Thinking Beyond the Water:

Start Small, Think Big

New Partners for Smart Growth Conference | February 2, 2017

Kevin Robert Perry, ASLA

Urban Rain | Design

Photo: www.graham.umich.edu

Why Do We Need To Retrofit With Green Infrastructure?

Portland's First Retrofit Projects

Thinking Beyond The Water: Putting The Green Back Into Green Infrastructure

Start Small, Think Big

Why Retrofit?

Photo: Google Earth

Natural Landscape

Photo: Google Earth

Urbanization

Minneapolis, Minnesota

Photo: Google Earth

Natural Landscape

Photo: Google Earth

Urbanization

Houston, Texas

Photo: Google Earth

Natural Landscape

Photo: Google Earth

Sub-Urbanization

California Central Valley

Desert

Redwoods

Riparian

Oaks

Moving Towards An Unhealthy Watershed

Photo: Kevin Robert Perry

The Urban Street Stormwater System

Impervious, Little or No Landscape

Photo: Kevin Robert Perry

The Natural Stream Stormwater System

Pervious, Considerable Landscape System

Photo: Kevin Robert Perry

The "Green Street" Stormwater System

Pervious, Integrated Landscape System

The Green Infrastructure “Toolbox”

Portland’s First Retrofit Projects

Photo: Kevin Robert Perry, City of Portland

NE Siskiyou Green Street

Portland, Oregon

Photo: Kevin Robert Perry, City of Portland

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SW 12th Avenue Green Street

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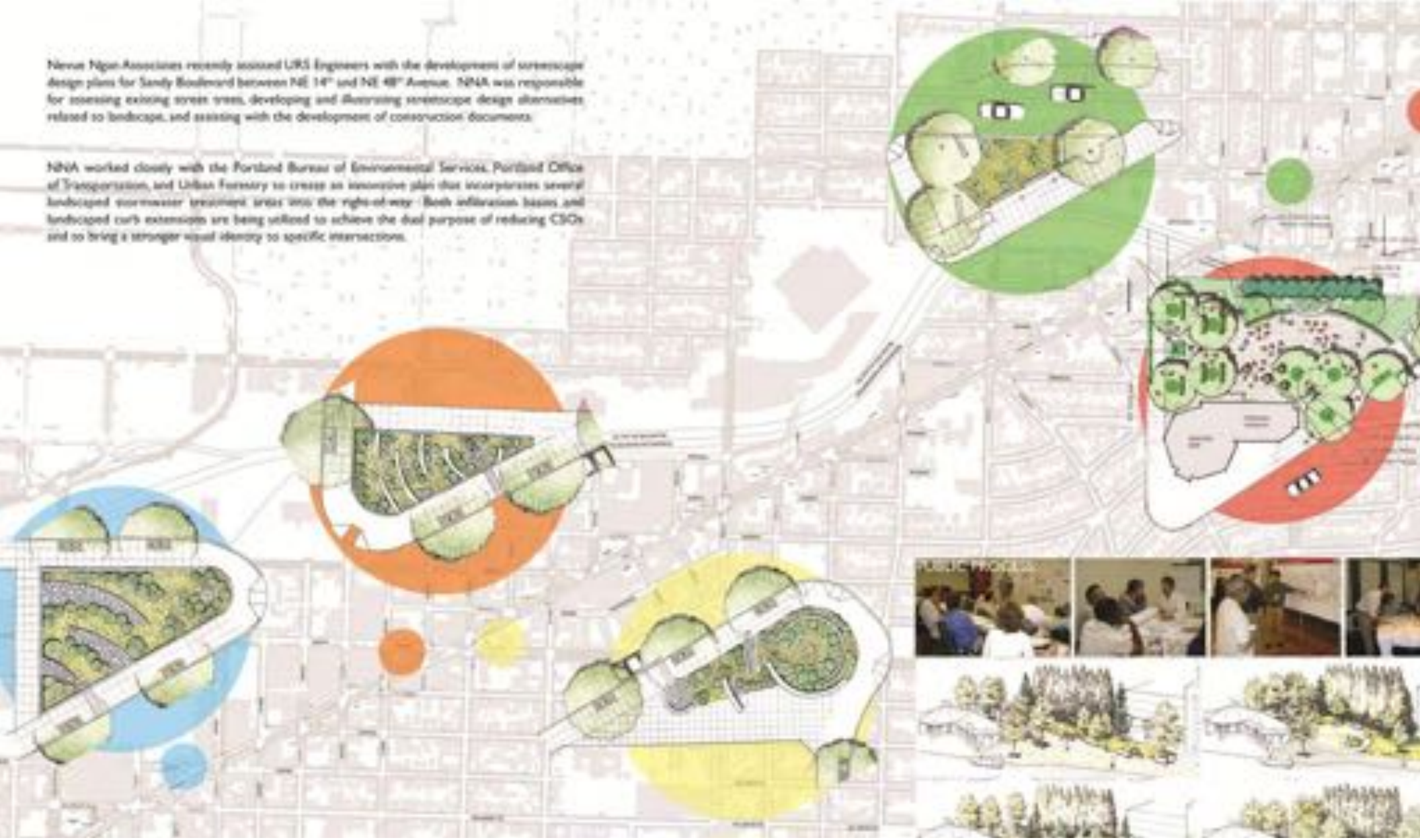

Illustration: Nevue Ngan Associates

NE Sandy Boulevard Rain Gardens

Portland, Oregon

Photo: Kevin Robert Perry, Nevue Ngan Associates

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Logus Road Green Street

Milwaukie, Oregon

Photo: Kevin Robert Perry, Nevue Ngan Associates

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Logus Road Green Street

Milwaukie, Oregon

Site Plan

SW Montgomery Green Street

Connecting the West Hills to the Willamette River

The SW Montgomery Green Street is regarded as Portland's most innovative green street effort. The project demonstrates how, in even the most ultra-urban conditions, downtown streets can be planned and retrofitted not only to fully manage stormwater runoff but to also create, integrate, and preserve vibrant pedestrian spaces. This 9-block concept plan incorporates a variety of green infrastructure and alternative transportation strategies throughout this emerging neighborhood in downtown Portland.

The "Stormwater Spine"

SW Montgomery Green Street

Connecting the West Hills to the Willamette River

1 Stormwater Bridges

Multiple pedestrian bridges across the stormwater spine are needed to provide adequate pedestrian flow throughout the corridor. These bridges should be wide enough and spaced frequently to accommodate specific users such as bikes, people, and even autos.

2 "Curbless" Street Profile

Providing a flush drainage condition along the stormwater spine allows stormwater runoff to sheet flow into the landscape area. This provides both a barrier free condition for pedestrians and a shallower and more aesthetic stormwater facility.

3 High-Density Planting

The stormwater spine is a functional landscape area used to clean and absorb stormwater runoff. Providing a high-density spacing of trees, shrubs, and groundcovers maximizes the ability for plant roots to clean pollutants and absorb runoff.

4 Simple and Shallow

There is a maximum grade change of 6-inches from the walking surface to the finish grade of the stormwater spine. This simple design approach eliminates the typical need for a perimeter curb around the landscape and still allows for adequate pedestrian safety.

5 A Continuous Theme

The stormwater spine functionally and visually links individual blocks within the street corridor. Planting types and the width of the spine does vary from block-to-block in response to unique conditions. However, the overall "green thread" remains consistent throughout.

The continuous Stormwater Spine along the SW Montgomery Green Street is planned as a highly functional landscape system used to capture and manage stormwater runoff from over 75,000 square feet of impervious area. The spine is the project site's "workhorse" for stormwater management. Each block along the corridor has the stormwater spine traversing through it, however, the form and size of the landscape system does vary in response to the unique conditions of each block. Sections of the stormwater spine have already been built along the SW Montgomery Green Street and are so well integrated into the urban fabric that many can not even distinguish them as being functional stormwater landscapes.

2009

Photo: Kevin Robert Perry, Nevue Ngan Associates

Smith Memorial Student Union Plaza

Portland, Oregon

Photo: Kevin Robert Perry, Nevue Ngan Associates

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Urban Center Plaza Stormwater Retrofit

Portland, Oregon

Photo: Kevin Robert Perry, Nevue Ngan Associates

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Photo: Kevin Robert Perry

Urban Center Plaza Stormwater Retrofit

Portland, Oregon

Thinking Beyond the Water

Photo: Kevin Robert Perry, ASLA

"One of the primary impacts of stormwater is related to the increased volumes of surface runoff that are a direct result of increased impervious surfaces in urbanized watersheds..."

EPA NPDES Program

"Three Keys to BMP Performance"

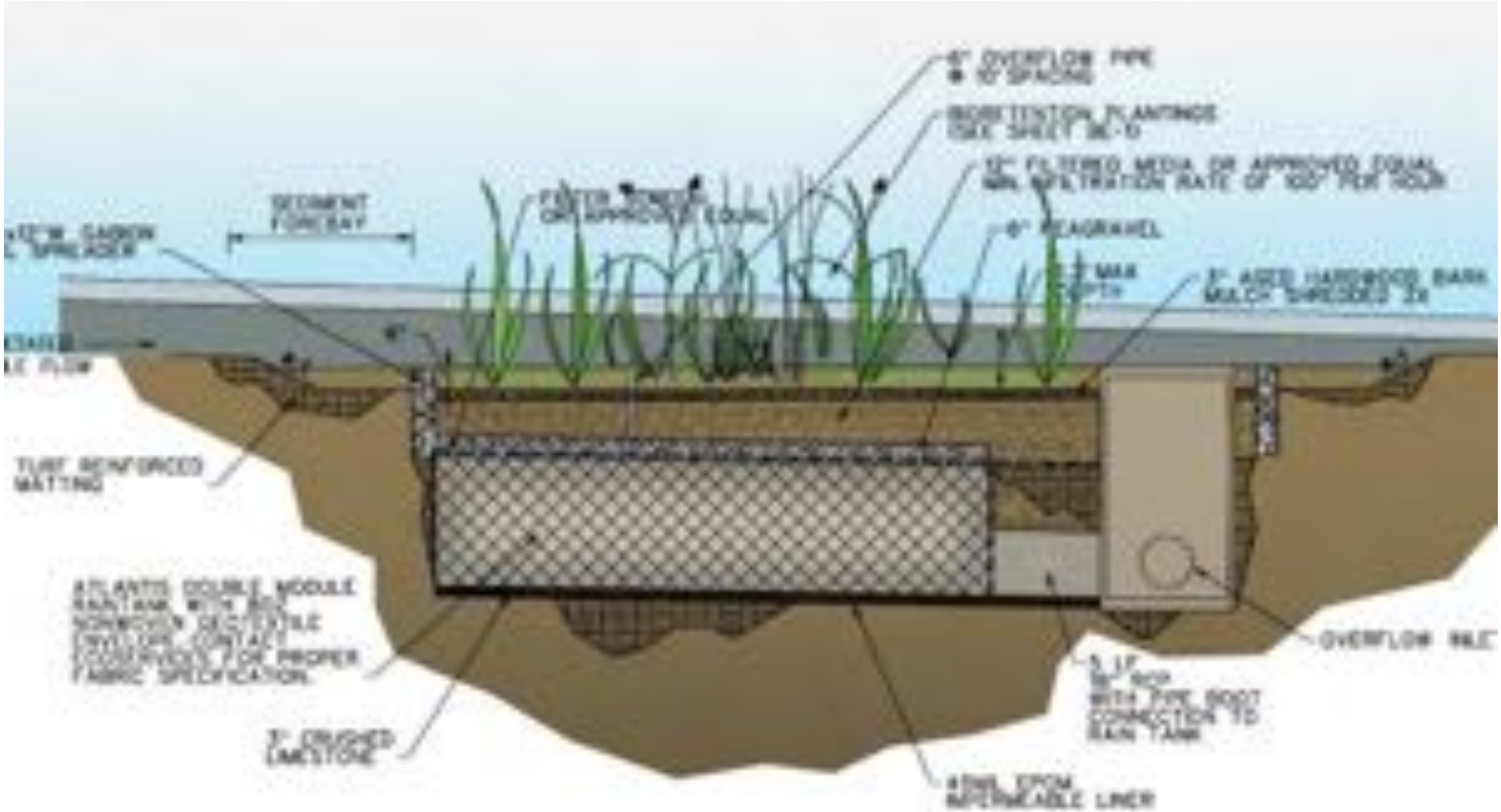


Photo: www.freese.com

Conventional Stormwater Solution

A focus on water volume removal: "Plants over a Pipe Solution"

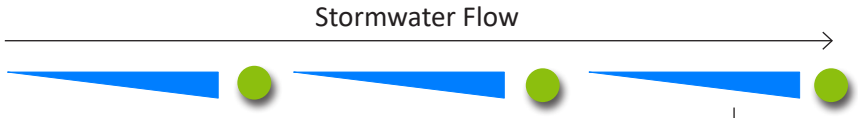
Photo: Nevue Ngan Associates

Photo: Kevin Robert Perry, ASLA

Highly Engineered, Deep, and Concentrated

Too much focus on water volume removal

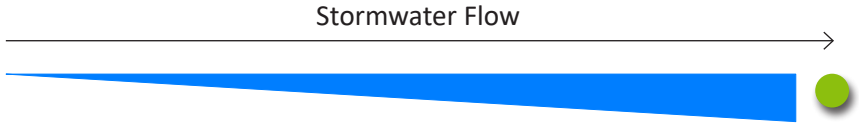
Decentralized Natural Capture Approach



The amount of stormwater runoff volume is distributed frequently amongst stormwater facilities

Widespread and shallow stormwater facilities captures stormwater using decentralized management approach

Concentrated Capture Approach



The amount of stormwater volume runoff is concentrated towards one downstream stormwater facility

A small and deep stormwater facility captures stormwater using a concentrated management approach

Photo: Kevin Robert Perry, ASLA

Create More Landscape In The Public R.O.W

Photo: Kevin Robert Perry, ASLA

Create More Landscape In The Public R.O.W

Photo: Kevin Robert Perry, ASLA

Create More Landscape In The Public R.O.W

Photo & Design: Hood Design Studio, LLC

Create More Landscape In The Public R.O.W

Photo: www.actfortransit.org

Create More Landscape In The Public R.O.W

Photo: Kevin Robert Perry, ASLA

Look to the Urban Landscape As A Design Model

The Micromanagement of Stormwater

Photo: Kevin Robert Perry, ASLA

Look to the Urban Landscape As A Design Model

Nature is Fighting Back

Accidental Pervious Surface

A crack in the asphalt accepts roof stormwater runoff

Photo: Kevin Robert Perry, ASLA

Accidental Pervious Surface

A crack in the asphalt accepts roof stormwater runoff

Accidental Pervious Surface

A 100-year old street. Is this street failing?

Accidental Pervious Surface

Nature is telling us that it wants to be pervious

Accidental Pervious Surface

Nature is telling us that it wants to be pervious

Photo: Kevin Robert Perry, ASLA

Accidental Pervious Surface

It can be beautiful

Accidental Pervious Surface

Vegetation growing between the street and gutter intercepts runoff

Photo: Adria Goula
Design: Lola Domenech

Formalized Pervious Surface

A Bold Streetscape Example from Barcelona, Spain

Image: Kevin Robert Perry/Ray Papa

Formalized Pervious Surface

NW Kennedy Street Design Competition

Photo: Kevin Robert Perry, ASLA
Design: ASLA Green Roof, Washington DC - Michael Van Valkenburgh

Formalized Pervious Surface

A Walkable Surface Over Vegetation

Start Small, Think Big

UC Davis California Avenue Rain Garden:

A Simple and Cost Effective Student Green Infrastructure Project

Reduce Irrigation Use

Manage Stormwater Runoff

Provide Hands-on Learning for Students

Demonstrate Simple & Cost Effective Green Infrastructure

Integrate the Project into Larger Campus Retrofit Efforts

Photo: UC Davis

Project Location

California Avenue @ Robbins Hall

Photo: Kevin Robert Perry, ASLA

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California Avenue @ Robbins Hall

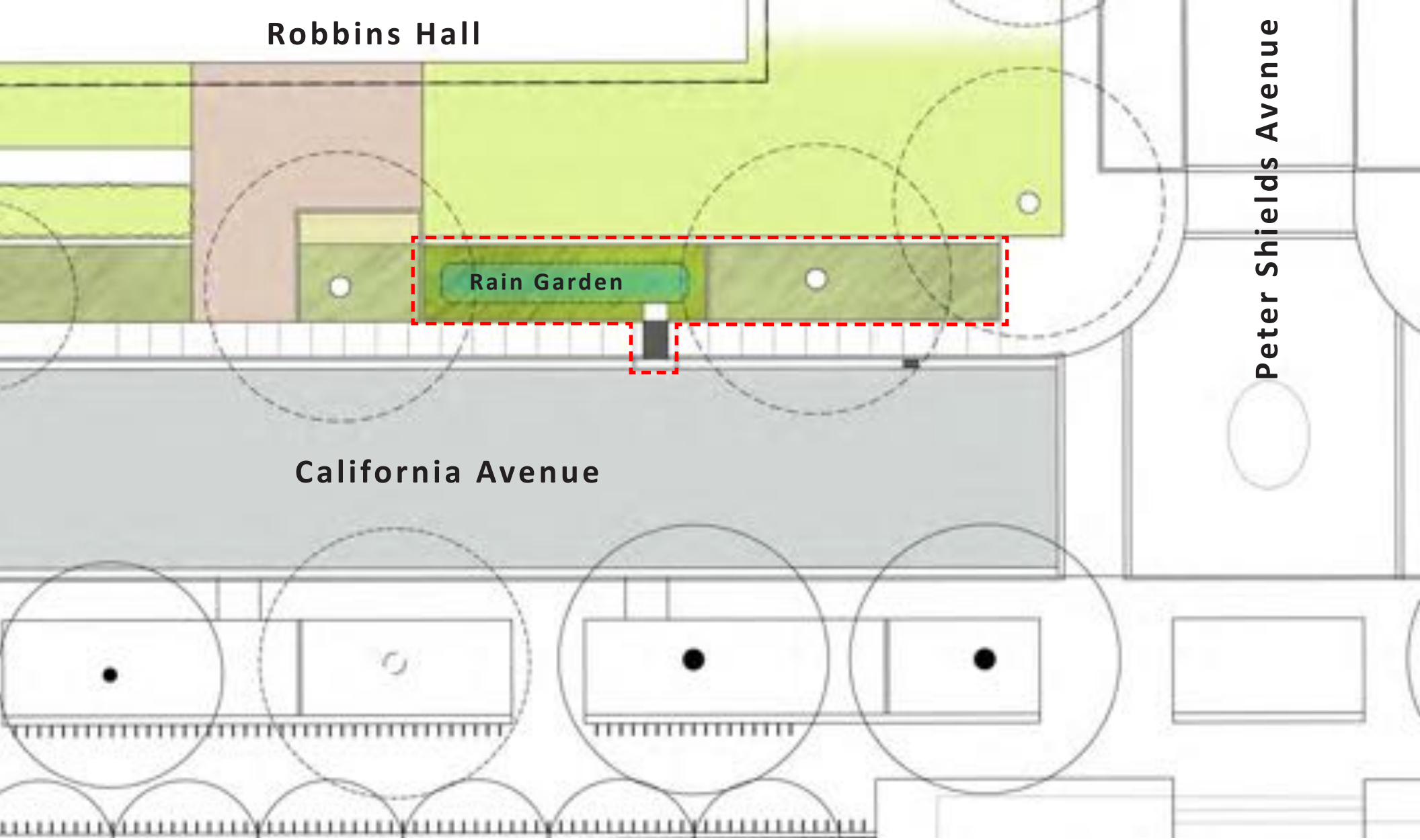
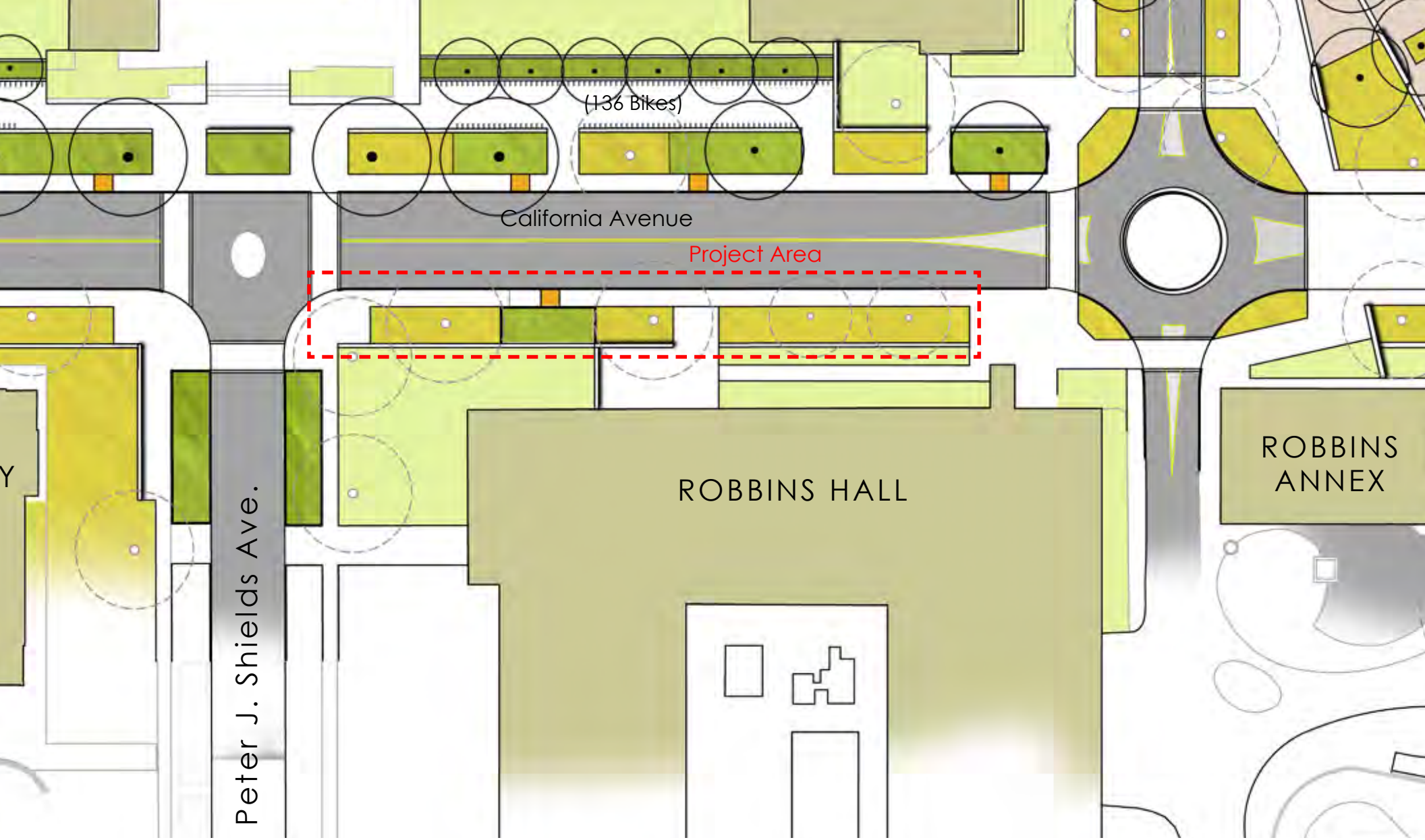


Photo: Kevin Robert Perry, ASLA

Project Concept Plan

California Avenue @ Robbins Hall



California Avenue Green Street Concept Plan

One of Many Projects Envisioned

Photo: Kevin Robert Perry, ASLA

Before Conditions

Thirsty Lawn, Low Plant Diversity

Photo: Kevin Robert Perry, ASLA

Before Conditions

Thirsty Lawn, Low Plant Diversity

Photo: Kevin Robert Perry, ASLA

Before Conditions

Stormwater Runoff From Street, Sidewalk, and Plazas

Photo: Kevin Robert Perry, ASLA

Before Conditions

Stormwater Runoff From Street, Sidewalk, and Plazas

Photo: Kevin Robert Perry, ASLA

Construction

Layout the Grass Removal Boundary

Photo: Kevin Robert Perry, ASLA

Construction

Define the Grass Removal Boundary

Photo: Kevin Robert Perry, ASLA

Construction

Removal of Lawn Progress

Photo: Kevin Robert Perry, ASLA

Construction

Rain Garden Grading

Photo: Kevin Robert Perry, ASLA

Construction

Rain Garden Grading

Photo: Kevin Robert Perry, ASLA

Construction

Rain Garden Grading

Photo: Kevin Robert Perry, ASLA

Construction

Drip Irrigation System Installation

Photo: Kevin Robert Perry, ASLA

Construction

Drip Irrigation System Installation

Photo: Kevin Robert Perry, ASLA

Construction

Paver Walkway Installation

Photo: Kevin Robert Perry, ASLA

Construction

Paver Walkway Installation

Photo: Kevin Robert Perry, ASLA

Construction

Phase I Plant Installation

Photo: Kevin Robert Perry, ASLA

Construction

Phase I Plant Installation and Mulching

Photo: Kevin Robert Perry, ASLA

Construction

Phase I Plant Installation and Mulching

Photo: Kevin Robert Perry, ASLA

Construction

Keeping Plants Alive Over Summer 2015!

Photo: Kevin Robert Perry, ASLA

Plant Establishment

Keeping Plants Alive Over Summer 2015

Photo: Kevin Robert Perry, ASLA

Plant Establishment

Ready for El Nino!

Photo: Kevin Robert Perry, ASLA

Trench Drain Installation

UC Crews Cut the Street Curb Making the Project "Active"

Photo: Kevin Robert Perry, ASLA

Trench Drain Installation

UC Crews Cut the Street Curb Making the Project "Active"

Photo: Kevin Robert Perry, ASLA

Trench Drain Installation

UC Crews Install New Trench Drain From Curb

Photo: Kevin Robert Perry, ASLA

Project Completion

First Rainfall is Captured by the Trench Drain

Photo: Kevin Robert Perry, ASLA

Project Completion

First Rainfall is Captured by the Trench Drain

Photo: Kevin Robert Perry, ASLA

Project Completion

First Rainfall is Captured by the Trench Drain

Photo: Kevin Robert Perry, ASLA

Project Completion

Project is Infiltrating Stormwater Very Effectively

Photo: Kevin Robert Perry, ASLA

Project Completion

Plant Material Is Thriving

Photo: Kevin Robert Perry, ASLA

Project Completion

A Great Campus Demonstration Project!

Photo: Kevin Robert Perry, ASLA

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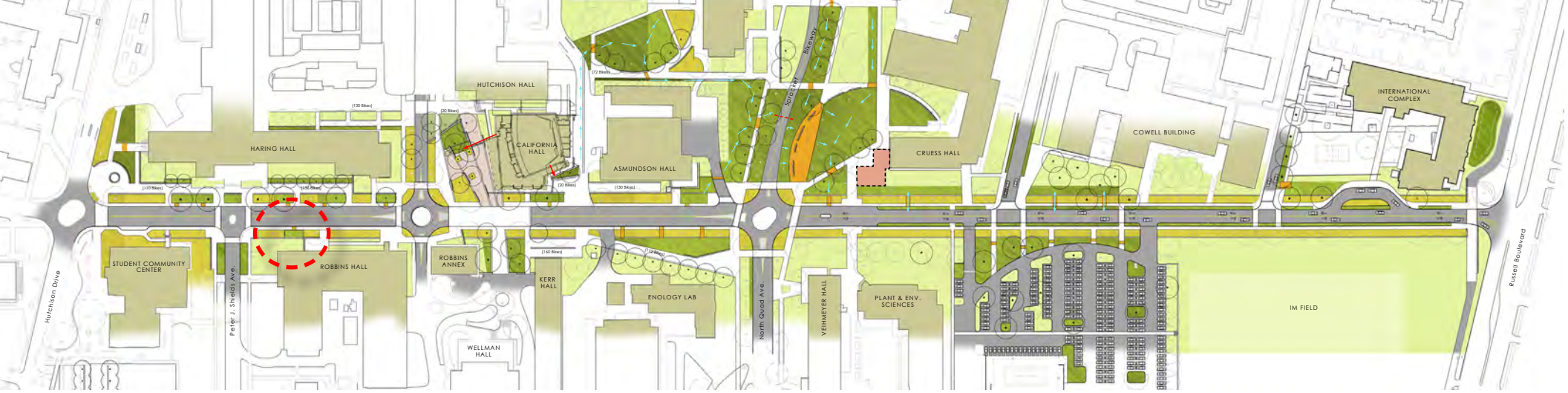
Project Completion

A Great Campus Demonstration Project!

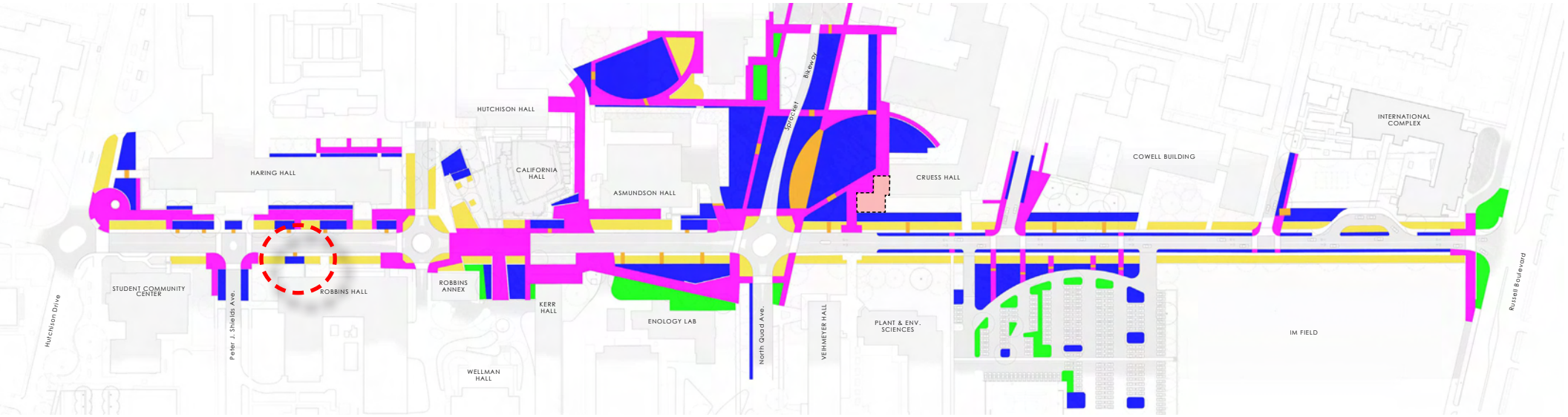


Plan View Concept

Legend

- Stormwater Capture Landscape Zone
- Drought Tolerant Landscape Zone (Arboretum All-Star Showcase)
- Conventional Lawn/Shrub Zone
- Boardwalk for Stormwater Conveyance
- Specialty Paving

Note: Plan currently shows 644 bikes supporting the new lecture hall and 245 bikes supporting Haring Hall.



New Hardscape and Landscape Project Improvements

Legend

- New Stormwater Landscape Area
- New Drought Tolerant Landscape Area
- New Hardscape Area
- New Conventional Lawn/Shrub Zone
- New Stormwater Conveyance/Boardwalk

Urban Rain | Design

The Office of Kevin Robert Perry, ASLA

February 2015

Start Small, Think Big

Urban Rain | Design

Kevin Robert Perry, ASLA

kevin@urbanraindesign.com
www.urbanraindesign.com
(503) 928-5522