



SACRAMENTO  
STATE

# Retrofitting Low Impact Development (LID) for Stormwater at Sacramento State

City of Sacramento  
Sacramento State Facilities Management

# Project Background – Campus Storm Drain System



Drain Inlet - Campus



Storm Drain Discharges into American River

# Project Background – American River



Outfall – Guy West Bridge



Upstream  
Sample

Discharge  
Sample



# Project Background

1. Phase II Stormwater Permit
  - Requires Implementation of Low Impact Development



Kevin Perry - Urban Rain Design

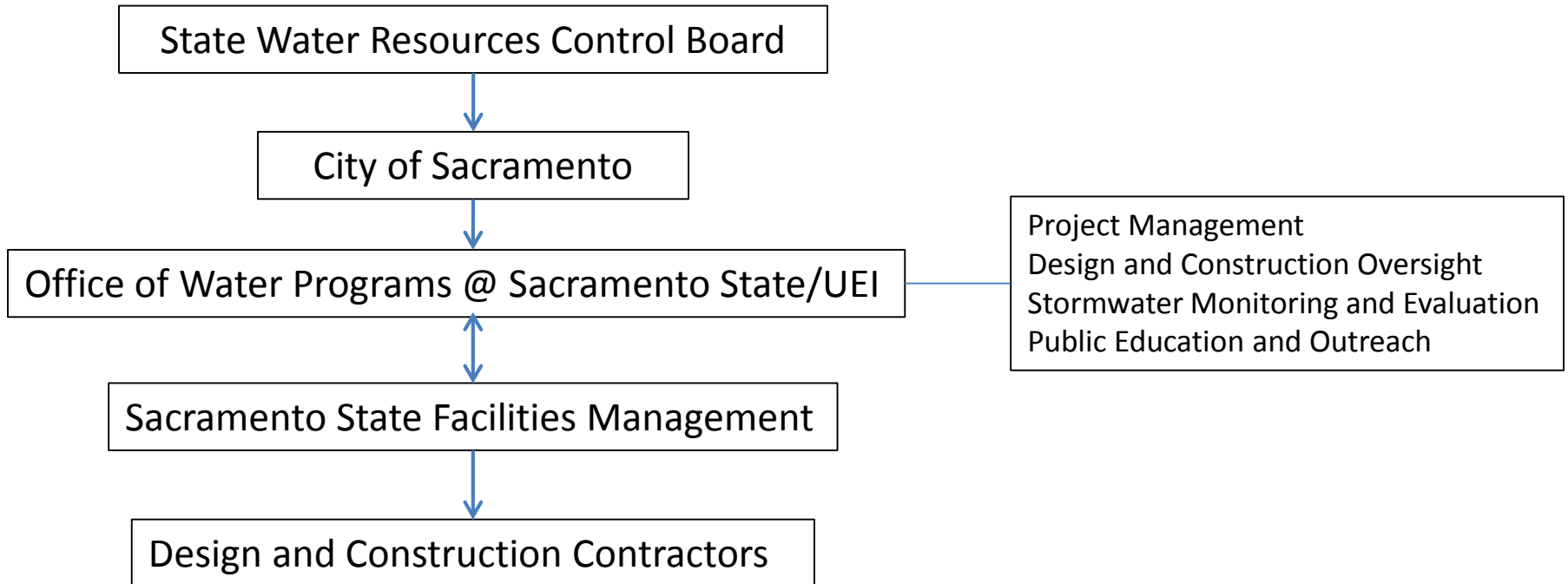
# Project Background

1. Proposition 84 – Stormwater Grant Program
2. State Water Resources Control Board
3. Objectives:
  - a) Prevent stormwater contamination of rivers, lakes, and streams.
  - b) Implement requirements of stormwater permits
  - c) Implement Low Impact Development (LID)
  - d) Monitoring and Education Outreach



City of Kirkland, WA

# Project Collaboration



# Project Funding - Summary

Project Total - \$3.3M

A. Prop 84 - \$2.6M

B. Local Match - \$0.7M

- i. Sacramento State FM - \$500K
- ii. City of Sacramento - \$112K
- iii. Office of Water Programs – \$31K
- iv. Dry Creek Conservancy - \$30K
- v. Local LID Expertise - \$25K
- vi. County of Sacramento - \$1K



# Project Benefits

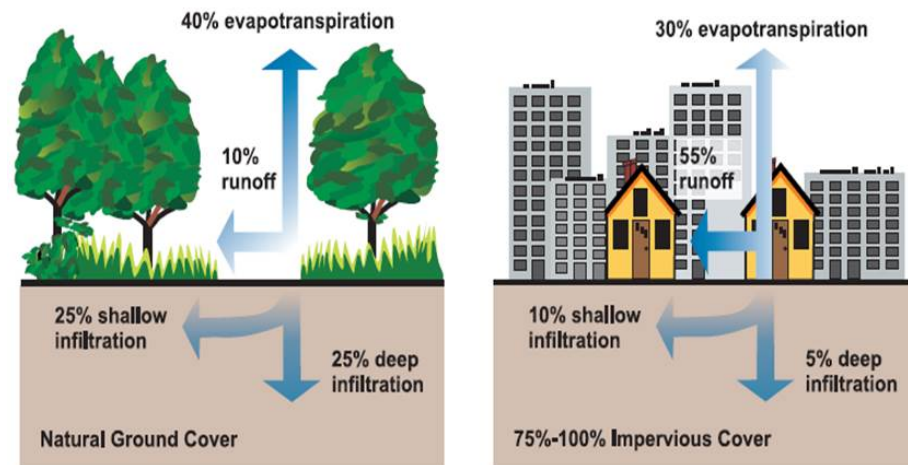
1. Meet Stormwater Permit Requirements
2. Faculty/Student Involvement
3. High Visibility
4. Protects the American River
5. Replenish Irrigation Wells
6. Demonstration and Training Facility for Northern CA





# Low Impact Development (LID)

1. Mimic Natural Hydrology (Infiltrate)
2. Protect Receiving Waters
3. Reduce Flooding
4. Groundwater Recharge
5. Opportunities for Reuse

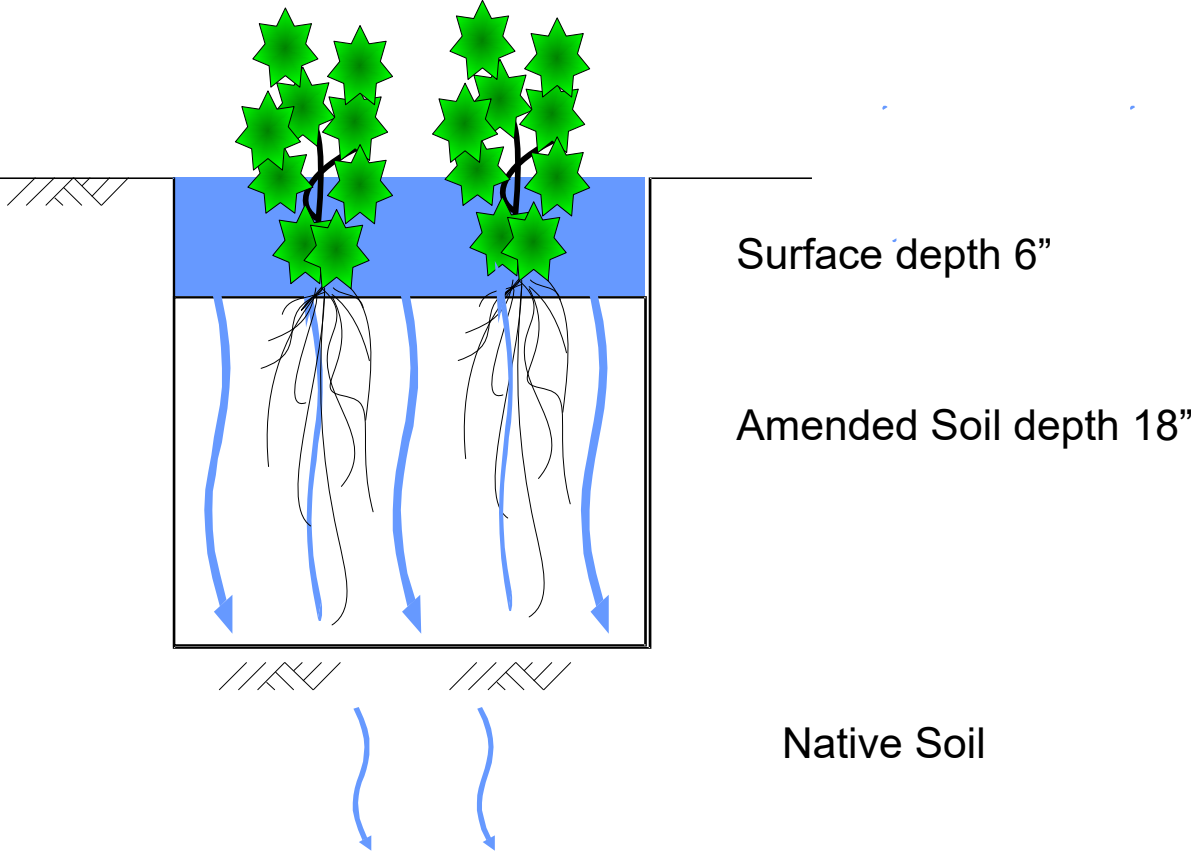


US EPA

# Types of Low Impact Development Devices

- 1. Bioretention Planters**
- 2. Rain Gardens**
- 3. Bioswales**
- 4. Porous Pavement**
5. Biostrips
6. Road Narrowing (reduce impervious area)
7. Cisterns or Rain Barrels
8. Tree Box Filters
9. Constructed Wetlands
10. Green Roofs

# Rain Garden Profile and Function



# Rain Gardens



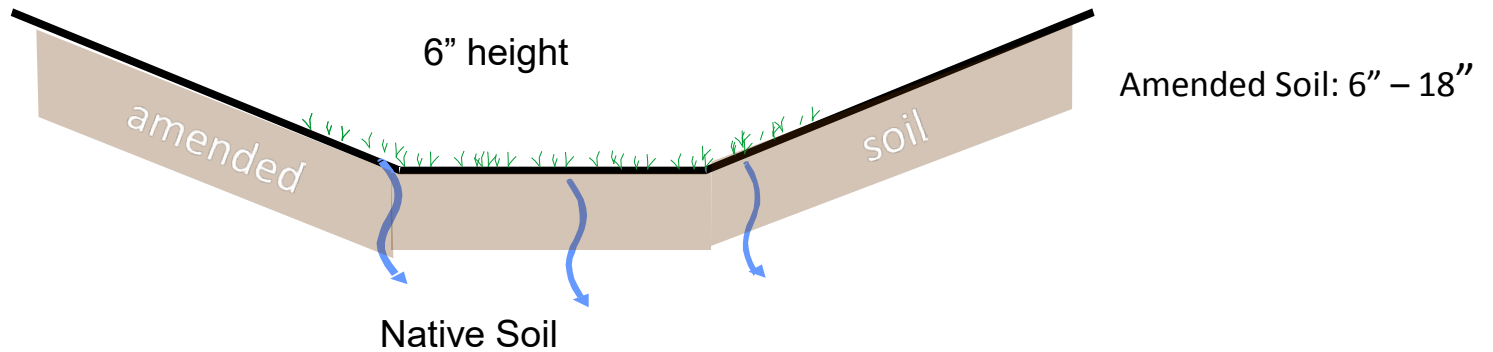
US EPA



Harford County, MD



# Bioswale - Profile



# Bioswales

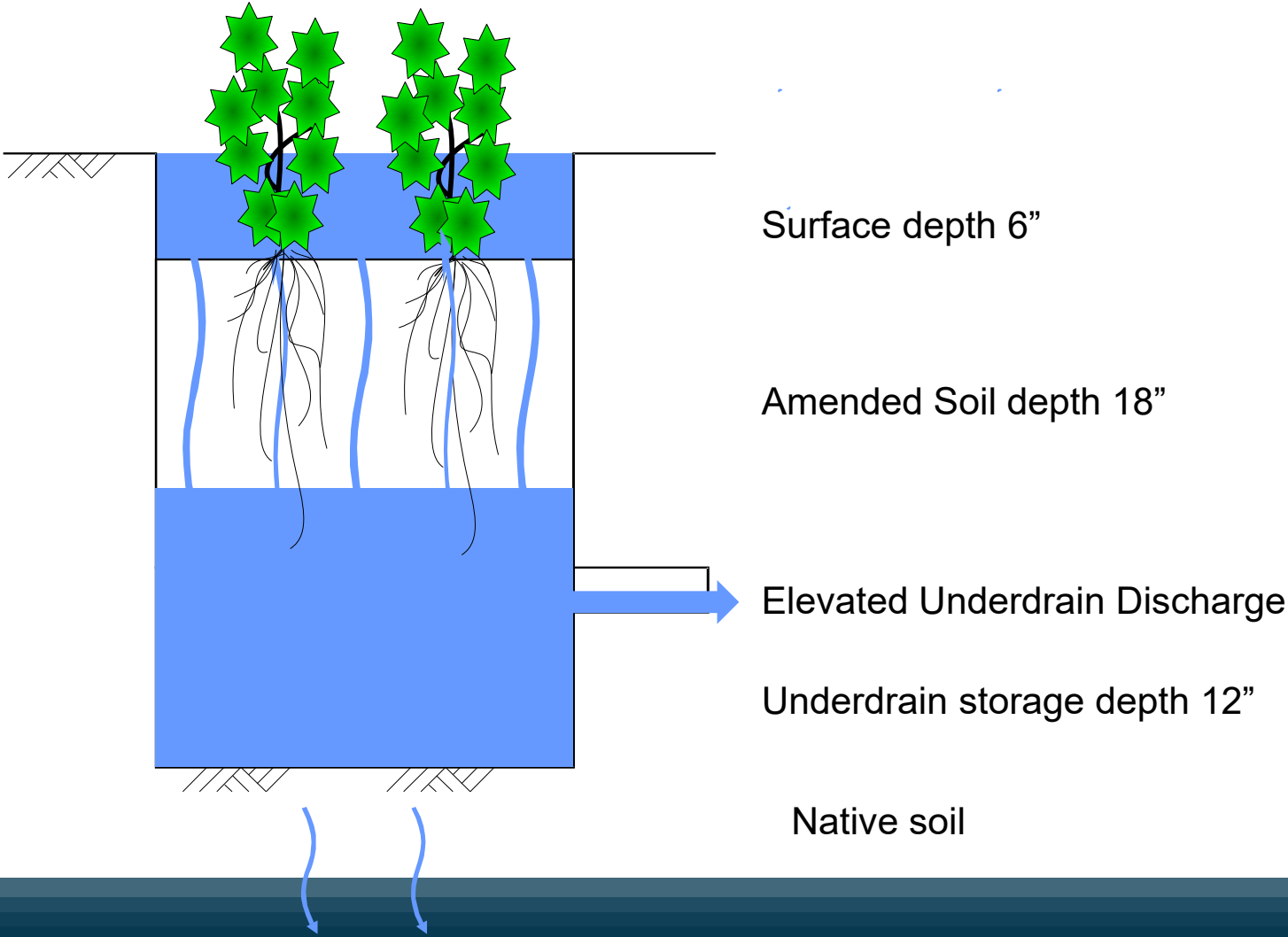


Caltrans



Lake County, IL

# Bioretention Profile and Function



# Bioretention – Parking Lots



Scott Taylor, PE  
RBF Consulting



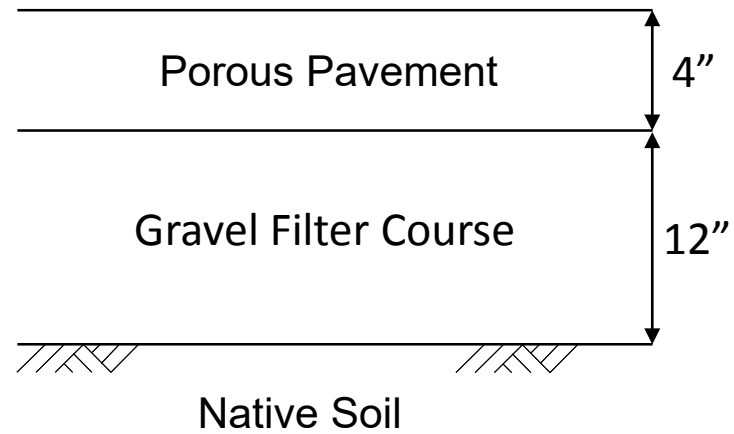


# Bioretention – Streets

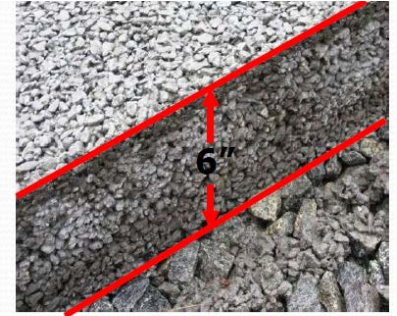


Scott Taylor, PE  
RBF Consulting

# Porous Pavement - Profile

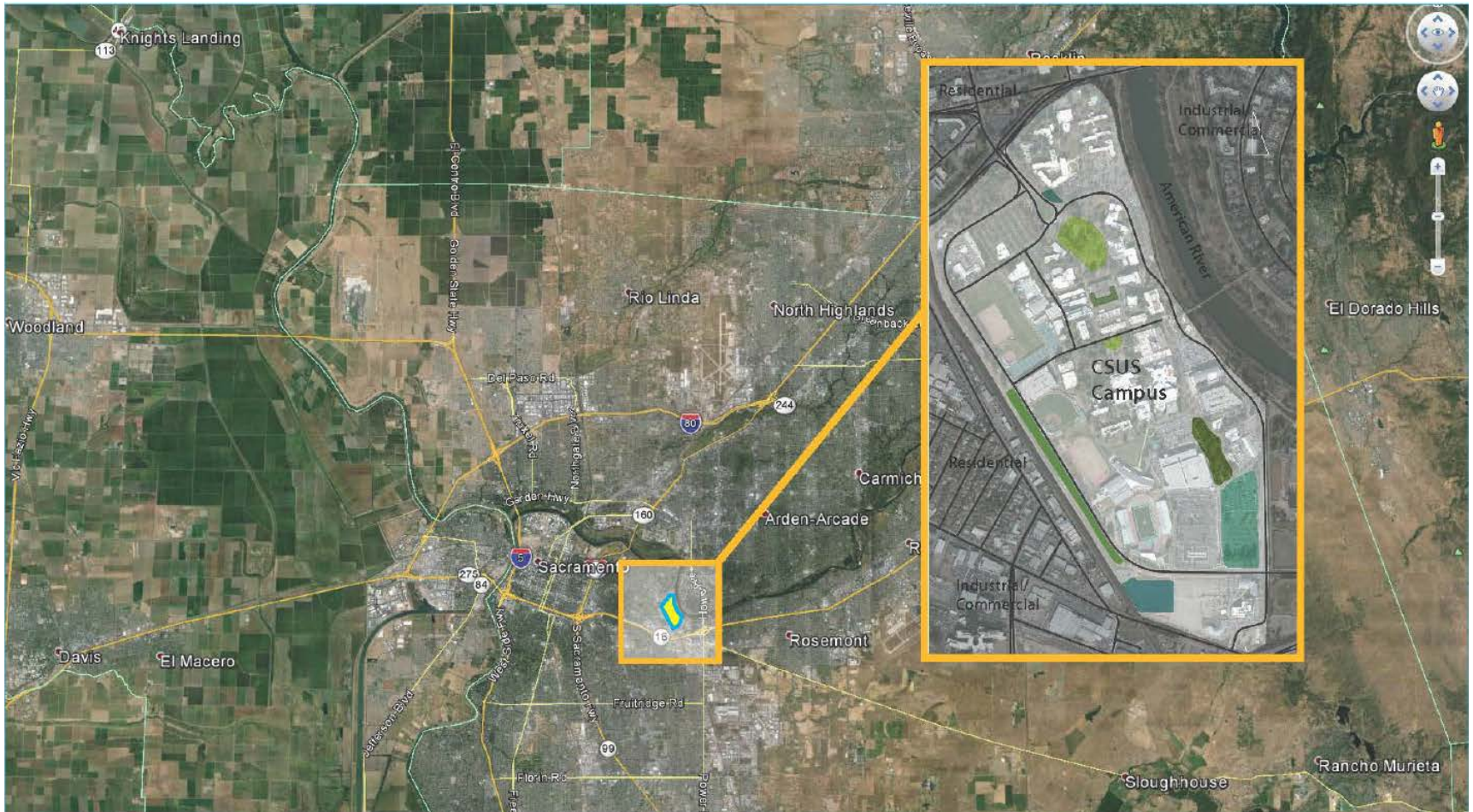


# Porous Pavement





# Project Location





# Campus Layout



# Ongoing LID Construction

1. 8 Bioretention Planters
2. 8 Rain Gardens (Street Side and Low Lying Lawn Drain Inlets)
3. 3 Rooftop Disconnects with Rain Gardens
4. 2 Bioswales
5. 1 Green Street (Porous Pavement and 6-10 Rain Gardens)

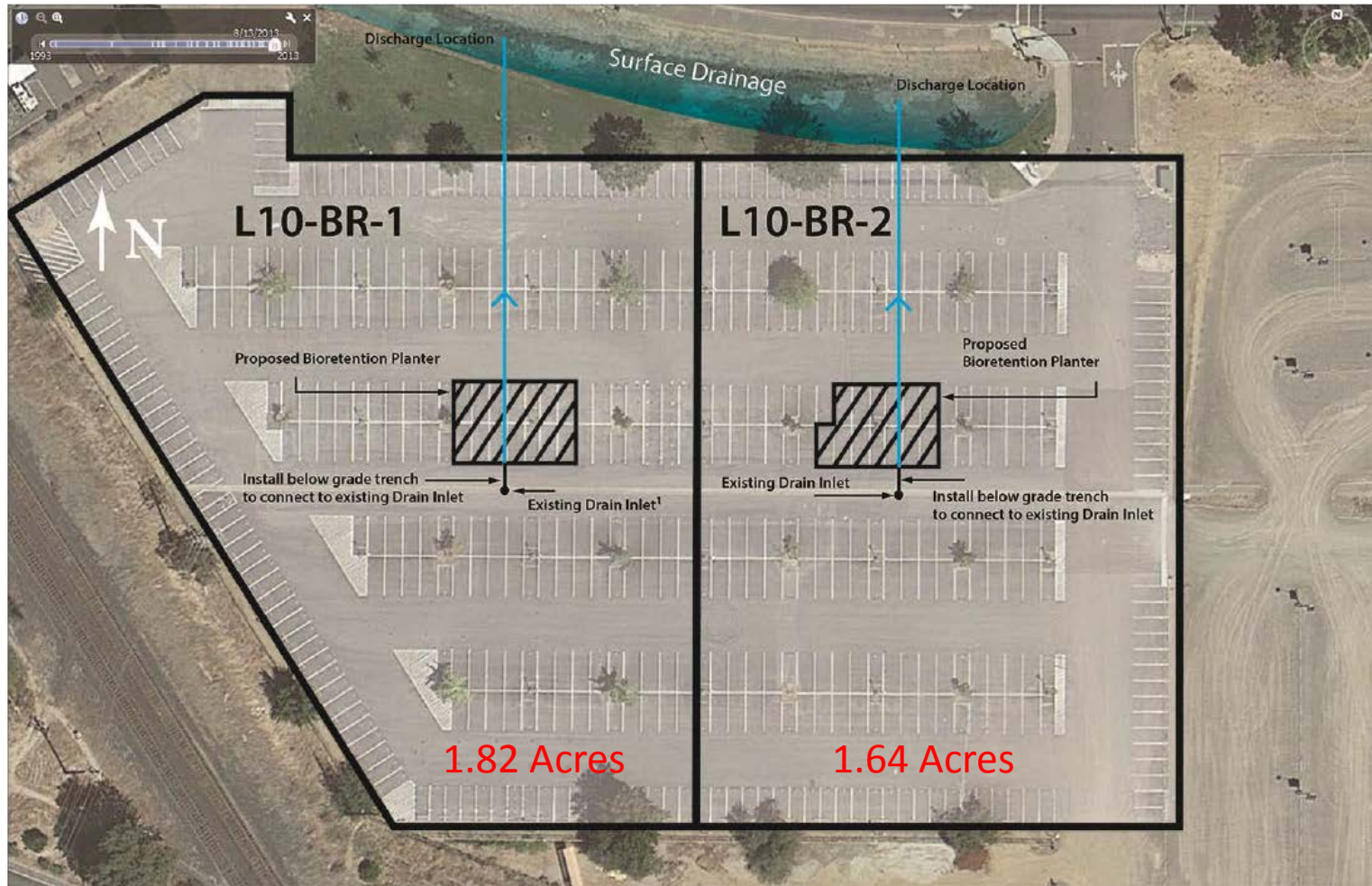
# Design Goals

## Enhance Infiltration

- A. Silty sands over gravels
- B. No devices lined
- C. 14 acre-feet per year infiltrated or treated
- D. 13.2 acre-feet per year - infiltration alone



# Design Goals – Large Tributary Areas



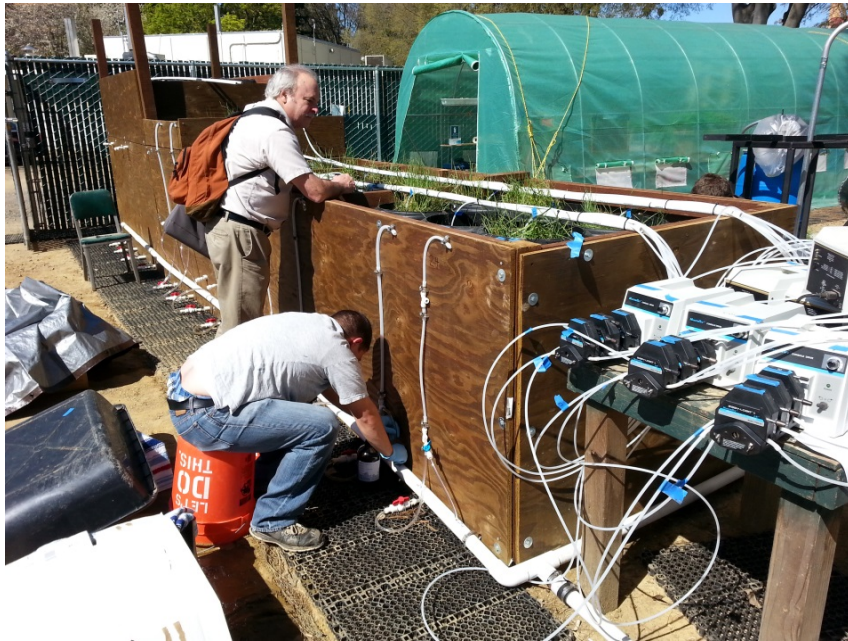


# Design Challenges

1. Fitting into the existing drainage system
  - a. Horizontal
  - b. Vertical
2. Negotiating the removal of parking stalls
3. Fitting into existing topography
4. Existing infrastructure
5. Interactions with buildings
6. Subsurface soil?
7. Timing
8. Compatibility with Campus Master Plan

# LID Device Monitoring

Performance Monitoring  
Evaluation and Reporting



# Education and Outreach

1. Signage, Website, Tours (Mobile App)
2. Brochures
3. Conferences and Papers
4. LID Conference
5. Campus Presentations
6. Public Affairs



Kitsap Conservation District



Green Side Up

A "Save the Date" poster for the fifth Low Impact Development (LID) Regional Conference. The poster features a collage of images related to LID, including a street scene, a water treatment facility, and a residential area. The text reads: "Save the Date November 4<sup>th</sup> 2015 California State University, Sacramento | Alumni Center Mark your calendars for the fifth Low Impact Development (LID) Regional Conference Hosted by the American Basin Council of Watersheds and Sacramento State, Office of Water Programs A conference for local government, planners, designers, developers and environmental organizations to learn about strategies for integrating LID into sustainable community planning, design and construction Registration materials available in coming months For more information, please visit: www.drycreekconservancy.org Sponsorships and vendor opportunities available!"



# Operation and Maintenance

1. Weed, Litter, and Debris Removal (As needed)
2. Infiltration Inspections (Runoff Infiltrating?) (Twice a year during storms)
3. Low or no Infiltration? Remove and Replace Topsoil (~ 5 to 10 years)
4. Use integrated pest management (IPM) techniques to minimize use of fertilizers, pesticides and herbicides. (As needed)
5. Inspect (~ 2 times per year – including once at end of wet season) for erosion and sediment buildup. Correct problems as needed.



Kevin Perry  
Urban Rain Design



# Project Funding - Summary

Project Total - \$3.3M

- A. Project Admin: \$0.2M
- B. Planning and Design: \$0.5M
- C. Construction: \$2.1M
- D. Monitoring and Reporting: \$0.3M
- E. Education and Outreach: \$0.3M

# Project Timeline

Spring 2015: Completed Design

Summer and Fall 2015: Construction

2015/2016: Post-Construction Monitoring

January 2017: Final Report

2016 – 2036: O&M

# Breaking Ground

- Next Year?  
Construction  
Challenges



# Project Funded by SWRCB

Funding for this project has been provided in full or in part through an agreement with the State Water Resources Control Board. The contents of this document do not necessarily reflect the views and policies of the State Water Resources Control Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for us.

