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Planning Challenges: Special Stormwater Needs and Community Inclusion

Bellingham, WA – September 30, 2009

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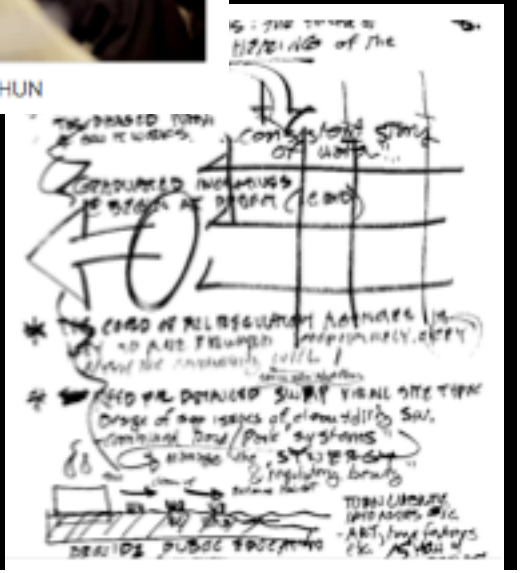
THE CHARETTE

April 22, 2008 (Earth Day)

Charrette Participants | Photo by MITHUN



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CHARRETTE FACILIATION

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CHARRETTE PARTICIPANTS

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Washington State's Department of Ecology
through the Port of Bellingham

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THE CHARETTE

Goals

- Consider innovative approaches and evaluate application on waterfront brownfield sites.
- Identify barriers/constraints: Do they exist for innovative approaches?
- Identify stormwater management solutions.
- Identify developer incentives: Are they needed to exceed regulatory minimums?
- Generate criteria guidelines for public realm improvement and private development.
- Produce a resource book with photos, drawings, and narrative on issues.
- Avoid obstacles: Being too specific to Bellingham Waterfront District would prevent finding outcomes that benefit a variety of waterfront brownfield sites.

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SYSTEMS THINKNG

Site scale water system design

Site surface water Strategies

- Ecological stormwater management: Low-Impact Development (LID)
- Increased recharge
- Mimicking undeveloped natural conditions most closely
- Provide enhanced water quality

Built water system strategies

- Engineered systems at the site, project, and neighborhood scale
- Small scale and distributed
- Design for conservation

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LOW IMPACT DEVELOPMENT
Introduction

L.I.D. Site Design Techniques:

- **Planning** (clustering, maximize density where appropriate, preserve ecologically sensitive areas, site selection, etc.)
- **Street Geometrics** (skinny streets, interconnected street grid, etc.)
- **Porous Pavements**
- **Bioretention** (or "Raingardens")
- **Soil Amendments** (Compost amended soils to increase water retention and reduce irrigation needs)
- **Disconnecting impervious surfaces** (curbless streets, downspouts to splash blocks and not connected to a piped stormwater system, sheet flow to greatest extent possible, grass filter strips, etc.)
- **Green Roofs** (vegetated roof systems)
- **Rainwater Collection and Reuse**

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LOW IMPACT DEVELOPMENT
Introduction

LID Goals…

Minimize concentrating stormwater

- ✓ Sheet flow
- ✓ Small drainage basins
- ✓ Surface conveyance

Work with the soil

- ✓ Amended soil with compost
- ✓ Bioretention / raingardens
- ✓ Pervious pavements

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LOW IMPACT DEVELOPMENT

Introduction

Use smaller decentralized solutions at the source…

Decentralized Approach

(Small Scale Systems)

vs.

Centralized Approach

(Large Scale System)

Use smaller infiltration rates over larger areas…

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LOW IMPACT DEVELOPMENT

Compact Development/Site Planning

- Reduce Sprawl and create open space
- Integrated LID stormwater systems

High Point Images Courtesy of MITH

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LOW-IMPACT DEVELOPMENT

Bioretention / Raingardens

What is a Raingarden?

- Concept originated in Prince George's County, MD in early 1990's
- Small depressions in the ground that receive stormwater from small basins
- Provide stormwater treatment and/or retention
- Soil, plants, and soil microbes work as a system to break down pollutants

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MITHŪN

LOW-IMPACT DEVELOPMENT

Bioretention / Raingarden Types

- Treatment Only
  - Bioinfiltrate the WQ storm (i.e. 6 month)
  - Overflow the other storms
- Retention on outwash soils (infiltration basin like)
  - Design similar to infiltration basin
  - Have a reservoir as needed below
- Retention on till soils
  - Use flow control credits because a good easy to use stormwater model is not available
  - Flow Control Credits are available through King County and Washington State Department of Ecology

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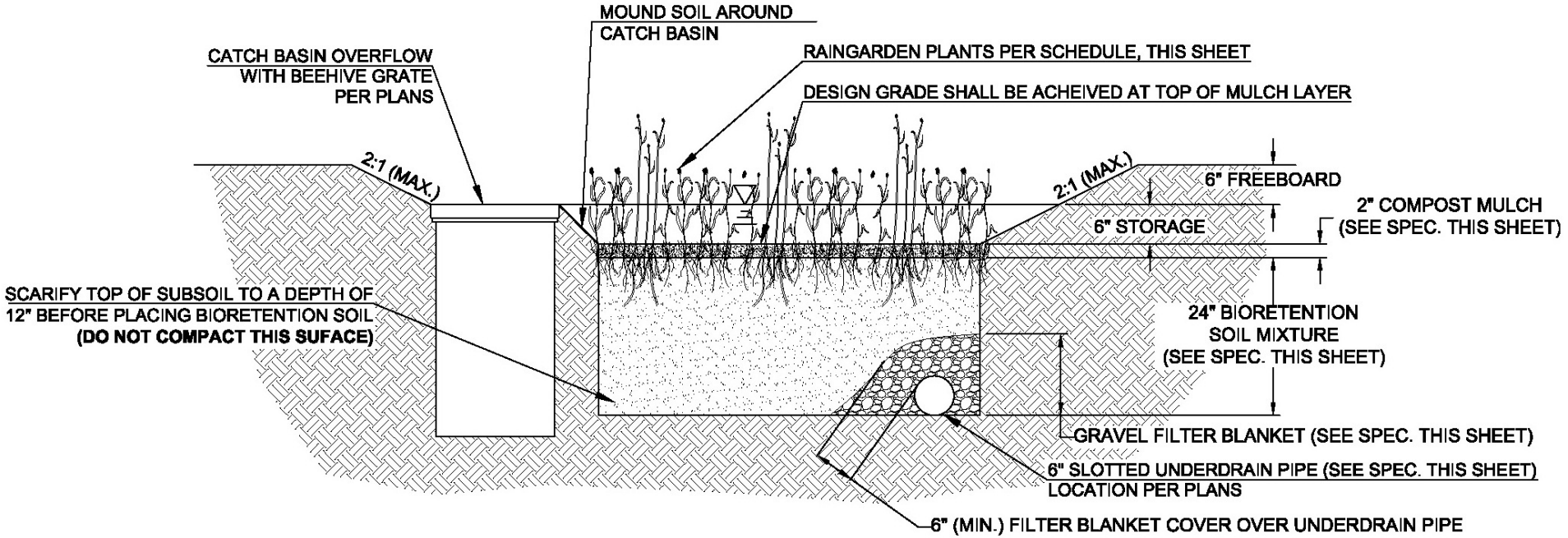
LOW-IMPACT DEVELOPMENT

Bioretention / Raingardens



Key Design Features:

- 6” freeboard
- 6” ponding allowed on surface
- 2” mulch
- 18”-24” compost amended soil
- Underdrain (if needed)
- Woody plants (not wetlands)

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POROUS PAVEMENT DESIGN

Impervious Surface Reduction Strategies

Permeable (Porous) Surfaces

- Hardscapes
  - Porous Concrete / Asphalt Pavements
  - Interlocking Concrete Pavers
  - Gravel Cellular Confinement Systems
- Softscapes
  - Reinforced Grass Surfaces
  - Grass Cellular Confinement Systems

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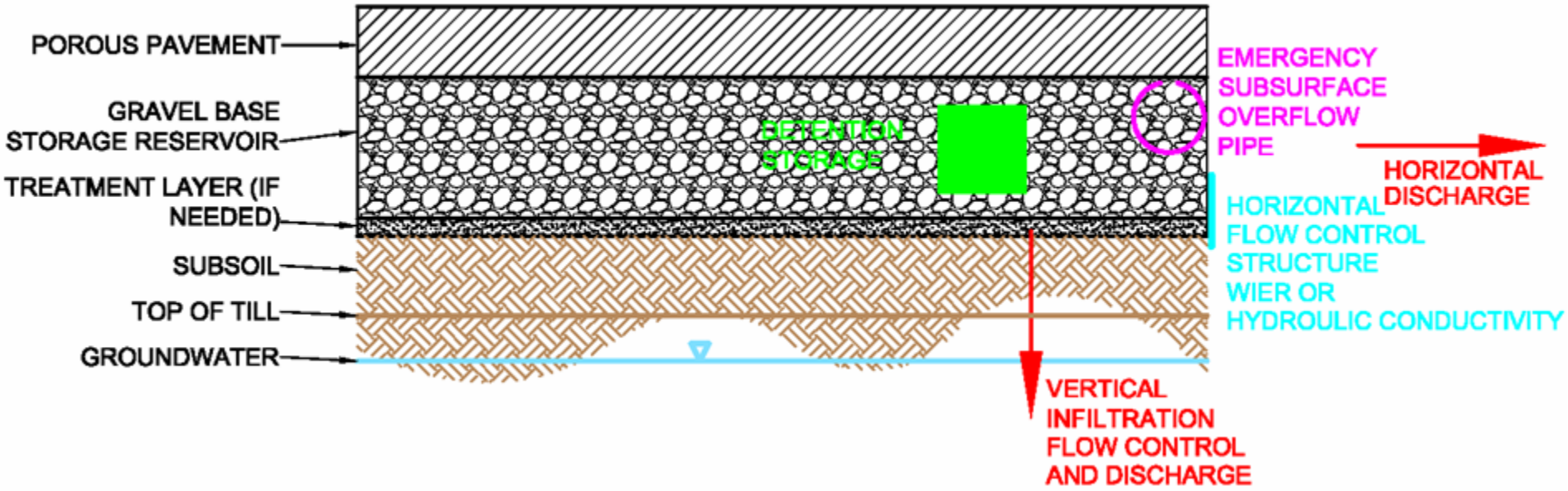
POROUS PAVEMENT DESIGN

Hydraulic Performance Model



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PERMEABLE ASPHALT PAVEMENT

Summary

- Full Depth Permeable Asphalt Pavement vs. what has been used for years in noise and safety mitigation (friction course)
- Lower cost than pervious concrete
- More frequent replacements (i.e. less durable)
- Pervious ATB is available

Dense Graded Mix (Left) Versus PFC (Right) on RM 1431 (Same Truck)

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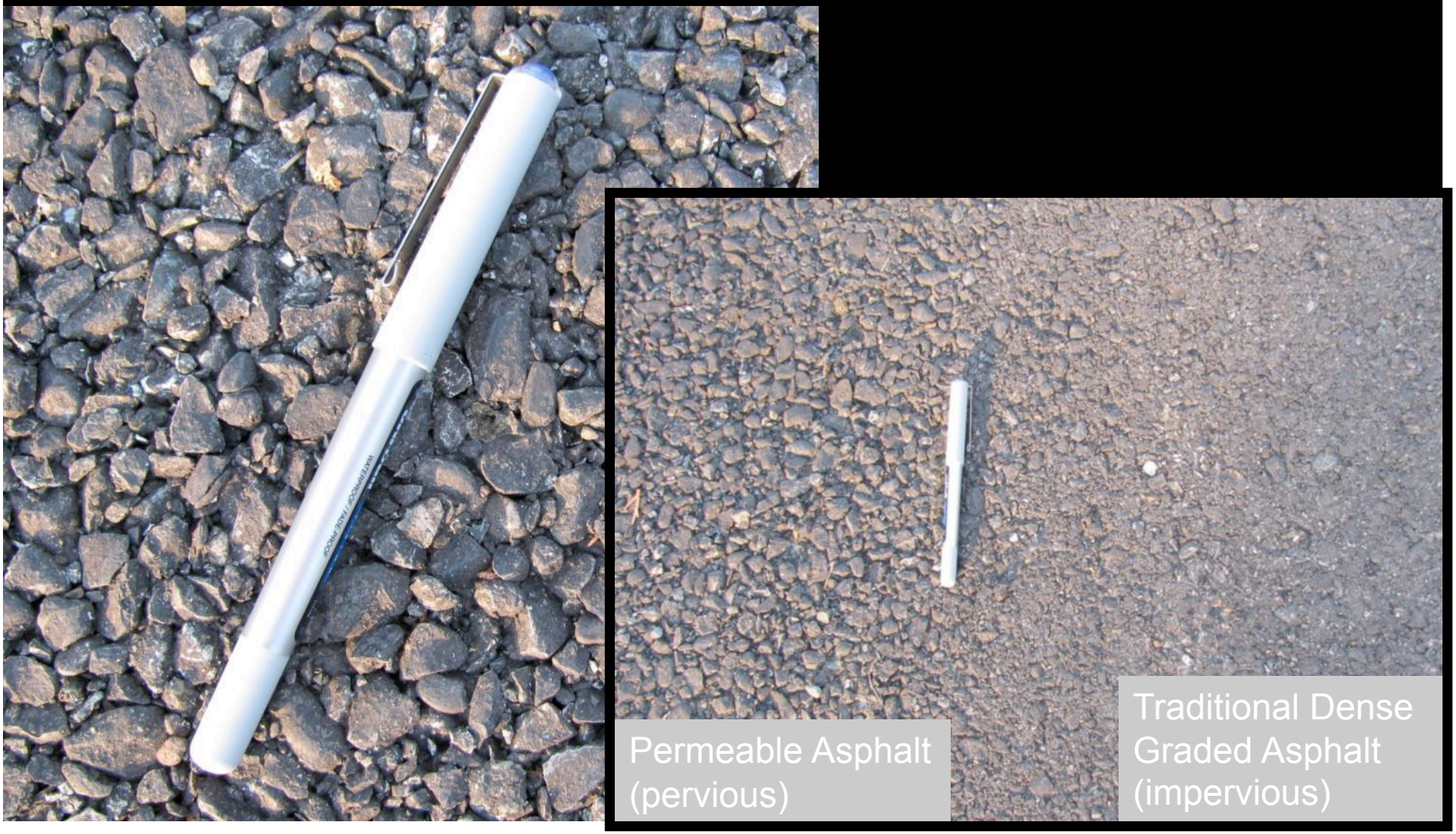
PERMEABLE ASPHALT PAVEMENT

Pak-a-Nut Example Project



POROUS CONCRETE PAVEMENT

Impervious Surface Reduction Strategies

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LOW-IMPACT DEVELOPMENT

Example Project (Municipal Community Center)

Pervious Concrete

Raingarden Strip

Pervious Concrete

Raingarden Strip

Firstenburg Community Center, City of Vancouver, WA

INTERLOCKING CONCRETE PAVERS

Example Project

Residential Driveway, Bellingham, WA

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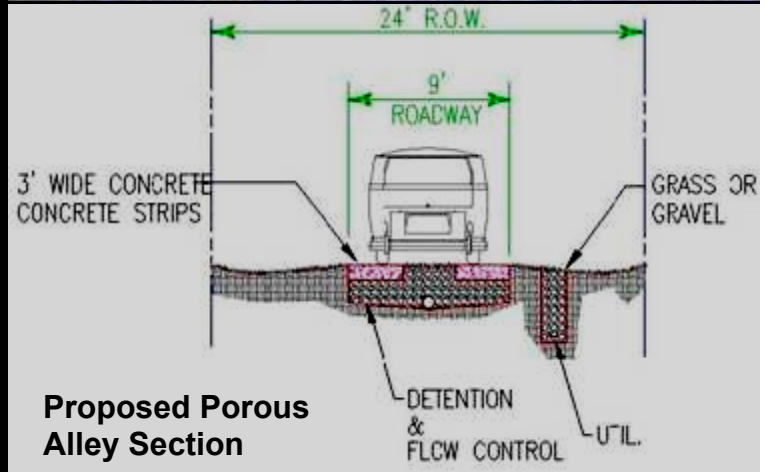
LOW-IMPACT DEVELOPMENT

Example "Country Lane" sections

City of Vancouver BC Country Lane Alley Program

Residence, Bellingham, WA



Proposed Porous Alley Section

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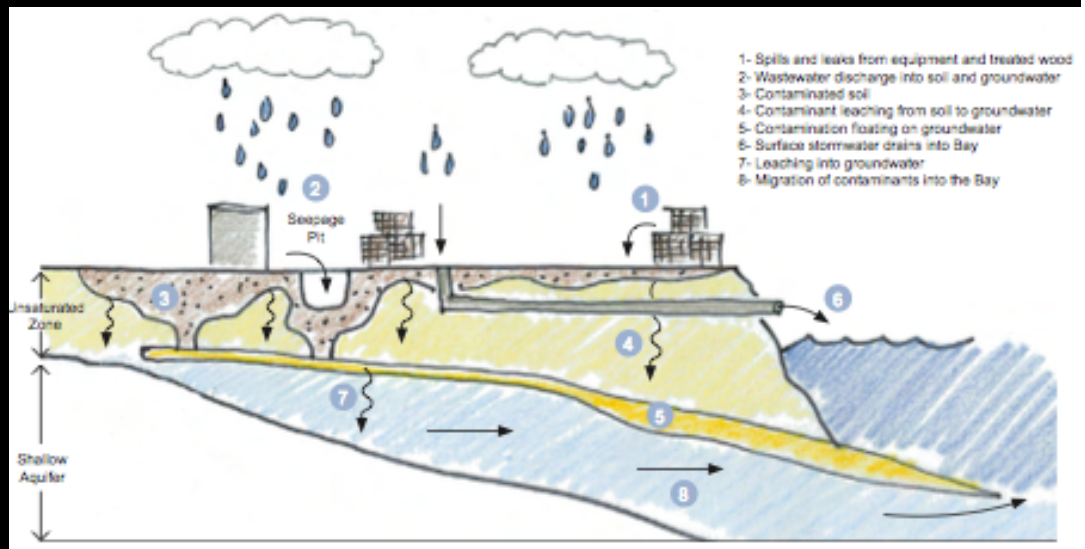
Results – Challenges and Opportunities

Highly varied site conditions:

- soil / groundwater
- contamination type / levels
- topography
- caps type / location
- regulatory, etc.

- Be opportunistic
- Have more tools in the toolbox
- Don't dismiss LID because of assumptions about limited infiltration site-wide



Typical Conceptual Model of Contaminant Migration

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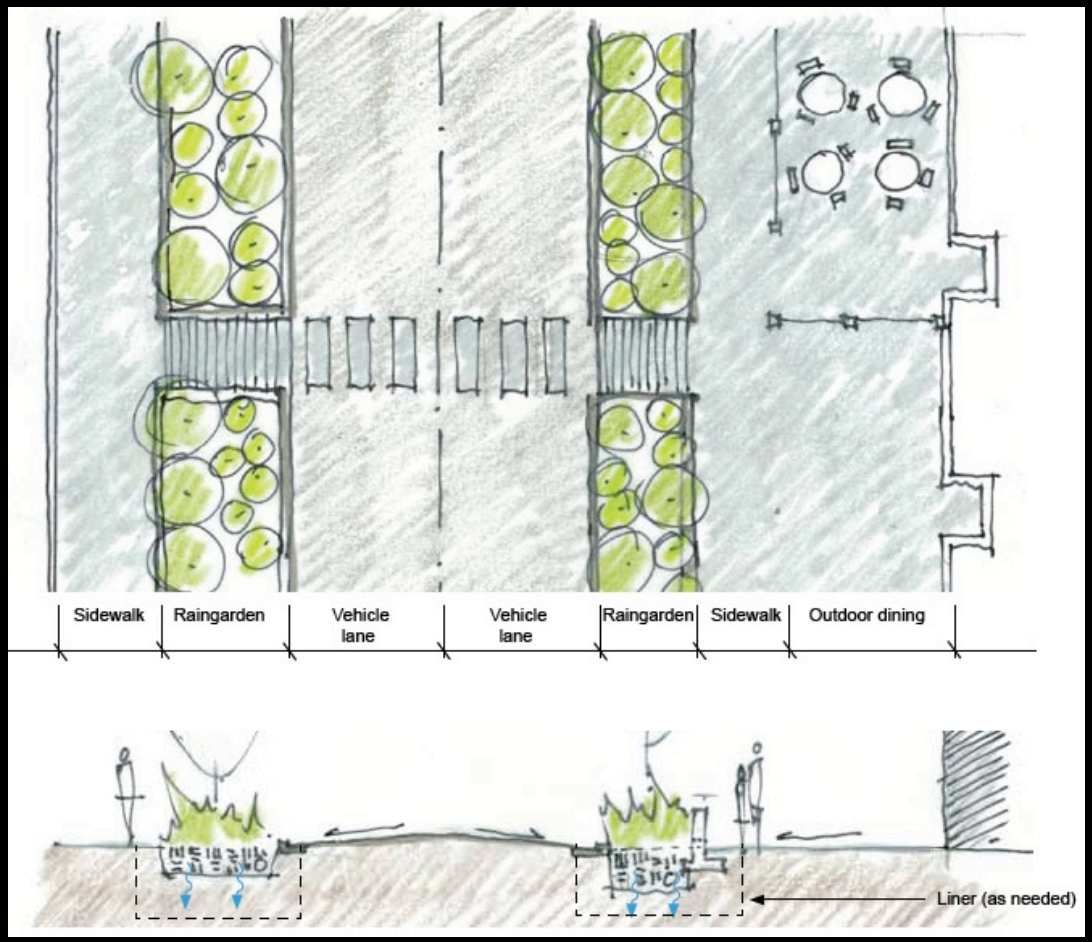
Results – Principles and Objectives

1. Reduce the amount of stormwater that needs treatment.



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Results – Principles and Objectives

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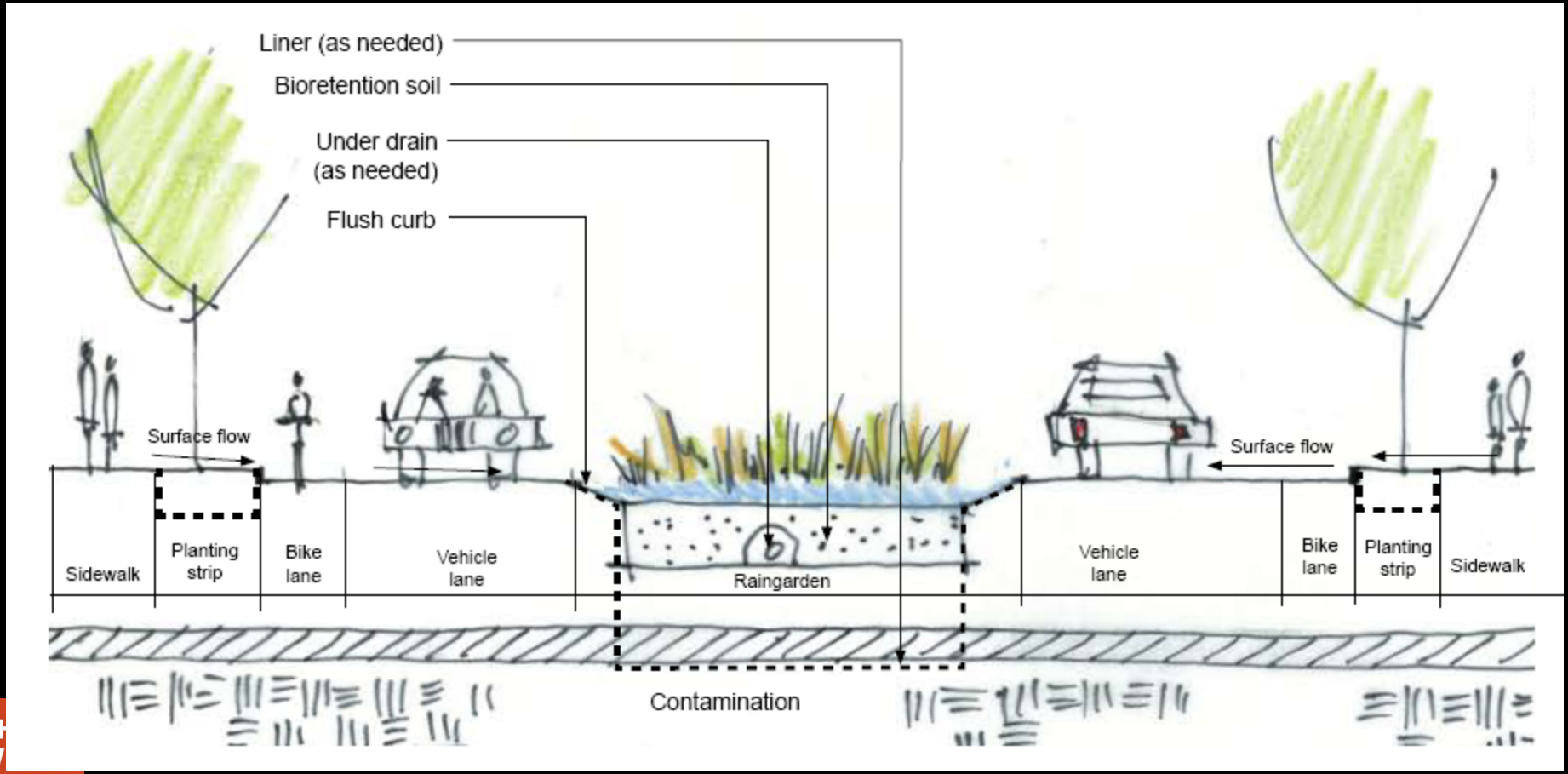

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Results – Principles and Objectives

1. Reduce the amount of stormwater that needs treatment.

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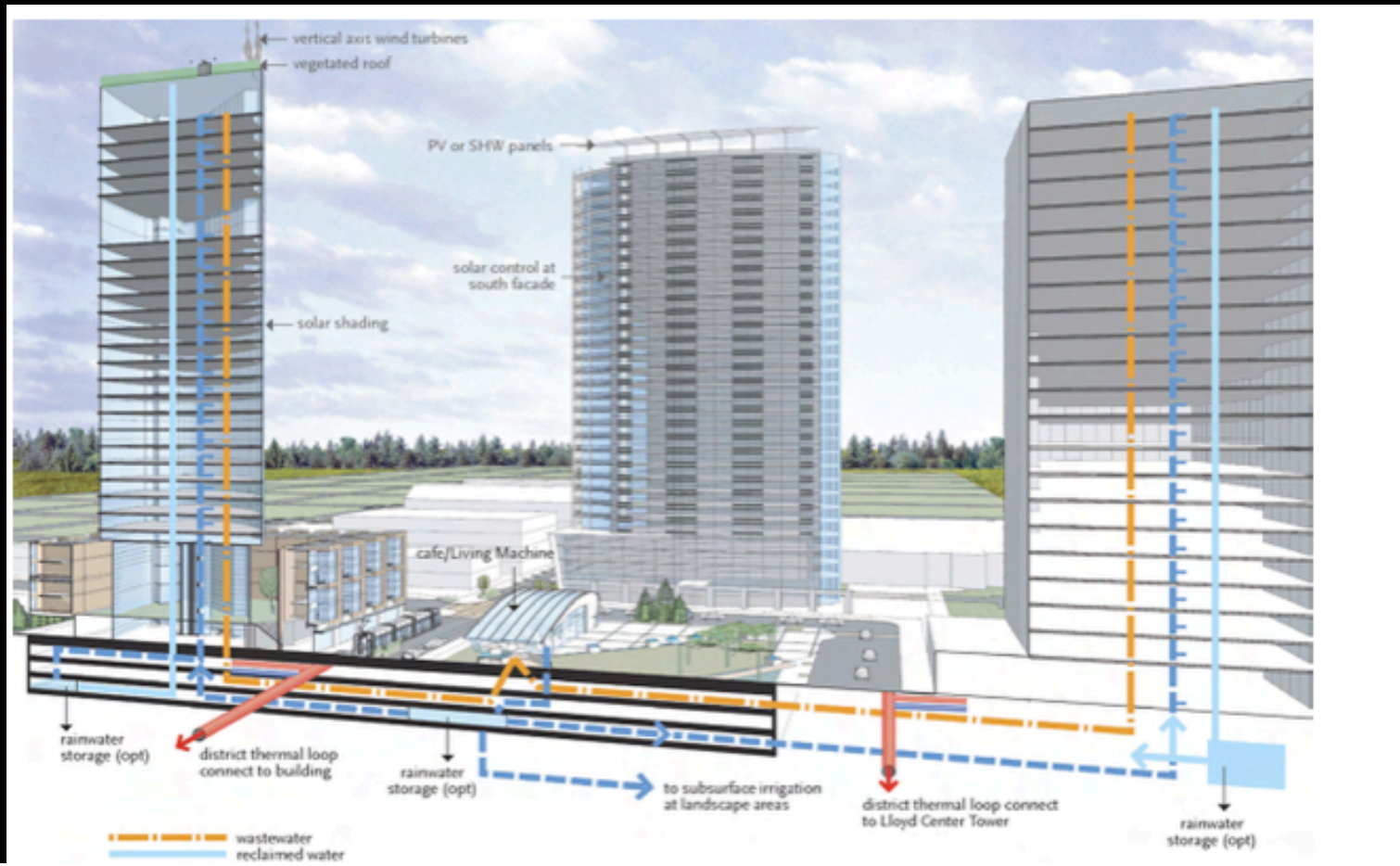
Results – Principles and Objectives

2. Provide multiple opportunities for water treatment &reuse.



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Results – Principles and Objectives

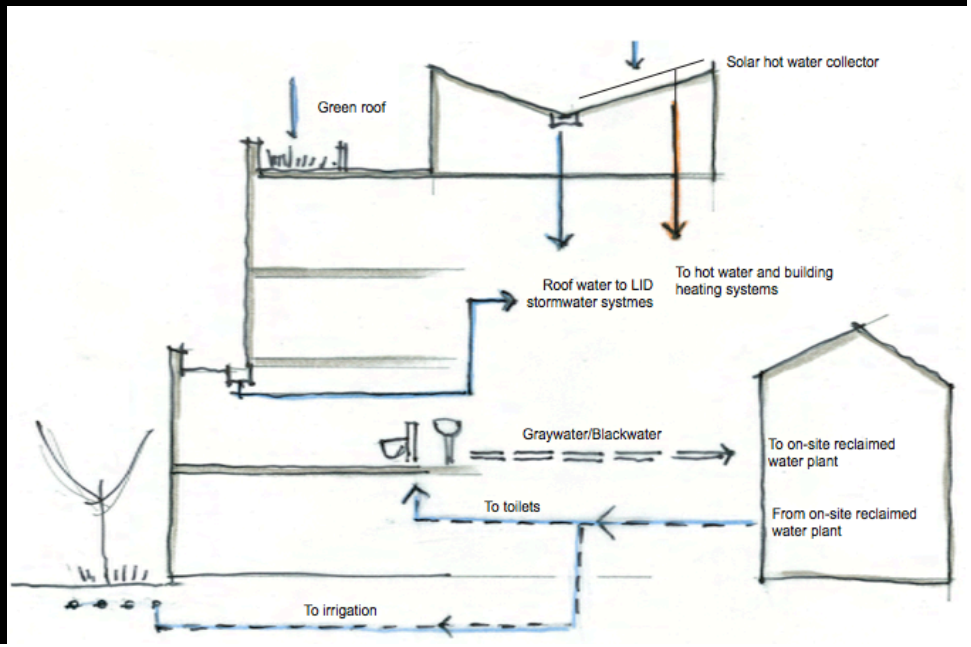
3. Provide for phased treatment and control strategies.

3.1. Future-proof design strategies to allow for new concepts and materials as development phases occur.

3.2. Implement robust solutions that meet today's regulatory standards and are adaptable to meet increasing standards in the future as additional development occurs.

3.3. Provide detailed design strategies for the phasing in of stormwater controls and treatments as urban development occurs.

3.4. Create a plan for using public infrastructure that can be a synergistic solution for public and private uses.



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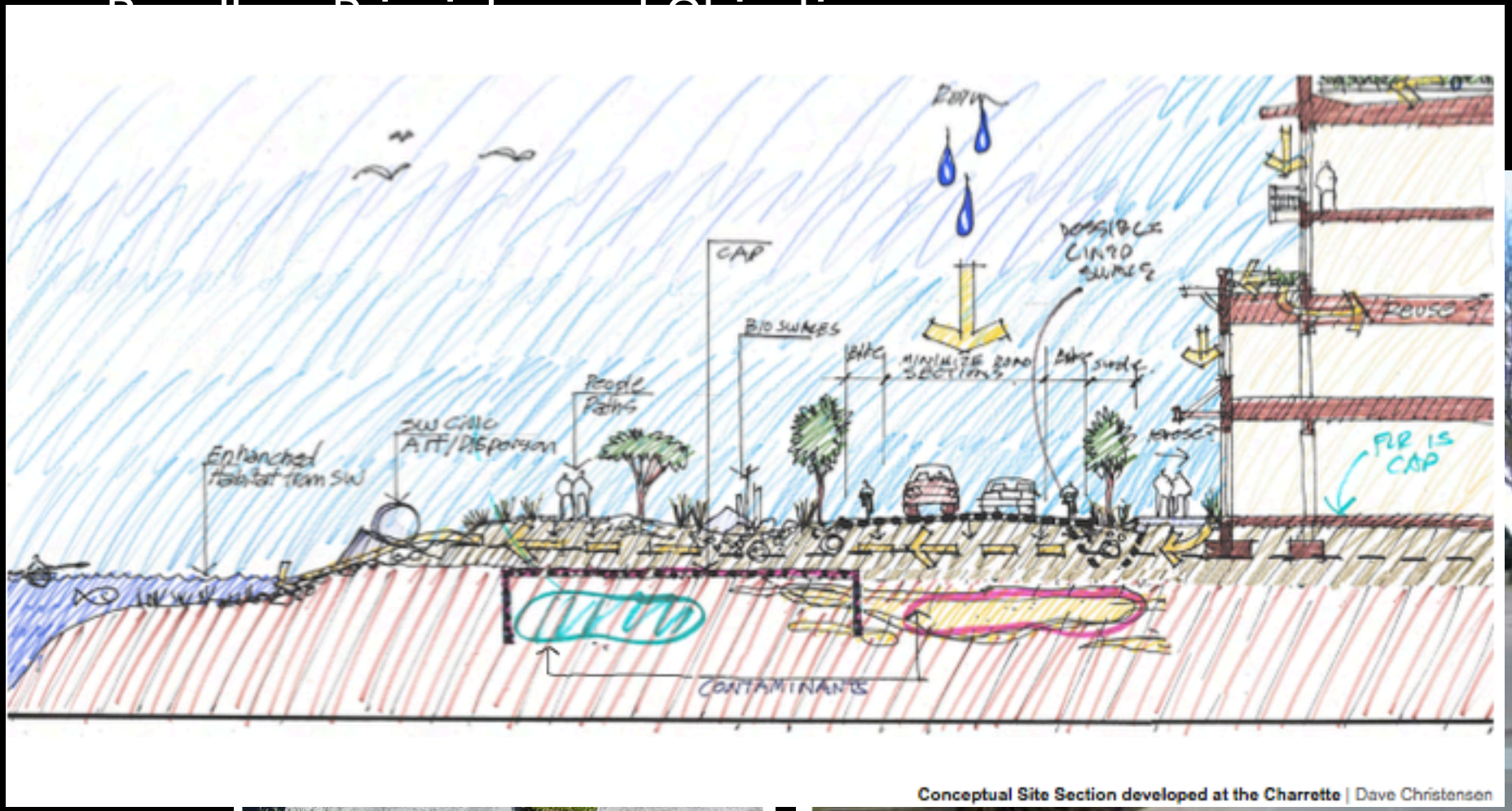

Conceptual Site Section developed at the Charrette | Dave Christensen

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Results – Principles and Objectives

4. Stormwater management as an organizing principle

Stormwater Boulevard | watercolor by Stephanie Bower

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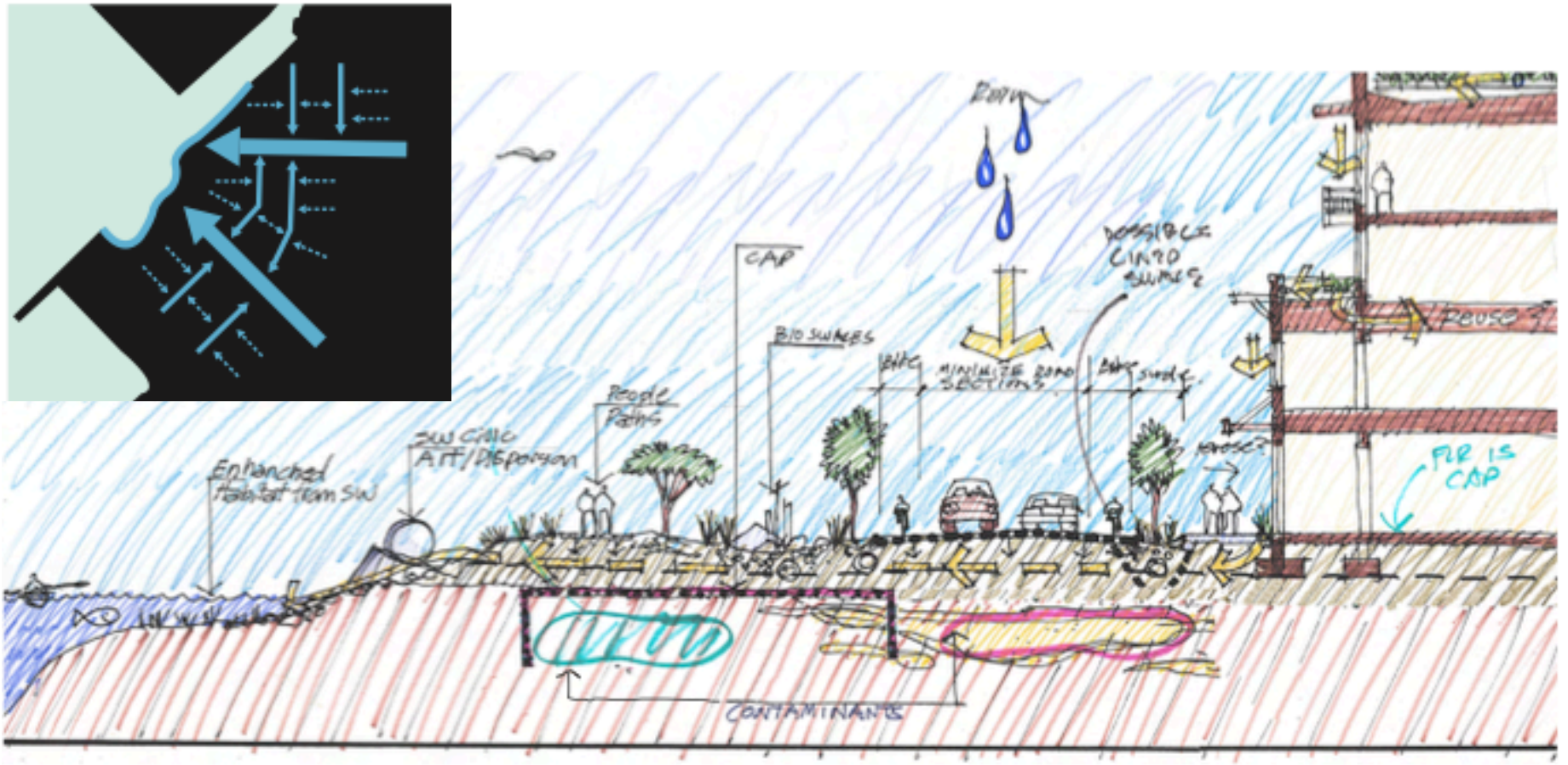
Results – Principles and Objectives

5. Provide a Stormwater Master Plan



Conceptual Site Section developed at the Charrette | Dave Christensen

THANK YOU…

Questions

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PDF of Handouts here: www.chriswebbpe.com/coastal