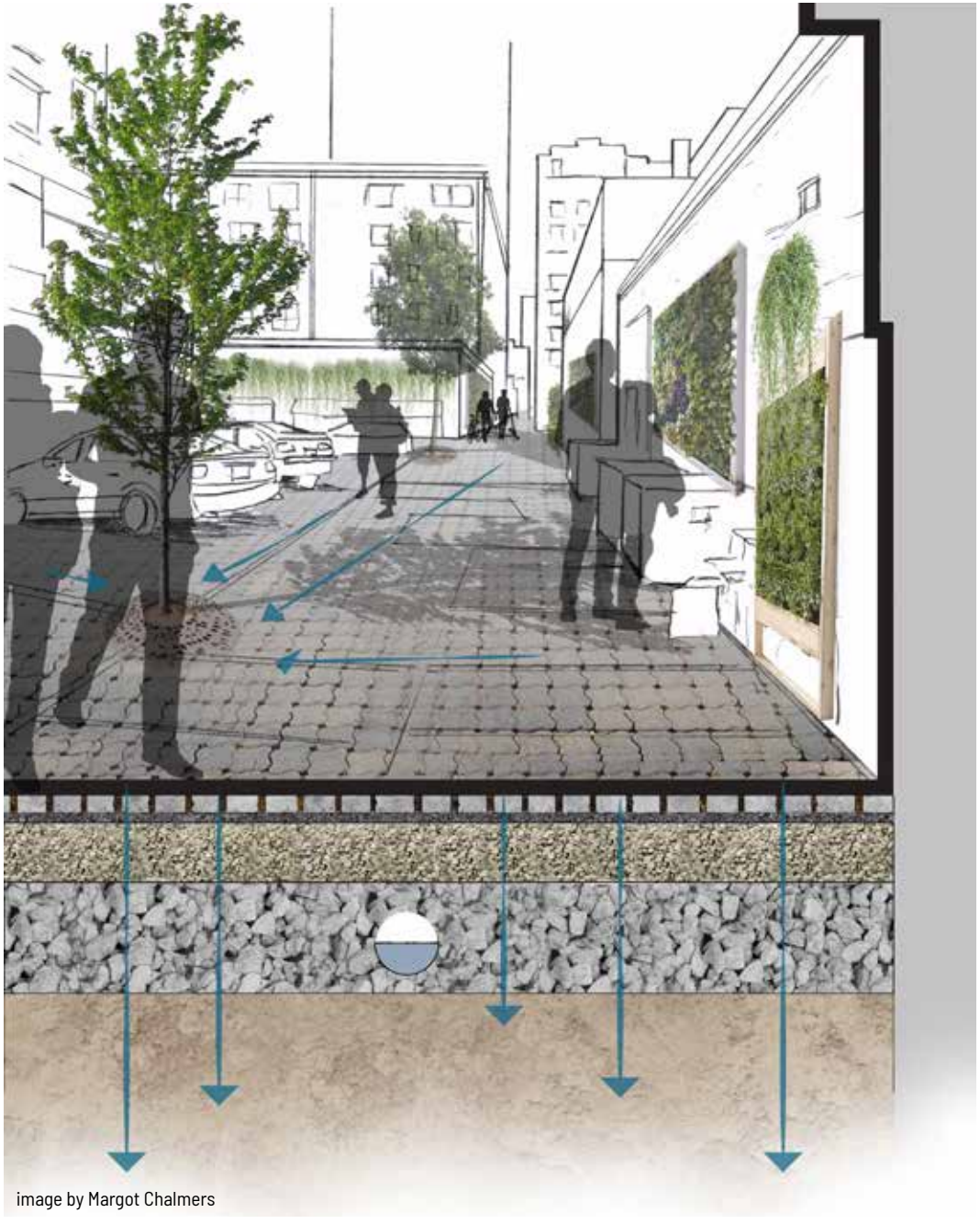


image by Margot Chalmers

PERMEABLE PARKING LOTS

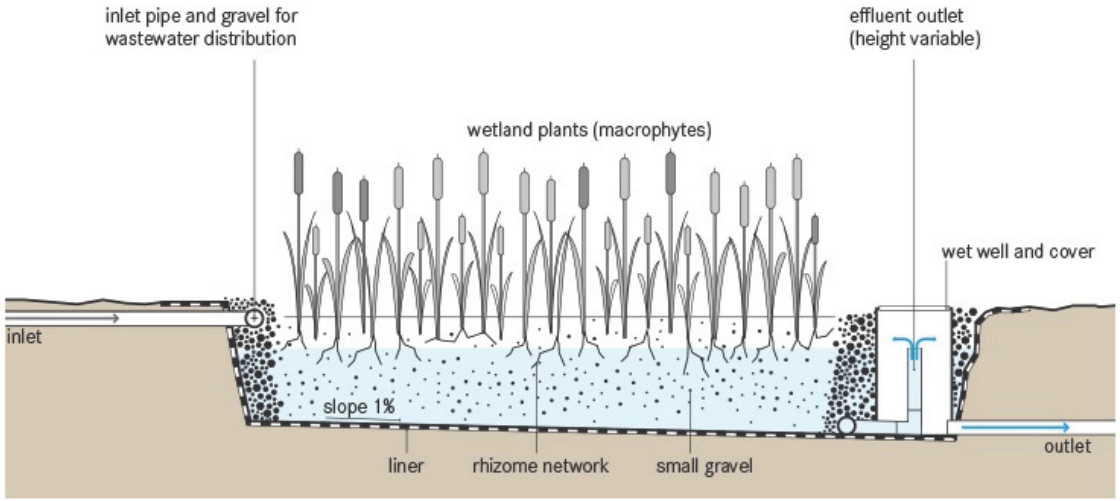
Parking lots are to have permeable paving installed, allowing water to be absorbed into the ground and cleansed. Trees with permeable, cleansing underground tree boxes will be installed, and the grading will adjust the flow of water to go into the tree box. This reduces the amount of irrigation the tree needs, and the tree's roots further aid in water absorption and reuse. Parking lots will be lined with green walls, furthering Belltown's "green corridor" and habitat connectivity.

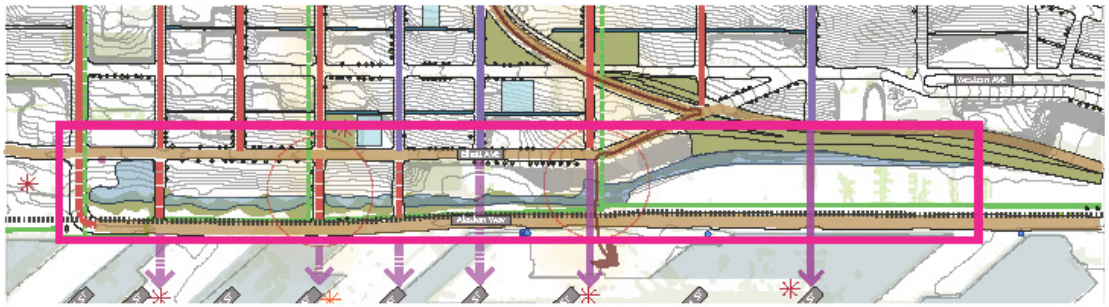
Multi-modal Mobility:

Image: https://waterfrontseattle.org/overview

The new Seattle waterfront plan re-imagines Alaskan Way and Elliott Ave as a multi-modal corridor (Car+Bus + Bike+Pedestrian Walkway) along he waterfront with safe pedestrian connections

WATER STORAGE/MANAGEMENT CALCULATIONS: WETLANDS





References:

New Jersey Stormwater Best Management Practices Manual." New Jersey Stormwater, New Jersey Stormwater, Feb. 2004, www.njstormwater.org/bmp_manual/.

"Rain Garden Handbook for Western Washington." 700 Million Gallons, Department of Ecology, State of Washington & Washington State University Extension, June 2013, www.700milliongallons.org/wp-content/.

"Storm Water Wet Pond and Stormwater Management Guidebook ." Center for Watershed Protection , Center for Watershed Protection , Feb. 2009, www3.epa.gov/npdes/pubs/.

"Subsurface Characterization and Infiltration Testing for Infiltration Facilities." Seattle DPD, City of Seattle , Apr. 2014, www.seattle.gov/dpd/cs/groups/pan/@pan/documents.

"Design Criteria for Filtration." Design Criteria for Filtration - Minnesota Stormwater Manual, Minnesota Pollution Control Agency, 22 Sept. 2016, stormwater.pca.state.mn.us/index.php?title=Design_criteria_for_filtration.

FORMULA

1. Find square footage of wetlands (draw a polygon over your plan in Autocad, then look at properties to find square footage)

2. Find volume: Multiply square footage by average depth of wetlands

SYSTEM'S RETENTION TIME: Minimum 4 days
FLOW-THROUGH TIME: Water must be able to pass through the system for the peak discharge of no less than a 2-yr/24-hr storm

Total flow rate infiltrating = 1.0 in/hr x 1 ft/12 in x 1000 ft squared x 1hr/3600 sec
*formula varies with different design criteria and materials

BELLTOWN CALCULATIONS

AREA of PROPOSED WETLADNS: 145,201 sq. ft.

AVERAGE WETLAND DEPTH: 18"

VOLUME: 1629264.62 gallons

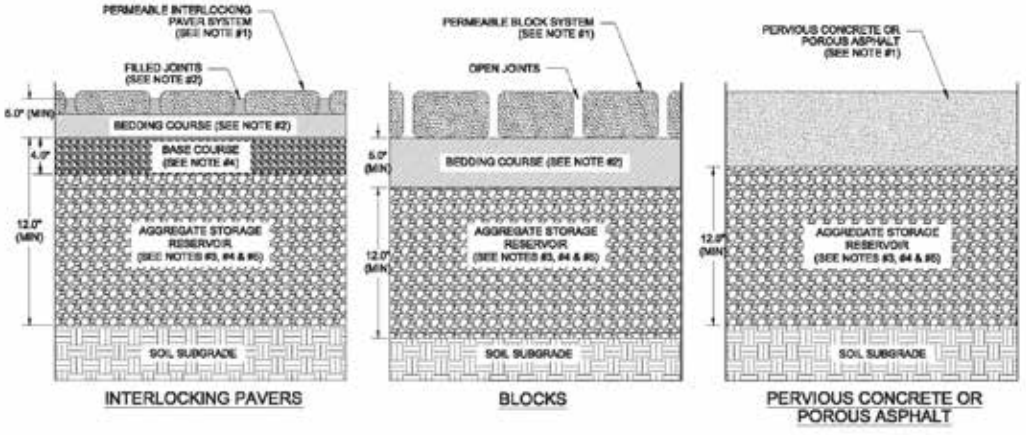
Seattle has an annual precipiation of 30-40" (although this may fluctuate due to climate change, with longer periods of drought and more intense precipitation)

100 year storm event = 1.4"/hr

RECOMMENDED WETLAND TYPE FOR THIS SITE: semi-wet; indundated only during storm events

Flow rate must be under 4'/sec to minimize erosion

PERMEABLE PAVEMENT



Typical layering structure and dimensions permeable pavement system.

Image Source: Wood, Pete. "Permeable Pavement Design for Storm Water Management." wisconsinlandwater.org. http://wisconsinlandwater.org/files/events/Permpave_WOOD.pptx. (accessed October 18, 2017).

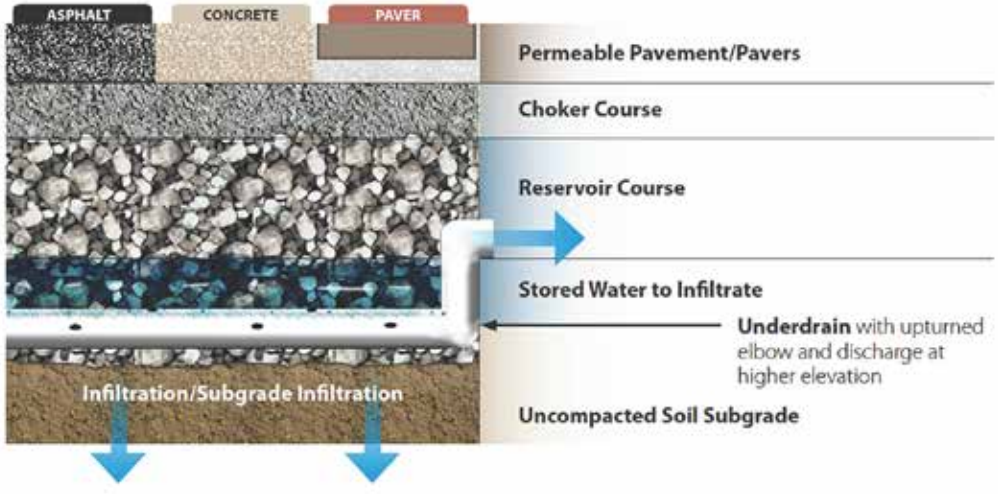


Diagram illustrates the typical water infiltration process through permeable pavement.

Image Source: "Permeable Pavements Recommended Design Guideleines" ftp://ftp.asce.org/EWRI/Permeable%20Pavement/~1_PermeablePavement_FULLSET_DRAFT_102313.pdf (accessed October 18, 2017).

Proposed opportunity areas:

Streets: Clay, Cedar, Vine, Wall, Battery, Bell, Blanchard, and Lenora Street.
Total square footage of these streets: 832,000 SFT (approx.)

Parking Lots (both private+Public): 498,156 SFT (approx.)

Total proposed permeable surface (Streets+Parking lots) = 1,330,156 SFT (appx.)

Calculation: A typical permeable concrete pavement reservoir has a void ratio of 30% and 1 Cu.Ft (12"x12"x12") of reservoir can hold .3 Cu.Ft of water or 2.244 gallons of water. In order to match CSO's goal of 130,000 gallons of water storage for Belltown neighborhood, we need (130,000/ 2.244) = 57,932 SFT of permeable surface. Where our proposed opportunity areas including the streets and parking lots, we can store min 2,984,870 gallons of water for the neighborhood. As our proposed permeable surface areas are way more than the required storage SFT, this leaves us with more room and options for choosing strategic locations for both the permeable surface and reservoir.

However, the depth of the reservoir can vary depending on various design criteria, constraints, and storage requirements. Another important element is the material, size, and depth of the stone bedding, which must be designed so that the water level never rises into the asphalt.

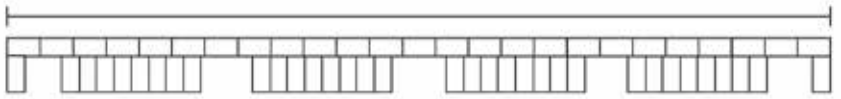
References:

California Department of Transportation. "Pervious Pavement Design Guidance." http://www.dot.ca.gov. http://www.dot.ca.gov/hq/oppd/stormwtr/bmp/DG-Pervious-Pvm_082114.pdf (accessed October 18, 2017).

Department of Executive Services Finance and Business Operations Division Procurement and Payables Section Strategic Partnerships and Analytics. "Pervious Pavement". http://www.kingcounty.gov/~/media/depts/finance/procurement/Documents/Environmental/EP_Products_Pervious.ashx?la=en (accessed October 18, 2017)

SILVA CELL CALCULATIONS

approx.19.70 gal (74.5 L)
for stormwater storage



total number: (25+34) × 2(two layers) =118

Calculation:

1. using CAD measure the length of streets where we want to put silva cells
2. chose a mould of silva cells and use it size and find how the date of how much water it can store
3. decide the way how we set silva cells. We choose 100' in length as a unit which included 118 silva cells
4. calculate the total number of silva cells in the whole area
5. multiply the totle number of silva cells and volume of water which single silva cell could store

Reference:

"SubscribeGreen Infrastructure." Green Infrastructure, www.deeproot.com/blog/blog-entries/video-integrating-silva-cells-utilities.

User, Super. "SILVA CELL 2 OVERVIEW." Silva Cell Tree and Stormwater Management System from DeepRoot, Deeproot. 2017, www.deeproot.com/products/silva-cell/landing-page/silva-cell-2/overview.

	Length	Number	Stormwater Storage approx.
1	337'-8 1/2"	397	7819.5 gal
2	805'-6 5/16"	590	11597 gal
3	515'-4 5/8"	606	11887.7 gal
4	572'-3/16"	674	13261.4 gal
5	535'-8 7/8"	631	12416.1 gal
6	663'-2 7/8"	782	15401.2 gal
7	238'-10 13/16"	280	5521.2 gal
8	377'-7 3/16"	445	8771 gal
9	461'-1"	544	10699 gal
10	521'-9 9/16"	615	12099 gal
11	130'-1 1/8"	153	3011.6 gal
12	443'-3 11/16"	523	10566.9 gal
13	392'-8 11/16"	462	9087.5 gal
14	446'-7 9/16"	526	10355.5 gal
15	1760'-4 3/4"	2077	40814.6 gal
		total:	183,309.2 gal

TREE BOX CALCULATIONS

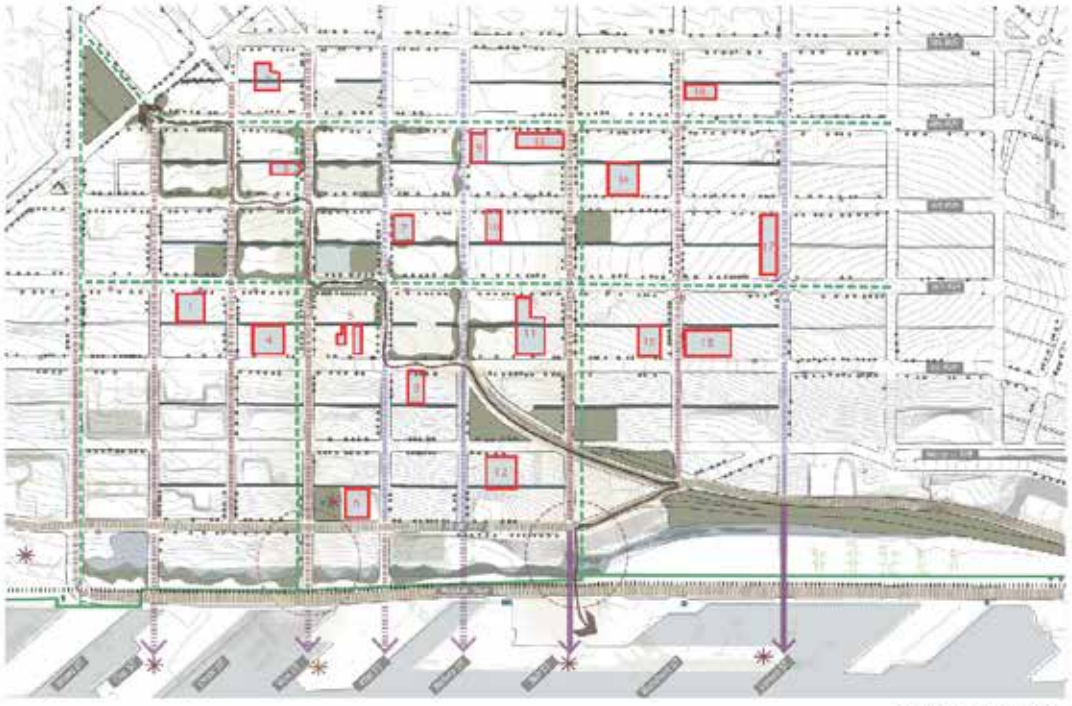
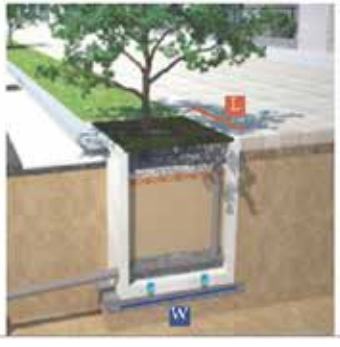


Image: Jiyoung Park

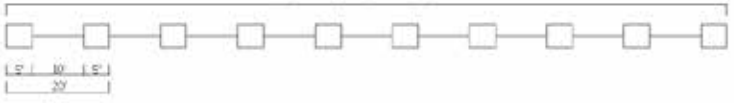
L Length: 5" (1.5m)

W Width: 6.5" (2m)

Approx. 21.13 gal (80 L)
for stormwater storage



(5' X 10) + (10' X 9) = 100'



Calculation

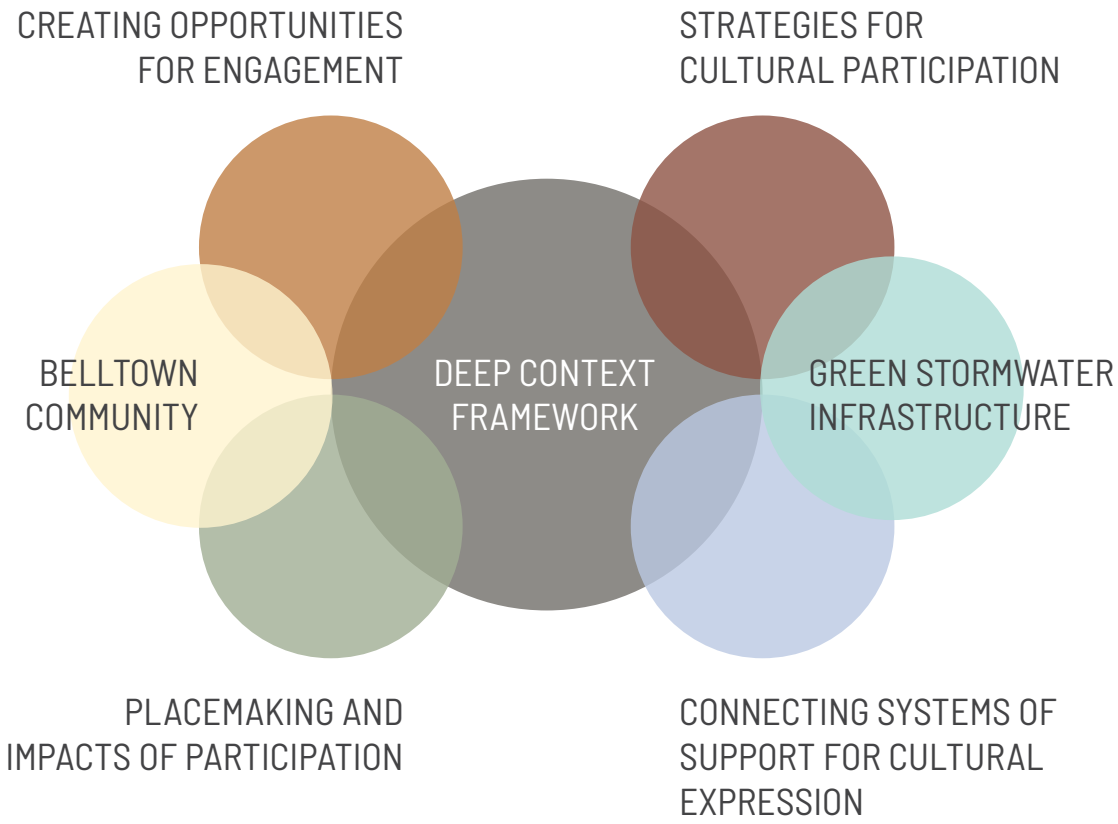
1. Use the Auto CAD measure the potential parking lot where we want to put tree boxes
2. Find how much water tree box can store
3. Decide the way how we put tree boxes. We choose 20feet as a unit
4. Calculate the total number of tree boxes in the whole length of the parking lot area
5. Multiply the total number of tree boxes and volume of water which single tree box could store the water

References:

http://www.tmdl.co.kr/subpage.php?sd=3&sc=3_8

	Length	Number	Stormwater storage approx.
1	413'-5 1/16"	41	866 gal
2	378'-0 1/4"	37	781 gal
3	334'-0 3/8"	33	435 gal
4	476'-3 5/8"	48	1014 gal
5	283'-8 15/16"	29	612 gal
6	429'-7 9/16"	41	866 gal
7	366'-0 1/8"	37	781 gal
8	386'-1 1/8"	39	824 gal
9	337'-11 1/2"	33	697 gal
10	382'-5 3/16"	39	824 gal
11	719'-10 11/16"	71	1500 gal
12	477'-1 11/16"	48	1014 gal
13	467'-11 5/8"	47	993 gal
14	475'-6 13/16"	48	1014 gal
15	424'-9 9/16"	42	887 gal
16	357'-10 5/8"	36	760 gal
17	602'-3 7/8"	60	1268 gal
18	572'-7 1/16"	58	1225 gal
		TOTAL :	16,361 gal

District Opportunities



DISTRICT FRAMEWORK:

DEEP CONTEXT

Nina Mross, Sophie Krause, Yang He

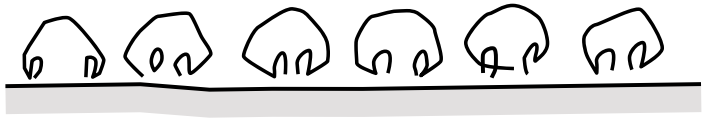
Framework Goal = Supporting Arts, Culture, History, and Creative Expression at the neighborhood level:

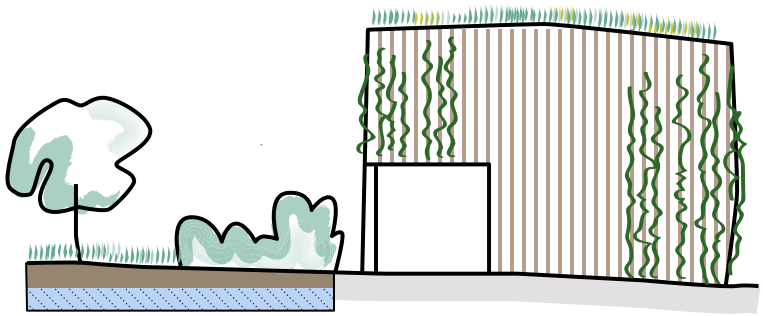
Grounding a conceptual walking tour framework that enhances and daylights the many identities and sensory experiences of an adapting Belltown.

By mapping historic landmarks, cultural landmarks, and potential loved sites, this framework works to marry the history, people, eras, and arts that make Belltown an old, new, and "now" place.

In reaching to advance it's presence as an Arts and Cultural district, how can urban nature strategies also help strengthen the four domains essential to understanding community cultural conditions and dynamics: opportunities for engagement and participation, systems of support for cultural expression, placemaking, and community building?

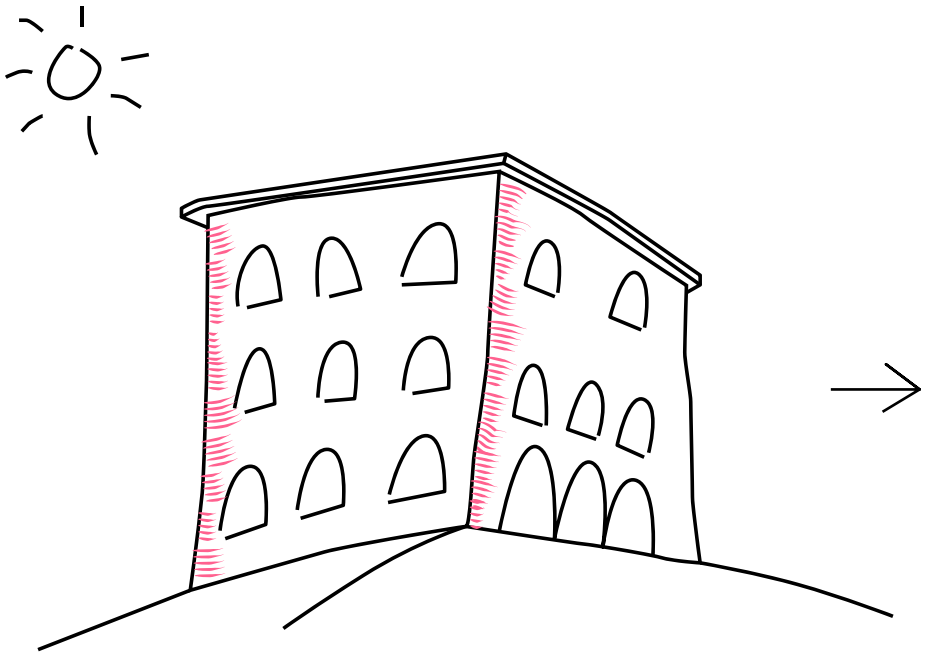
INTERVENTIONS

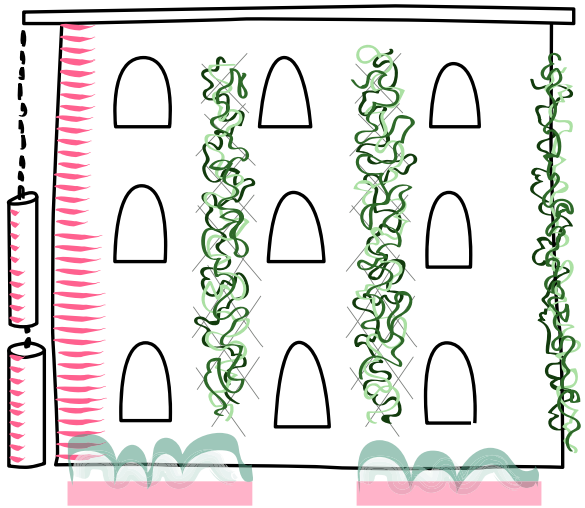




PARKING TO PRAIRIES:
NATIVE BELLTOWN VISION

Garage, Greenspace, Artspace, Soft, Public,
Multi-functional, Habitat, Culture Point

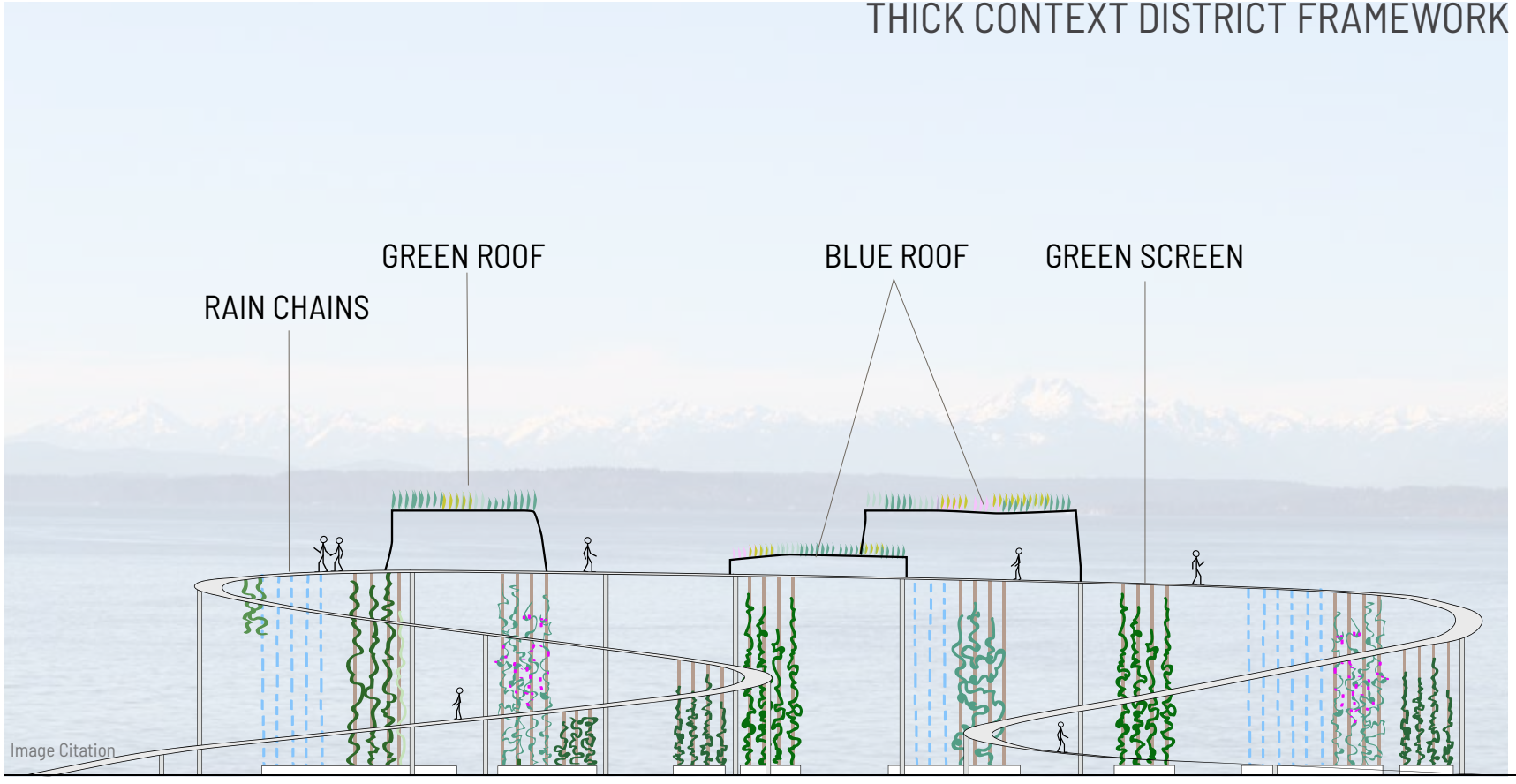




ADAPT HISTORIC BUILDINGS :
Hull Building: Green-less, Hard, Heat Island

ADAPTED :
Side Cisterns, Green Facades, Planters

Image by Nina Mross



DENNY HILL WALK

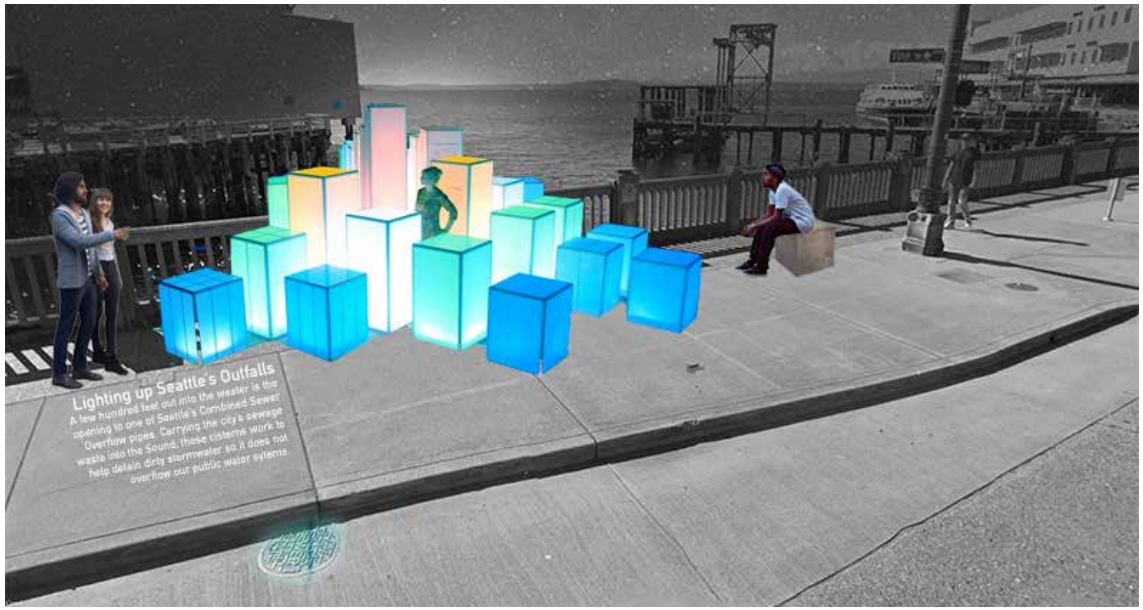
Elevated Pathway near the site of the former summit of Denny Hill. Attached to the Monorail, this pathway connects users with the history and topography of the neighborhood. Public views of Elliott Bay and Puget Sound can be found from the top, re-democratizing what had been a public amenity before high rise development. GSI tools are integrated into the structure for performance, habitat, and beauty.

LITTLE PRAIRIES PARK

Community Park near the site of the original Little Prairies Village, next to the current Battery St. Tunnel entrance. Following the outline in the Native Belltown Vision Plan, this park incorporates desired design elements as well as dense GSI.

PLANTING PALETTE

Gaultheria *shalon*
Rosa *nutkana*
Pinus *contorta*



Making Outfall Events Visible

Using the NPS069 Outfall to highlight how stormwater management works in urban areas.

From Viaduct to Art Space: Public Art Pillars

Some remaining parts of the Viaduct can be a historical and cultural landmark for Belltown and it would be cool for the future generation to see the Viaduct. In our plan, instead of removing the whole viaduct, we're keeping some pillars from the viaduct and making it a "canvas" for artists. Local artists and art lovers will be welcomed to paint on these pillars. The Art Pillars will make the streetscape more vivid and fun and thus add to the cultural identity of this art district. On the top of the pillars, there are some cisterns collecting water and irrigating the plants. In this way, the pillars will be turned into artful green stormwater infrastructure.

Sophie Krause

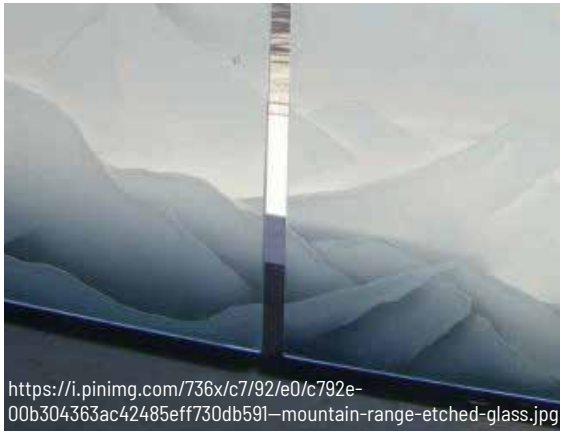
WHAT CAN A CISTERN SAY?

http://img.archiexpo.com/images_ae/photo-g/55235-4915681.jpg

Materiality can be performative, such as using historical photographs etched into glass as panels for an external cistern sculpture. Imagine standing outside of NPS069 and being able to see historical imagery of what the area looked like during the Denny Hill Regrade era.

https://i.pinimg.com/originals/ca/4d/9e/ca4d9e-7c140a06641a59f61b05b1498d.jpg

https://i.amz.mshcdn.com/_cdHYJn8J9RiWLSGXtdlLZ_VN8s=/1200x627/2015%2F08%2F18%2F56%2Fseattleregr.489b1.jpg



https://i.pinimg.com/736x/c7/92/e0/c792e-00b304363ac42485eff730db591—mountain-range-etched-glass.jpg

ADAPTING HISTORIC BUILDINGS

Thinking scalar...
Evapotranspiration on Green Facades:
If each historic building had two mature wisteria vines or greenscreens, that would mean processing 506,000 gallons of water over a summer.
23 Historic Buildings
220 gallons/day x 100 days of summer = 22,000 gallons
22,000 gallons x 23 buildings = 506,000 gallons

What if every historic building in Belltown had...

A Blue Roof...

http://www.greenroofs.com/projects/cuartel_de_ballaja/cuartel_de_ballaja10.gif

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...

https://i.pinimg.com/originals/c3/18/60/c3186075efa014ce-f69730ab9df15ee6.jpg

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 Potential **515,400 gallons**

A Rain garden...

http://www.landezine.com/wp-content/uploads/2012/10/Edinburgh-Gardens-Raingarden-by-GHD-Pty-Ltd-01.jpg

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**

BLUE ROOF STORAGE:

- Ave roof area: 7,000 ft²
- Blue roof depth: 3”
- Storage per building: 13,090 gals

13,090 X 23 = **301,070 GAL**

+

SIDE CISTERN STORAGE:

- Size of Beckoning Cistern
- 15’ x 6’
- 3,000 gals

3,000 X 23 = **69,000 GAL**

+

RAIN GARDEN STORAGE:

- 30 ft
- 6” Depth
- 112 gals

112 X 23 = **2,576 GAL**

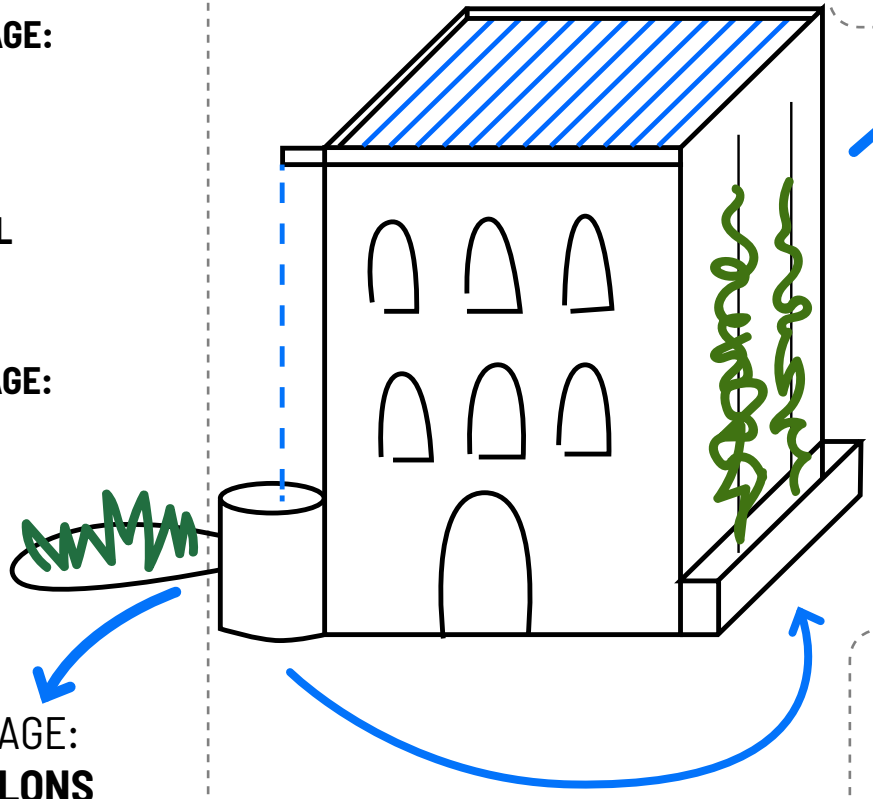
=

TOTAL STORAGE:
372,646 GALLONS

GREEN FACADE EVAPOTRANSPIRATION:

- Two mature climbing vines
- 2 vines transpire 220 gals/day in the hot season
- 220 x 100 days =22,000 gallons

22,000 X 23 BUILDINGS = **506,000 GAL**



Nina Mross

ROOF RUNOFF:

1” Storm:

- 7,000 ft² x .83 x .623 =
- 3619 x 23 = **83,251 Gal**

YEARLY: 83,251 X 40” =
3,330,059 GAL

References:

1) https://www.seattle.gov/arts/arts-and-cultural-districts - Office of Arts and Culture
2) http://friendsofhistoricbelltown.org/wp/ - Friends of Historic Belltown
3) http://www.belltownartwalk.com/ - Belltown Art Walk

GREENWALLS

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.

DISTRICT FRAMEWORK:

SOCIAL SPACES

Nicky Bloom, Kyle Cotchett, Aaron Parker, Rachel Wells, Lauren Wong

Taking into account the public and private social spaces in Belltown, this framework looks to maximize social activity by mixing cultural communities and focusing on a core area. This diagram shows the layers of consideration, from pedestrian movement into the neighborhood to existing and proposed open spaces.

LEGEND

There are few existing **open-space** opportunities within Belltown and the existing parks are highly used by residents

The **new waterfront design** opens new opportunities for social staying and access into the neighborhood

Pedestrians corridors are connected through the streetscapes leading to and from the surrounding neighborhoods

Greenwalls can be utilized on existing blank facades for slowing stormwater, fighting heat island effect, and supporting natural processes

The **core** of Belltown is the focus of developing social spaces and networks of movement inwards

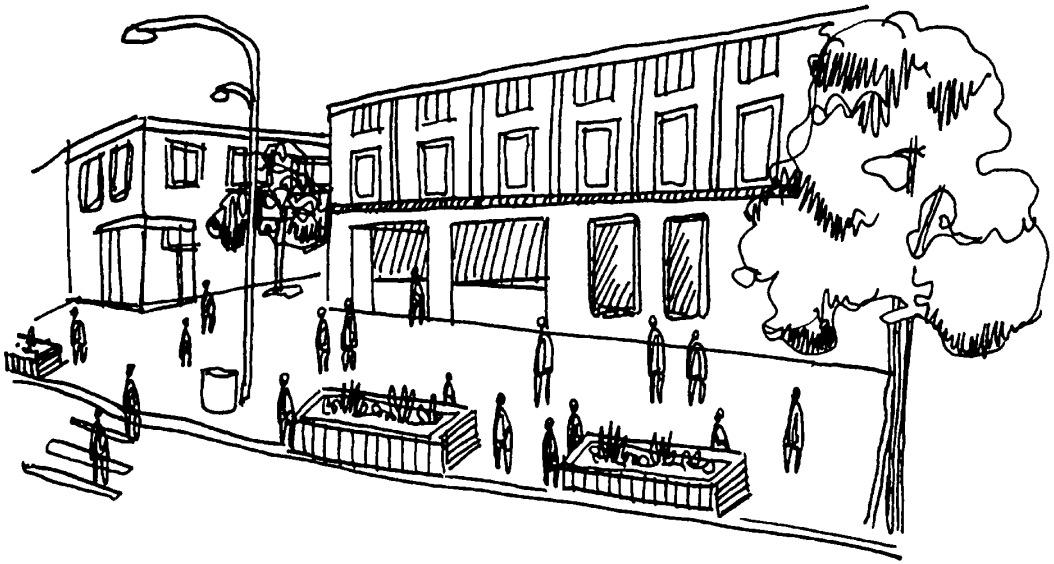
Locations for **bioretention planters**, both flat non-infiltrating and tiered weirs

Sub-surface connections allow planters to work as integrated units maximizing water retention

Private social space in buildings

Study area boundary

BIORETENTION CELLS



Water + People = Robust Public Life

With the larger frame of integrating green stormwater infrastructure to not only meet stormwater management goals but also to enhance public life, it seemed intuitive to first notice where people are moving and where they are staying. 1st and 2nd Avenue are activated by businesses and restaurants, while 3rd Avenue is a heavily trafficked transit corridor. Wide sidewalks on these avenues present an opportunity to integrate bioretention cells, which can filter water from impervious surfaces before directing it through an under-drain.

Placed on the sunny side of the avenues where people are likely to stay, bioretention cells also present an opportunity for social amenity. They may provide seating, buffer pedestrians from the street, or help form a protected bike lane. In all cases, they can make stormwater management a more visible, and beautiful, process.

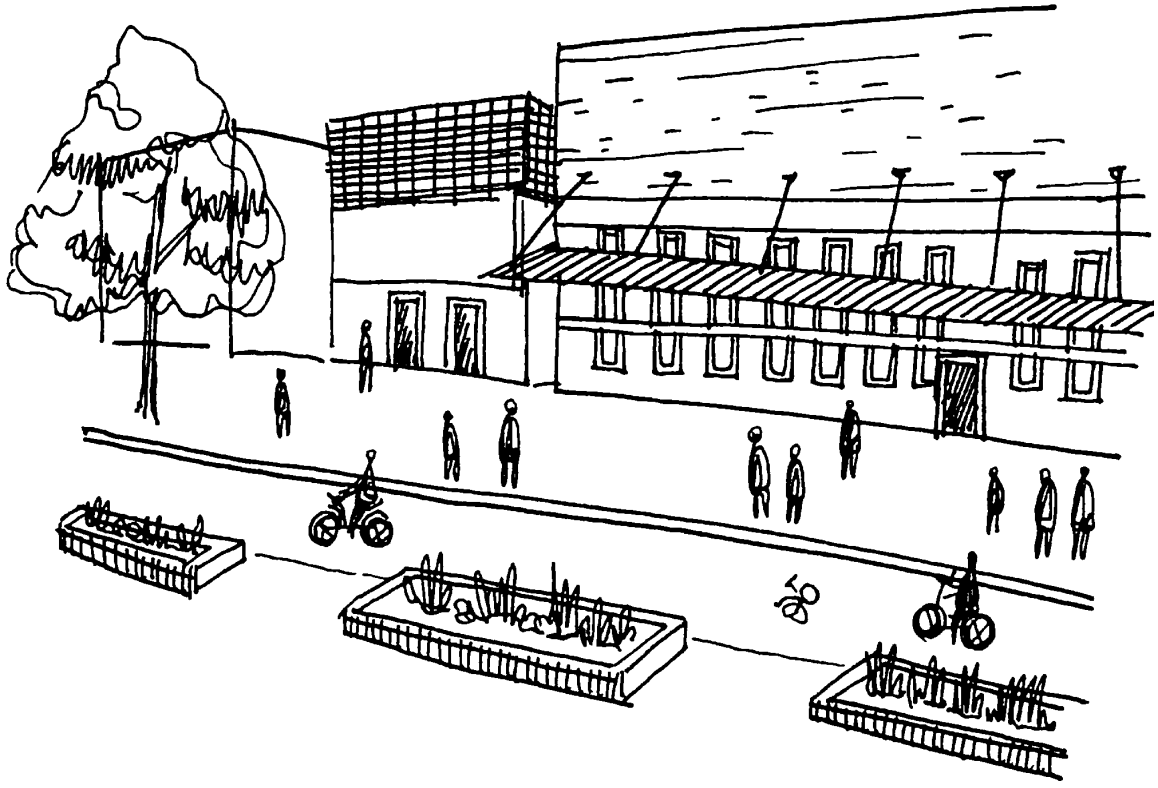
Current Sidewalk Conditions

Current sidewalks along avenues feature some tree canopy but little other green space. Bioretention cells could function as a small but impactful intervention.

Different Options for Placement

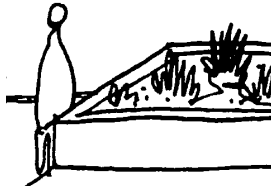
Bioretention cells could help delineate space for a protected bike lane, enhancing pedestrian flows and prioritizing biker safety. Especially on streets identified as busy transit corridors, bioretention cells would improve air quality, reduce the amount of impervious surface, and provide traffic calming.

Leaving space in between bioretention cells could also provide room for parallel parking, if desired.



https://planning.com/736x/a5/c5/b3/a5c5b3fbe73a3af8e11829afae8bed95--drainage-urbanism.jpg

HTTP://THEWELLDRESSEDGARDEN.COM/PAGE/35/



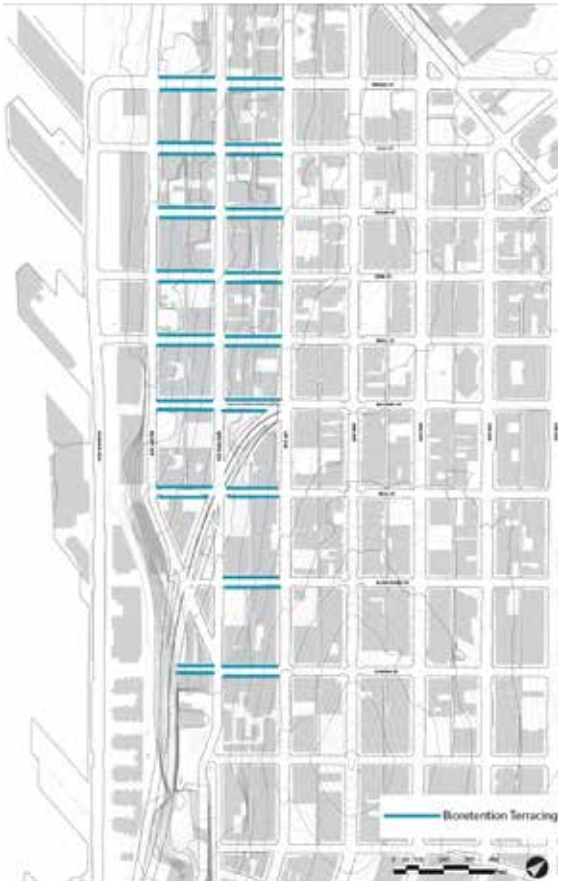
Encouraging Staying

Bioretention cells with opportunities for seating can buffer people from the street and encourage them to stay.

BIORETENTION TERRACING

Our goal was to blend street designs that could lead people to linger and socialize in with stormwater management solutions. In Belltown, there are great examples of how roofwater can be captured and detained before entering the storm drain. However, there exists the need to address street and sidewalk runoff. To combat this issue, we have imagined a terracing bioretention system that has curb cuts to capture street runoff and sidewalk gutters to catch sidewalk runoff. Benches that saddle the terraced rain gardens will help slow the movement of water, while providing a place for people to sit and enjoy the street.

This stormwater management would be implemented on all of the sidewalks between 1st Avenue and Elliot Avenue. The steep topography and current impervious surface that dominates the terrain calls to the need to slow the movement of water in the area.



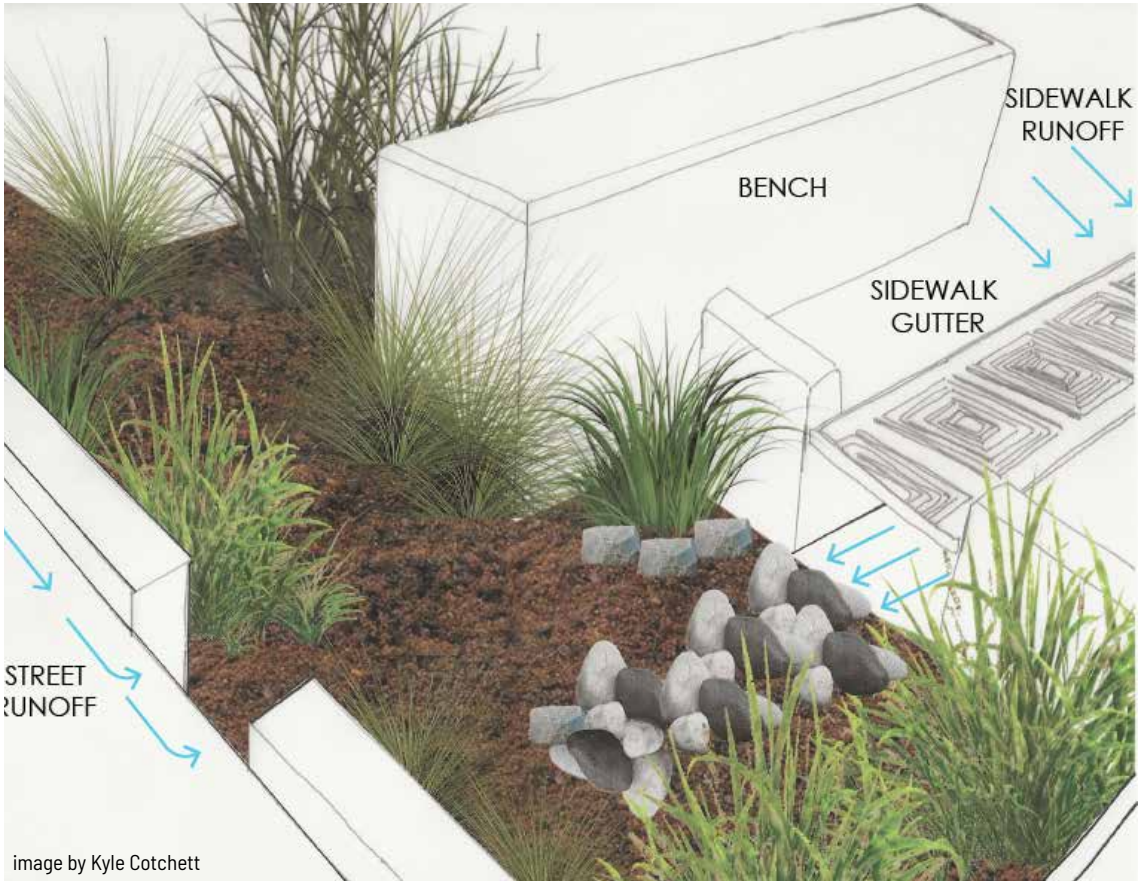


image by Kyle Cotchett

Invitations to Stay:

Alongside addressing street and sidewalk runoff, seating can be incorporated to invite residents and visitors of Belltown to enjoy the street.

image by Kyle Cotchett

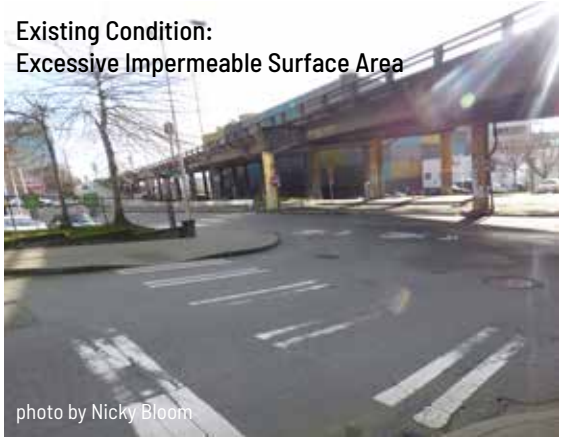
image by Kyle Cotchett

GREEN ROOFS AS SOCIAL SPACE: BUS STOPS

Belltown Bus Stops as Educational Network

Existing Condition:
Extreme Lack of Green Space

Existing Condition:
Excessive Impermeable Surface Area



Existing Condition:
Need for Social Gathering Spaces

Green Bus Stops as Social/Educational Spaces

Belltown has excessive impermeable surfacing, a lack of green space, a shortage of social spaces, and an apparent lack of awareness of the stormwater contamination of the Puget Sound happening right at the base of the hill. One solution that would address several of these factors simultaneously would be to convert all public transit stop shelters into functional, educational green roofs. While the overall square footage available to convert is only around 3,000 square feet, one advantage of green roofs at street level is to teach people about their function and use while creating much-needed beautiful gathering space. While massive green roofs on the large, private, flat roofs that abound in Belltown would create a more significant benefit in terms of stormwater management, bus stops offer a supplementary tool that operates on public infrastructure that is already built. Bus stops create a pre-existing potential network for education, and converting the roofs and installing art and educational signage describing other green stormwater infrastructures operating in Belltown would influence a large audience of public transit users, thus improving both the corridor functioning of Belltown and also providing critical patches of "stay" space.

Precedent:
San Francisco

Image: http://www.greenroofs.com/projects/sheffield

Precedent:
Sheffield

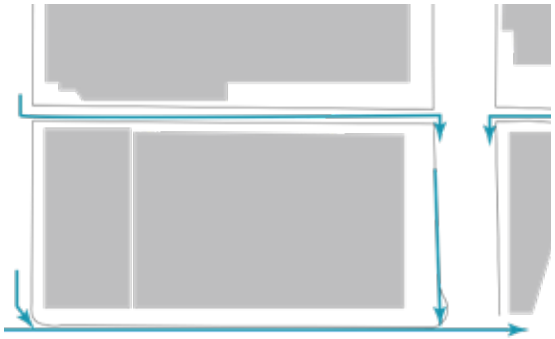
Image: http://www.greenroofs.com/projects/sheffield

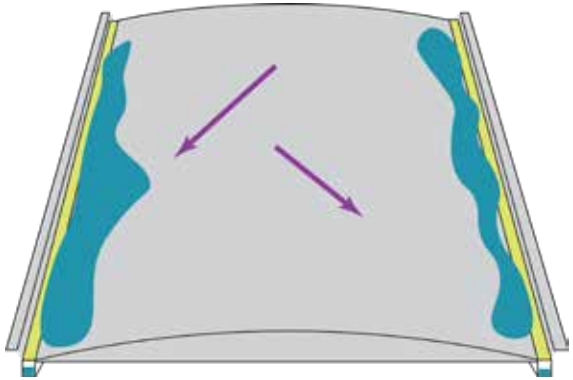
Precedent:
Sheffield

Image: pbs.twimg.com

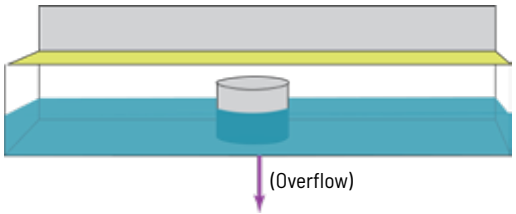
Image: OurTravelPics.com + Nicky Bloom

ALLEYS





images by Rachel Wells



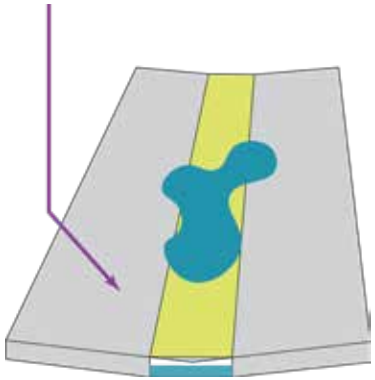
Drains on Streets with Crowns:

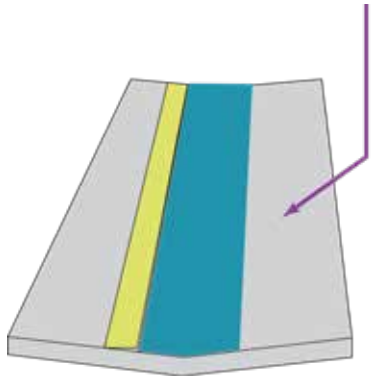
Streets with crowns (non alleys) are designed to shed water to either side. Instead of sending that water to the sewers, water enters a covered channel-style drain and begins to flow through the stormwater interface.

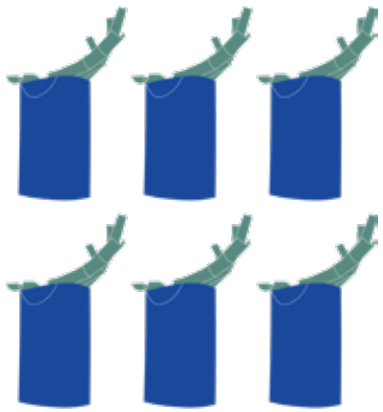
Street Runoff:

Our project site is full of streets and alleys that produce large amounts of stormwater, currently sent directly to water treatment. We propose capturing as much street runoff as possible to store for irrigation and other non-potable uses.

Stormwater captured would be captured from roofs and streets, and flow into the waterbar/trench drain system. From there, water is directed into bioretention planters and cisterns.







Runoff Volume:

Runoff from streets and alleys in our study area is estimated at 14,609 gallons per hour, or the volume of 6 Beckoning Cisterns (left) for every hour of rainfall. This huge volume represents a significant opportunity for water pooling, storing, and reuse.

Harnessing this water could contribute substantially to Belltown's current goals for stormwater management and potable water use reduction.

Alleys:

Stormwater flowing into alleys can be collected using covered channel trench drains (above left) or simple waterbars (above) depending on factors such as grade change/topography, connections with other GSI interventions, risk of flooding, etc.

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STORMWATER RETENTION CALCULATIONS

GREEN WALLS

Technology:

- Using a cistern to capture storm-water
- Drip irrigation using .5 gal/hr emitters per 'system'
- Calculating the storm-water retained only
- Based on 25 sq ft green wall 'systems'
- Each 'system' handles 5.3 gal/day

Average height of buildings: 6 stories

Total blocks in study area: 46

Average facade usable on block: 50%

Average length of the blocks: 290 feet

Average facade usable: 29%

Calculation:

60 ft (height) x 290 ft (block) x .5 (coverage) =

2700 sq ft x 29% (facade use) x 46 (blocks) =

36,390 sq ft / 25 sq ft (GW systems) =

1,455 (25 sq ft systems) x 2.5 gallons =

3,640 gallons of runoff/day X 365 =

1,328,600 gallons of runoff/year

http://www.journalofgreenbuilding.com/doi/pdf/10.3992/1943-4618-9.3.85?code=copu-site

STREET RUNOFF

The length of each road was measured using GIS from the center of the street for site boundaries, and to the curb for all others.

Average Street Width: 54 feet

Average Avenue Width: 42 feet

Alley Width: 20 feet

Formula for Runoff Volume:

(Rainfall depth/hour) x (Runoff coefficient) x (Square footage) = Runoff volume in cubic feet/hour

Runoff coefficient: 1.4 inches/hour =.117 feet/hour
claims to be for a 100 year storm event as classified in 2006

(.117 feet/hour) x (.98 for pavement) x (17033.52 square feet) = 1,953.1 cubic feet/hour

cubic feet to gallons:
(runoff in cubic feet/hour) x (7.48 gallons/cubic foot) = runoff in gallons/hour

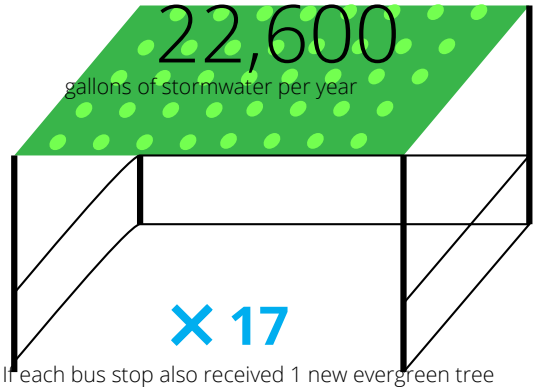
(1,953.1 cubic feet/hour) x (7.48 gallons/cubic foot) =
14,608.9 gallons of runoff/hour
assuming 40" rainfall a year,

584,357 gallons of runoff/year

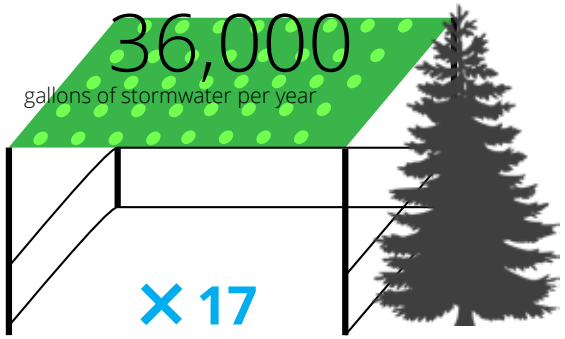
GREEN ROOFS ON BUS STOPS

There are about 17 bus stops in the study area, and each bus stop is around 18'x10', which means there is approximately 3,145 square feet of roof space available on public bus stop roofs.

If 100% of that available bus stop roof space was converted to green roof planting, then according to the District 2030 Stormwater Calculator, the network of bus stop green roofs could manage about:



If each bus stop also received 1 new evergreen tree planting as a social amenity, habitat opportunity, and stormwater management tool, then the system of 17 bus stop green roofs and 17 evergreen trees could manage a total of about:



DATA: DISTRICT 2030 STORMWATER CALCULATOR

BIORETENTION CELLS:

These calculations are based on the placement of bioretention cells along sidewalks on the north (sunny) side of avenues within the study area.

Though bioretention cells will vary in size depending on contextual constraints and needs, we will make generalizations about the average size of a cell. The National Association of City Transportation Officials (NACTO) suggests a minimum width of 4 ft and length of 10 ft, with a maximum ponding depth of 6 in. Maximum soil depth is 36 in.

The amount of stormwater managed by this intervention will be purportedly equal to the Soil Storage Volume of one bioretention cell, multiplied by the proposed number of bioretention cells within the study area.

Soil Storage Volume (ft^3) =
Soil Area (ft^2) x
Soil Depth below the overflow (ft) x
Void Ratio (0.2 for bioretention soils)

SSV for one bioretention cell:
40 ft^2 x 3 ft x 0.2 = **24 ft^3**

Number of Avenue blocks in site area: 41
Average length of Avenue block: 418 ft
Average length of bioretention cell: 10 ft
Average number of cells per Avenue block (allowing for a 10 ft pedestrian cut through after each 40 ft of cells): 33
Number of cells in study area: **1,353**

1,353 bioretention cells x 24 ft^3 = **32,472 ft^3**

1 ft^3 = 7.48052 US liquid gallons

Total stormwater managed by 1,353 bioretention cells:
242,907.43 gallon
510,104 gallons of runoff/day
186,187,960 gallons of runoff/year

BIORETENTION TERRACE:

The bioretention terracing solution would be placed from Broad Street to Lenora between 1st Avenue and Elliot Avenue. Making them 3ft wide and the length of the sidewalk would give us about 597,600 ft2 of bioretention surface area. We are assuming this slope would be planted with sandier soils and would be 3ft deep. The total volume of the bioretention cells in the area would be 1,792,800 ft3.

Penn State (Artful Rainwater Design)

We have calculated how much rainfall this solution could possibly soak up by assuming an infiltration rate of 3.5in per hour for a 24 hour period. Multiplying this by total volume, we assume this strategy could infiltrate 752,976 gallons/day or

274,836,240 gallon of runoff/year

http://www.deeproot.com/blog/blog-entries/3-questions-about-bioretention-soils-and-infiltration

TOTAL WATER RETENTION POSSIBLE:

462,973,157
GALLONS MANAGED PER YEAR


DENNY WAY
BAY ST
WARREN PL
EAGLE ST
BROAD ST
CLAY ST
CEDAR ST
VINE ST
WALL ST
BATTERY ST
AURORA AVE
8TH AVE
7TH AVE
6TH AVE
5TH AVE
4TH AVE
3RD AVE
2ND AVE
1ST AVE
BELL ST
BLANCHARD ST
LENORA ST
WESTERN AVE
ELLIOTT AVE
ALASKAN WAY
VIRGINIA ST
STEWART
PIKE
POST
LEGEND
Belltown Study Area
Areas of Potential
Garden Street
Canopy Corridor
Habitat Epicenter
0
200
400
600
Feet

DISTRICT FRAMEWORK:

ECOLOGY

Julia Brasch, Allison Ong, Diana Settlemeyer and Jess Vetrano

This framework aims to maximize the potential biodiversity, habitat connections, and habitat typologies in Belltown.

ECOLOGY: EXISTING CONDITIONS

map by Jess Vetrano

Existing Green Roof on Bell Street

Battery Street Tunnel

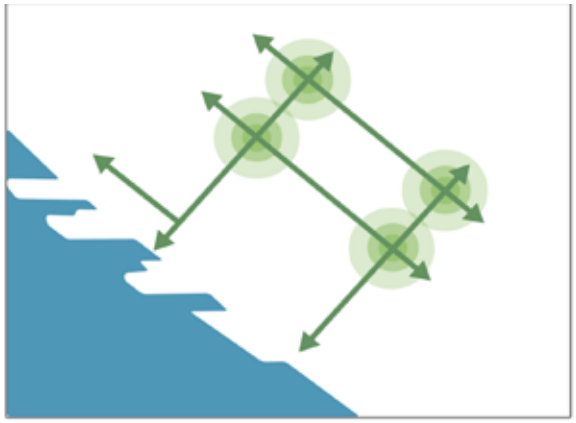
4th Street Facing Northeast

Bell Street Park

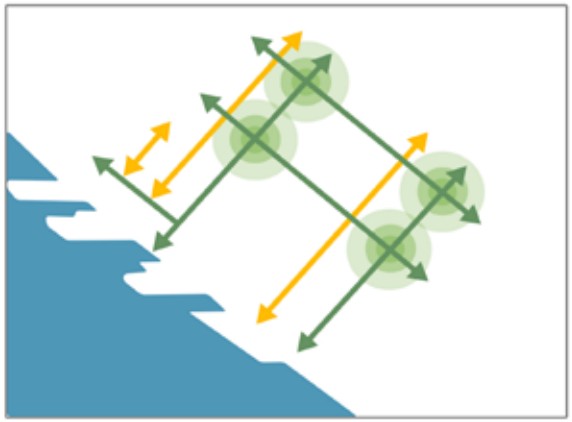
Belltown P-Patch

Existing Conditions

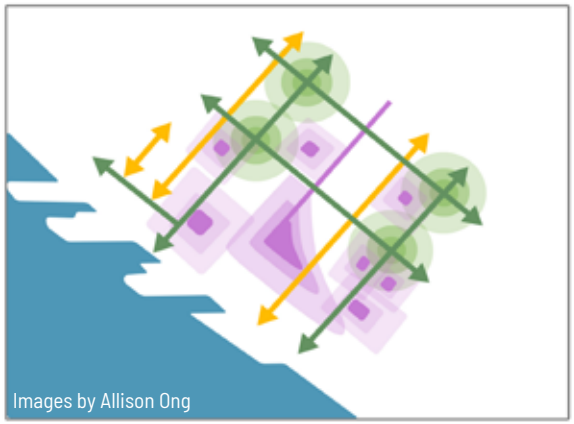
The existing ecological typologies (explored in the ecology district analysis) were analyzed and condensed to display where the most potential lies for future habitat in Belltown. The trees in the neighborhood were inventoried and narrowed down to display those with the most potential for creating habitat canopies, which we define as trees that grow taller than 35' and spread wider than 25'. Parks, plazas, and planters are identified using the same symbology as they provide similar habitat conditions. Unkempt vegetation and areas of potential are displayed as areas with the least existing habitat, but the fewest constraints for creating new habitat. Finally, the existing distribution of green roofs is included to display the non-ground level habitat that Belltown currently contains.



Streets with potential for continuous canopy are designated **Canopy Corridors**. Continuous canopy supports habitat and migration for birds and insects. Intersecting corridors are buffered by green roofs and walls.



Streets that lack potential for continuous canopies but have other green interventions such as planters, were designated **Garden Streets**. This typology caters to a more human scale while still contributing to a green Belltown.



Parking lots and sites to be demolitioned represent opportunities to create new habitat from scratch. We envision these to be radical **Habitat Epicenters** where living things of all kinds are invited to stay.

Images by Allison Ong

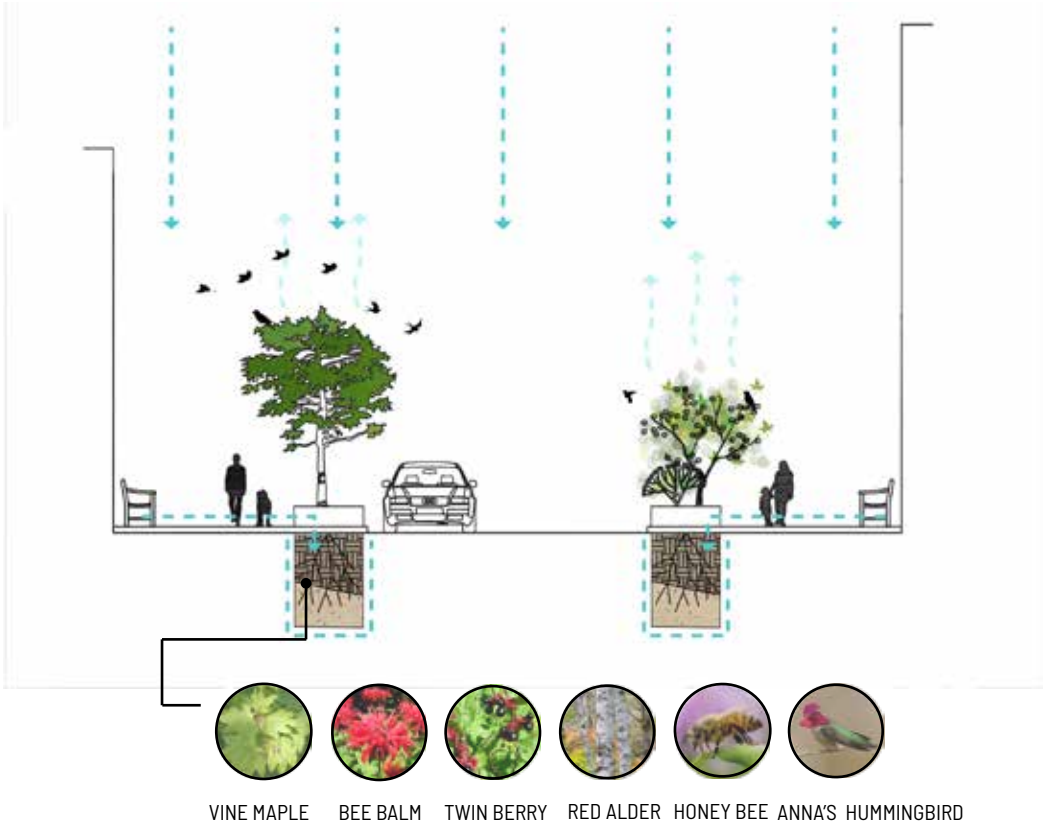
image by Julia Brasch

Biodiversity Connections

In addition to examining connections within the project area, this framework looks beyond the site boundaries to external nodes of biodiversity. It is important to pay attention to their role in the ecology of the area and enhance their connections to the site.

DISTRICT FRAMEWORK

Images by Allison Ong and Diana Settlemyer



GARDEN STREETS

Garden streets build off of existing habitat typologies that cater to the human-scale. An existing example of this typology is Bell Street Park, which contains planters and small street trees, but primarily aims to prioritize pedestrian mobility. As a result, garden streets will incorporate similar scales of vegetation as already exist, and will serve smaller species.

Flora

Vine Maple | Bee Balm | Twin Berry | Red Alder

Fauna

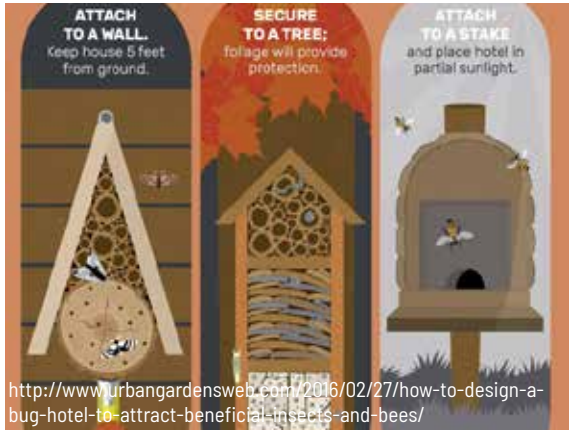
Honey Bee | Anna's Hummingbird

Tools

Bioretention Planters | Green Walls | Green Facades | Pollinator Strips | Insect Hotels | P-Patch

Images by Allison Ong & Julia Brasch

Existing garden street (Bell Street)



Insect hotel typologies

Average streetscape (left) transitioned to pollinator strip (right)

CONTINUOUS CANOPIES

Continuous canopy corridors build on streets that already have large growth trees with spreads that are able to connect in the center. These corridors expand beyond the street level, incorporating habitat on roofs as well. It aims on accommodating birds and insects from a sky standpoint, creating habitat above the urban life.

Flora

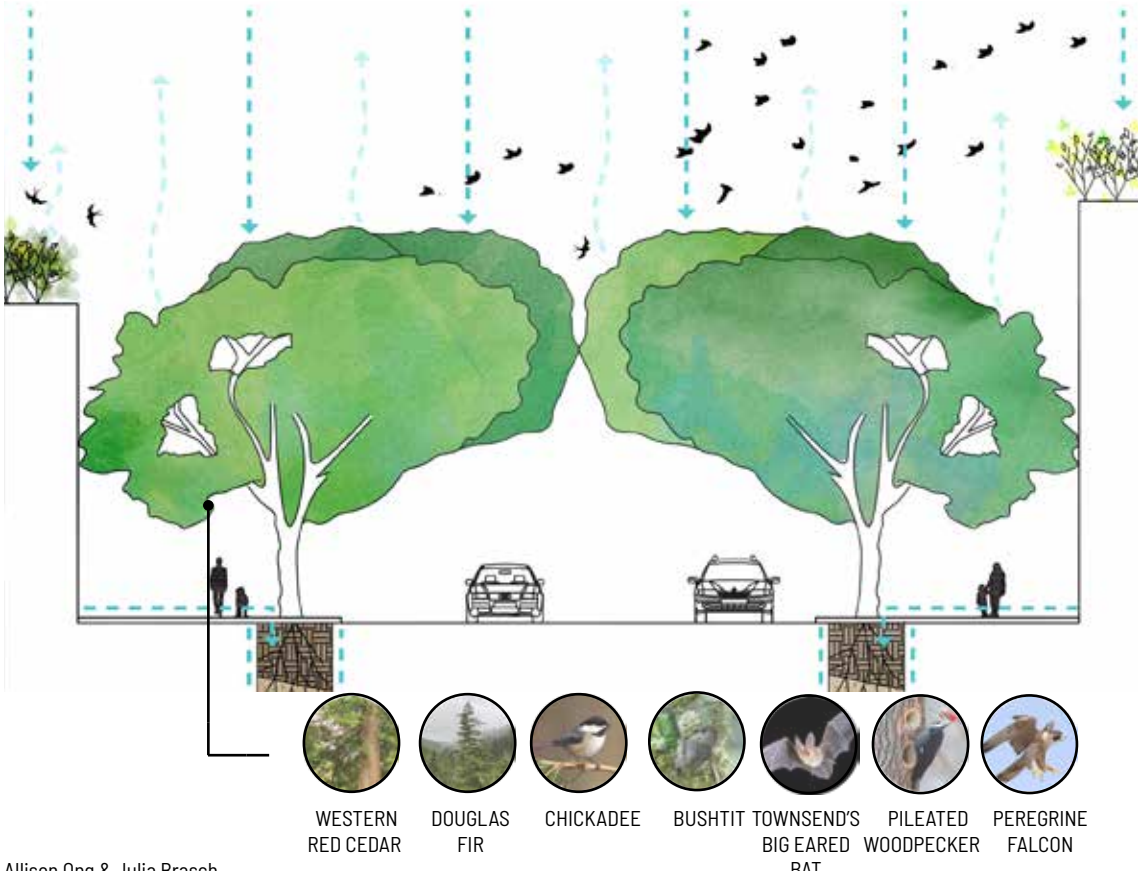
English (hedge) Maple | Red Oak | Western Red Cedar | Douglas Fir

Fauna

Chickadee | Bushtit | Townsend's Big-Eared Bat
Pileated Woodpecker | Peregrine Falcon

Tools

Pollinator Strips | Insect Hotels | Canopy Trees | Green Roofs (including roof agriculture) | Blue Roofs | Constructed Wetlands



Allison Ong & Julia Brasch

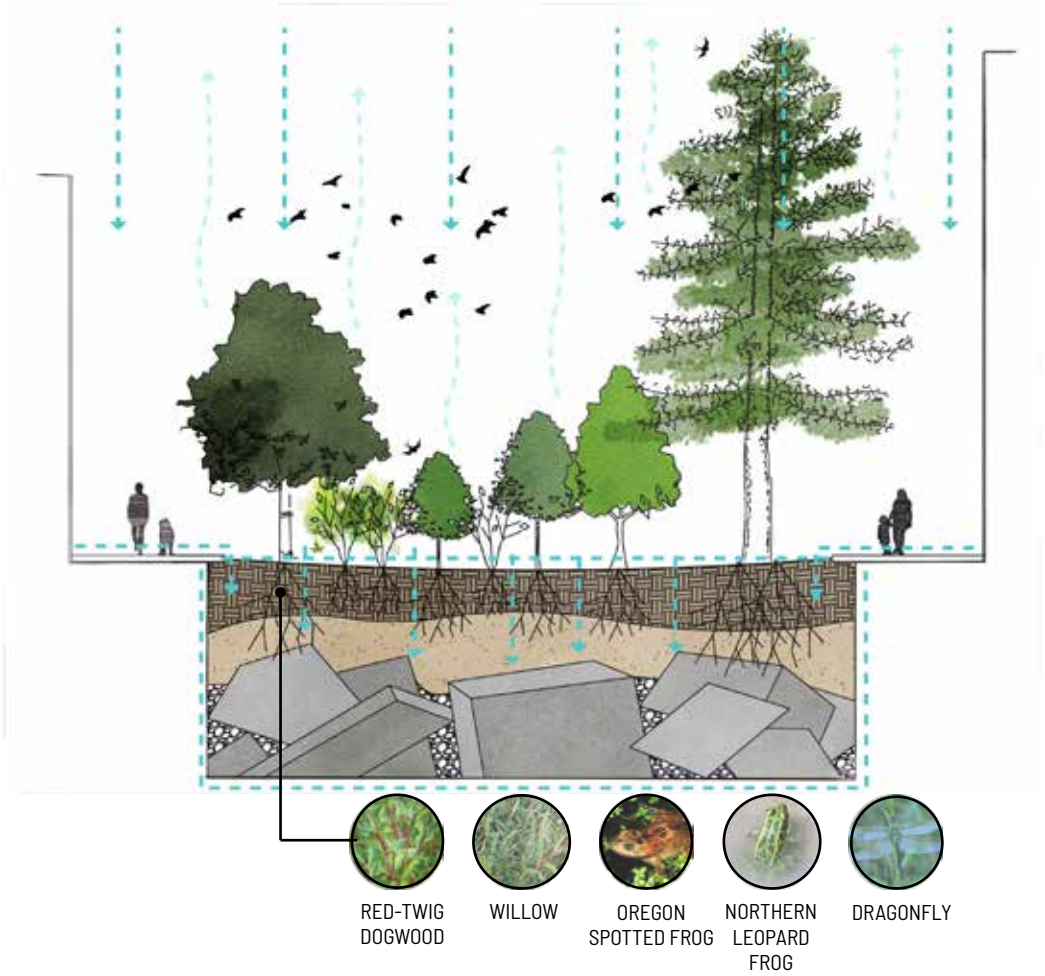
Existing continuous canopy (4th Ave)

Agricultural roof

Combined blue and green roof

Elevated pedestrian/bicyclist path

Constructed wetland



Allison Ong & Julia Brasch

HABITAT EPICENTERS

Habitat epicenters utilize areas that are considered "blank slates" from an ecological stand point, meaning they have no established habitat typologies to build off of. As a result, the proposed interventions within this category are more radical than those found in the previous two. They aim to introduce new habitat to Belltown, and create areas that maximize habitat potential and accommodate unique and/or endangered species.

For Battery Street, we propose utilizing debris from the demolished viaduct to partially fill the Battery Street Tunnel. The remainder of the tunnel should be filled with gravel and sand below Silva/strata cells that can support a wider variety of vegetative habitat than is possible elsewhere in Belltown. At the Battery Street Portal Site, we propose a constructed wetland area that will introduce an entirely new habitat typology to the area. A raised pedestrian/cyclist walkway could be incorporated for connectivity and natural immersion.

The Harbor Habitat Epicenter would include building off of the seawall remodel project to enhance the shoreline for aquatic habitat, as well as introducing floating wetlands in the harbor where possible. Some viaduct infrastructure could be maintained to support roosting posts for large harbor birds (osprey, eagles, etc.), or even raised habitat islands.

Potential future habitat epicenters could be included in the expansion of the p-patch into the adjacent surface parking lot, as well as the transition of the other surface parking lots to vegetated areas and potentially additional constructed wetlands.

Flora

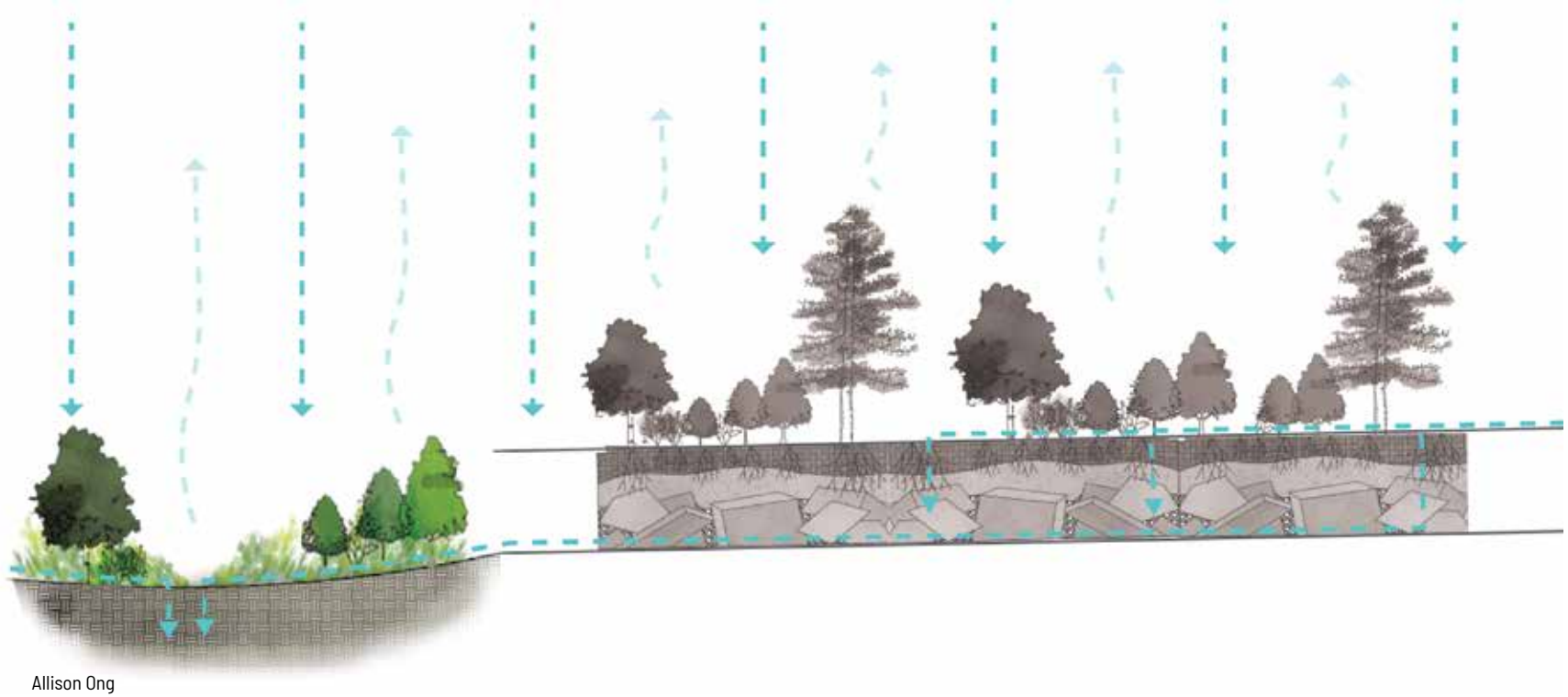
Red Twig Dogwood | Willow | Eelgrass

Fauna

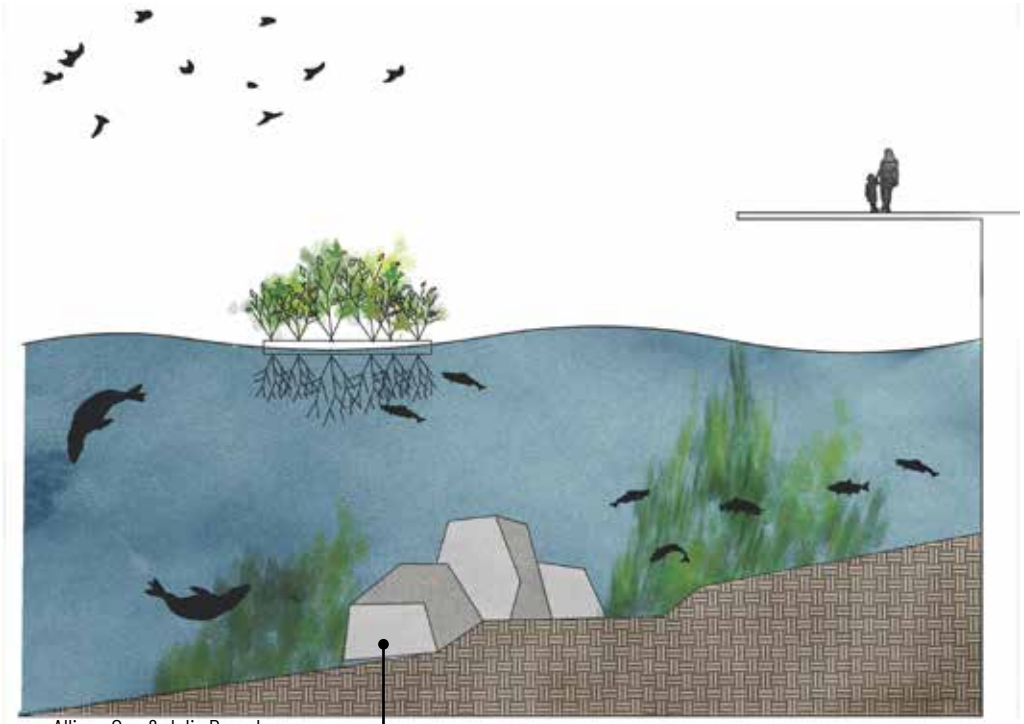
Osprey | Oregon Spotted Frog | Northern Leopard Frog | Dragonfly

Tools

Strata Cells | Bat Boxes | Habitat Islands | Floating Wetlands | Pollinator Strips



Allison Ong



Allison Ong & Julia Brasch

EELGRASS SALMON OSPREY

Constructed wetland in harbor

Constructed nesting post

Images by Allison Ong

Bat Houses

- Typically roost under the bark of a dead tree and other safe crevices
- Bat Houses can be placed on buildings or on poles with at least 20 feet of open space
- Supports Big Brown Bat (Eptesicus fuscus), Little Brown Bat (Myotis lucifugus), Mexican Free-Tailed Bat (Tadarida brasiliensis), Pallid Bat (Antrozous pallidus), and Yuma Myotis (Myotis yumanensis)
- A common single-chamber bat house is capable of housing 50 bats, while a larger multi-chamber design can attract nursery colonies of 200 or more bats
- Ten bat houses spread along the harbor and into the Battery Street site would provide **habitat for around 2,000 bats**

Constructed Wetlands

- Located over the Battery Street Tunnel and the Battery Portal Site
- Provides habitat for hundreds of species of birds, amphibians, and insects
- Serves as a food source for the bat houses in these areas
- With a 6 inch gap between the berm and the surface of the water during normal conditions, these wetlands could **accommodate over 500,000 gallons of water** during a major storm event

Insect Hotels

- Located along Garden Streets because of their need for partial sunlight and their educational potential for pedestrians
- Useful for insects that hibernate in the winter
- Offers habitat for pollinators and insects that eat garden pests
- Caters to beetles, ladybugs, butterflies, and green lacewings
- Just a handful of insect hotels could **add thousands of beneficial insects**

Pollinator Strips

- Some pollinators can only fly about three blocks before they need more food, so creating strips throughout the neighborhood is essential for pollinator survival
- **Pollinator habitat almost quadruples** by just using existing planting space more effectively – wildflowers and herbs instead of lawns and mulch, and fruiting trees rather than just leaf canopies
- Should contain a wide variety of species that bloom at different times of the year and provide a spectrum of different colors
- There should be at least 5-7 plants (or 9 ft^2) in each pollinator attraction area, and there should be some repetition of species within these groupings
- This framework has the potential to provide over **100,000 square feet of pollinator strips** if they were to be implemented at 3 ft widths along every proposed street typology

Canopy and Bird Habitat

- In order to provide valuable habitat for bird populations using street vegetation:
- Structural diversity (the use of plants of a variety of heights and densities) is very important, and
- The presence of a diversity of tree ages, as dead or dying trees serve as nesting places for many species
- Selecting native plants that offer flowers and fruit can support increased bird numbers by providing food
- Plants that support insect populations in turn support bird populations
- Maintaining existing large trees as much as possible: **the larger the tree, the more habitat it offers.**
- With the addition of a strategic plant selection along the identified key corridor streets in Belltown, bird habitat could be increased significantly.
- A total of **15,250 ft of canopy** could be produced in the framework plan (including embellishment of existing canopy)
  - 12 sides of blocks at 400 ft = 4,800 ft
  - 25 sides of blocks at 250 ft = 6,250 ft.
  - 14 sides of blocks at 300 ft = 4,200 ft.

References:

Reissman, Hailey. “How to save pollinators? Let public land go to the (wild) bees.” March 3, 2017. Ted X Innovations. Web.

NRSC. “Pollinator Biology and Habitat.” April 2013. Web.

www.audubon.org/magazine/july-august-2013/how-create-bird-friendly-yard

Parsons. “Best Practice Guidelines for Enhancing Bird Habitat.” Birds in Backyards Program.

Zwarts, Bjilsma. 2015. “Detection probabilities and absolute densities of birds in trees.”

Lerman, Nislow. “Using Urban Forest Assessment Tools to model bird habitat potential.” Landscape and Urban Planning.

photo by Tatyana Vashchenko

TARGET

SEATTLE 2030 DISTRICT'S STORMWATER MANAGEMENT TARGET :

61,000,000
GALLONS MANAGED PER YEAR

SEATTLE PUBLIC UTILTY'S STORMWATER STORAGE CAPCITY TARGET :

130,000
GALLONS

STRATEGY

FRAMEWORK STRATEGIES:

green walls
bioretention cell avenues
trees at bus stops
bioretention cell terraces
blue roofs on historic buildings
extensive green roofs
intensive green roofs on future buildings
permeable paving on select streets
detention wetlands along waterfront
filterra treeboxes along "the green ribbon"

FRAMEWORK STRATEGIES:

green walls
blue roofs on historic buildings
side cisterns
rain gardens
combined roof to rain garden
green screen (evapotranspiration)
intensive green roofs on future buildings
Silva Cells on "the green ribbon"

FRAMEWORK STRATEGIES:

grey and blackwater recycling within district buildings

CAPACITY

STORMWATER MANAGEMENT POTENTIAL :

894,413,635
GALLONS MANAGED PER YEAR

STORMWATER STORAGE POTENTIAL:

2,338,670
GALLONS

POTENTIAL POTABLE WATER SAVINGS:

468,819,140
GALLONS

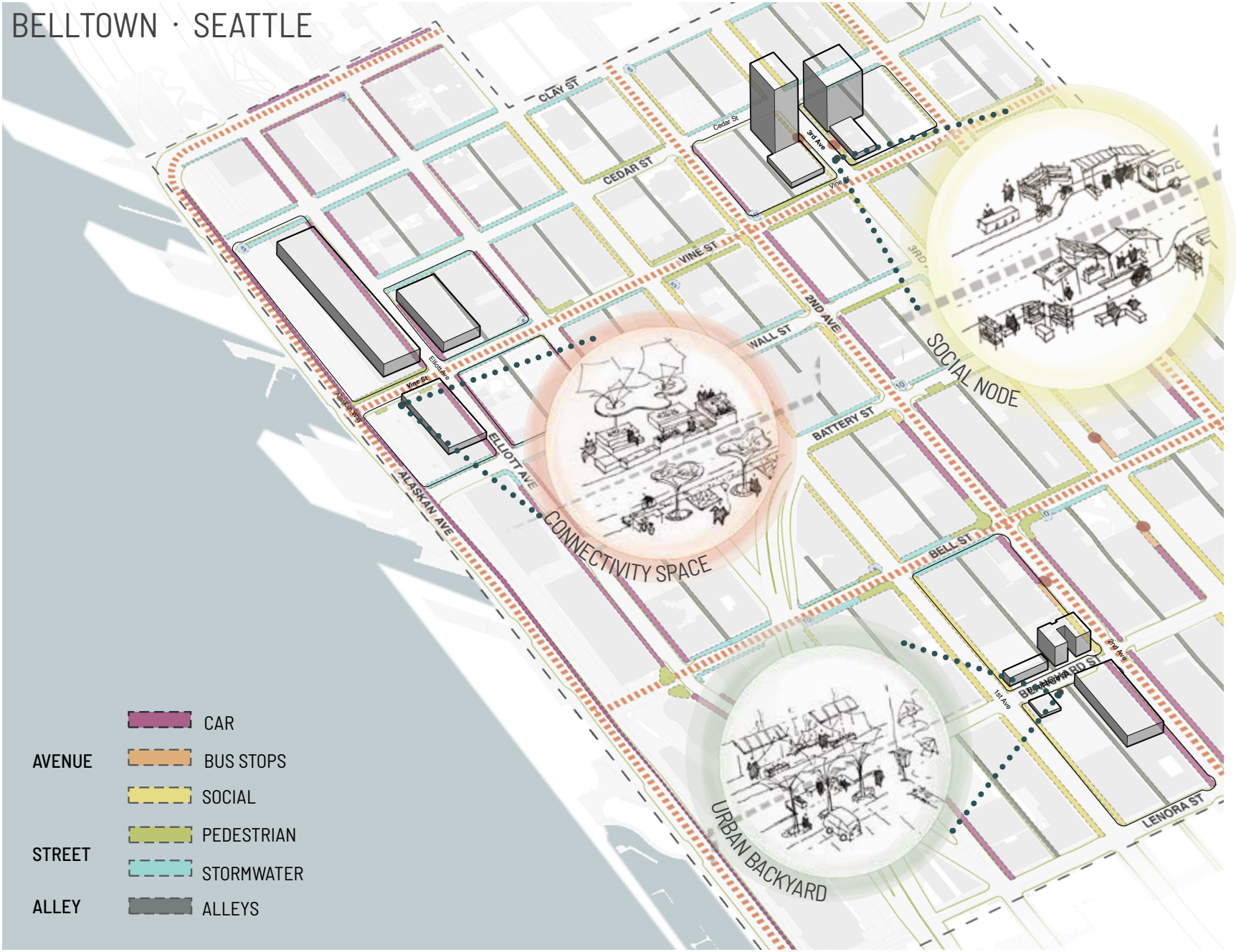
photo by: Tatyana Vashchenko

DISTRICT VISIONS AND SITE DESIGNS

Having spent several weeks analyzing the Belltown District and developing design frameworks and strategies for key systems shaping this neighborhood, the class collectively identified and narrowed a range of opportunity sites. The opportunities identified ranged from bounded parcels, to networks of streets, to flexibly deployable interventions. Students formed groups based on their design interests and developed robust visions that hold the potential to catalyze a more socially, ecologically and hydrologically resilient public realm in Belltown.

Opposite Page: Hanna Tania presents her group's vision for the Belltown District. Their approach consisted of a myriad of creative small-scale interventions organized into a game that could be played at public outreach events.

BELLTOWN · SEATTLE



DISTRICT ANALYSIS

Transportation

There are various types of roads in Belltown. Road typology helps to decide the main function of the street through project analysis.

Streets Facilities

Based on usage, there are three different spaces identified which can be potential spaces for human activities and biodiversity.

Water Management

The district network of sewer and drainage is used as a base map for interventions related to stormwater to mitigate the CSO issue.

Building Types

The buildings types are used to determine the interventions to be applied to enhance the public realm.

DISTRICT VISIONS:

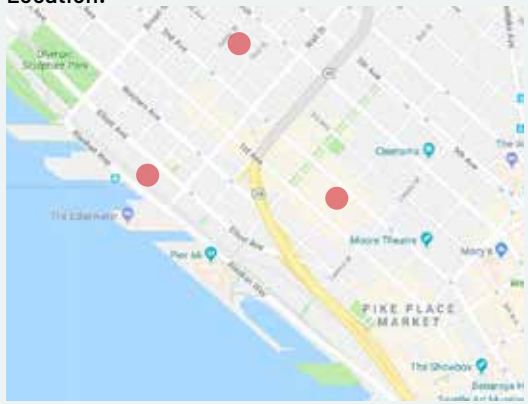
SMALL-SCALE INTERVENTIONS

Hanna Tania, Yutong Hu, Yunxin Du

An urban public realm is interconnected by the experience of walking and staying on the street. This project identifies opportunities for introducing various small-scale interventions in Belltown. Using the toolbox of interventions that are developed in this project, a wide range of interventions can be layered and integrated to develop multi-functional spaces that address urban resilience, elevate the public realm, create habitat and manage stormwater.

Belltown is rapidly growing with a lot of development in progress. Each street serves different modes of transportation and is surrounded by a variety of building types. With its unique features, patterns, and qualities, there are many needs and opportunities identified within the neighborhood. This project focuses on identifying different street categories and types of street users to further develop the small-scale interventions that have the potential to elevate the urban experience.

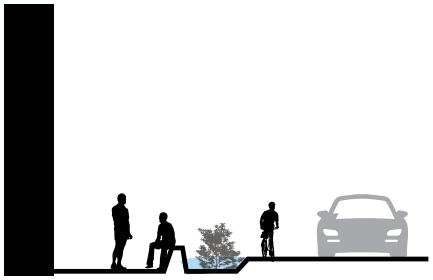
Location:



TYPES OF POCKET SPACES

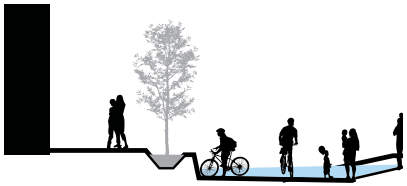
For Car

- Sound cancellation
- Safety
- Good visibility
- Temporary parking
- Shared street with bike lanes



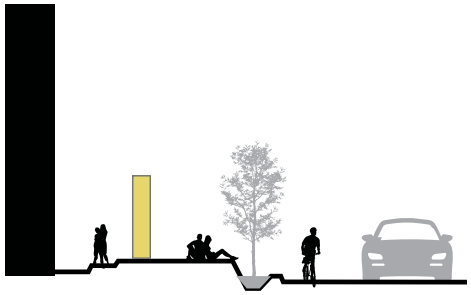
For Stormwater

- Water collection features
- Site water treatment
- Detention areas
- Cisterns
- Education
- Play



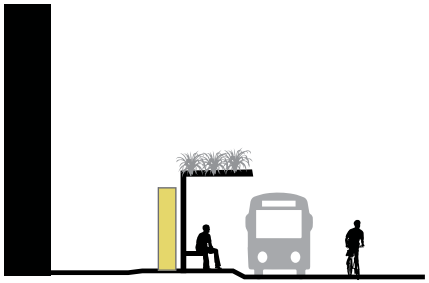
For Pedestrain & Green

- Seating areas
- Street aesthetics
- Place for children and elders
- Balance of trees and visibility
- Light
- Right soil selection
- Branding, identity & art



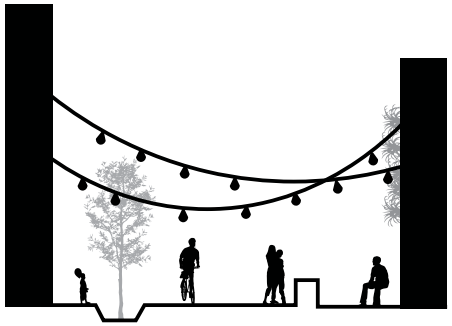
For Social

- Minimal intervention
- Seating, shelter
- Branding, identity & art
- Water closet
- Street vendors
- Street aesthetics



For Bus Stops

- Seating areas
- Social zone
- Rain shelter
- Green roof (bird habitat)
- Interactive space
- Education
- Branding, identity and art



For Alleys

- Seating areas
- Green walls
- Pathway
- Light
- Community gathering
- Branding, identity and art
- Water detention

OBJECTIVES

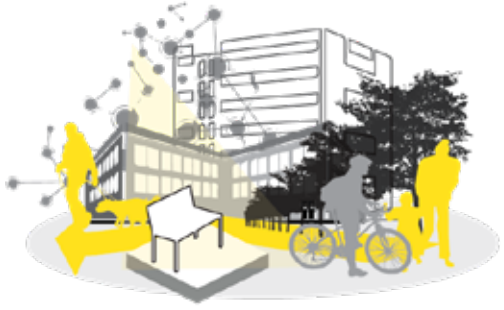
Lifting the quality of the public realm in Belltown by adding elements that are inviting and sustainable.

Stormwater:

- Harvest
- Reuse
- Retention
- Infiltration
- Treatment

Ecology:

- Wildlife Habitat
- Adaptive / Resilient
- Energy / Sustainable



Public Realm:

- Inviting & Attractive
- Connectivity
- Comfort
- Human Scale
- Community Engagement

PRIORITIES

Every intervention in the toolbox has multiple functions. Some will place greater focus on one element over others:

Incorporating **STORMWATER** management

Producing **ENERGY** in an urban setting

Introducing urban **LIGHTING** elements

Creating the **IDENTITY** of Belltown

Providing spaces for **BIODIVERSITY** in the urban area

Engaging **PEOPLE** with experience

QUALIFICATIONS

Cost	$	$$$
Time		
Scale		
Alteration		
Entity		

SMALL SCALE INTERVENTIONS TOOLBOX FOR BELLTOWN

HOW TO USE THE TOOLBOX ?

STEP 0: Choose a site in Belltown that needs to be improved.
Analyze the site opportunities and limitations.

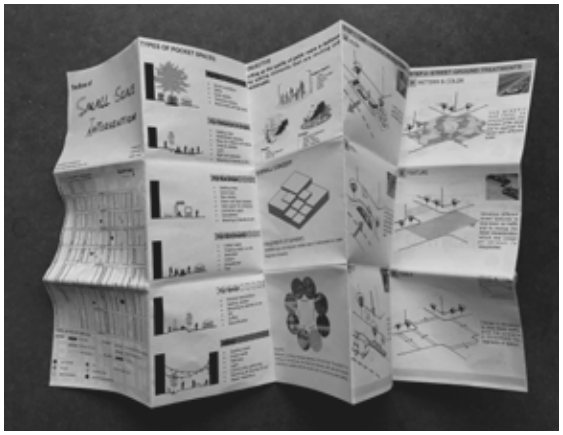
STEP 1: How to negotiate people and cars?

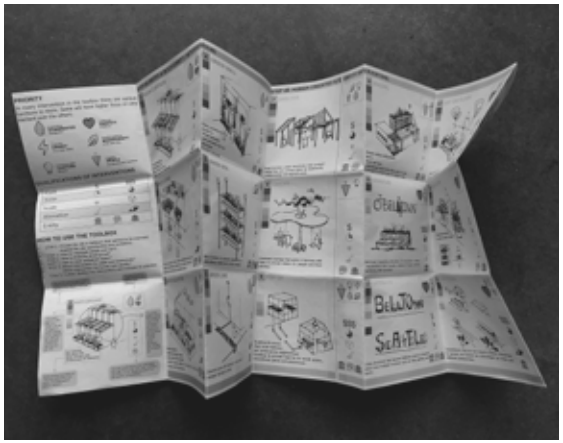
STEP 2: How to treat the street surface?

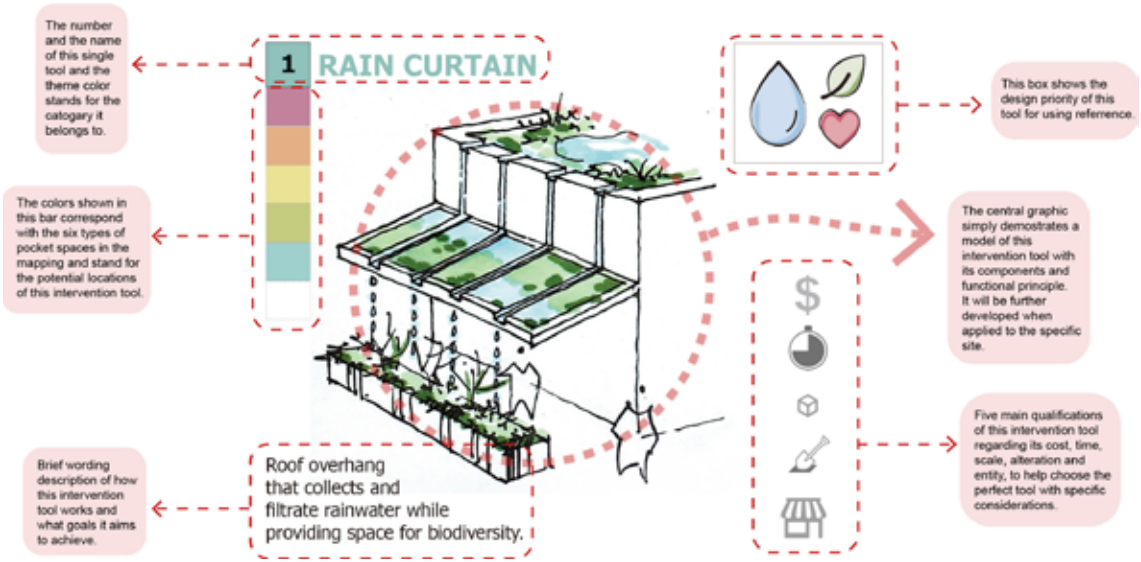
STEP 3: How to treat pedestrian space?

STEP 4: Which interventions for water and biodiversity?
Which interventions for culture and identity?

STEP 5: Further develop the interventions to site specific requirements

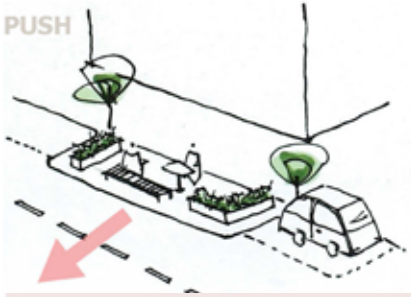






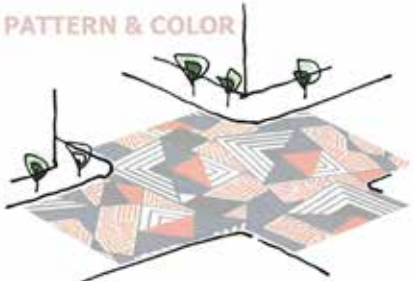
STEP 1: CAR - PEOPLE NEGOTIATION

PUSH



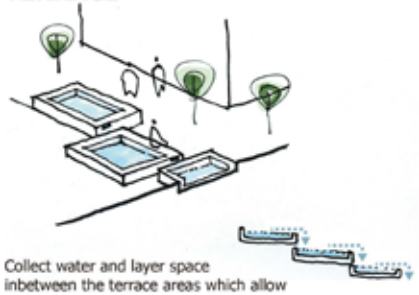
STEP 2: STREET GROUND TREATMENTS

PATTERN & COLOR



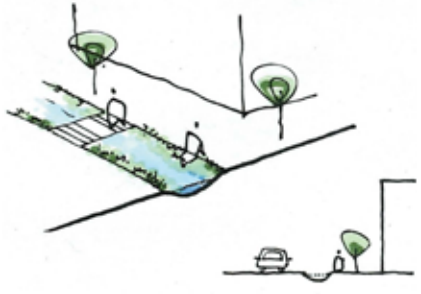
STEP 3: PEDESTRAIN SPACE TREATMENTS

TERRACE



Collect water and layer space inbetween the terrace areas which allow different usage of space in different period of time.

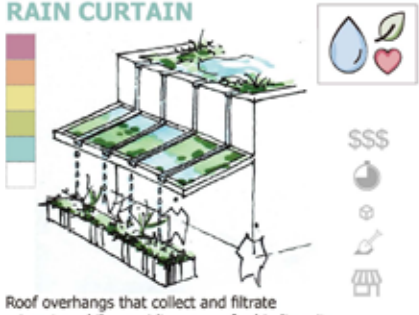
DEPRESS



Collect rain water and create a seperate layer of space.

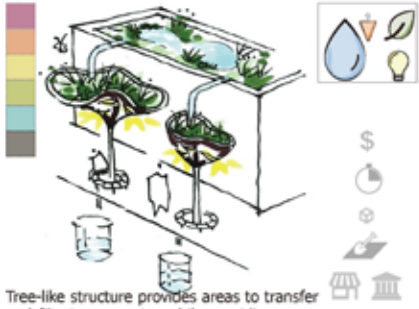
STEP 4A: WATER & BIODIVERSITY INTERVENTIONS

RAIN CURTAIN



Roof overhangs that collect and filtrate rainwater while providing space for biodiversity.

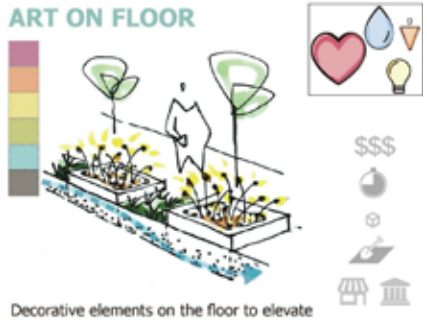
NOT A TREE



Tree-like structure provides areas to transfer and filtrate greywater while providing areas for biodiversity and pedestrian space.

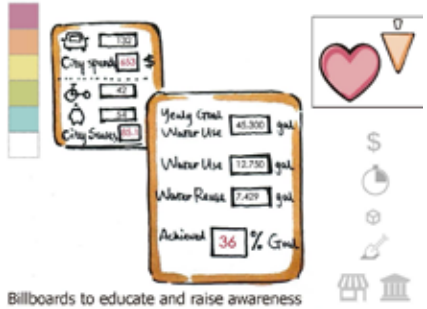
STEP 4B: HUMAN & IDENTITY INTERVENTIONS

ART ON FLOOR



Decorative elements on the floor to elevate public right of way aesthetics and experiences.

URBAN INFORMATION



Billboards to educate and raise awareness of the city goals of cost and saving by recycling water and using other means of transportations.

SEASONAL CHANGE

The small-scale interventions work all year round. In different seasons, they serve different functions. The design for the interventions has to be adaptable to respond to a variety of needs. These multi-functional interventions could benefit the community both in rain or shine, day or night, winter or other seasons.

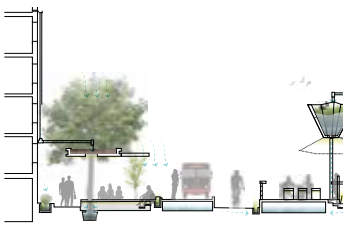
RAIN

SHINE

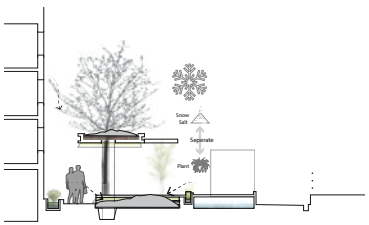
DAY

NIGHT

ALL SEASONS

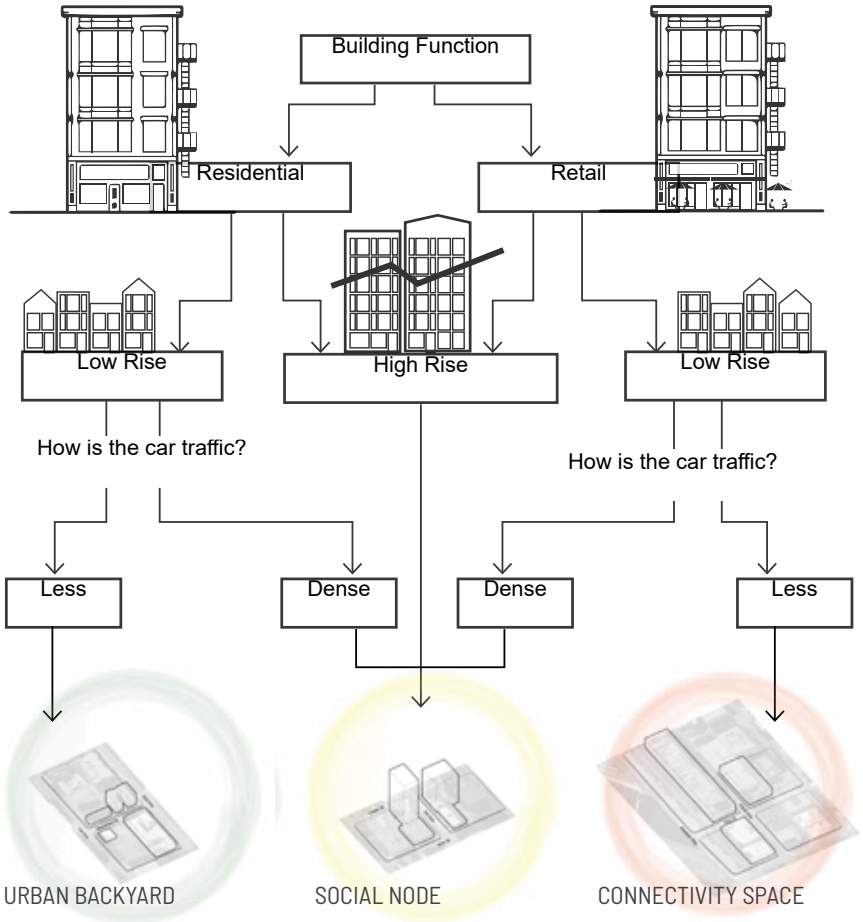


WINTER



STREET ANALYSIS

Every street in Belltown has different characteristics. In order to develop street design prototypes, the streets are categorized by the buildings' functions: either residential and/or retail spaces. The scale of the building impacts the street characteristics and requirements for the public realm. With mixed-use housing under development and the neighborhood becoming denser with high rise towers, three street design prototypes are developed. "Urban backyards", "social nodes", and "connectivity spaces" serve as references of how to apply the small-scale intervention toolbox on other streets in Belltown.



SITE IMPLEMENTATION

PUSH RAISE

PULL TEXTURE DEPRESS

PUSH TERRACE PATTERN & COLOR

RAIN CURTAIN GREEN WALL WATER SCULPTURE

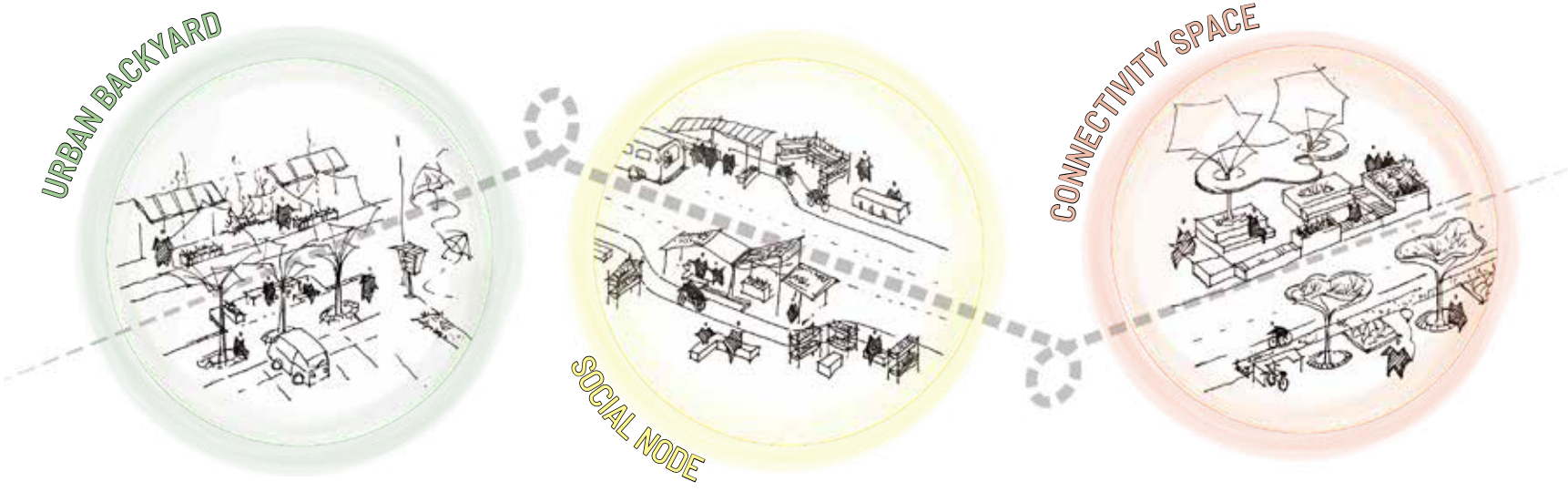
GREEN BOX

NOT A TREE GREEN LANE

ART WALL URBAN INFORMATION

SHELTER SEATING

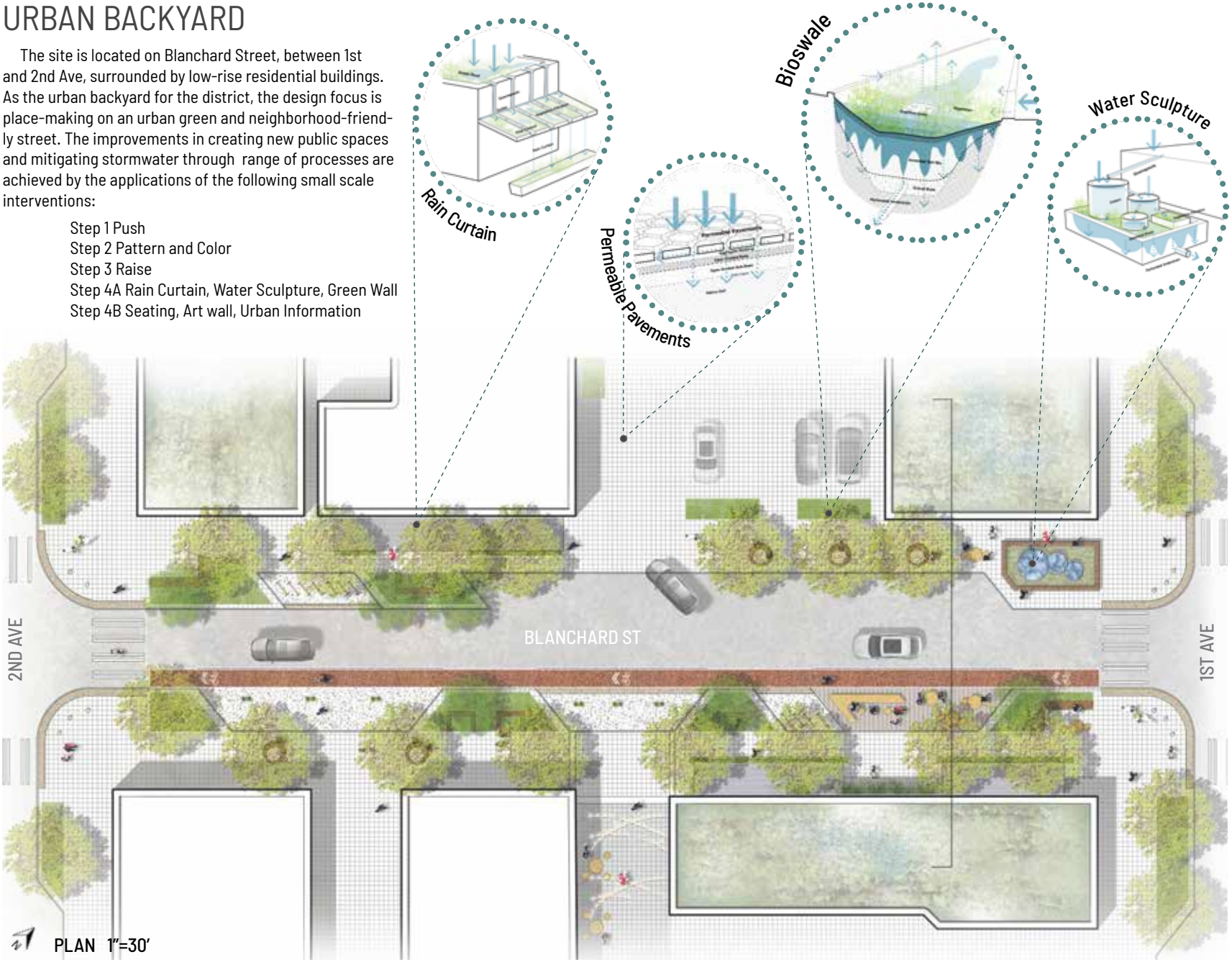
CANOPY SEATING SIGNATURE ART ON FLOOR



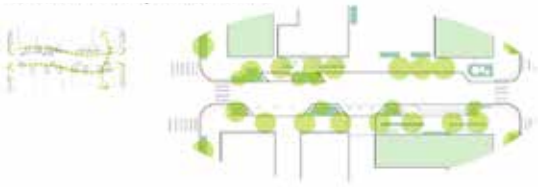
URBAN BACKYARD

The site is located on Blanchard Street, between 1st and 2nd Ave, surrounded by low-rise residential buildings. As the urban backyard for the district, the design focus is place-making on an urban green and neighborhood-friendly street. The improvements in creating new public spaces and mitigating stormwater through range of processes are achieved by the applications of the following small scale interventions:

Step 1 Push
Step 2 Pattern and Color
Step 3 Raise
Step 4A Rain Curtain, Water Sculpture, Green Wall
Step 4B Seating, Art wall, Urban Information

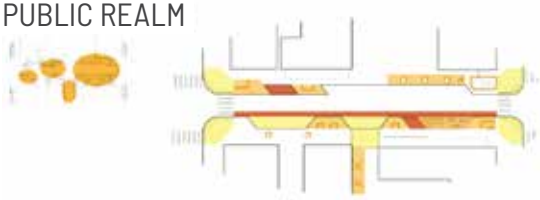


BIODIVERSITY CORRIDOR



- Canopy
- Green Roofs
- Planters

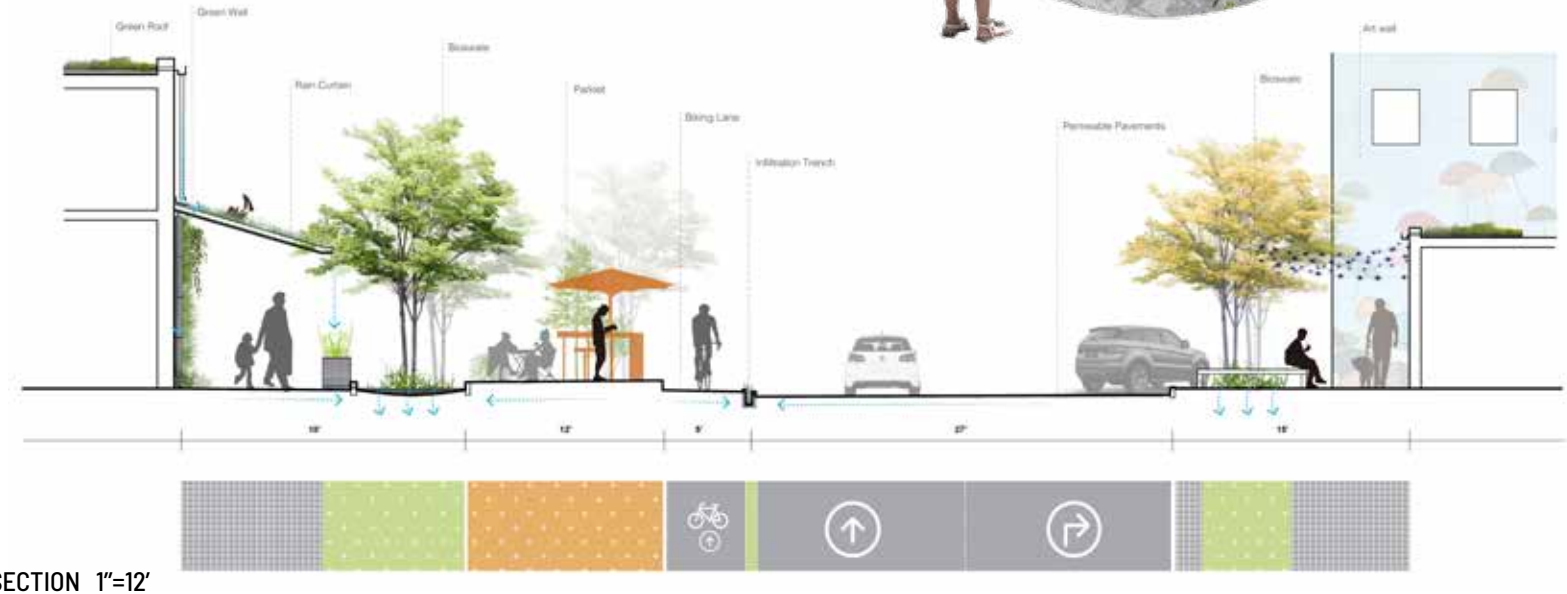
PUBLIC REALM



- Circulating
- Gathering
- Biking

STORMWATER MANAGEMENT

- Infiltration
- Detention
- Harvesting
- Filtration



SECTION 1"=12'

SOCIAL NODE

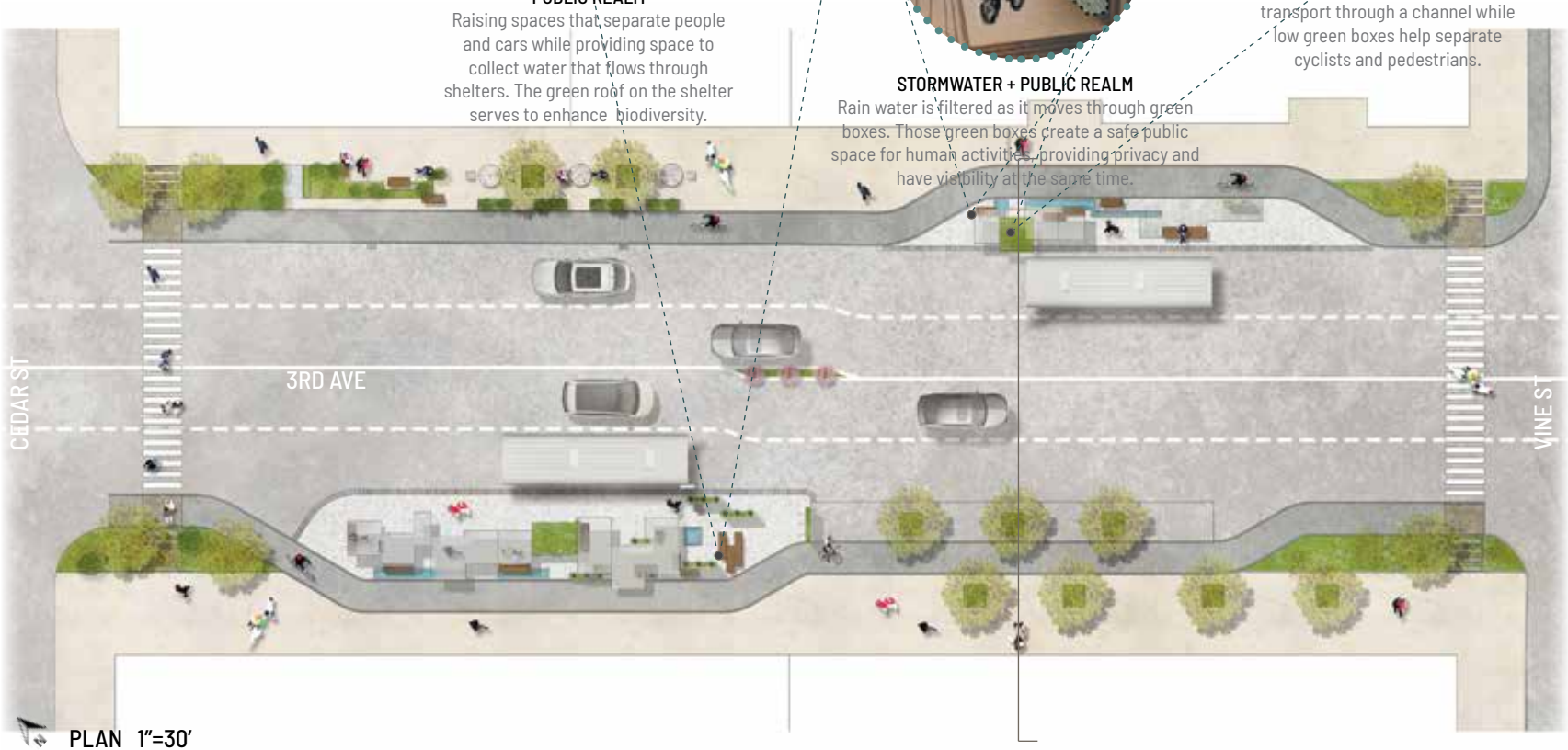
The site is located on 3rd Ave, between Cedar Street and Vine Street, which has bus stations distributed on both sides of the avenue. It is a two-lane road and 90 feet wide which could provide enough space for bus stations and human activities. Currently the bus stations are very simple and have no sitting place. To elevate the experience, series of small scale interventions will be introduced as follows:

Step 1 Pull
Step 2 Texture
Step 3 Depress and Raise
Step 4A Green Box and Green Lane
Step 4B Shelter and Seating

BIODIVERSITY + STORMWATER + PUBLIC REALM
Raising spaces that separate people and cars while providing space to collect water that flows through shelters. The green roof on the shelter serves to enhance biodiversity.

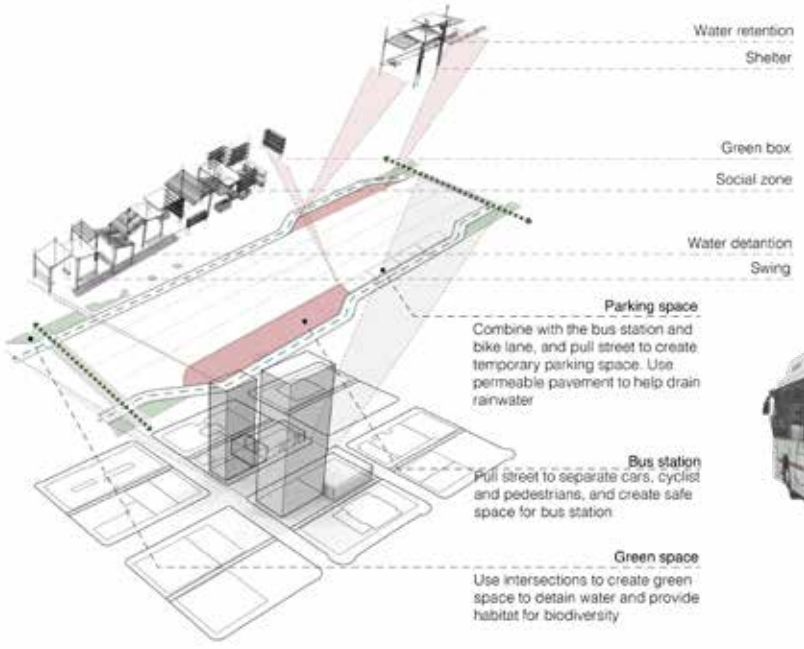
STORMWATER + PUBLIC REALM
Rain water is filtered as it moves through green boxes. Those green boxes create a safe public space for human activities, providing privacy and have visibility at the same time.

BIODIVERSITY + PUBLIC REALM
The rainwater that is collected from the surrounding buildings' roof is transport through a channel while low green boxes help separate cyclists and pedestrians.



PLAN 1"=30'

VERTICAL LAYERS

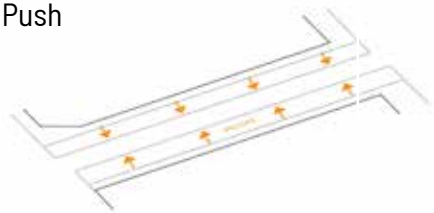


SECTION 1"=12'

CONNECTIVITY SPACE

Vine St has been a green belt for Seattle. The block in between Elliott Ave and Alaskan Way has yet to be developed. This street is next to Victoria clipper, Olympic Sculpture Park, dense housing, and receives a lot of throughfare. The CSO outfall is located close to this location, making this site an important area to manage rainwater flow. With a steep elevation and under-utilized streets, the area is proposed to be the Street Park of Belltown, closing it to car traffic to accommodate new space for people to stay and linger and stormwater management.

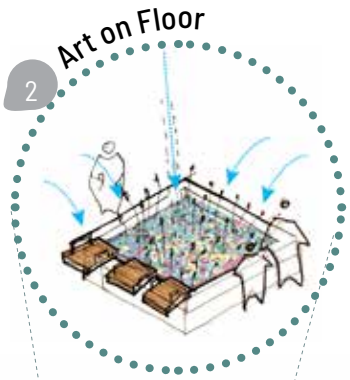
STEP 1:
Push



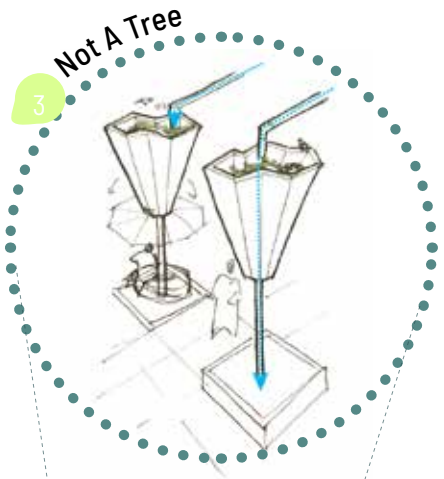
STEP 2:
Table + Color

STEP 3:
Raise + Terrace + Layer

BIODIVERSITY + PUBLIC REALM
The rain water that is collected from the block is filtered as it moves through planter boxes and greenlanes and is eventually used for public restrooms. The roof space is used for natural habitat.

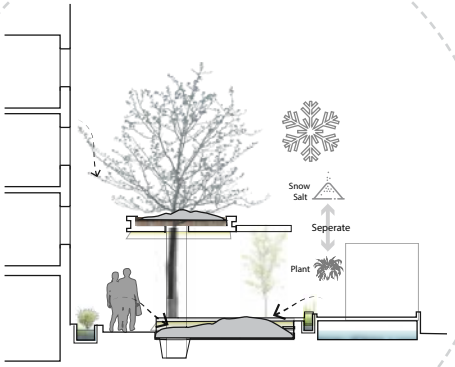


STORMWATER + PUBLIC REALM
Art installation that is combined with recycled glass for permeable surface



BIODIVERSITY + STORMWATER + PUBLIC REALM
Layering spaces that collect and filter rainwater and accommodate space for natural habitat while freeing the ground space for people.

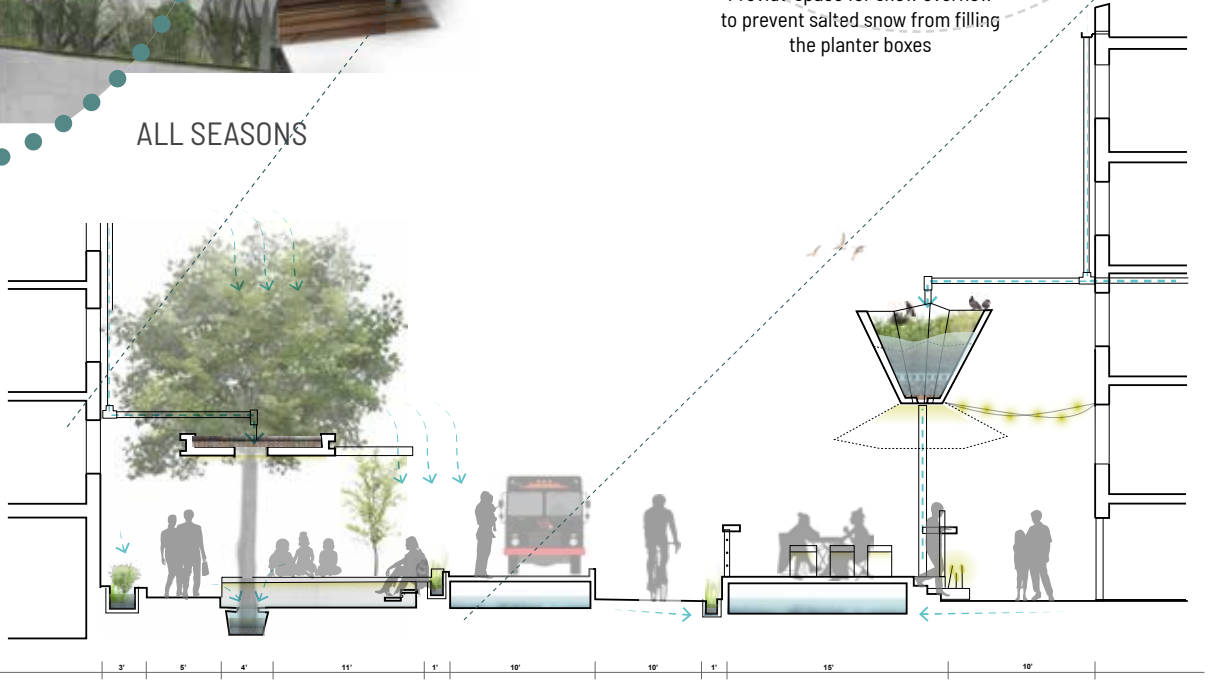
The social space will re-activate the treet's blank facade.



WINTER CONDITIONS

Provide space for snow overflow to prevent salted snow from filling the planter boxes

ALL SEASONS



SMALL SCALE INTERVENTIONS

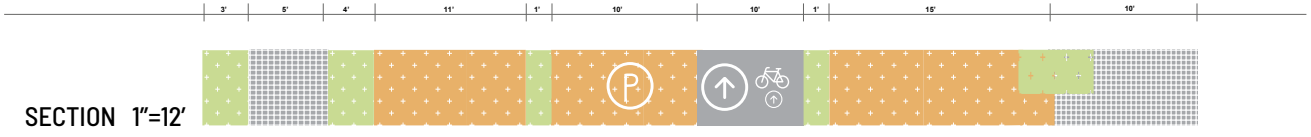
4 GreenLane
Filters rainwater

5 Gateway
Creates identity for the area

6 Water Sculpture
Detains and retains water during heavy rain to reduce load on the CSO system

7 Fun-ctional
Urban gym and playscape

8 Seating + Signature
Elevate public realm and create identity for social space



SECTION 1"=12'

Image by Lauren Wong

In Seattle's alleys, the city's hidden functions are tucked away. Vents hum, deliveries are received, trash is left behind or discovered. Alleys are ducked into or hurried through, afloat with strains of jazz or the steady drip of leaky air conditioners. As a ubiquitous space in the city, they present the potential for a landscape design laboratory — a series of spaces with common conditions and dimensions, but particular contexts and restraints.

CRACKS IN THE PAVEMENT:

ENVISIONING RADICAL FUTURES FOR BELLTOWN'S ALLEYS

Yang He, Fatema Maswood, Jiyoung Park, Farzana Rahman, Lauren Wong

Presented here are two designs of prototypical alleys for a network of shared pedestrian alleys throughout Belltown. These passageways act as an internal circulation system of connections to cultural hubs in the neighborhood, while also providing invitations to linger in spaces that are typically hurried through. Each representing a distinct alley typology, both designs transform unactivated and underutilized public rights-of-way into lively public space geared toward water storage, detention, infiltration, and conveyance that would mitigate the effects of stormwater on Elliott Bay.

In early analysis we identified quality criteria for a desirable alley to arrive at a set of design motivations. Existing qualities and uses were integrated, while green stormwater infrastructure and enhanced porosity were introduced to turn alleys into lively passageways with layered functions. Car access is limited to increase pedestrian safety, comfort, and health.

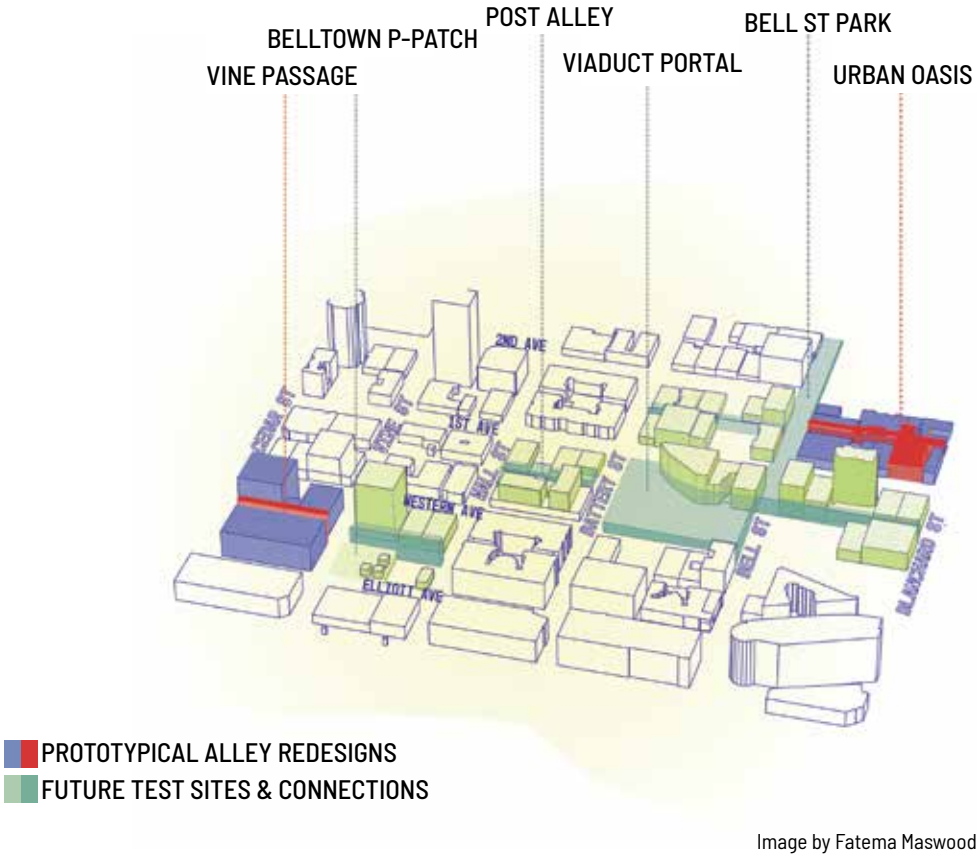


Image by Fatema Maswood

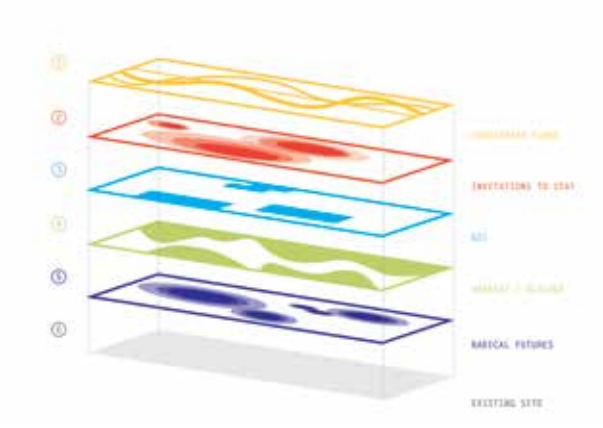


Image by Lauren Wong

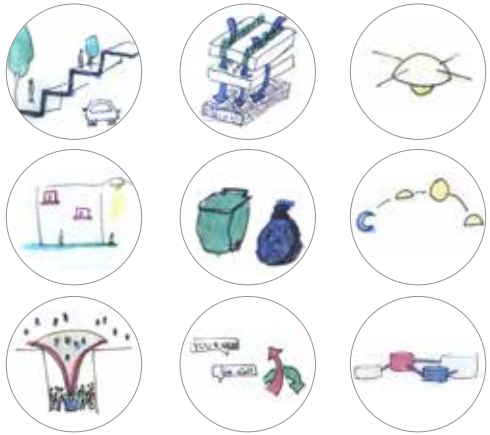


Image by Fatema Maswood

LOCATIONS:

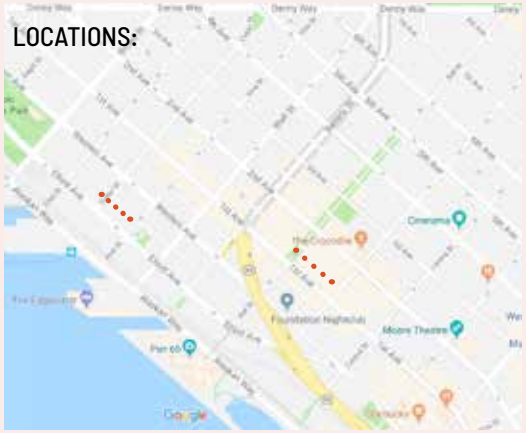


Image by Lauren Wong, Fatema Maswood

Proposed views in from Vine Street, depicted during night and day.

VINE PASSAGE

Context Analysis:

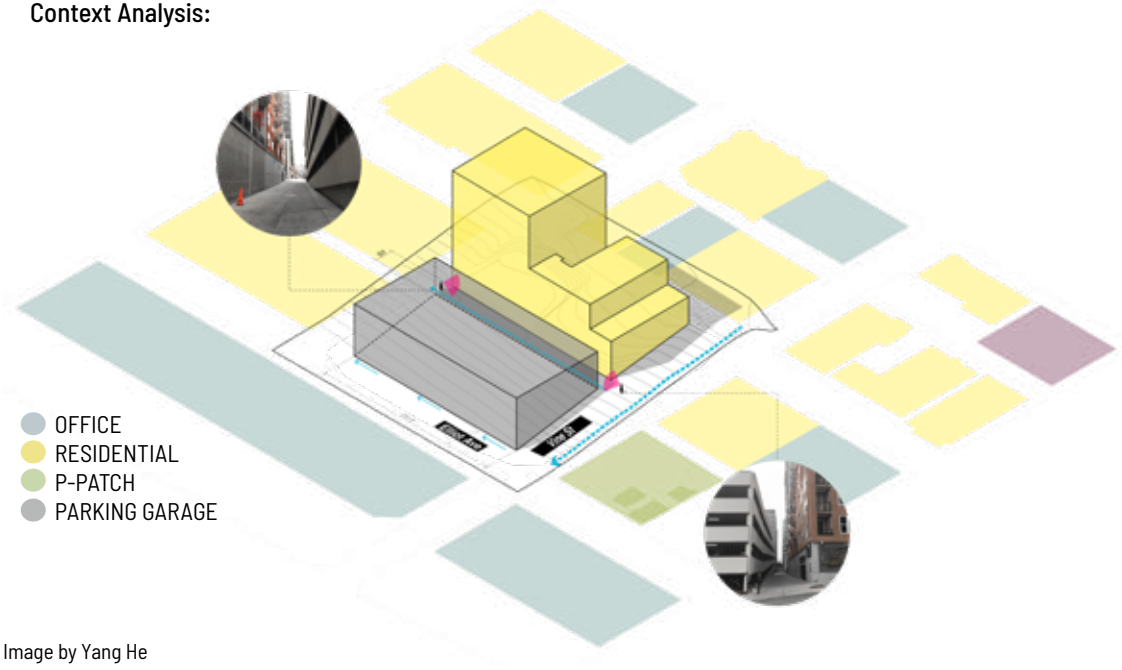


Image by Yang He

RESIDENTIAL ALLEY

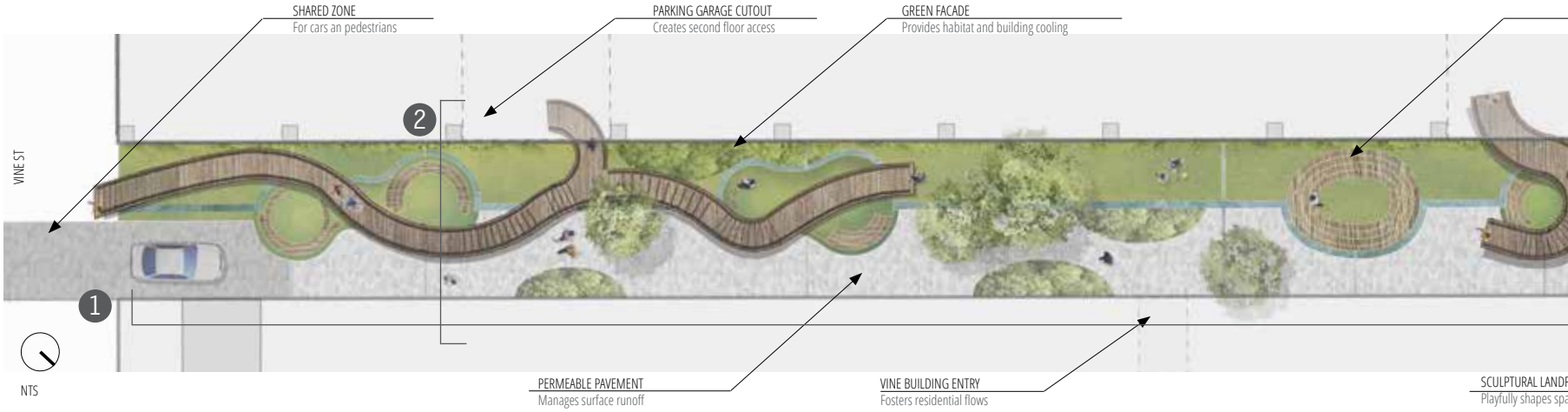
Located between a residential building and a parking garage, and adjacent to the Belltown P-Patch and Cistern Steps, this alley is one of the last points for infiltration before the CSO outfall at the base of Vine Street. Users passing through the site include residents of the surrounding buildings, commuters passing through the parking garage, and gardeners headed to the nearby P-Patch.

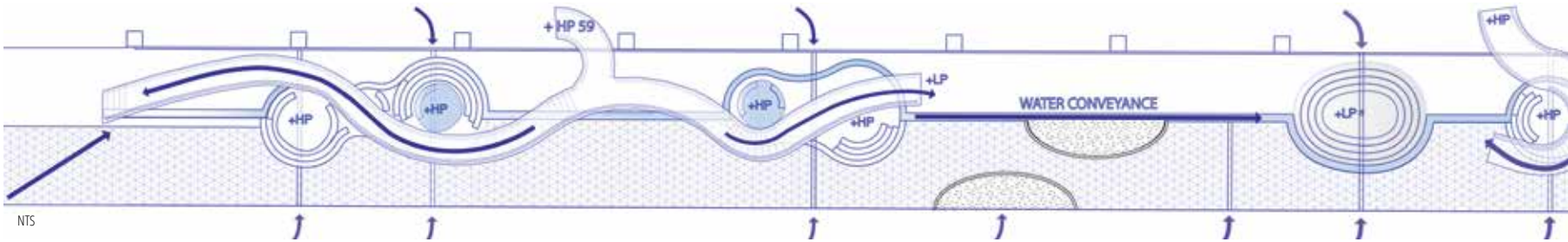
The alley is relatively wide but lacks invitations, and empty facades overwhelm the human scale, rendering the alley placeless. In our design we encourage apartment residents, gardeners, and commuters that already pass through the alley daily to linger by activating the site at different levels to shift the confined scale of an alley through verticality. We also designate spaces for community gathering and performance, and expand the alley's surface area for water infiltration, retention, and storage.

Existing Conditions:

Placeless alley exterior and details of adjoining parking garage.


1
NTS
CAR/WALKWAY
LANDFORM
BIKE RACK / SWINGS
LANDFORM
FLEXIBLE COMMUNITY SPACE / AMPHITHEATER
LANDFO


SHARED ZONE
For cars an pedestrians
PARKING GARAGE CUTOUT
Creates second floor access
GREEN FACADE
Provides habitat and building cooling
2
VINE ST
1
NTS
PERMEABLE PAVEMENT
Manages surface runoff
VINE BUILDING ENTRY
Fosters residential flows
SCULPTURAL LANDF
Playfully shapes spa


+HP 59
+HP
+HP
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+LP
WATER CONVEYANCE
+LP
+HP
+HP
NTS

Image by Yang He

RM | MONKEY BARS | LANDFORM | CAR/WALKWAY

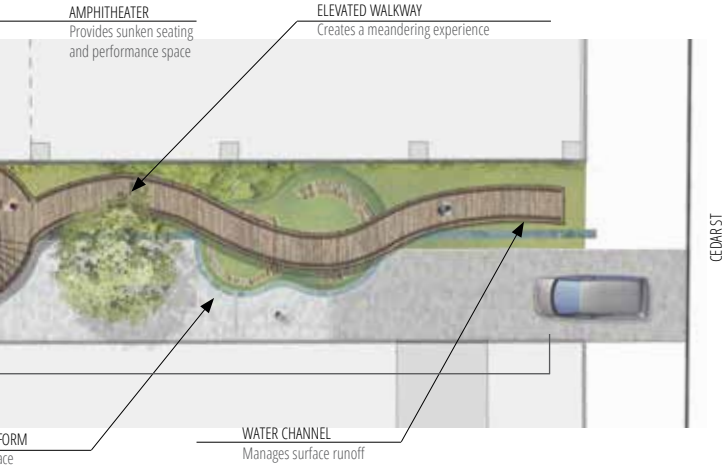


Image by Fatema Maswood, Lauren Wong

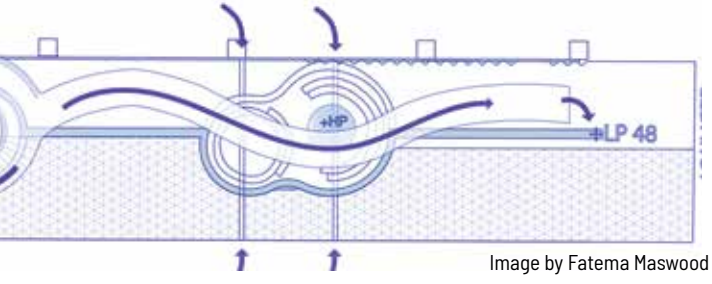


Image by Fatema Maswood

2

VINE PASSAGE

Image by Yang He

INFILTRATION | REUSE + DETENTION + INFILTRATION | INFILTRATION

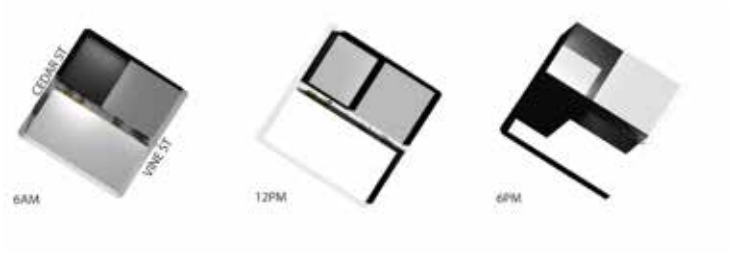
NTS

LANDFORM MULTIFUNCTIONALITY

URBAN OASIS

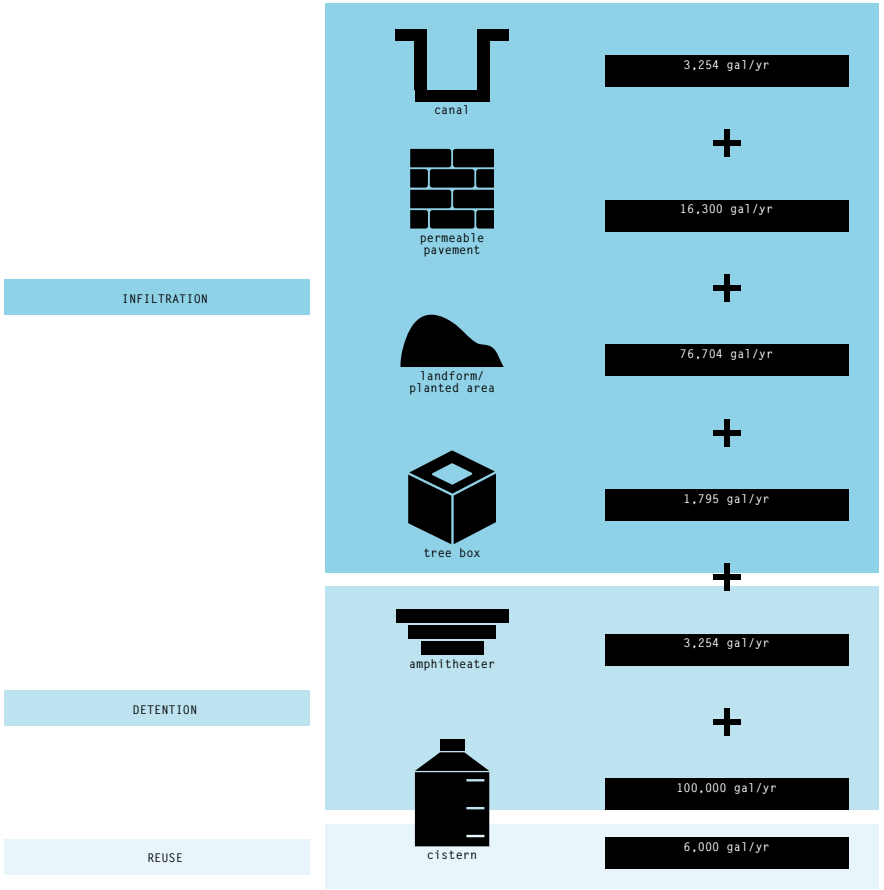
Image by Lauren Wong

The interplay of landform, cistern, elevated walkway, and the flow of water down the length of the alley create the suggestion of fluid movement through the site, as well as inviting and intimate spaces for gathering, play, or contemplation. Stormwater and rainwater collected from rooftops flows towards a central channel, a series of cisterns, and bioretention planters. In the center of the alley, the canal infiltrates into the soil beneath. Portions of the canal wrapping around landforms drain into cisterns and towards Cedar St.



Sun Exposure:
The site receives morning and afternoon sun, but is still quite shaded. The planting palette below proposes a series of native plants well suited to deep shade.

*TOTAL AREA = 4,980 sq ft
ANNUAL PRECIPITATION = 3 ft
Reference: 2030 District Calculator



207,120 gallons/yr

Water Managed

Image by Yang He

Context Analysis:

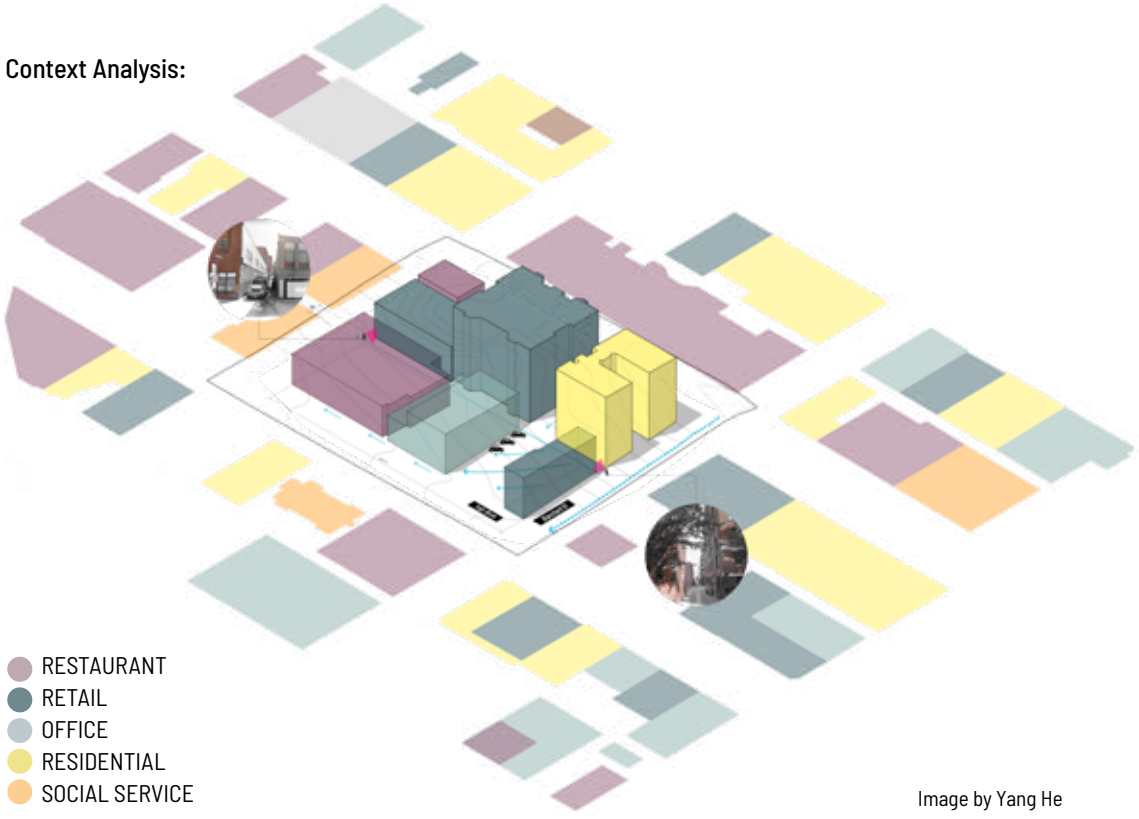


Image by Yang He

MIXED-USE ALLEY

INTEGRATING WATER + NATURE + PEOPLE:

The current mixed-use nature of the alley influenced the initial programming of our proposed design. Based on our observation and analysis the alley lacks interactive building facades, spaces to socialize and designated utility and service spaces. Apart from the functional and social needs of the alley, one of our major consideration in the design is to integrate creative ways to mitigate and manage stormwater into the site.


Animals foraging for food in the alley's trash


Plants and moss creating habitat


Existing business fenced off from alley


Trash awaiting pickup on cracked pavement

URBAN OASIS:
MIXED USE ALLEY

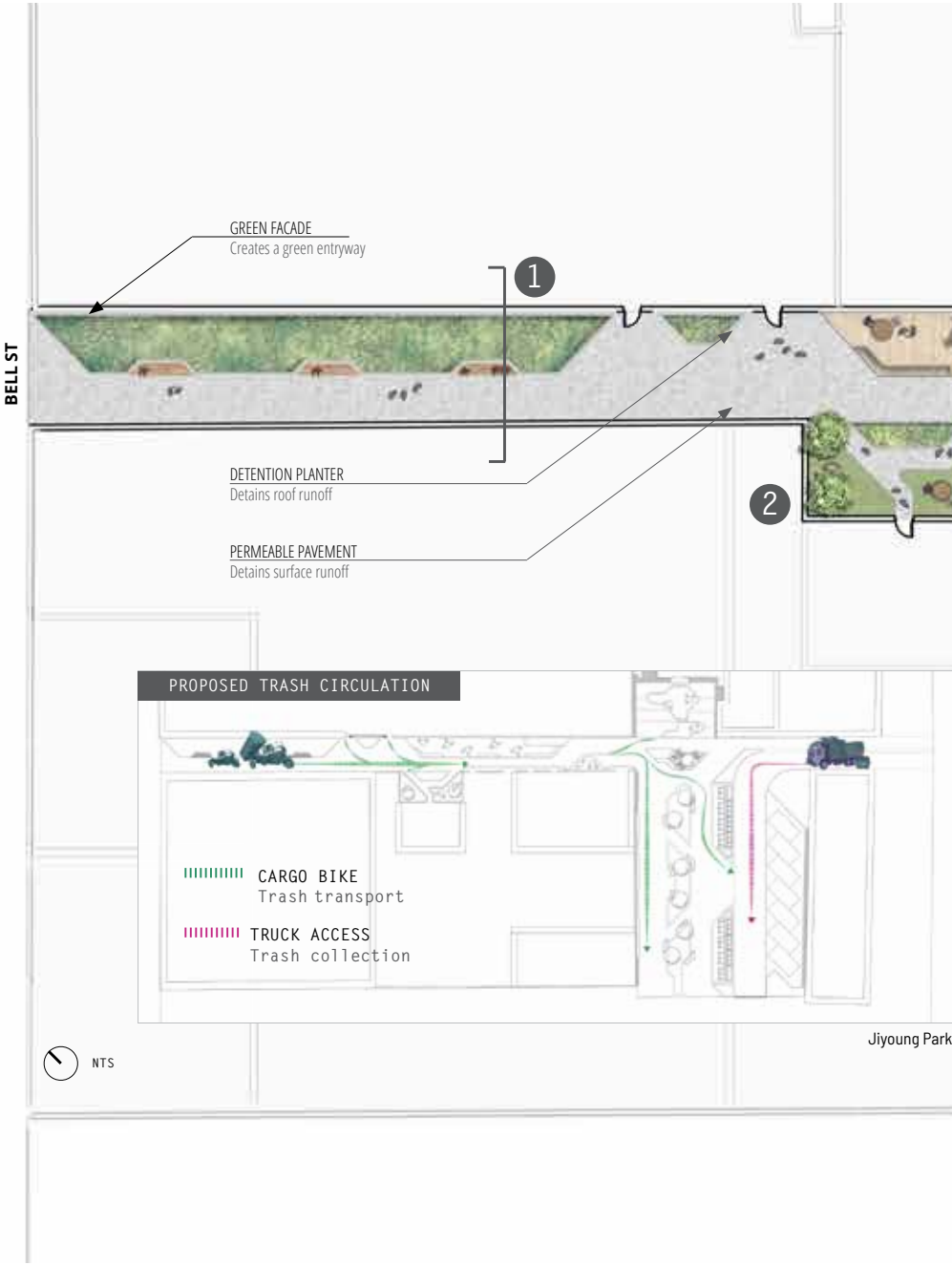


Image by Farzana Rahman, Jiyoung Park

CONCEPTUAL WATER FLOW

Image by Farzana Rahman

URBAN OASIS:
MIXED USE ALLEY

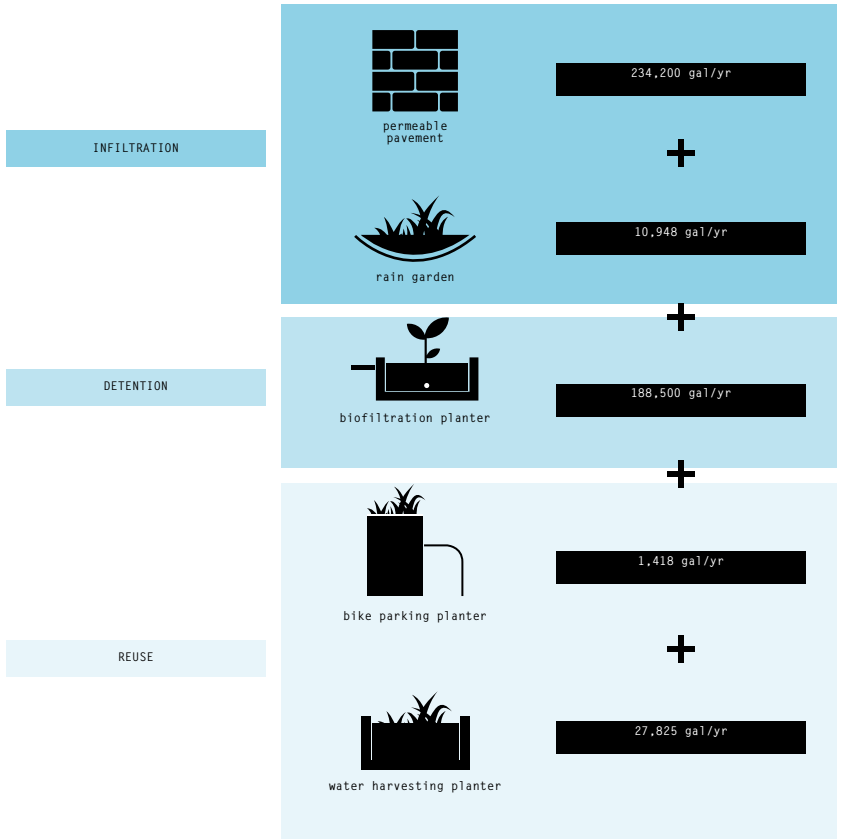
OPENING RESTAURANT BACK DOORS CREATES GREATER POROSITY WITHIN THE ALLEY

Image by Jiyoung Park

TERRACED GARDENS PROVIDE FOOD ACCESS AND SEATING

Image by Lauren Wong

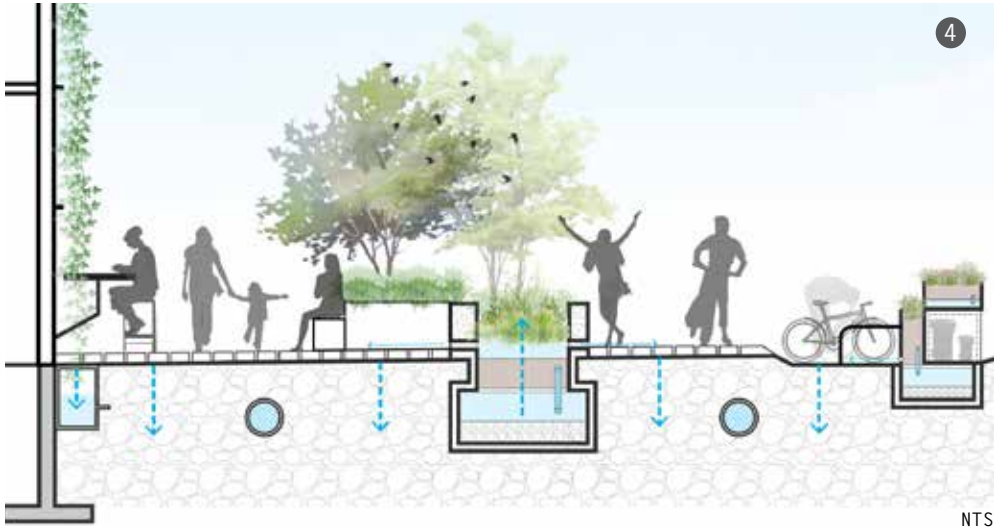
*TOTAL AREA = 20,320 sq ft
ANNUAL PRECIPITATION = 3 ft
Reference: 2030 District Calculator



462,892 gallons/yr

Water Managed

Image by Yang He



NTS

PEDESTRIAN

INFILTRATION | REUSE | INFILTRATION | REUSE

REVITALIZED PARKING LOT SERVES FUNCTIONAL, SOCIAL, AND ECOLOGICAL NEEDS

Image by Farzana Rahman

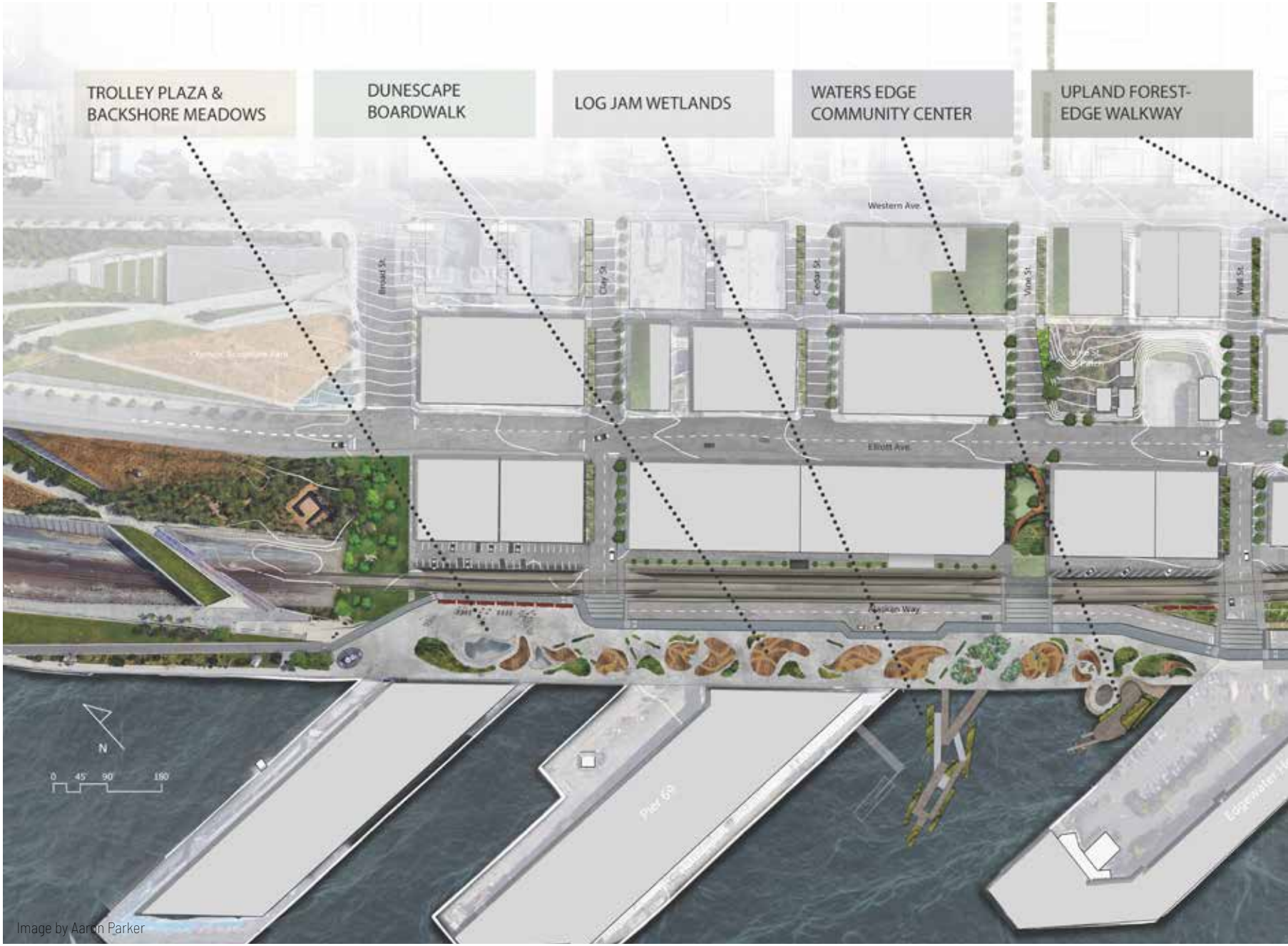


Image by Aaron Parker

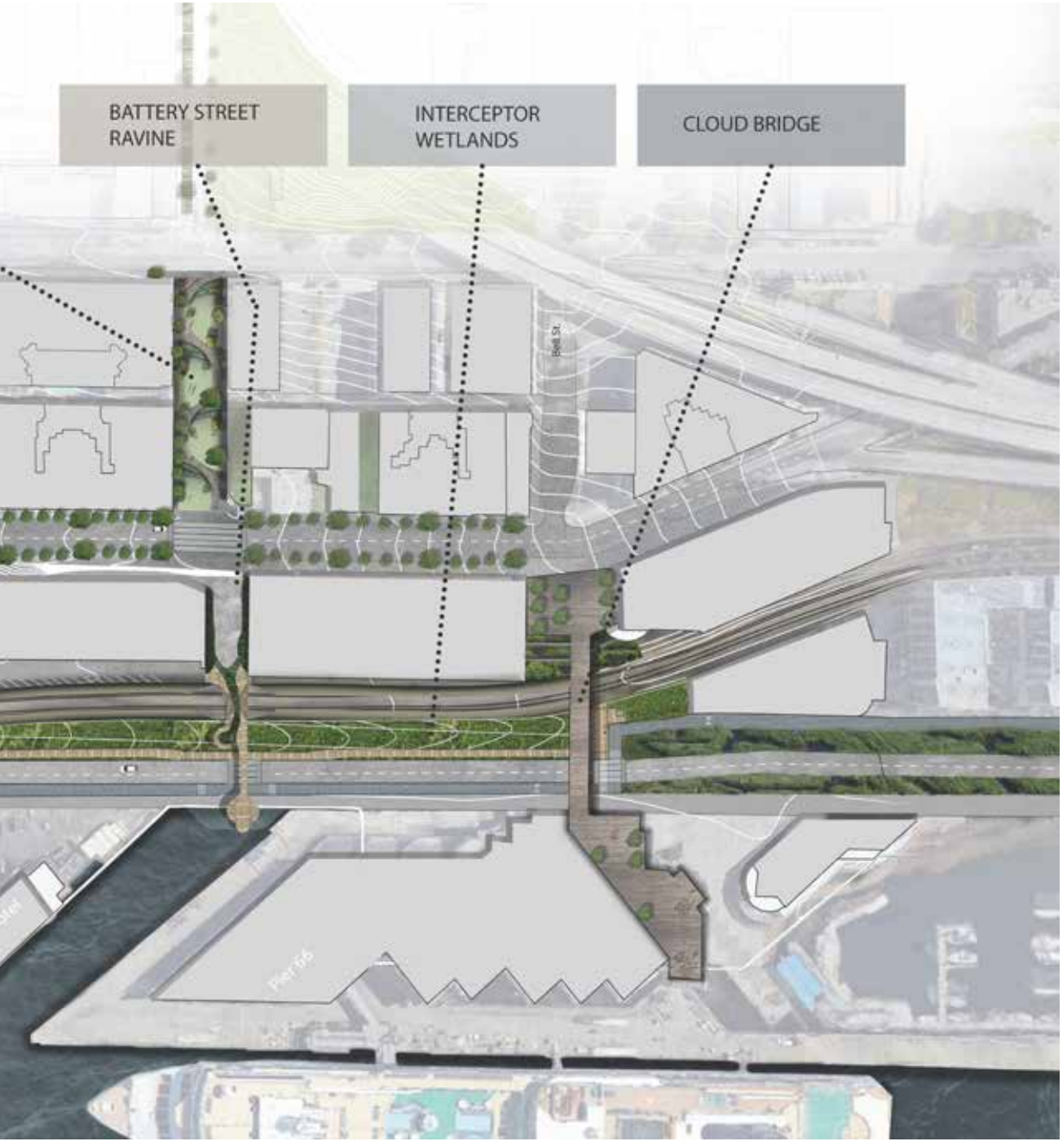
BEACH TO BLUFF

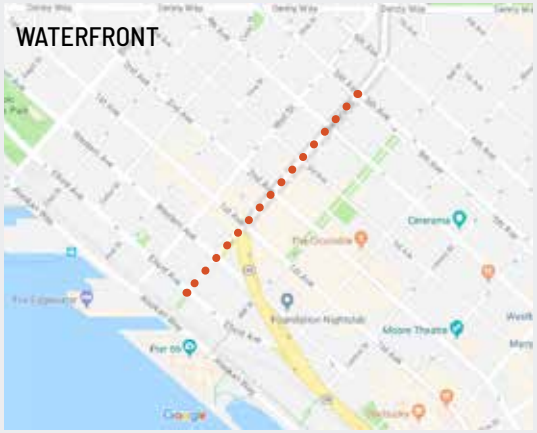
**Aaron Parker, Margot Chalmers,
Nina Mross, Roxanne Glick**

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.

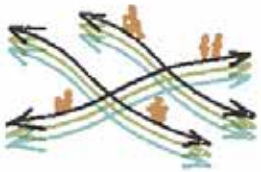
Our vision is to fill this void in the city fabric, by growing and layering social, cultural, ecological, and hydrological networks across the site. We looked at a pre-development ecotone of beach to bluff, and overlaid it onto the contemporary urban condition, interpreting beach, deflation plain, backshore, 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.



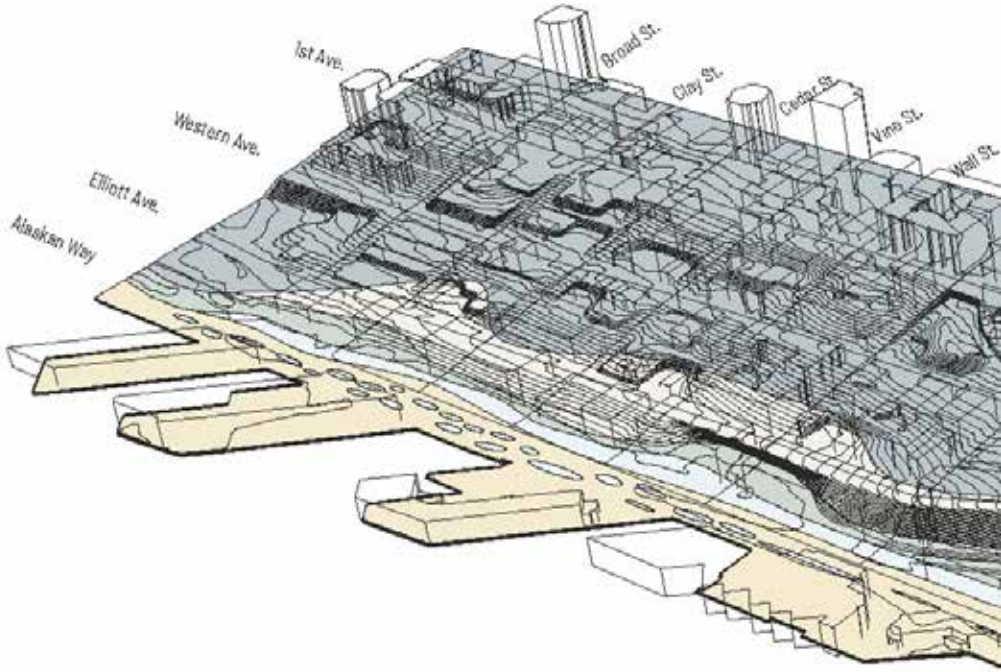


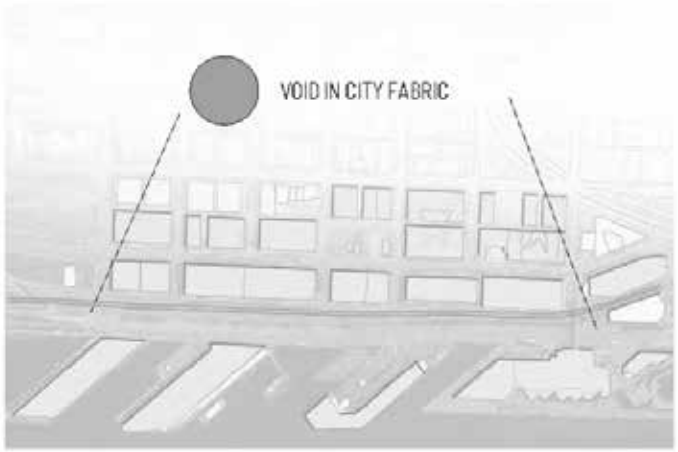
VIBRANT SOCIAL &
CULTURAL SPACES

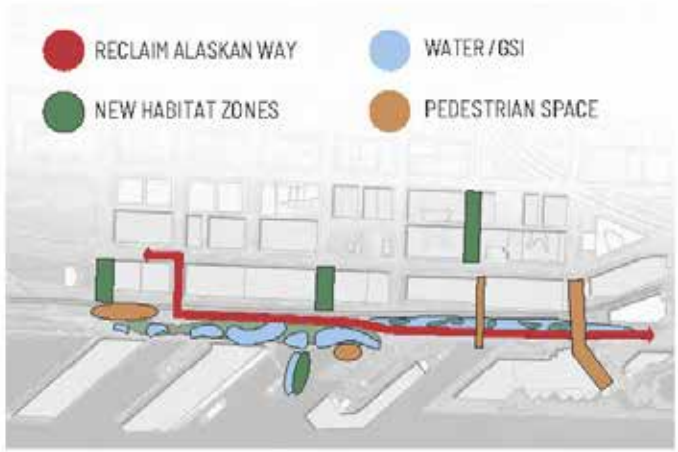


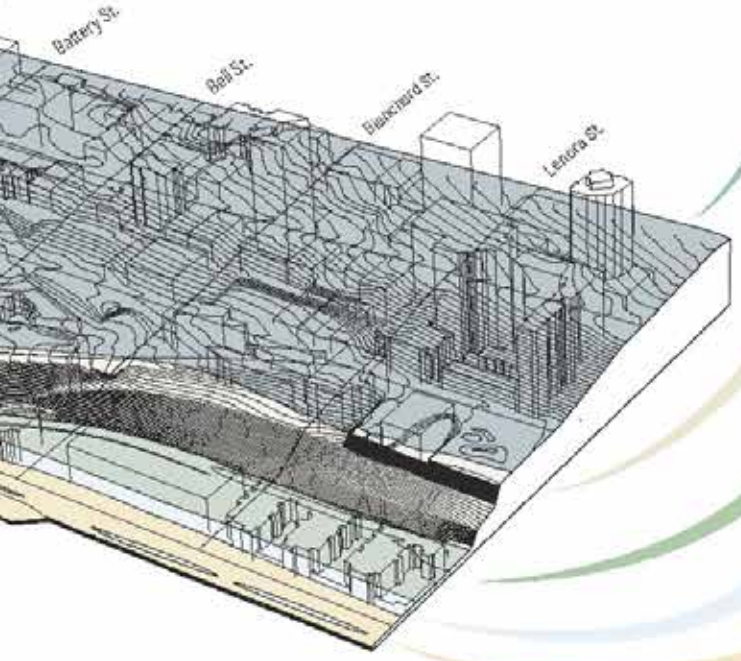
RECONNECT WEBS OF LIFE

SENSE OF PUGET SOUND









UPLAND FOREST EDGE

BLUFF

BACKSHORE

DEFLATION PLAIN / WETLAND

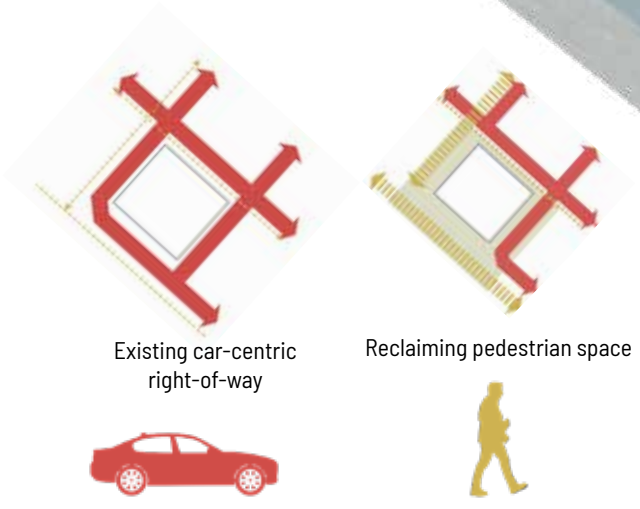
BEACH

TROLLEY PLAZA & UPLAND MEADOW

Image: Aaron Parker

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 enlivening waterfront.



Existing car-centric right-of-way

Reclaiming pedestrian space

Image: Aaron Parker

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.

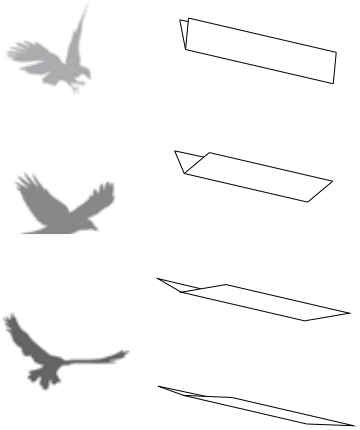
The re-designed boardwalk will serve as a dynamic, open-ended public amenity with areas for relaxing, socializing, strolling, playing + learning. Underneath the boardwalk is an water storage layer that collects water from surrounding streets + buildings. A series of meandering wetland, dunegrass and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

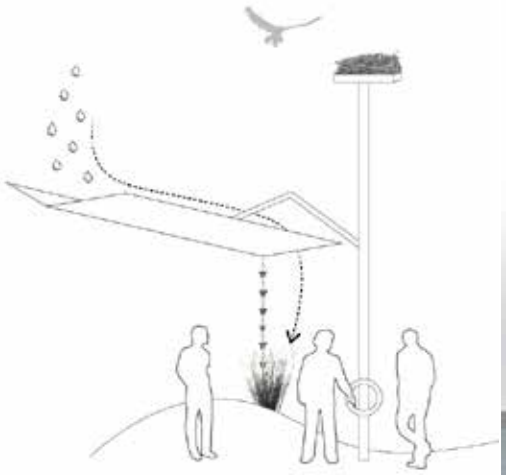
(Above) Concept: Flexible, adaptable "cells" respond to weather events and function as part of an integrated social and ecological system

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 by Margot Chalmers

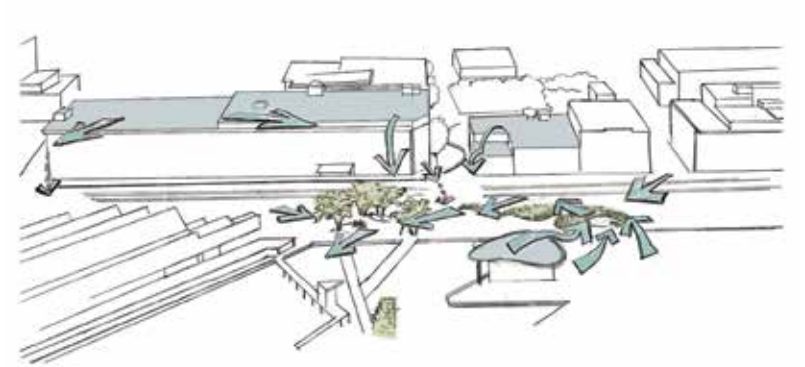




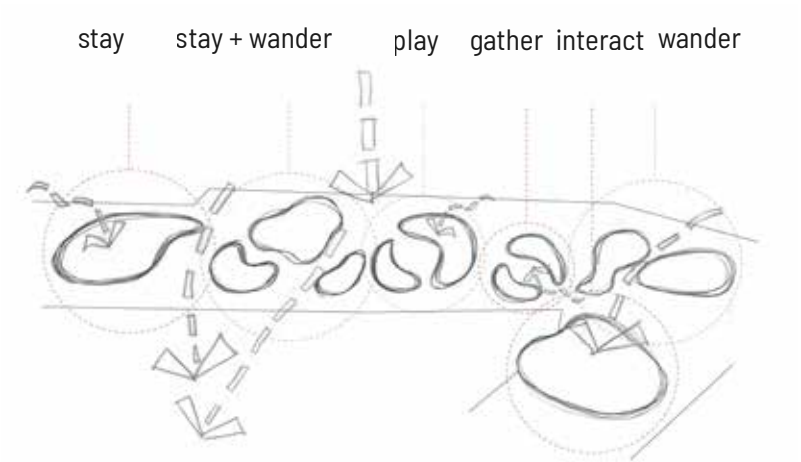
Inspired by the movement of avian wings, these multi-functional structures are found throughout the dunescape. These customizable shelters allow users turn the wheel to open and close the aluminum shelter flaps to their desired extent. The structures funnel water via rainchains into wetland grasses and 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

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

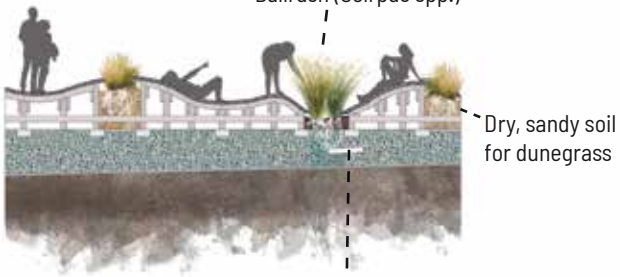


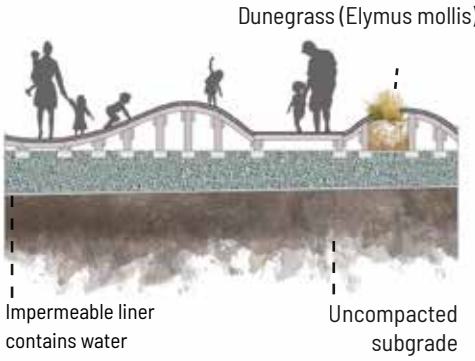
(Above) Site Hydrology: Arrows depict the movement of water throughout this area of the site. Water is collected from surrounding rooftops, parking lots, and streets. It then infiltrates the boardwalk and enters the underground water storage layer before being deposited to the sound.



(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 DECKING AND HYDROLOGY





All images: Margot Chalmers

CLOUD BRIDGE

Image by N. Mross

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.

WATER'S EDGE: COMMUNITY CENTER

This center provides 4,000 ft² 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.

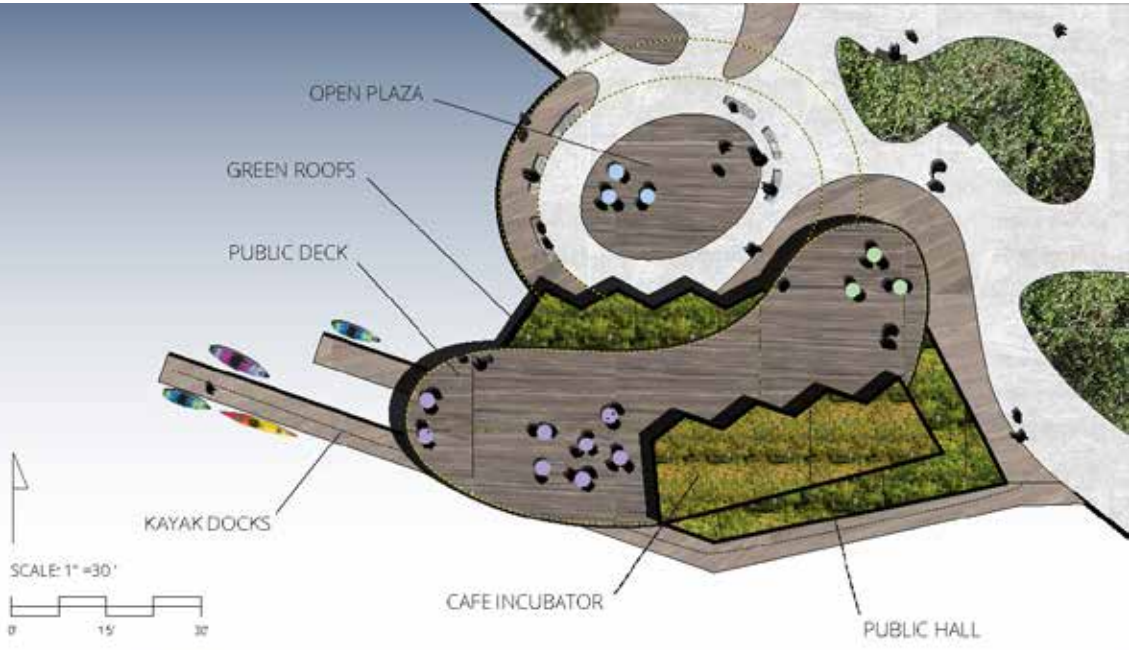


Image by N. Mross

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.

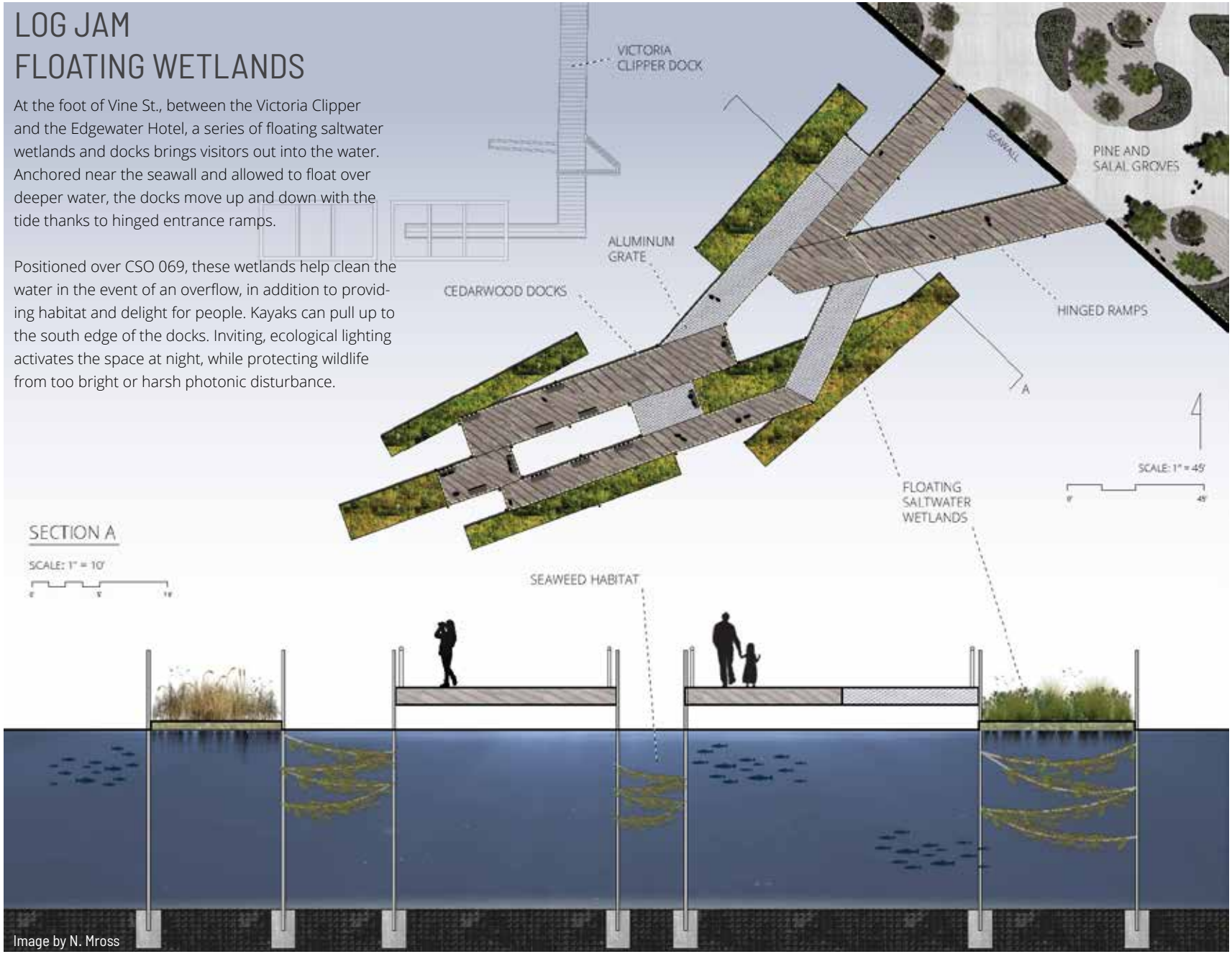


Image by N. Mross

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 driftwood logs. Loggers would use waterways to bring felled trees to the open harbor, where they could be shipped or processed.

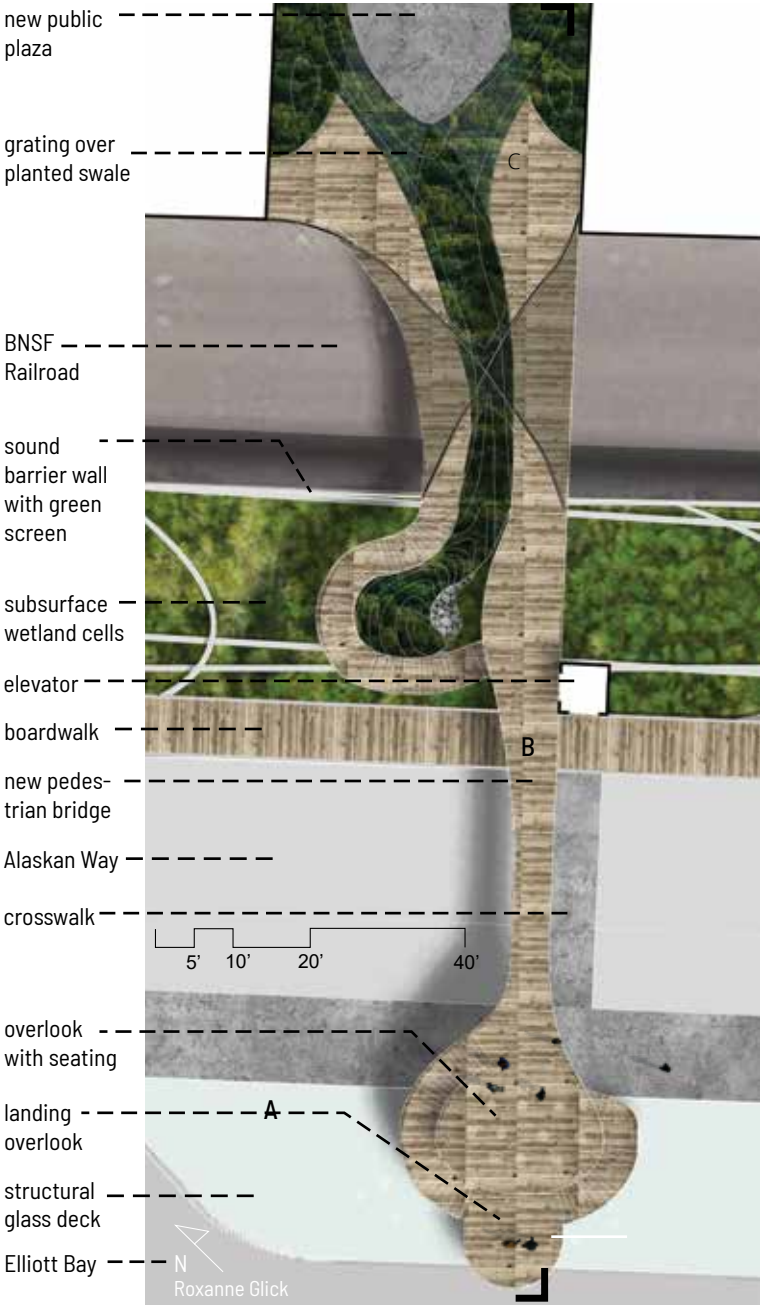
Now, the shapes inspired by these histories bring new life and vital processes to the waterfront.

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

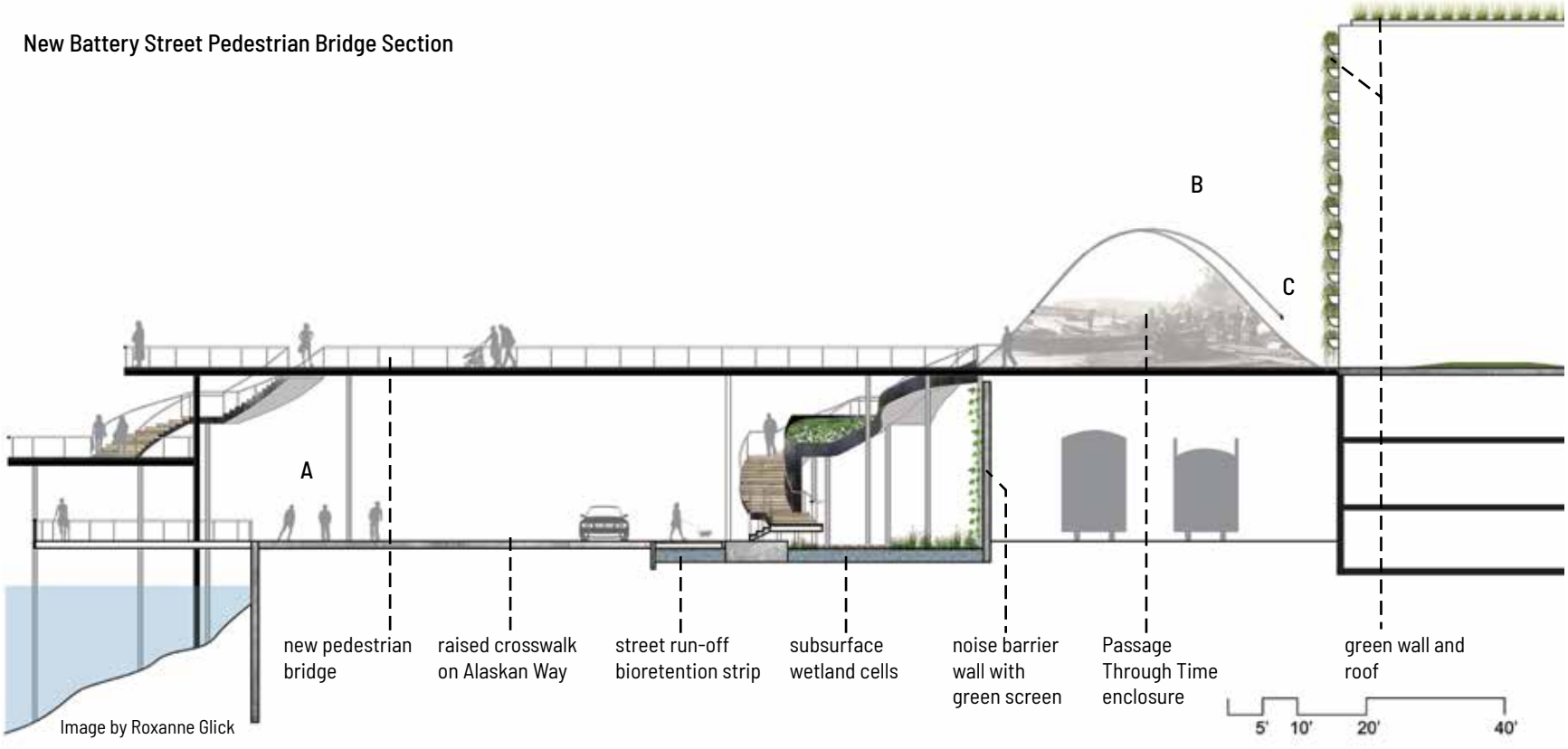
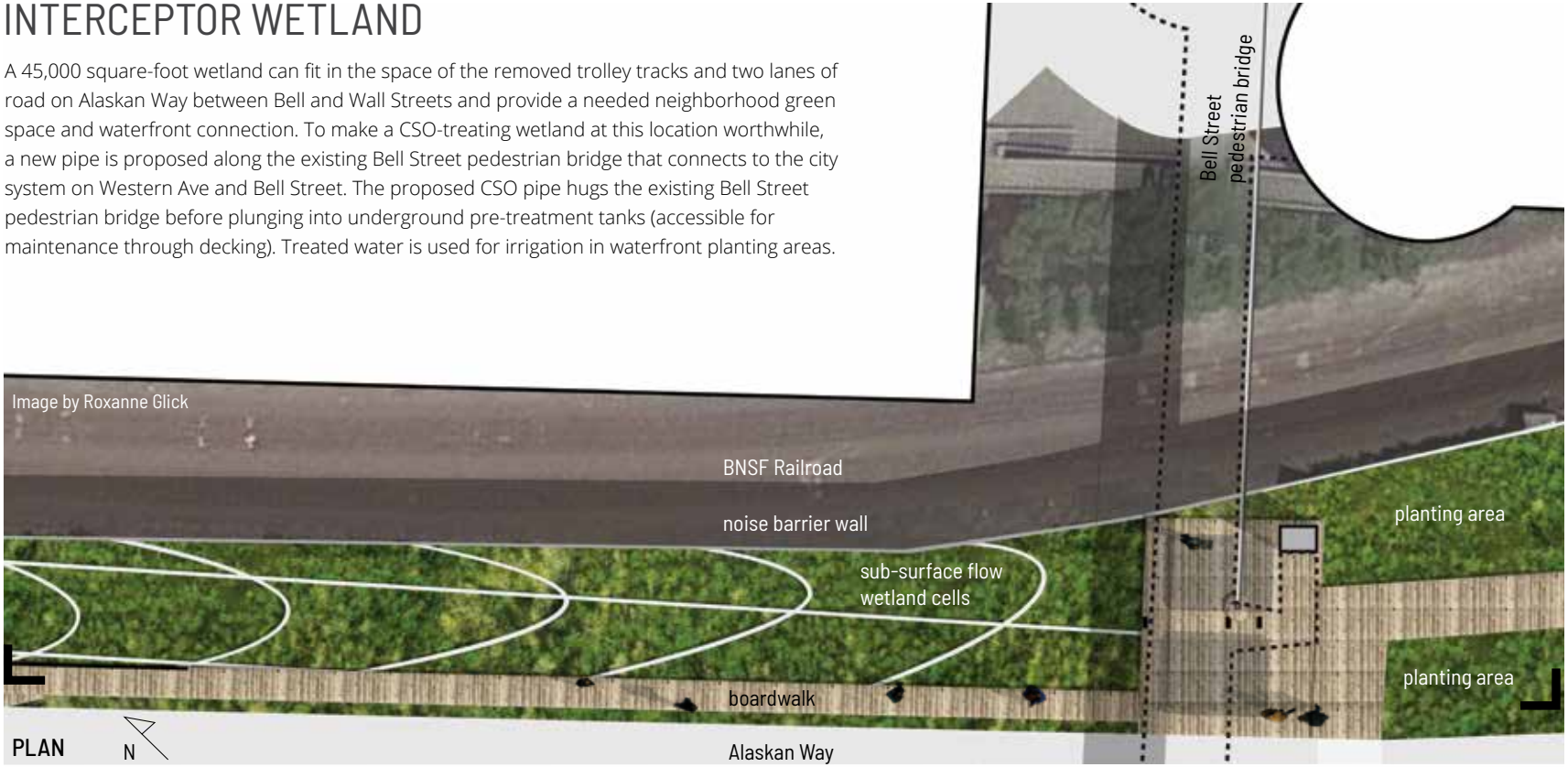
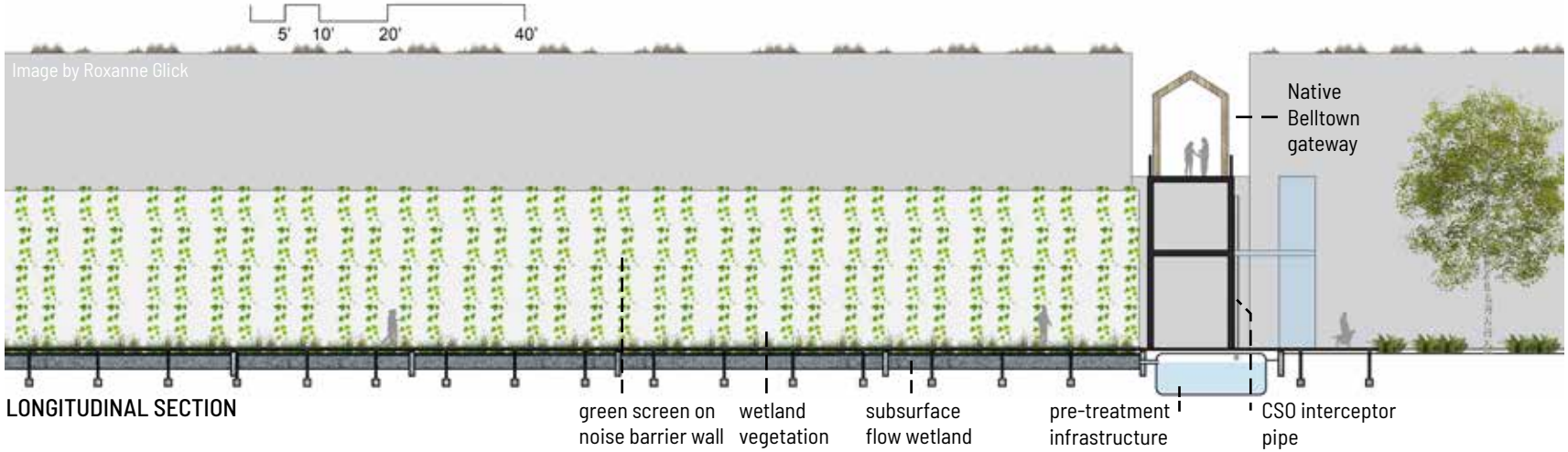


Image by Roxanne Glick

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.

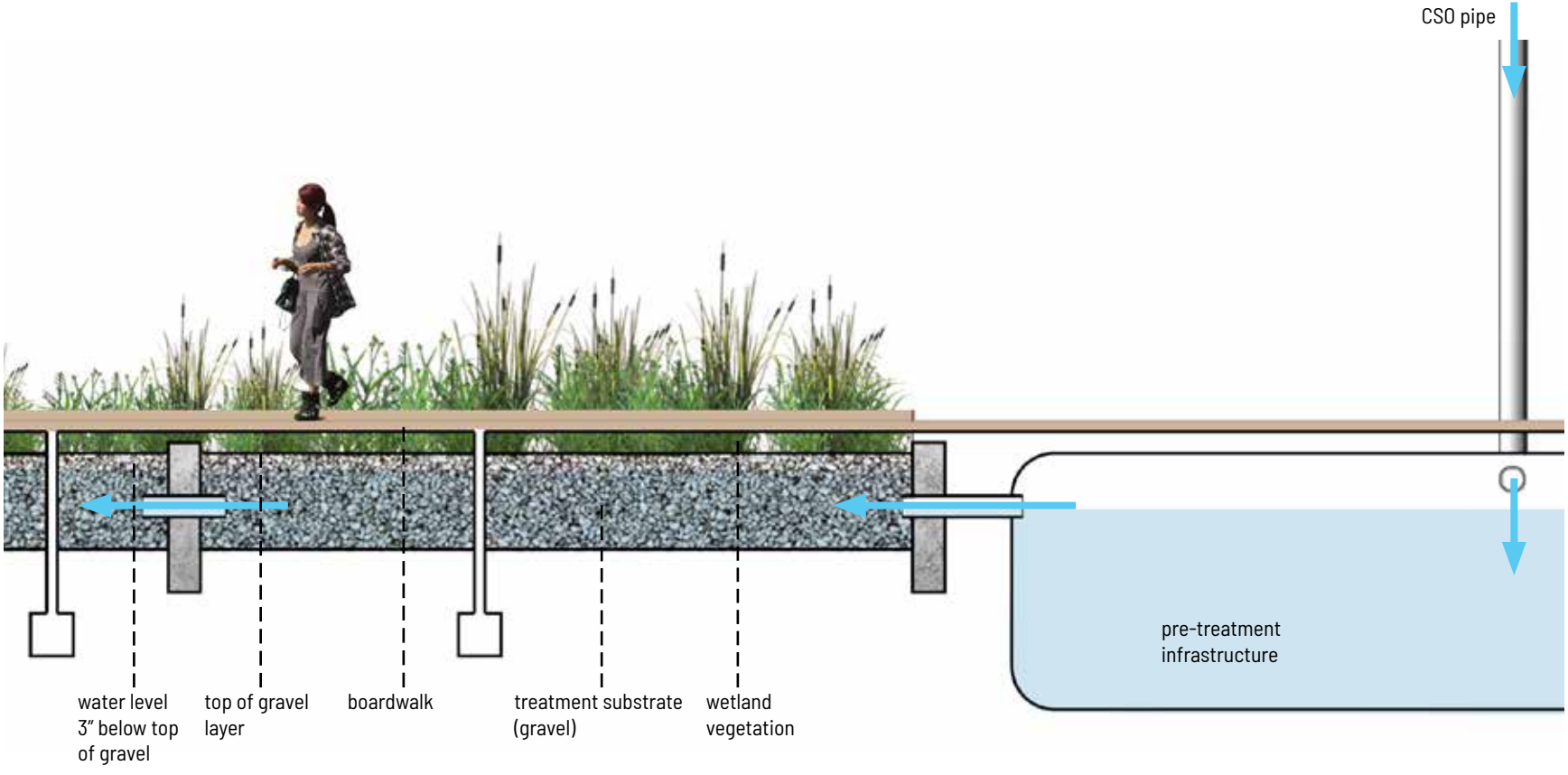




Subsurface Flow Wetland

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

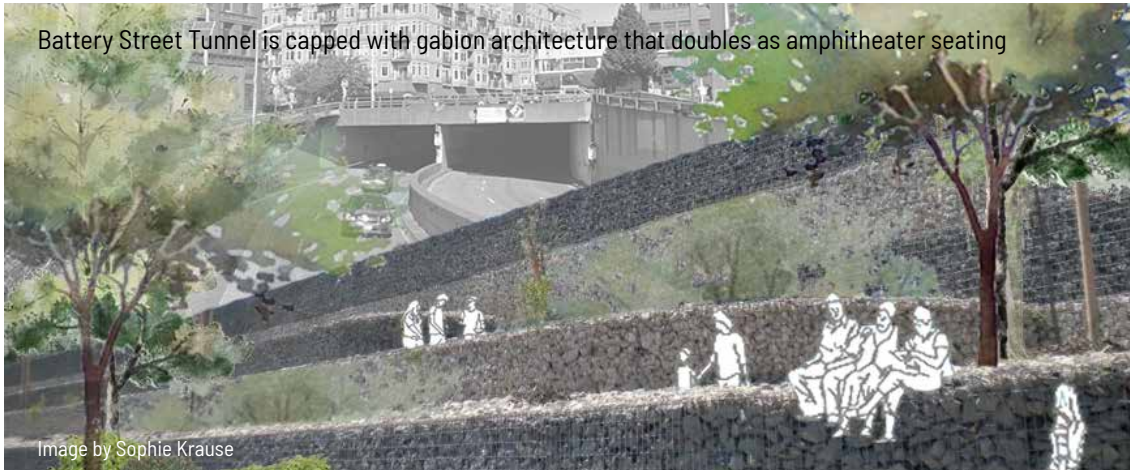


SUBSURFACE FLOW WETLAND DETAIL SECTION

A Chihuly inspired glass wayfinding sculpture also deposits rainwater into a runnel water feature that extends throughout the plaza

Image by Rachel Wells

Image by Dorothy Mulkern



Battery Street Tunnel is capped with gabion architecture that doubles as amphitheater seating

Image by Sophie Krause

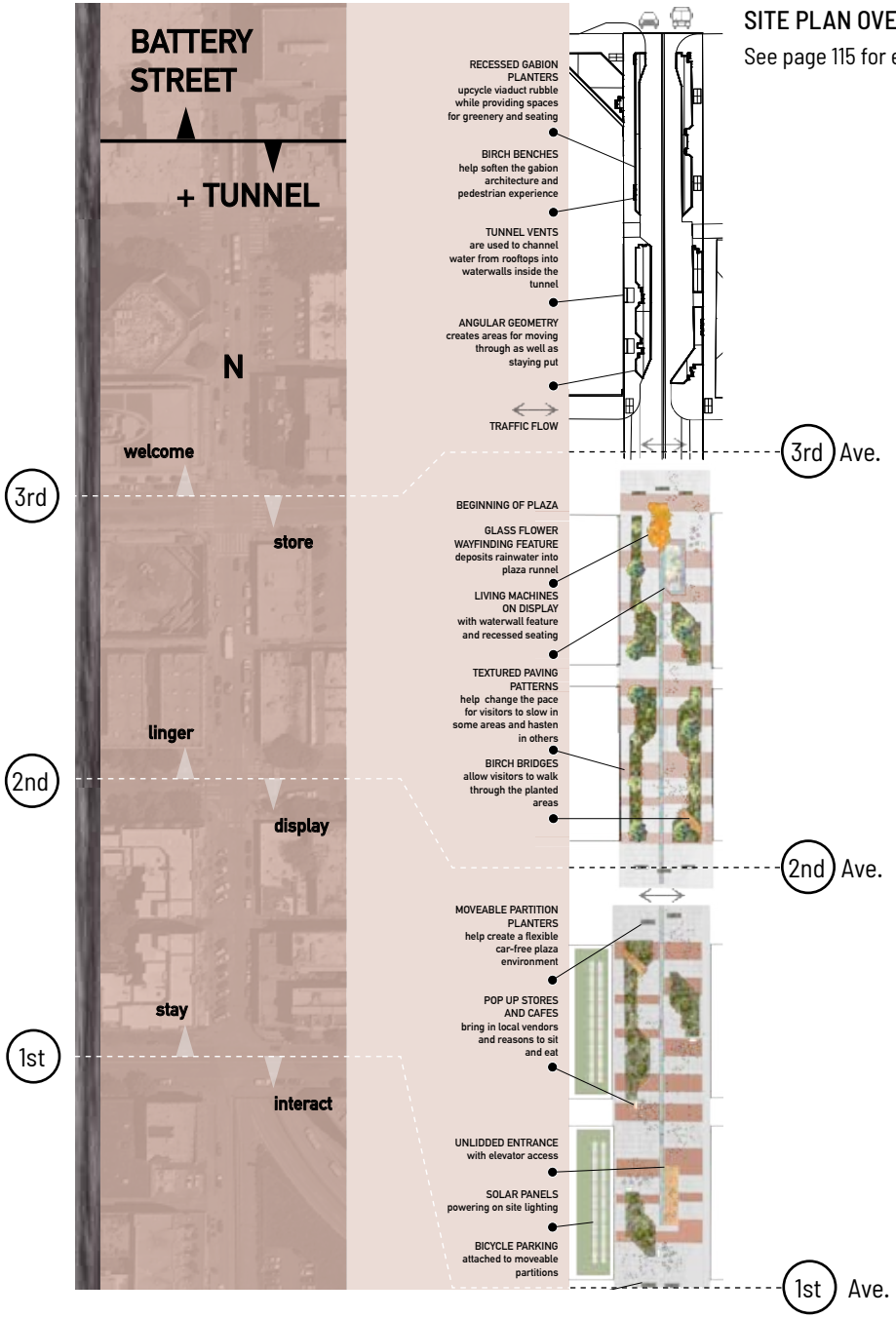
BATTERY STREET PLAZA

Dorothy Mulkern, Rachel Wells, Sophie Krause

"Ideally situated between the city's leading destinations, Battery Street holds promise to welcome millions of visitors to stop, linger and recharge."

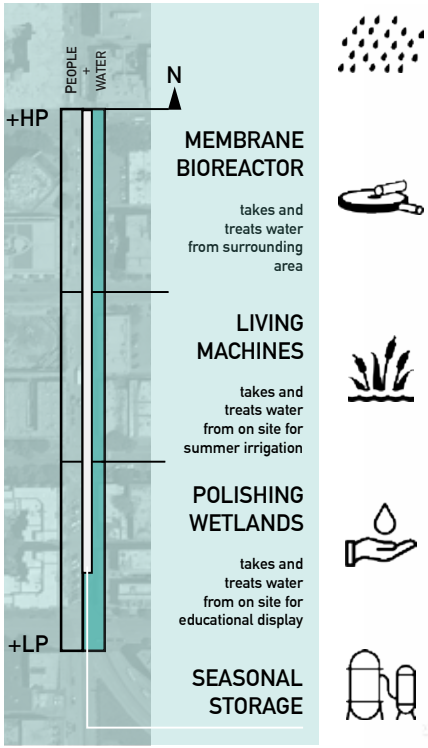
-Growing Vine Steet and Project Belltown

Battery Street and Tunnel is precious open space in Belltown, Seattle's highest density neighborhood slated for closure. This space could increase the city's storm water management and public amenity capacity. With looming mandates and civic concerns (the EPA's Consent Decree for significant CSO reduction by 2025, and a lack of publicly programmable space) filling the tunnel with viaduct rubble is a cost conscious but short sighted choice. As designers we recommend investing in Battery Street and Tunnel as a public resource to meet the longterm needs of a rapidly growing Seattle.

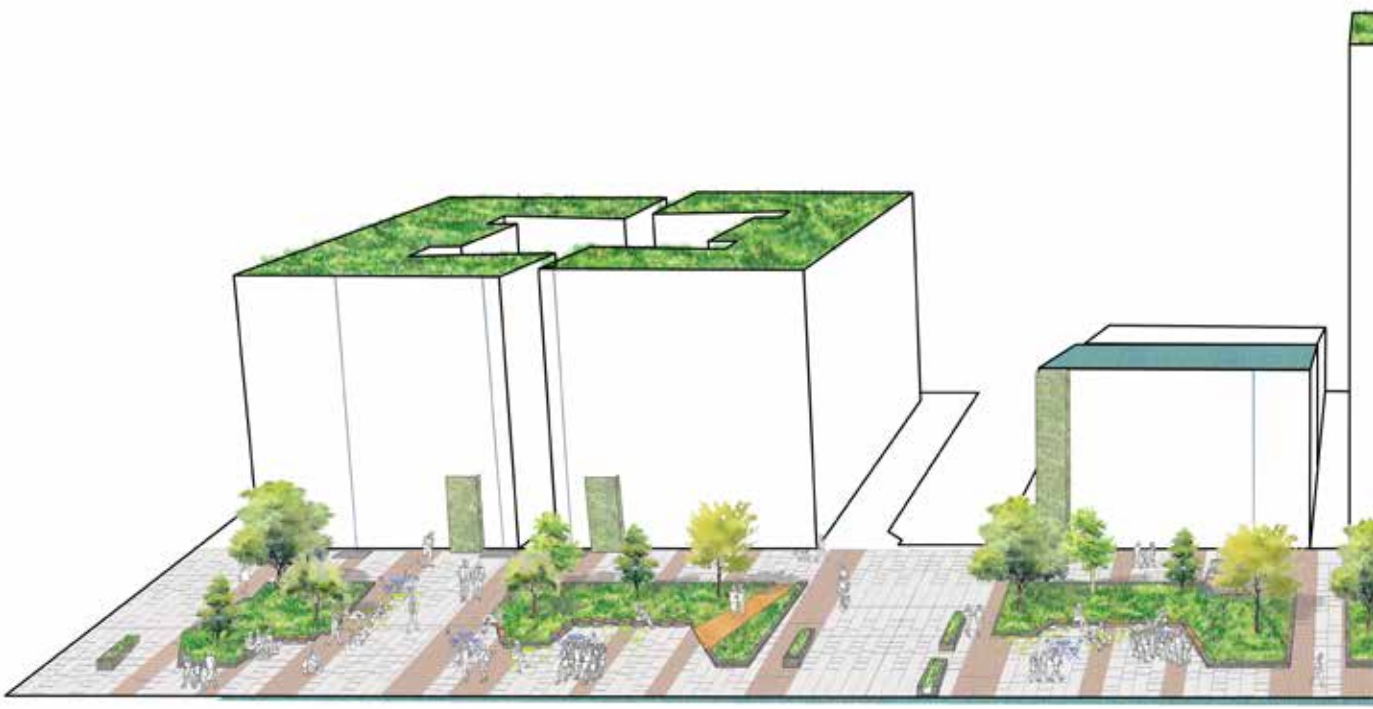


SITE PLAN OVERVIEW

See page 115 for expanded plan.

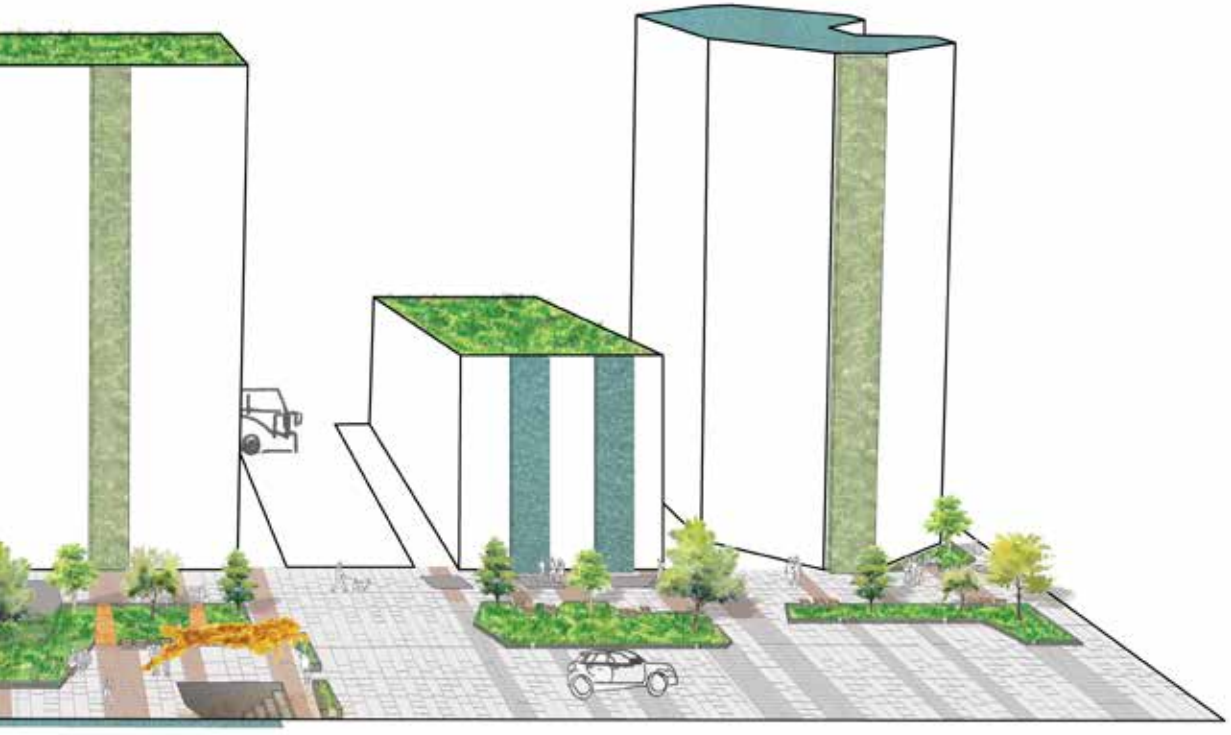


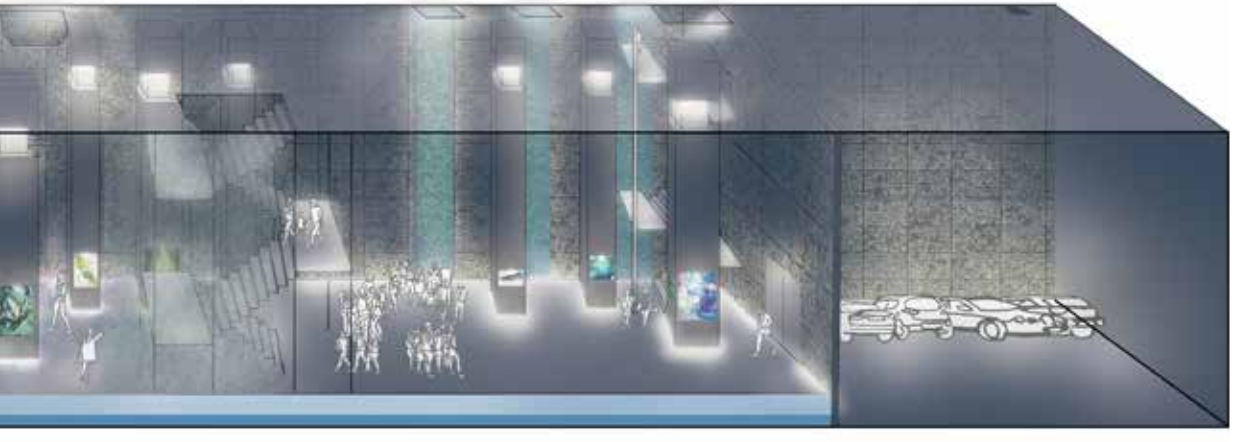
STREET/TUNNEL PERFORMANCE



BATTERY STREET SURFACE

BATTERY STREET TUNNEL





THE TWO SIDES OF BATTERY STREET TUNNEL

In the Battery Street Tunnel, there is a structural divider in the center, meaning there are actually two twenty-five foot tunnels running under Battery Street. In order to be occupied or used, the tunnel needs to be structurally retrofitted to comply with modern seismic code. To simplify this process, we decided to make one side occupiable by people, and the other to store and treat water. The northwest side or "people side" contains:

- a gallery with information on the significance of the Battery Street Tunnel and education on the water treatment and storage taking place on site
- a reservable event and gallery space;
- parking, water storage, and rubble fill.

The southeast side or "water side" contains:

- polishing water treatment wetlands where the public can interact with the water
- cisterns for gray water storage
- living machines
- membrane bioreactor.

Our intention is to use these water treatment methods as a way to take stress off the sewer system, provide opportunities for graywater reuse, and educate the public through guided tours.

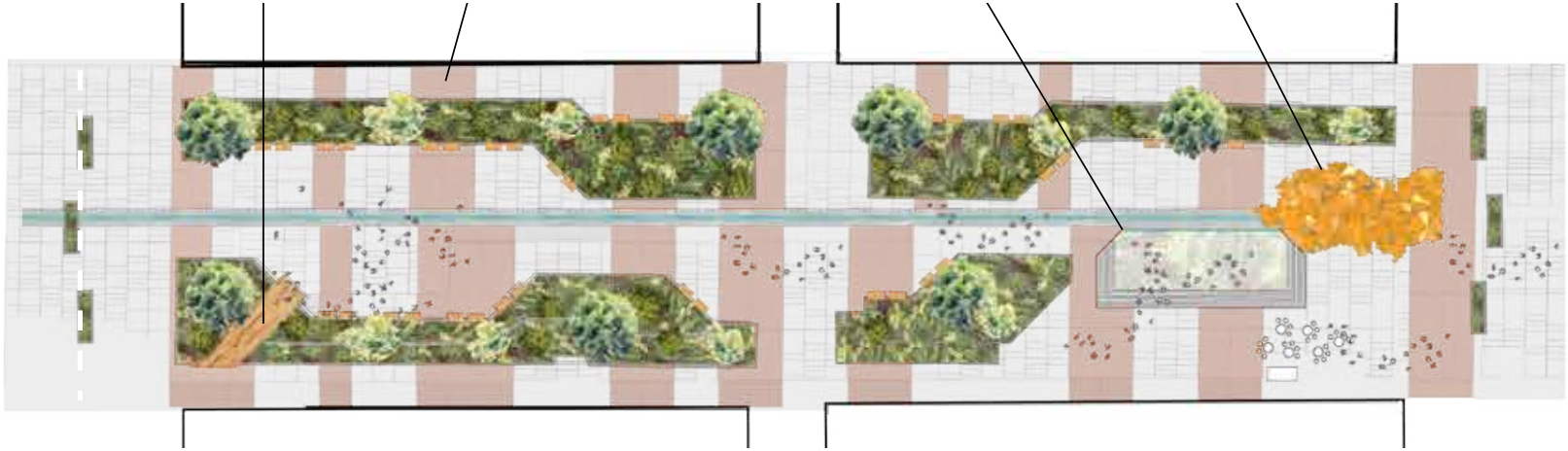
WATER CATCHMENT

Birch Bridges
Allow visitors to walk through planters

Textured Brick Pavement
Channels water and invites pedestrians to linger

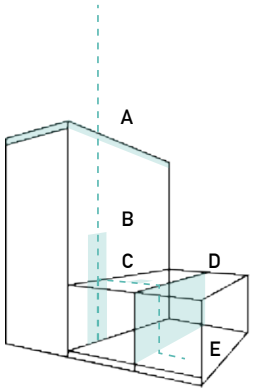
Window to Tunnel
Recessed seating area above glass with views in to tunnel

Glass Flower Sculpture
Deposits rainwater into runnel and serves as wayfinding feature

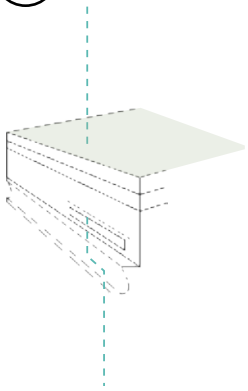


Vertical Typology

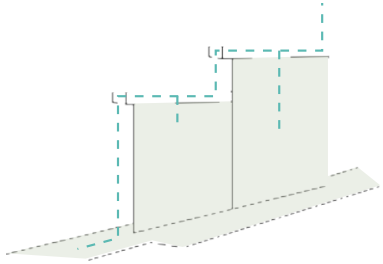
Rainwater moves vertically through the site, filtering via green stormwater infrastructure plantings as it travels passively. Ultimately making its way to the tunnel for treatment and storage through the plaza's surface runnel, water is also circulated year-round as an aesthetic and teachable moment.



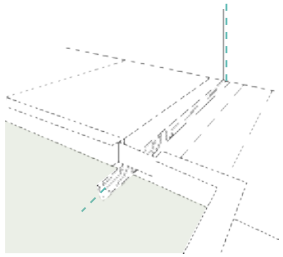
Greenroof to Downspout
A



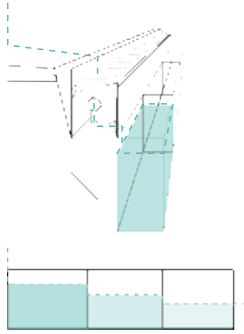
Downspout to Greenwall
B



Sidewalk to Planter
C



Runnel to Tunnel
D



Storage and Treatment
E

Images by Sophie Krause

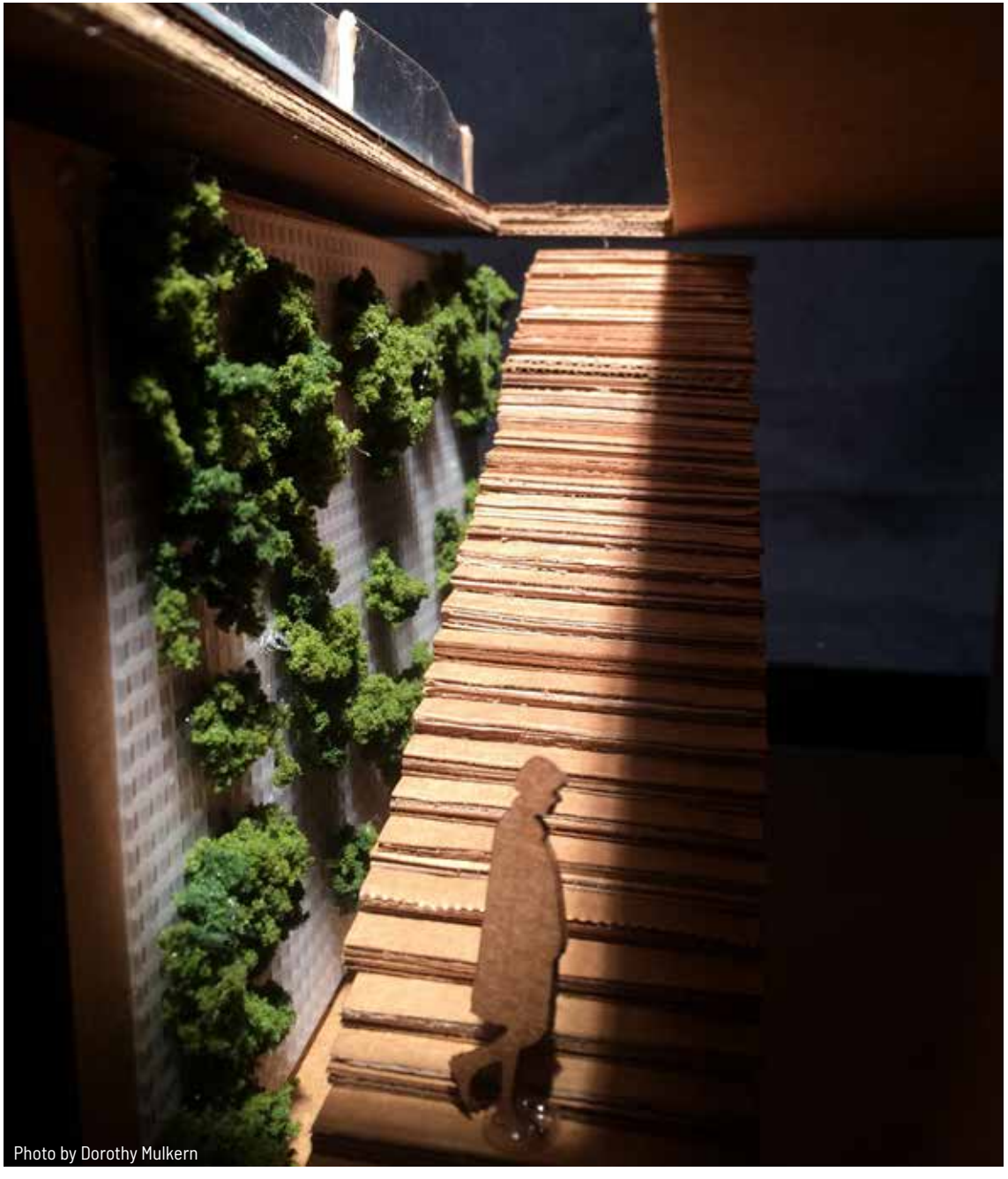


Photo by Dorothy Mulkern

Conclusion

Our intention for this project was to push the community's vision on what is possible on this contentious site. With so many stakeholders and many different visions, our challenge was to balance these with Belltown 2030's water management goals, EPA combined sewer overflow reduction requirements, and the need for public space in Belltown. We sought inspiration from the current proposals, while keeping Belltown's culture, residents, practicality at the forefront of our process. We chose to create a space in the tunnel and at the street level that showcases local visual, light, and glass artists, speaking to Belltown's rich artistic and progressive history. Our intention was to create an environment that facilitates small businesses and residents to interact and allows them to thrive.

Image by Sophie Krause

Image by Jessica Vetrano

P-PATCH PARK

Julia Brasch, Kyle Cotchett, Diana Settlemyer, Jessica Vetrano

The Belltown Cottage Park and P-Patch is an important neighborhood landmark that has become one of the only open, green spaces in the area. The adjacent lot contains an abandoned building and an underused parking lot surrounded by an unstable slope riddled with invasive plant and rodent species. Without intervention, the site will likely be developed as a building, shading out the existing p-patch in what would be an enormous loss to the Belltown community.

With storm water management as the overall goal of this project, we have proposed using the site's close proximity to the CSO 069 and the steep elevation change to accommodate a subterranean combined sewer vault to mitigate the occurrence of outfall events. This concealed infrastructure beneath an open, public green that expands gardening area and manages surface water offers multiple benefits to the community in a way that private development would not.

Location:
Elliot Avenue between Vine Street and Wall Street

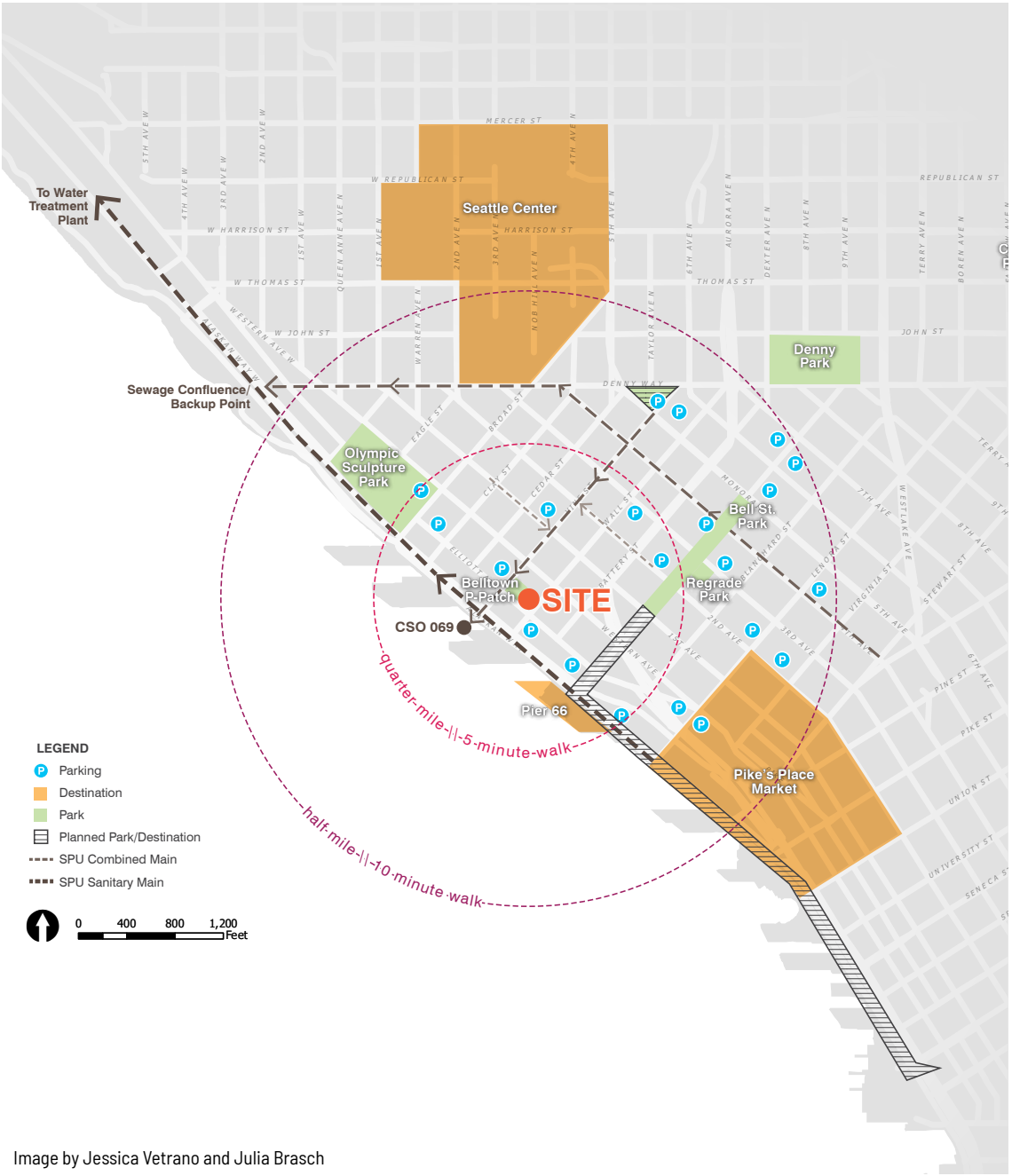


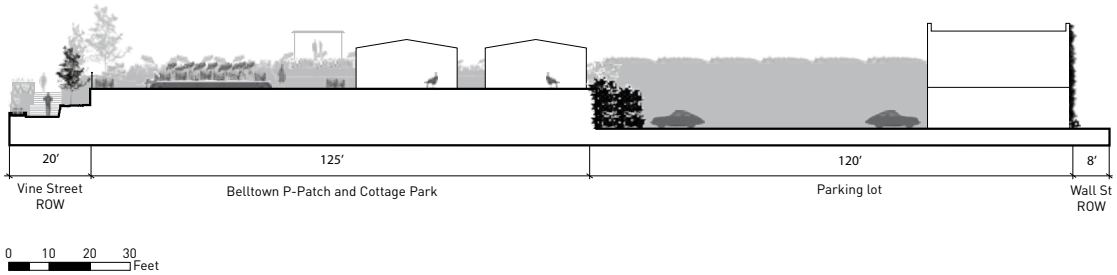
Image by Jessica Vetrano and Julia Brasch

EXISTING CONDITIONS

The site is located off of Elliot Avenue in between Vine Street and Wall Street. There is a steep and unstable slope held together by blackberry bushes. An abandoned building is situated on the sites southwest corner. People experiencing homelessness have been living in the space behind the building.

The surrounding land uses are predominately office and residential. There are two parking lots adjacent to the site, making the current land use of the site redundant.

Elliot Avenue is a busy thoroughfare that feeds traffic into downtown Seattle. The road creates high levels of noise pollution, but it was also observed that much of the foot traffic surrounding the site originates from this street.



Images by Kyle Cotchett

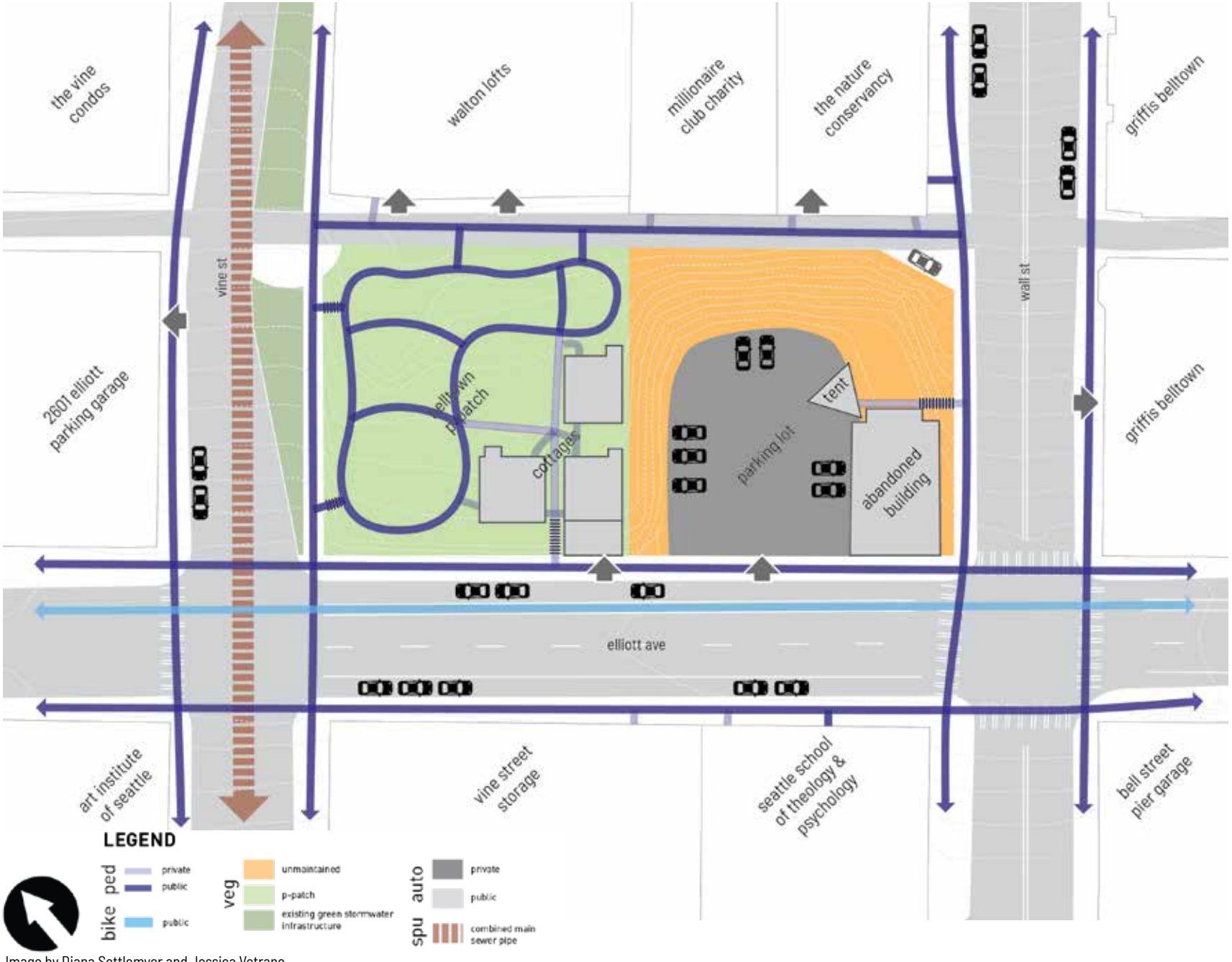
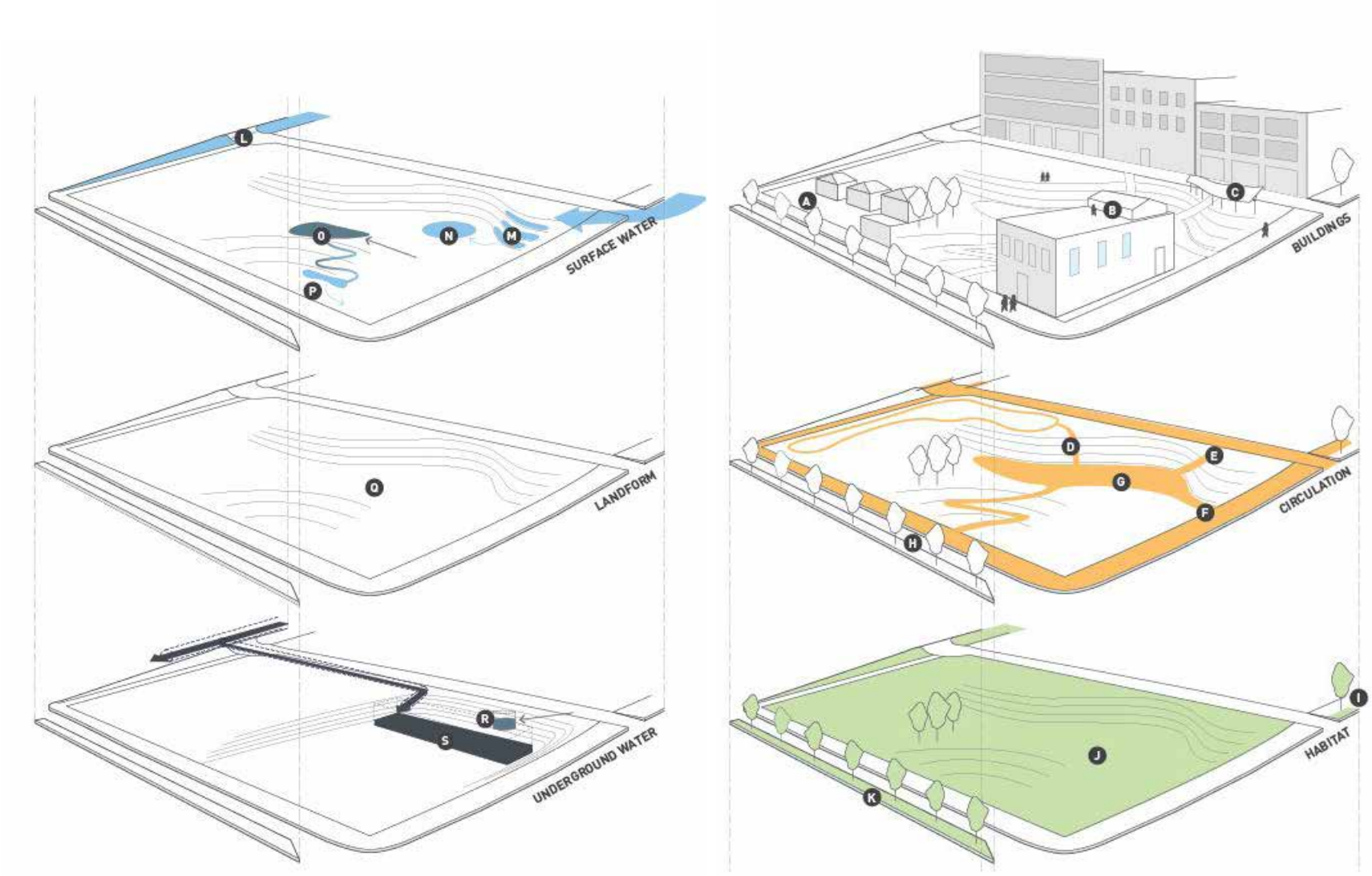


Image by Diana Settlemyer and Jessica Vetrano

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

With this context information in our hands, we wanted to create a program that responded to the existing conditions. We found these to be our user groups, the issues and opportunities the site presents for them, and what interventions we wish to use in our design to response.

Images by Julia Brasch

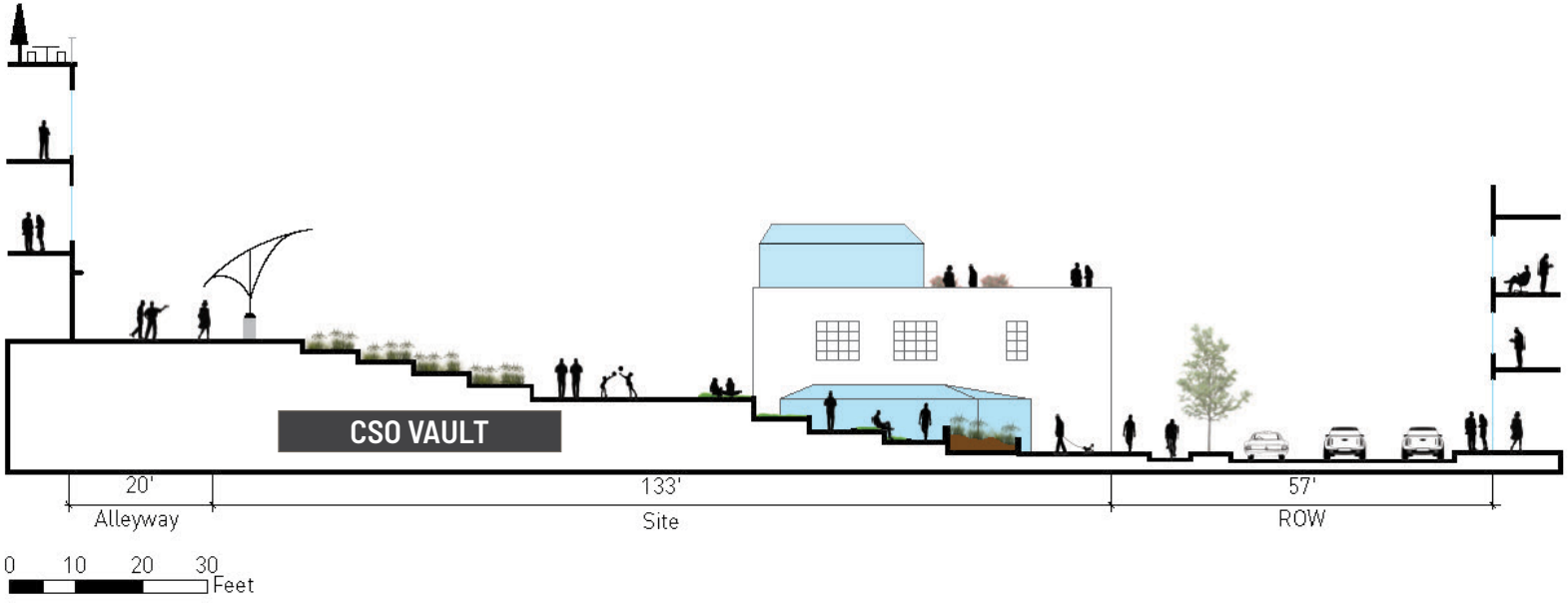


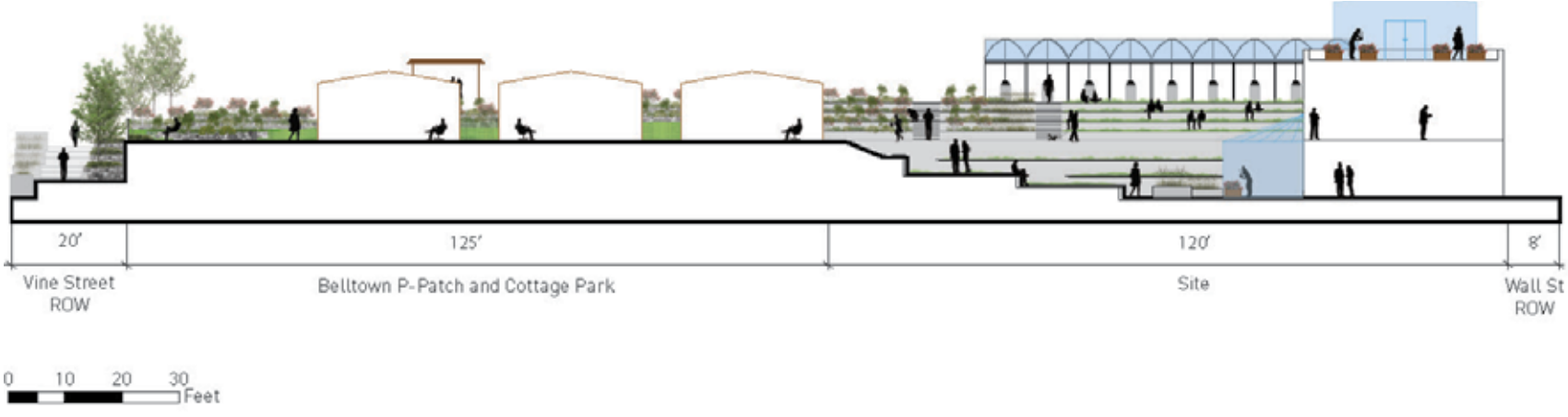
A. Relocated cottage
B. Expanded building footprint & new roof greenhouse & garden plots
C. Community Pavilion
D. Connection to existing p-patch
E. Connection to alley
F. Connection to wall street
G. Gathering area
H. Protected bike lane
I. Bioretention street planter with new vegetation
J. New green 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 Jess Vetrano

PROPOSED SECTIONS





Images by Kyle Cotchett

GRADING AND DRAINAGE

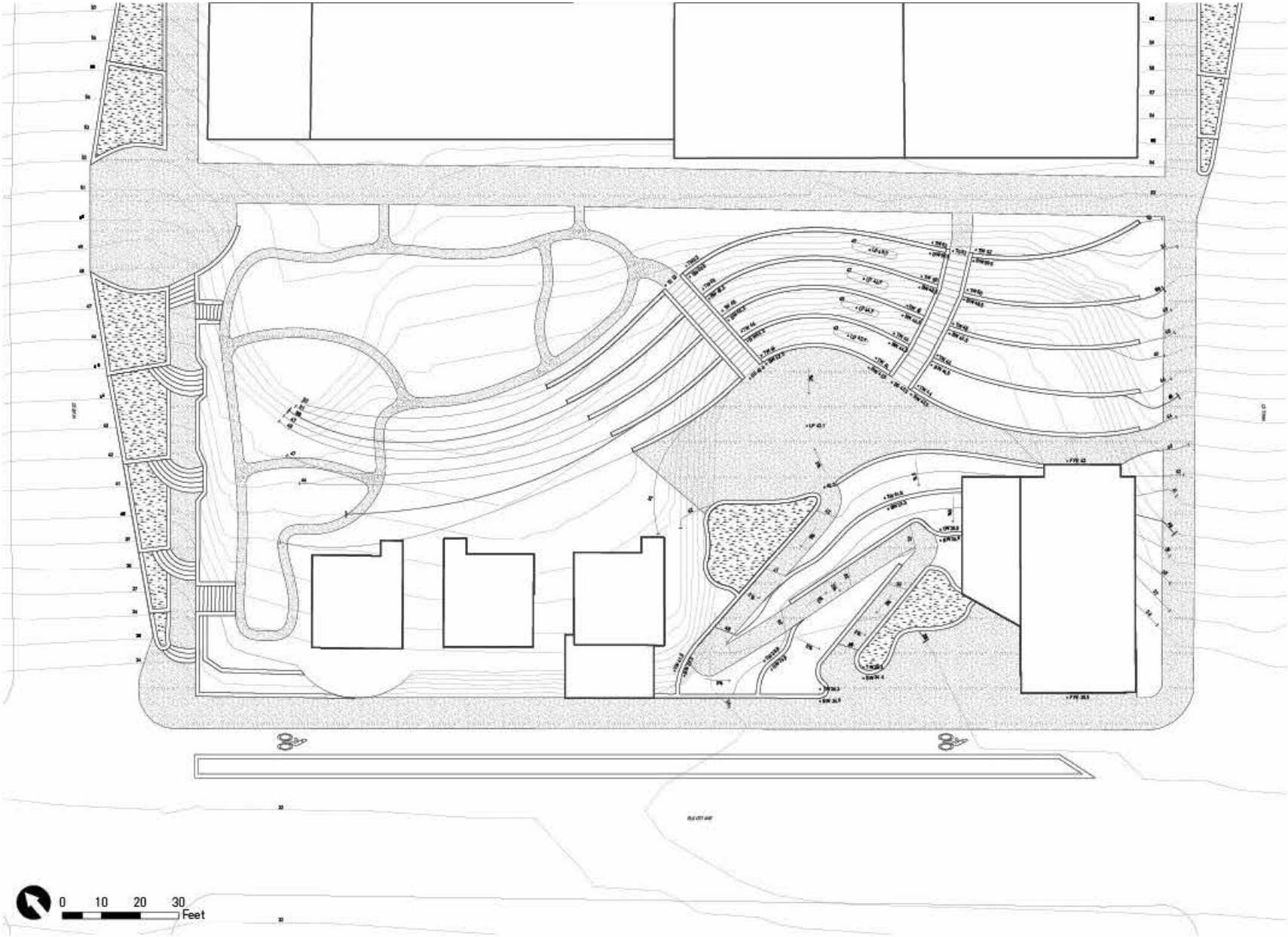
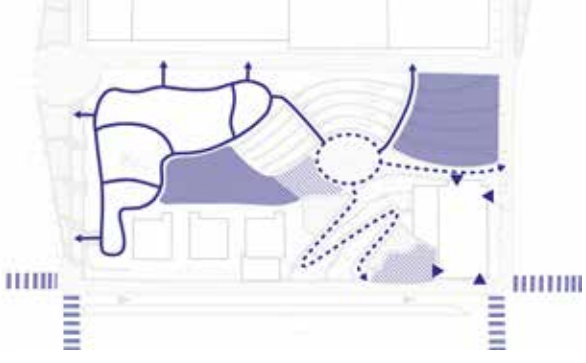


Image by Jessica Vetrano

Lighting

Circulation



Images by Diana Settlemyer

Image by Julia Brasch

Image by Julia Brasch

We strove to make one interconnected site that could mitigate storm water runoff issues, provide more p-patch plots, address the homelessness issue, and provide a place for the community to gather and play. We worked with the steep grade to create a terracing scheme that could provide space for a storm water vault, p-patch plots, an ADA accessible ramp, and facilities for public seating. It was felt that the exiting structure on the south-west corner helped define and create an intimate space. To ensure that this feeling was kept alive, we envision restoring the building and adding on two additional structures on the roof and north east corner. A pavilion was placed on the south east entrance that we see being able to house farmers markets and other community events despite the weather. One of the existing cottages was moved to the northwest side of the block in order to create cohesion between the exiting P-Patch and Cottage park to the new design. To make greater connections and calming efforts to the structures beyond our site, we have proposed moving the existing bicycle lane with the addition of a protected barrier to the location of current on street parking.

SITE PLAN


1st Ave
Overlook & Tunnel Entrance
A
Wetland
Bridge
Salal Prairie
Small Council Ring
ADA Path
Biofiltration Cells
Battery St
Large Council Ring
Sunny Slope
ADA Path
B
West Entrance
Western Ave
Bell St
Small Council Ring
Flexible Outdoor Space
Program House
C
Image by Allison Ong
0′ 20′ 40′ 100′ 200′

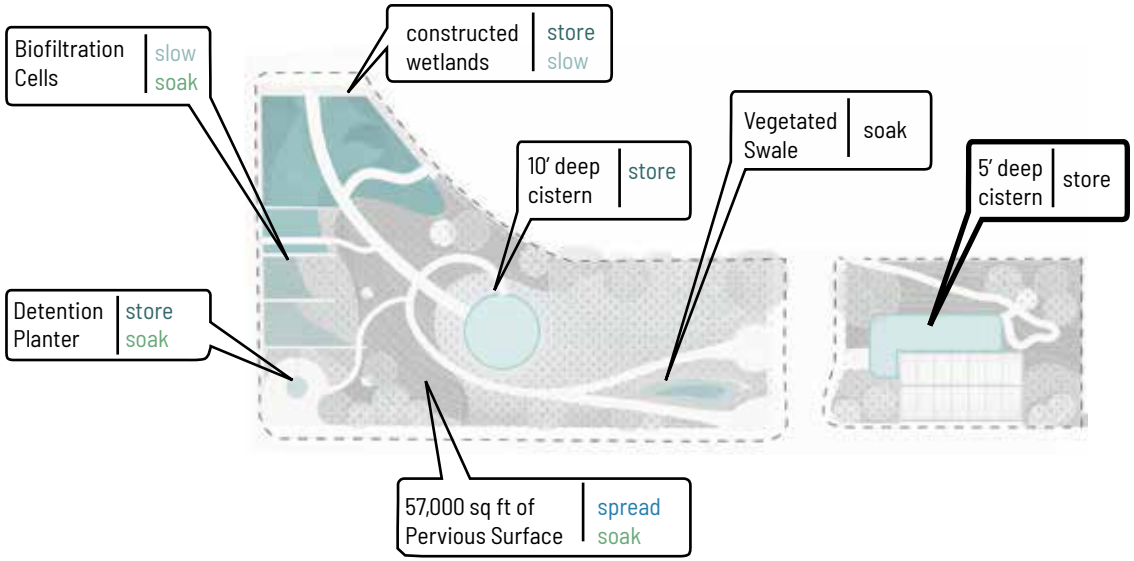
PORTAL PARK

Allison Ong, Nicky Bloom

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.

Water Management



Water Detention

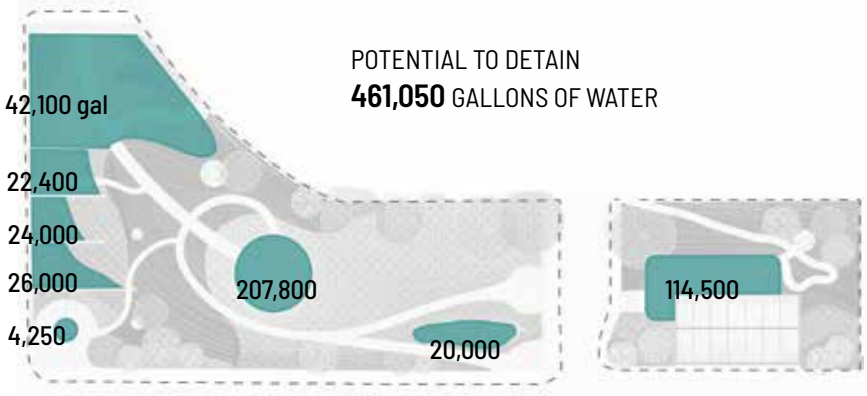
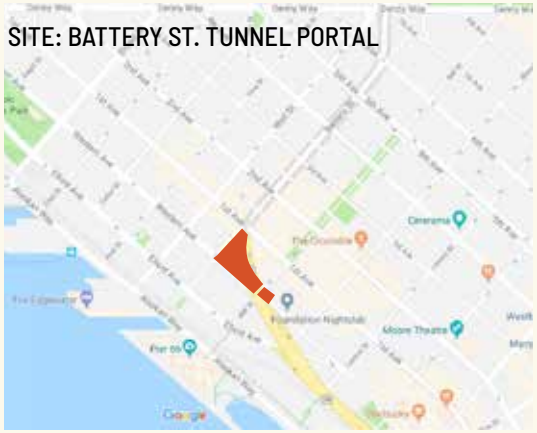


Image by Allison Ong

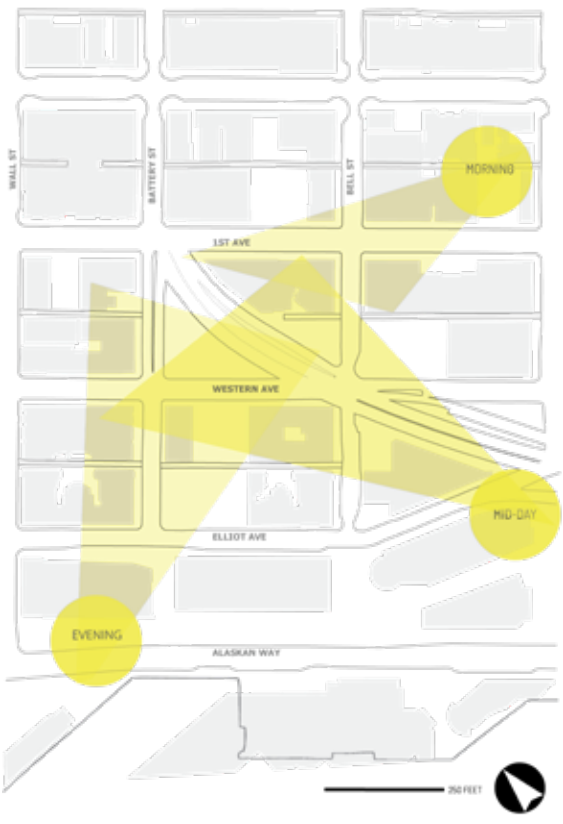


SITE ANALYSIS

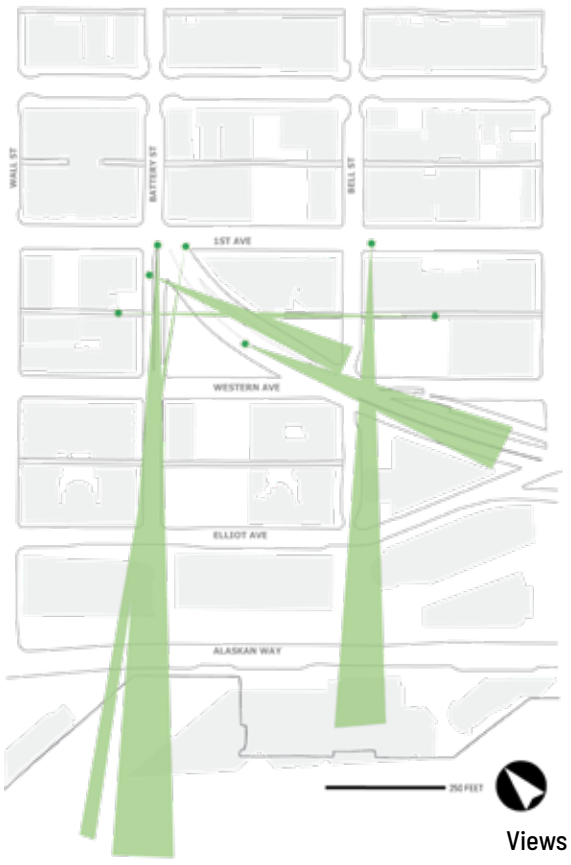
Image by Allison Ong

Site Context: Belltown, Seattle

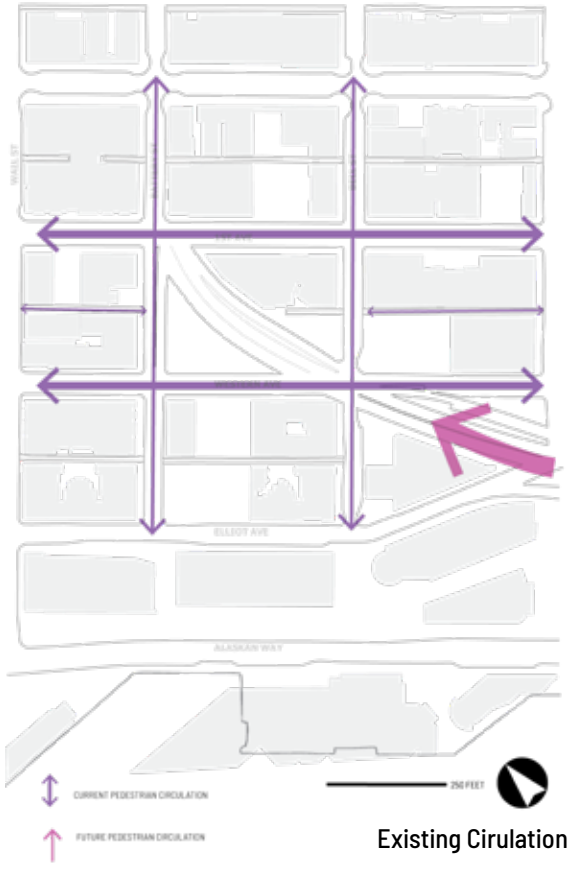
A severe shortage of greenspace in the densest neighborhood in Seattle drew us to the Portal Park as it will eventually become the largest park in Belltown. The site's location on a steep slope also offers great opportunity for gravity-fed water treatment systems.



Sun/Shade



Views



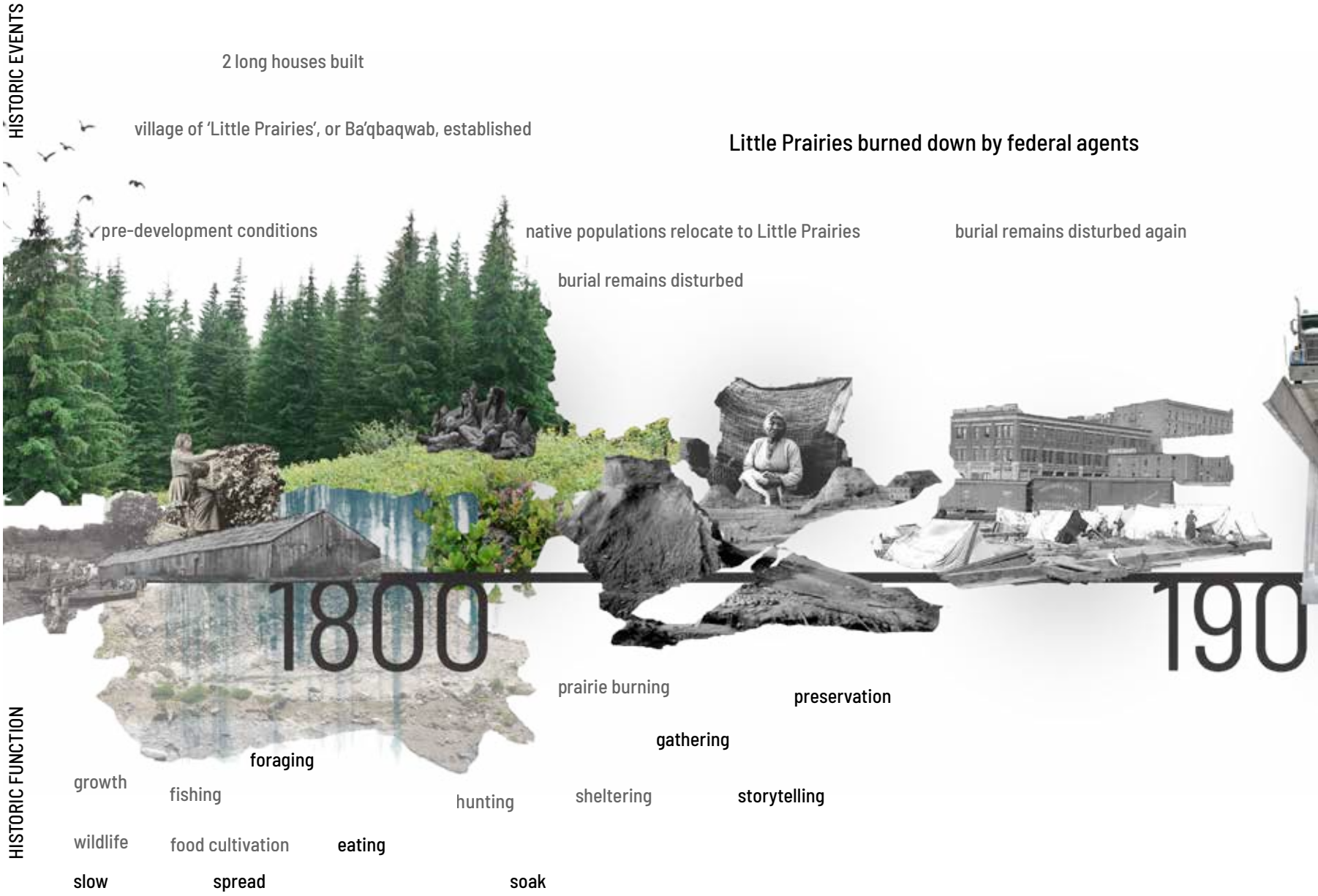
Existing Cirulation

Images by Nicky Bloom

Site Analysis:

Existing access to sunlight, long views of Mt. Rainier and the Puget Sound, and current and future pedestrian circulation patterns heavily influenced our design.

SITE ANALYSIS



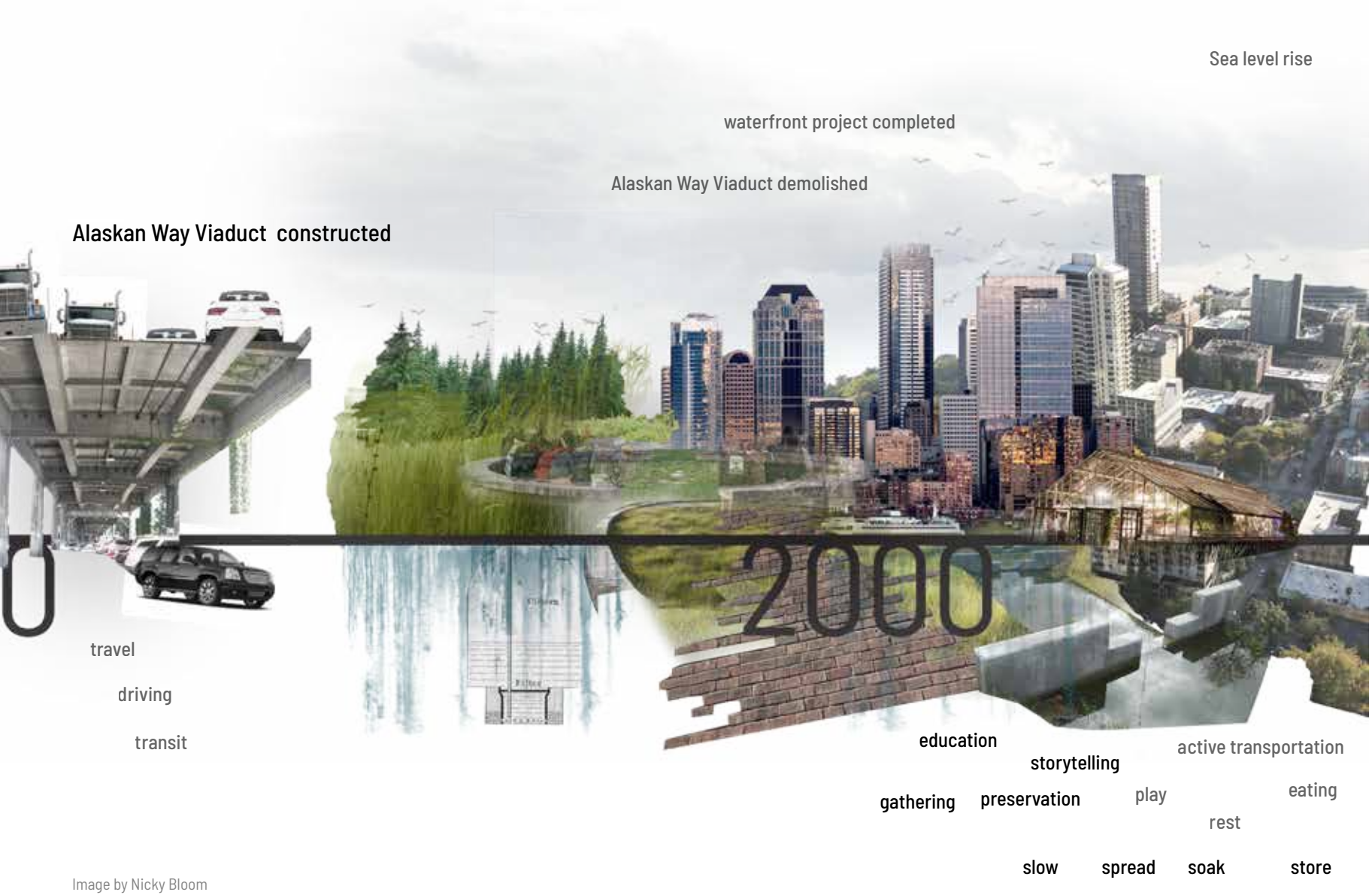


Image by Nicky Bloom

PROGRAM

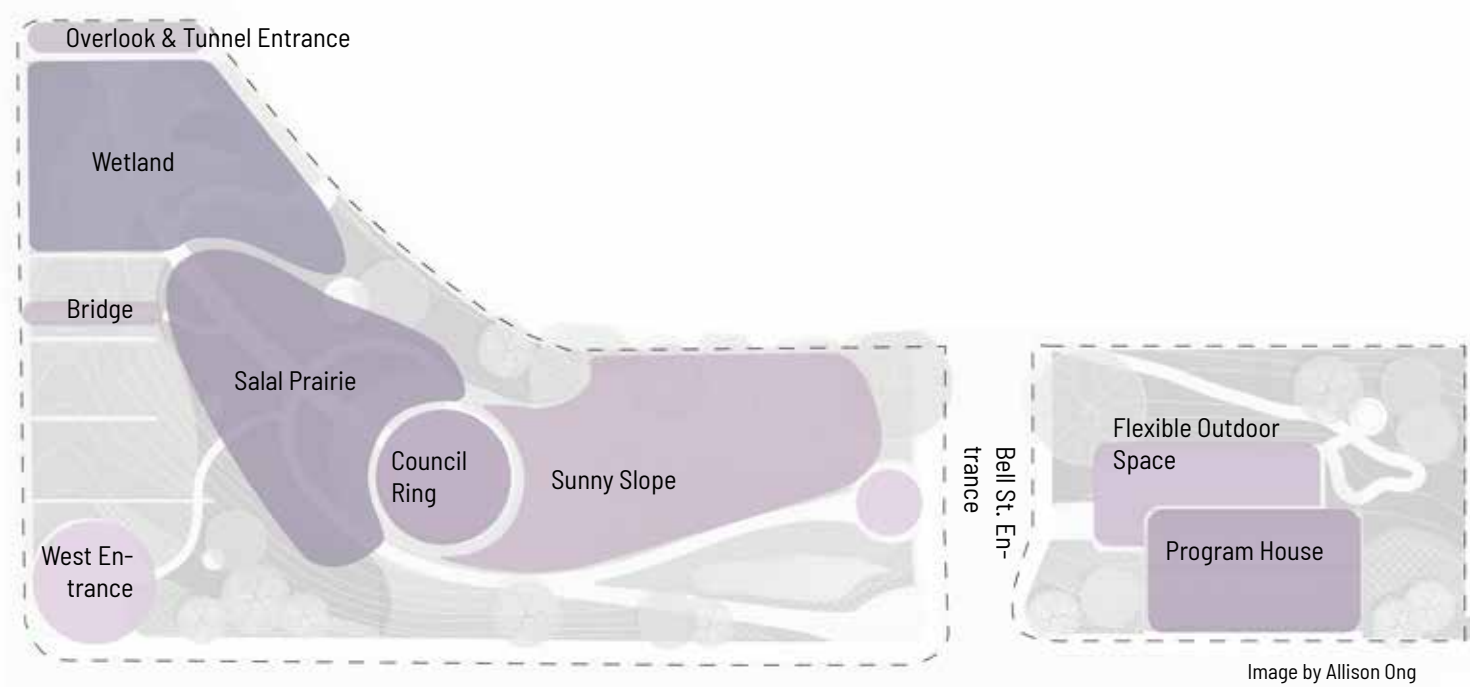


Image by Allison Ong

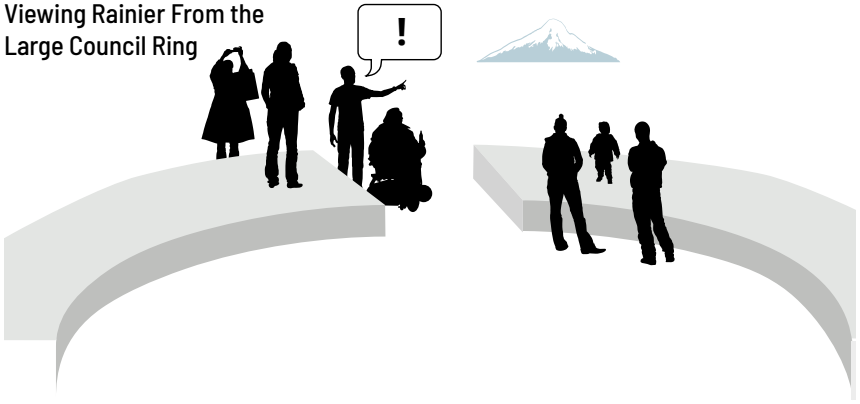
Site Timeline (previous page):

This design acknowledges the site's thick history—once a Duwamish village called Little Prairies, a gathering place for tribes after eviction from other parts of Seattle, a disturbed burial ground, and a viaduct. Our concept was to restore important historical functions related to ecological knowledge-sharing, such as gathering, eating, storytelling, to the site.

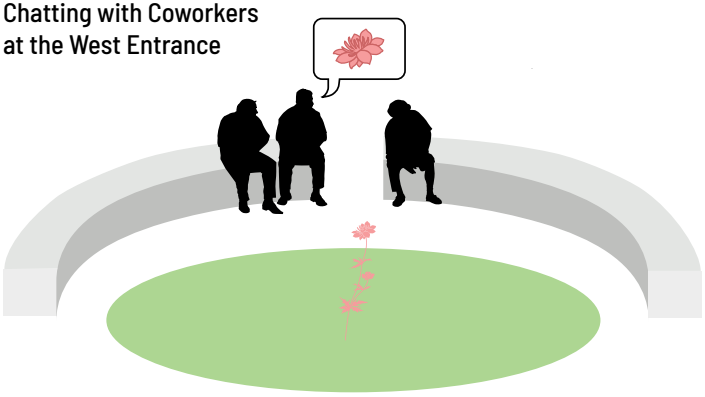
Program Diagram:

Native Seattlites gained ecological knowledge through direct experience with nature and through sharing those experiences with others. The concept for the program was the have a large natural area where people can experience natural elements first hand opposite a designated gathering space and program house that more pointedly connects people to the ecological knowledge and history in the site through events, workshops, exhibits, and classes.

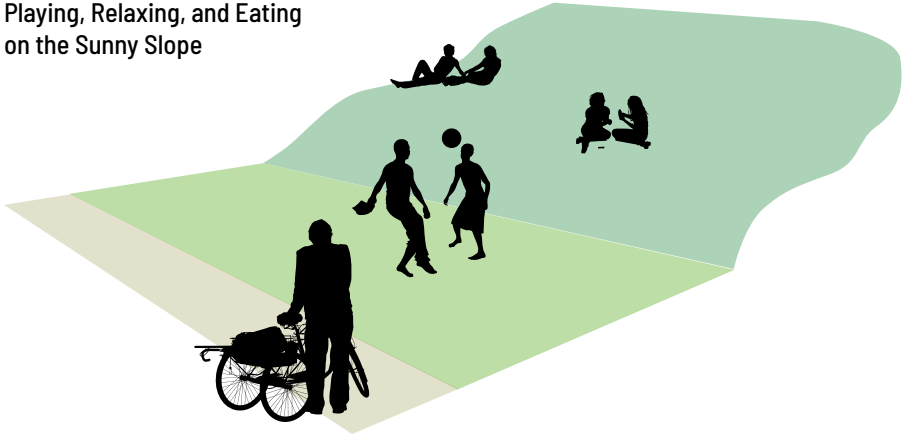
Viewing Rainier From the Large Council Ring



Chatting with Coworkers at the West Entrance



Playing, Relaxing, and Eating on the Sunny Slope



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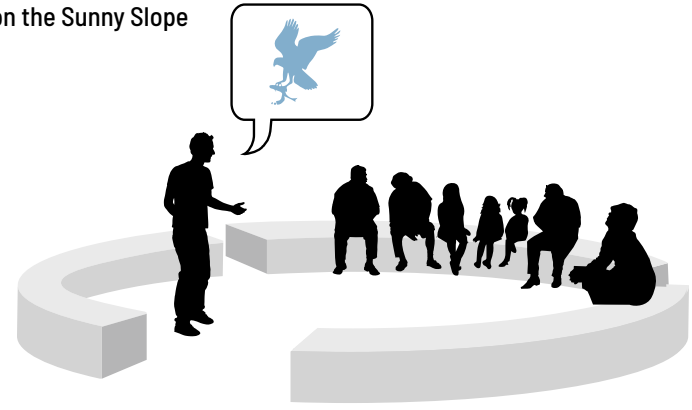
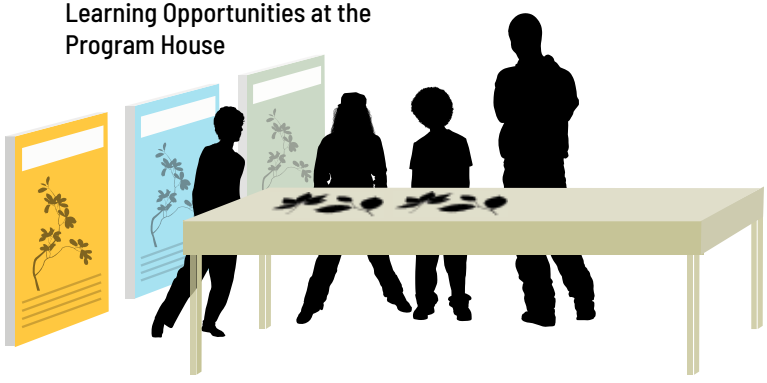


Walking over the Constructed Wetland After a Storm

Learning Opportunities at the Program House



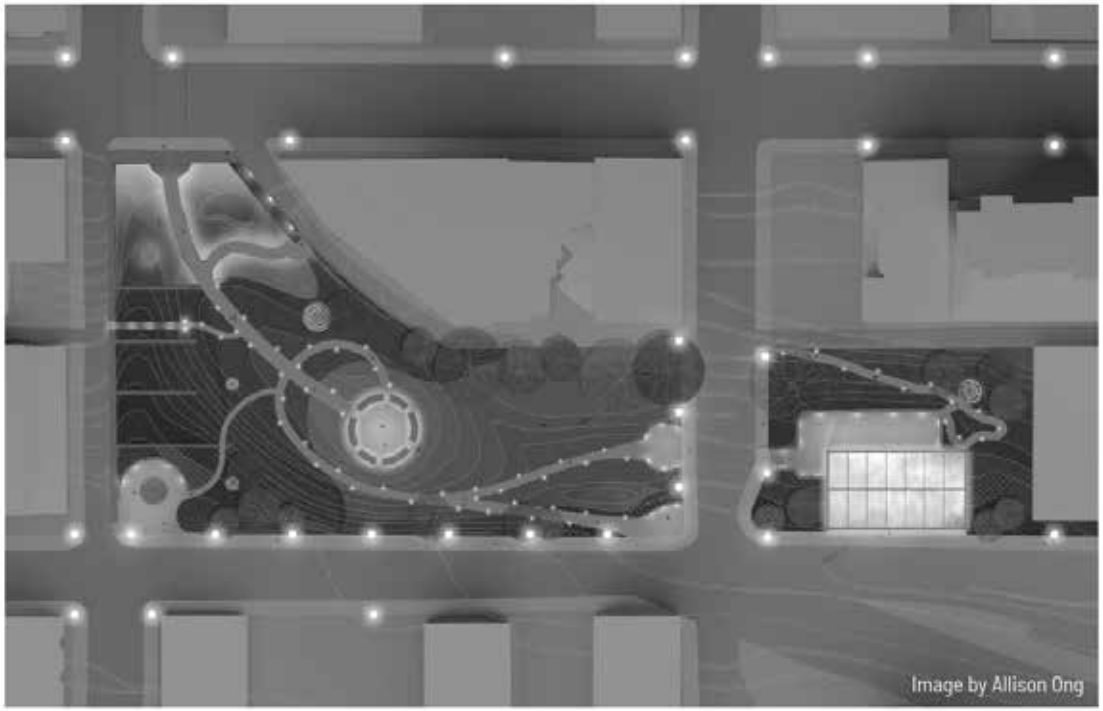
Images by Allison Ong

DYNAMIC SPACE

Night Lights and Seasonal Change

A lighting plan illustrates that the space should feel safe and welcoming at night. Glowing council rings invite pedestrians down into the site from 1st Avenue or up the slope from Western, while lights illuminate all the pathways to extend the use and comfort of the space.

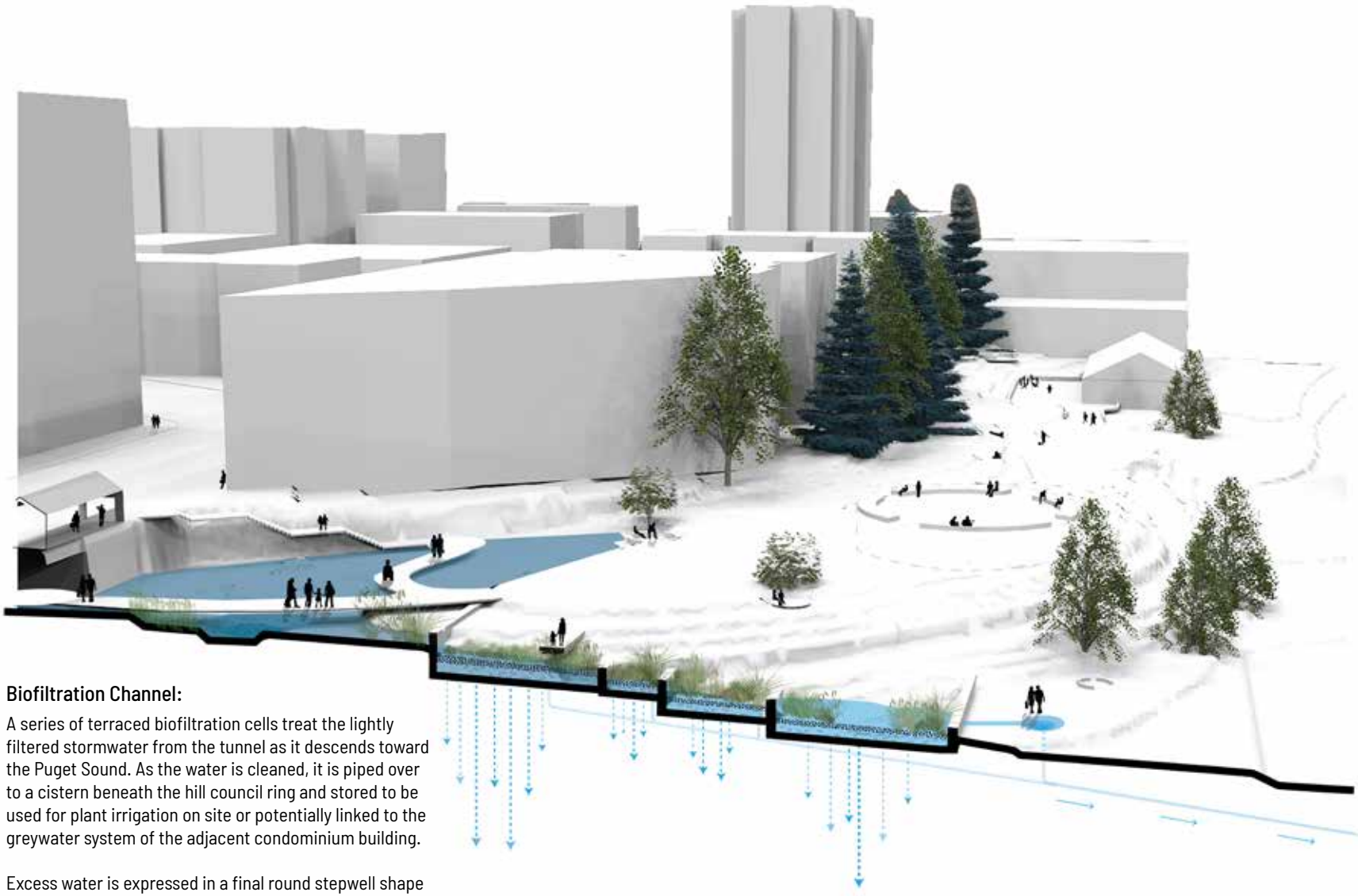
Seasonally rich plantings of red bud, vine maples, and native perennials provide a reason to return to the site over and over again to achieve the immersive, experiential education goals of the space.



People using the flexible program space for an event with dancing at dusk

Image by Nicky Bloom

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.

Image by Nicky Bloom

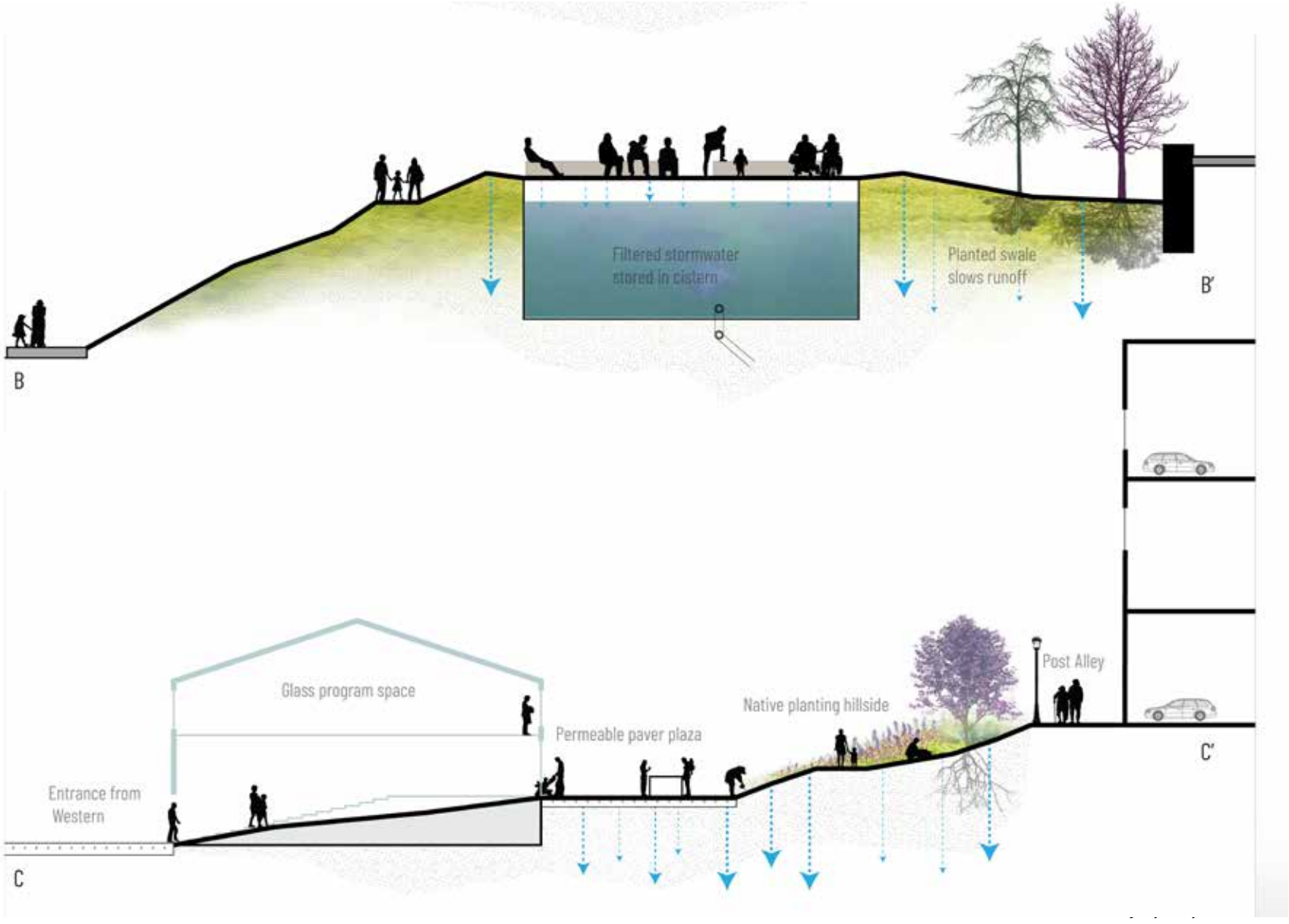
View from Battery Street showing the bridge over the biofiltration cells, leading to the Large Council Ring

Image by Allison Ong

SECTION A: WETLAND DOCK AND OVERLOOK

Image by Nicky Bloom

Sections A, B, and C illustrate the layered nature of the design. In A, an overlook layers on top of a viewing deck on top of a constructed wetland so people can view the stormwater feature up close. In B, a hill with a great view of Mt. Rainier provides much-needed social gathering space. A cistern is built into the hill to store water collected and cleaned by the biofiltration channel. In C, a pervious plaza helps infiltrate rain water next to the Program House which provides indoor programming space and a potential venue for classes, meetings, celebrations, shows, and other events.



SECTION C: PERVIOUS PLAZA

STUDY TOUR


1


2


5


3


6


4

1 A Netto tourboat winds its way through and around Copenhagen's canals and harbor.

2 Professor Nancy Rottle takes a moment to bounce.

3 COBE's Rune Boserup Jacobsen leads our group on a tour of the Bella Kvarter.

4 Copenhagen's fun and whimsical play structures invite engagement from humans of all ages.

5 Aaron Parker cruises past the recently completed SUND Campus Nature Park.

6 Western Harbor's water features are even better in the rain.

REVIEWERS + PANELISTS

Aaron Asis Recharge the Battery
Aamalia Leighton Cody Toole Design Group
Amy Waterman formerly of Seattle 2030 District
Barbara Oakrock Growing Vine Street
Ben Spencer UW LA Faculty
Brice Maryman MIG/SvR
Buster Simpson Artist
Derek Avery Magnusson Klemencic Associates
Diana Hasegan Osborn Consulting
Evan Cliffthorne Project Belltown
Hailey Mackay SCJ Alliance
Jeff Hou UW LA Faculty
Jess Aloisio MUP Graduate
Jesse Williams CH2MHill
Jim Brennan J.A. Brennan Associates
Jon Kiehnau Project Belltown/Growing Vine Street
Julie Johnson UW LA Faculty
Ken Yocom UW LA Faculty
Kelsey Hu Magnusson Klemencic

Laure Heland UW Affiliate Faculty
Lee Loveland DSA Development
Lesley Bain Framework
Lily Siu Magnusson Klemencic Associates
Lyle Bicknell Seattle Office of Planning and Community Development
Mami Hara Seattle Public Utilities General Manager
Matthew Combe Seattle 2030 District/CEO
Mashall Foster Office of the Waterfront
Meghan Feller Herrera Engineering
Noriko Marshall Noriko Marshall Landscape Architecture
Paul Olson Architect
Rick Johnson Seattle Public Utilities
Robin Thaler Mayfly Consulting
Ryan Storkman Site Workshop
Shailee Stern Seattle Public Utilities
Steve Hall Point Consulting, Friends of Historic Belltown
Vaughn Rinner ASLA Immediate Past President

+ others who participated in our Mid-Review/
Greener Belltown-Bluer Sound Workshop

1: Nicky Bloom receives design critique from a panel of designers, artists and engineers at the final review.

2: Midway through the quarter, The Nature Conservancy hosted a stakeholder workshop at which Rick Johnson and Amy Waterman participated as a design reviewers.

3: Noriko Marshall offers the Portal Park group design feedback at the studio's final review.


VINTAGE COFFEE