

Low Impact Development *for watershed protection*

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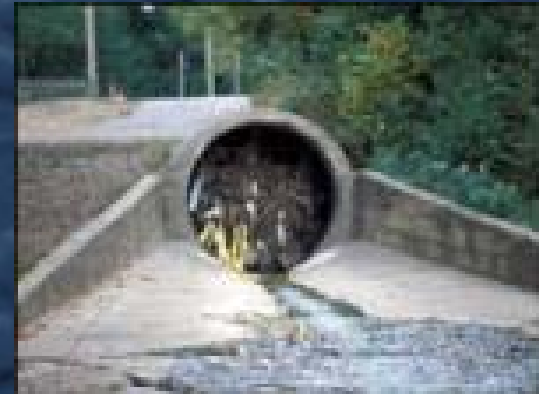
Topics

- How conventional urban drainage design affects watersheds
- How Low Impact Development can mitigate effects of urban drainage
- LID drainage design principles
- Using LID for NPDES Compliance for New Developments

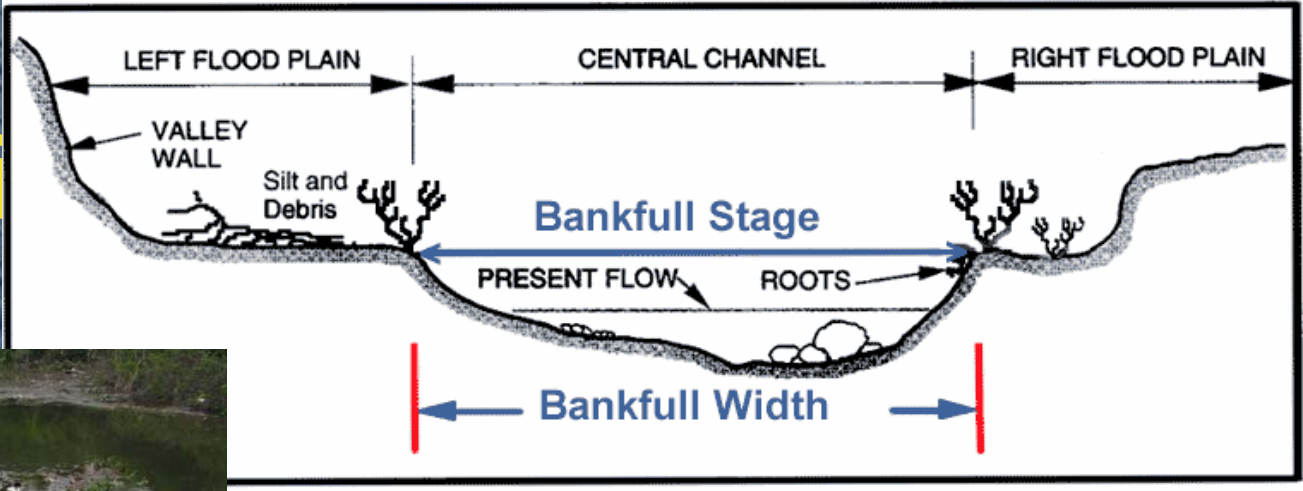
Conventional Urban Drainage

■ Features

- Impervious surfaces: roofs and pavement
- Catch basins and piped drainage
- “Collect and convey” design objective



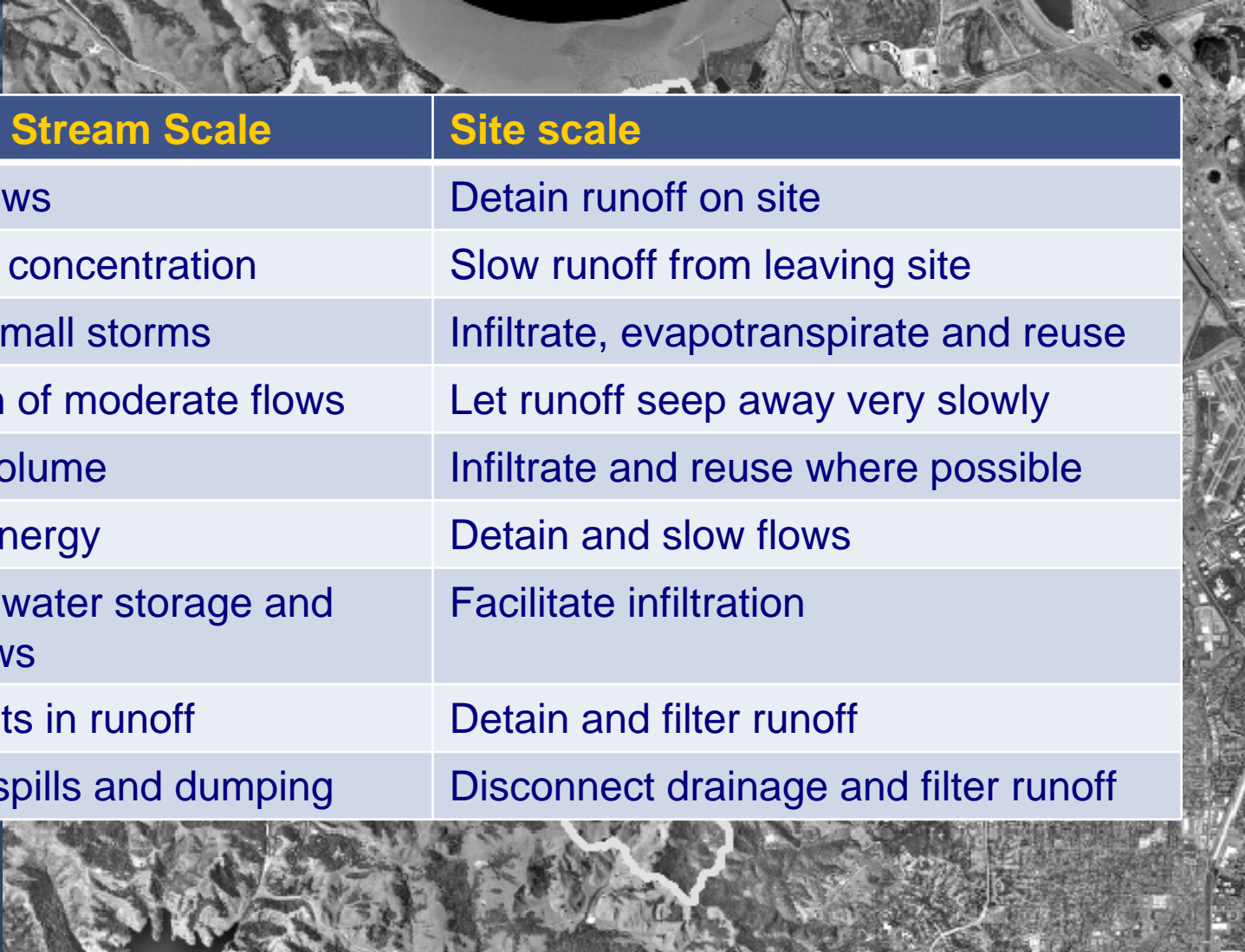
Drain



Watershed and Stream Scale	
	Flooding and scouring of stream beds
Concentration	Flash flows
Storms	Discharge when runoff did not infiltrate
Urban areas	Stream erosion at moderate stream discharges
Impervious surfaces	Higher pollutant loading
Greater runoff energy	Conveys trash and gross pollutants
Decreased infiltration	Lower and less frequent stream discharges
Dry weather discharges	High pollutant concentrations



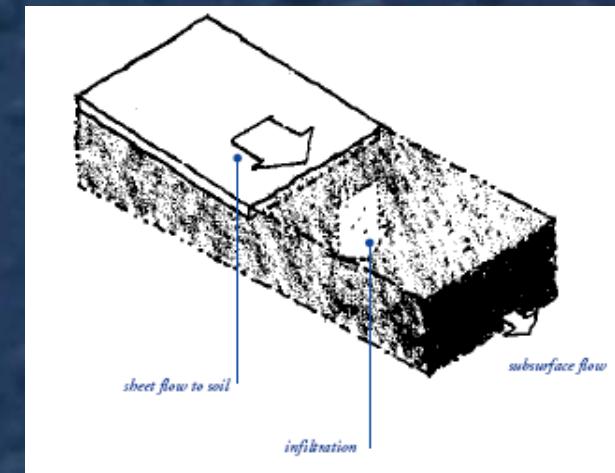
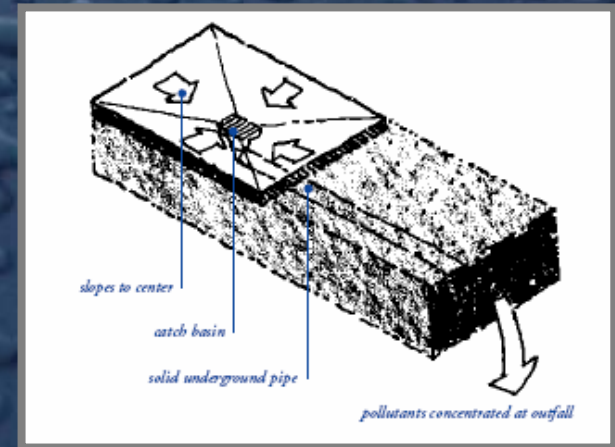
LID Design Objectives



Watershed and Stream Scale	Site scale
Reduce peak flows	Detain runoff on site
Increase time of concentration	Slow runoff from leaving site
No runoff from small storms	Infiltrate, evapotranspirate and reuse
Reduce duration of moderate flows	Let runoff seep away very slowly
Reduce runoff volume	Infiltrate and reuse where possible
Reduce runoff energy	Detain and slow flows
Increase groundwater storage and stream base flows	Facilitate infiltration
Reduce pollutants in runoff	Detain and filter runoff
Protect against spills and dumping	Disconnect drainage and filter runoff

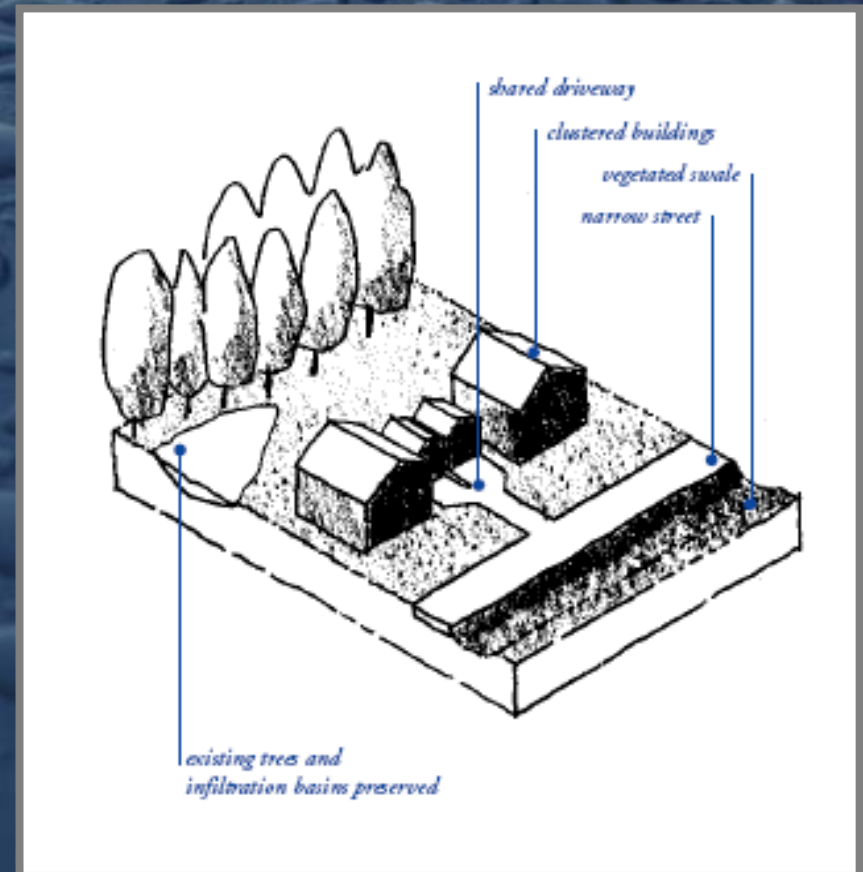
LID Drainage Principles

- Instead of “collect and convey,” “slow it, spread it, sink it.”
 - Avoid concentrating flows
 - Keep drainage areas small
 - Promote infiltration
 - Detain
 - Treat
- Route high flows so they flood safely



LID Design Steps

- Optimize the site layout



LID Design Steps

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- Use pervious surfaces and green roofs where possible



LID Design Steps

- Optimize the site layout
- Use pervious surfaces and green roofs where possible
- Disperse runoff to landscaping

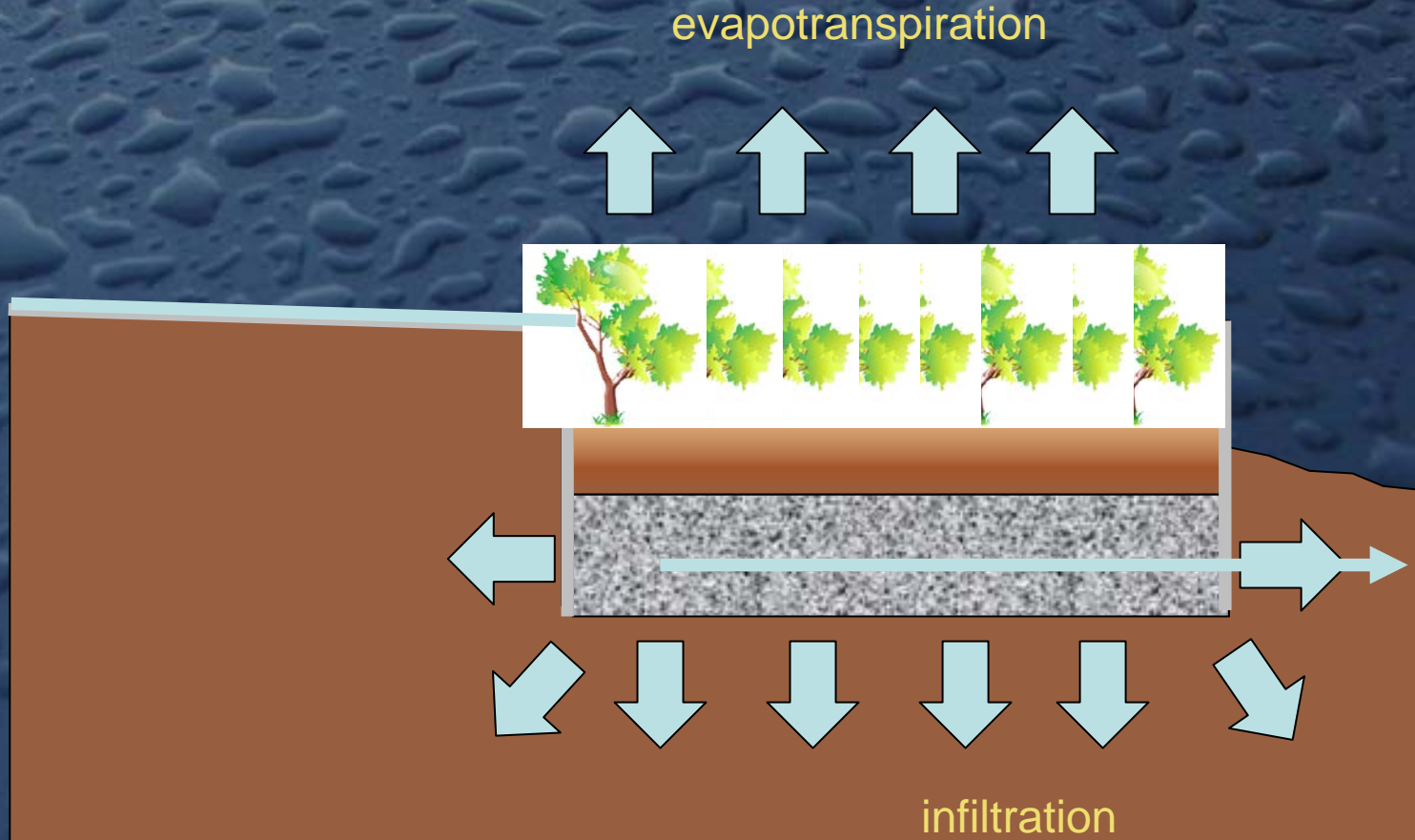


LID Design Steps

- Optimize the site layout
- Use pervious surfaces and green roofs where possible
- Disperse runoff to landscaping
- **Direct drainage from impervious surfaces to bioretention facilities, flow-through planters, or dry wells**



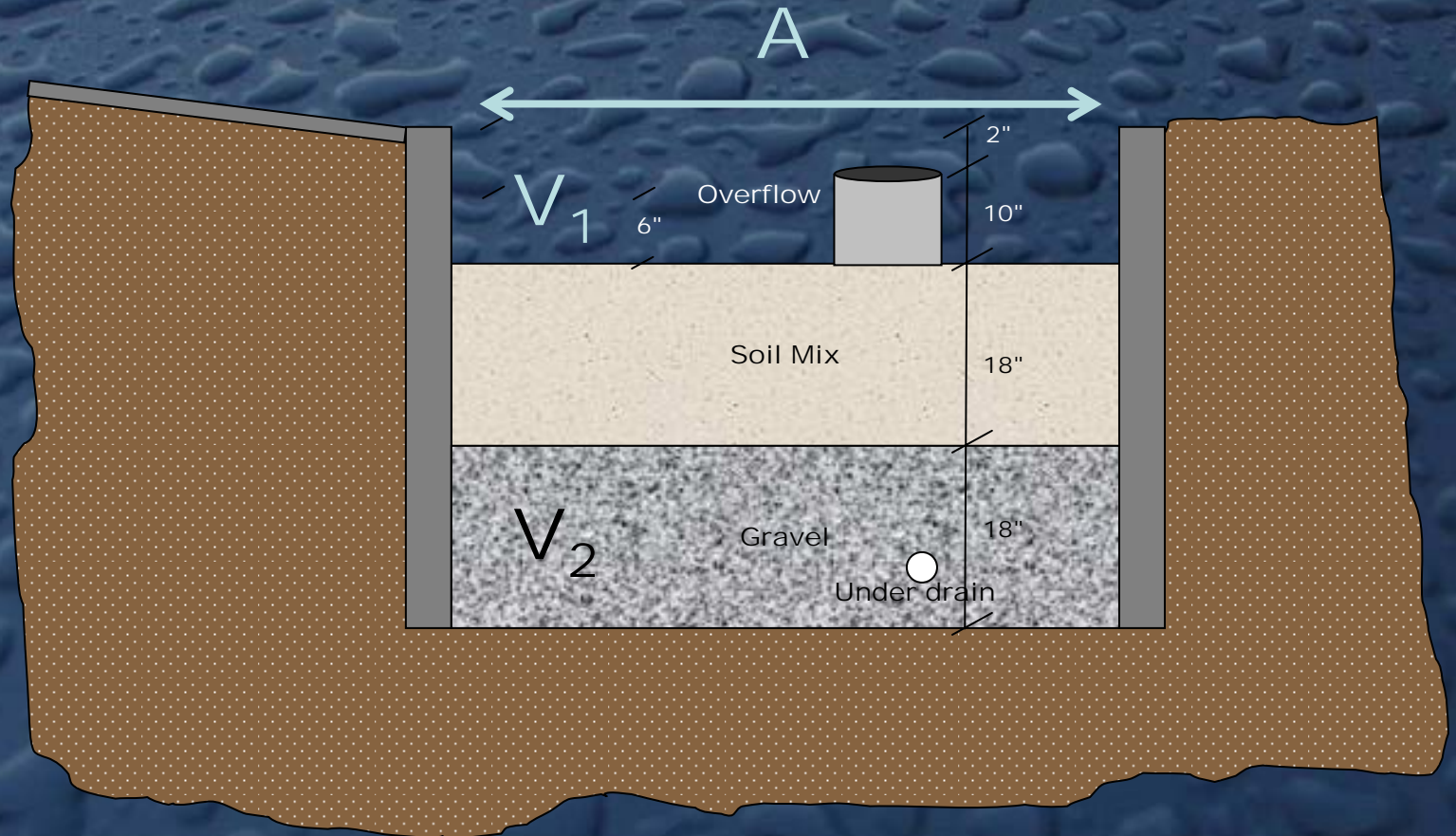
Bioretention



LID for NPDES Compliance

- Site design criteria
 - maximize infiltration (where appropriate)
 - provide retention or detention
 - slow runoff
 - minimize impervious land coverage
- Stormwater treatment criteria
 - Sizing requirements
 - Soil or filtration media specifications
- Flow-control (hydrograph modification management) criteria

Bioretention for Flow Control



Design and Compliance Tools

- *Stormwater C.3 Guidebook*
 - Available at cccleanwater.org
- IMP Sizing Calculator
- Free training



STORMWATER C.3 GUIDEBOOK

Stormwater Quality Requirements for Development Applications

Fourth Edition
September 10, 2008
Visit www.cccleanwater.org for updates.

File Tools Help

Project Information

All of the project information is required. Please fill in all of the information before editing the DMAs and IMPs.

Project Name Design Goal
 Treatment Plus Flow Control
 Treatment Only

Location

APN

Total Area sq ft Mean Annual Precip in

Drainage Management Areas (DMAs) Integrated Management Practices (IMPs) Calculation Warnings(6) Summary Report

ST-1 SR-1 SR-2 LS-1 PAVE-1 PAVE-2 PAVE-3 PAVE-4 ROOF-1 ROOF-2 ROOF-3 ROOF-4

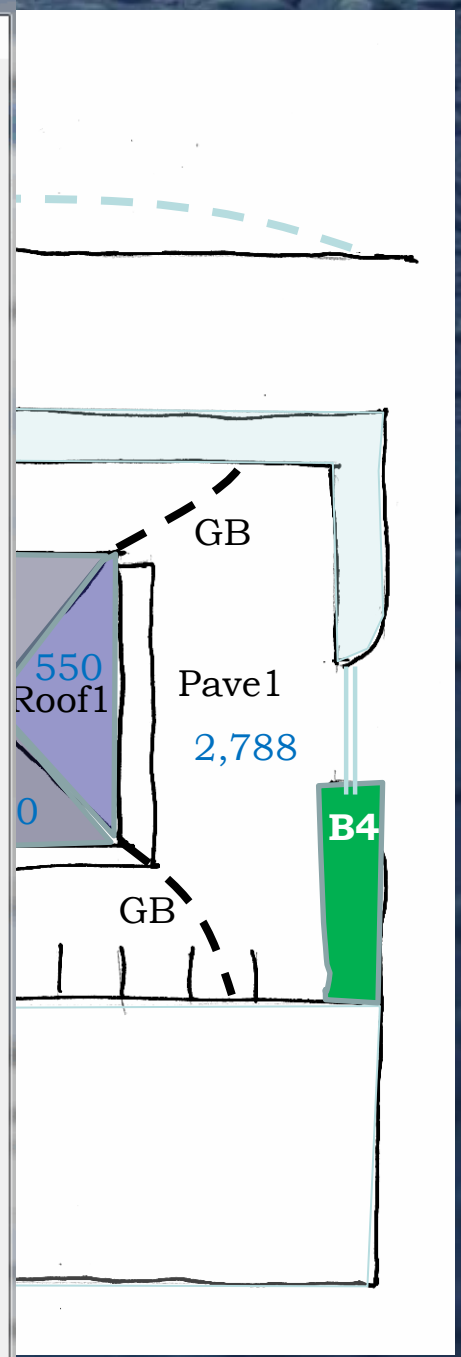
DMA Type IMP NOTE: The DMA can drain only to IMPs with the same soil type.

Drainage Area (sq. ft.) Drains to DMA

NRCS Soil Group

Post-project Surface Type

Total Area (Calculated)	
Drainage Management Areas	<input type="text" value="29445"/> sq. ft.
Integrated Management Practices	<input type="text" value="1015"/> sq. ft.
Total	<input type="text" value="30460"/> sq. ft.



LID Design Challenges

- Drain the site effectively for all size storms
- Integration into site design and landscape
 - Aesthetics
 - Multiple use
 - Circulation
 - Maintenance