Planning, Design, and Construction of Low Impact Development Features and Facilities

Provision C.3 Stormwater Compliance for Land Development Projects

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June 7, 2016

CONTRA COSTA CLEAN WATER PROGRAM

C.3 Basics

A quick review of objectives and methods

C.3 and LID Basics

- Mandate
- Objectives
- Methods
- Compliance Process
- Tools and Assistance

Mandate

- 1987 Amendments to the Clean Water Act
- Permits issued by California Water Boards
- C.3 added to Contra Costa's permit 2003, 2006
- Municipal Regional Permit 2009, 2011, 2015
- Municipalities are required to use their land use authority to require controls on runoff from new developments
- Low Impact Development (LID) is required

Objectives

Compliance

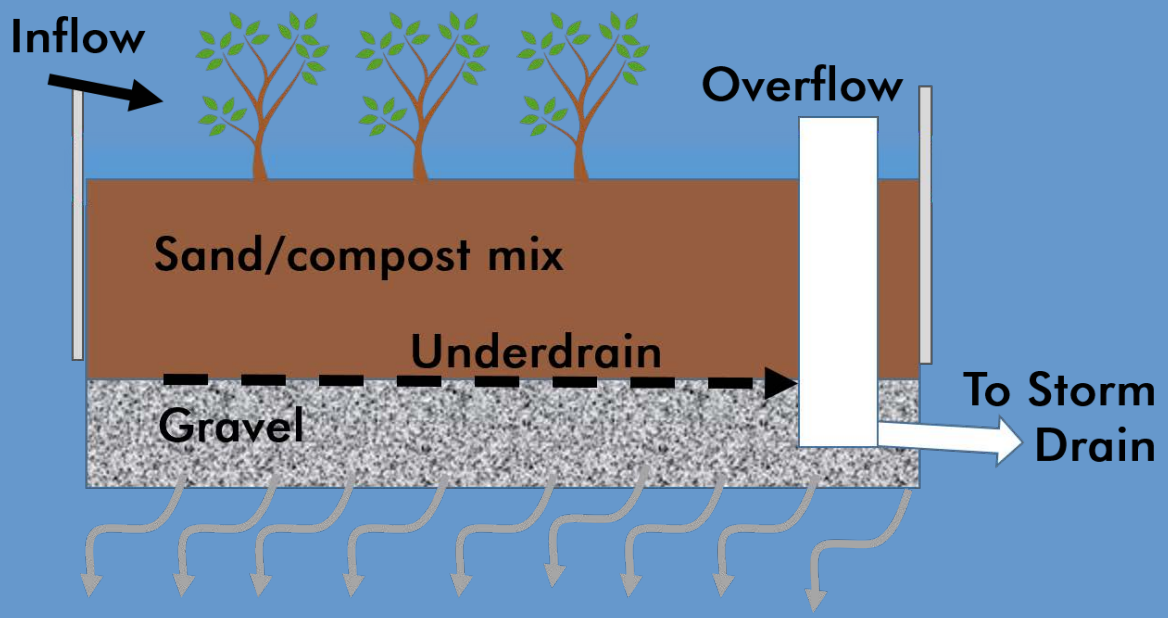
- Mandate
- Client support
- Acceptance of costs
- Structure
- Schedule
- Accountability

Project Quality

- Enthusiasm
- Interest
- Energy
- Synergies
- Opportunities
- Elegance

Methods

- Minimize imperviousness
  - Minimize roofs and paving
  - Substitute pervious paving where possible
- Disperse runoff to landscaping
- Direct runoff to bioretention facilities

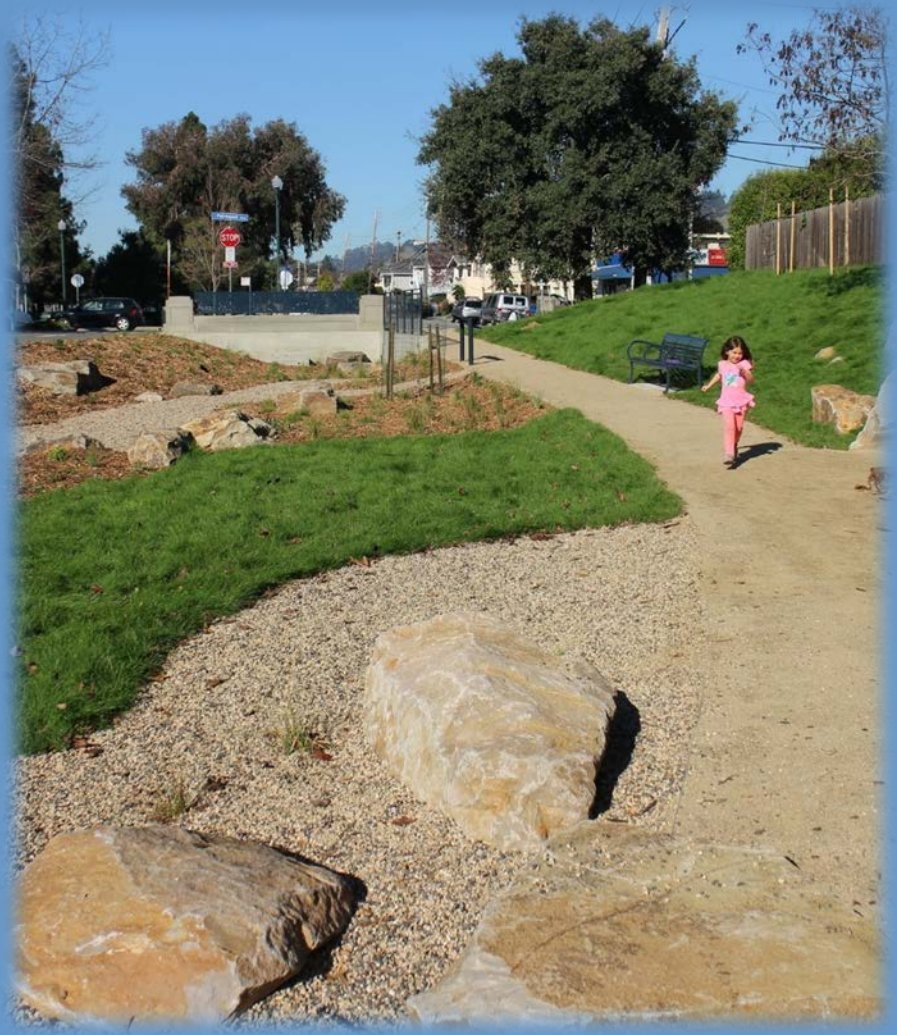


Methods – Bioretention

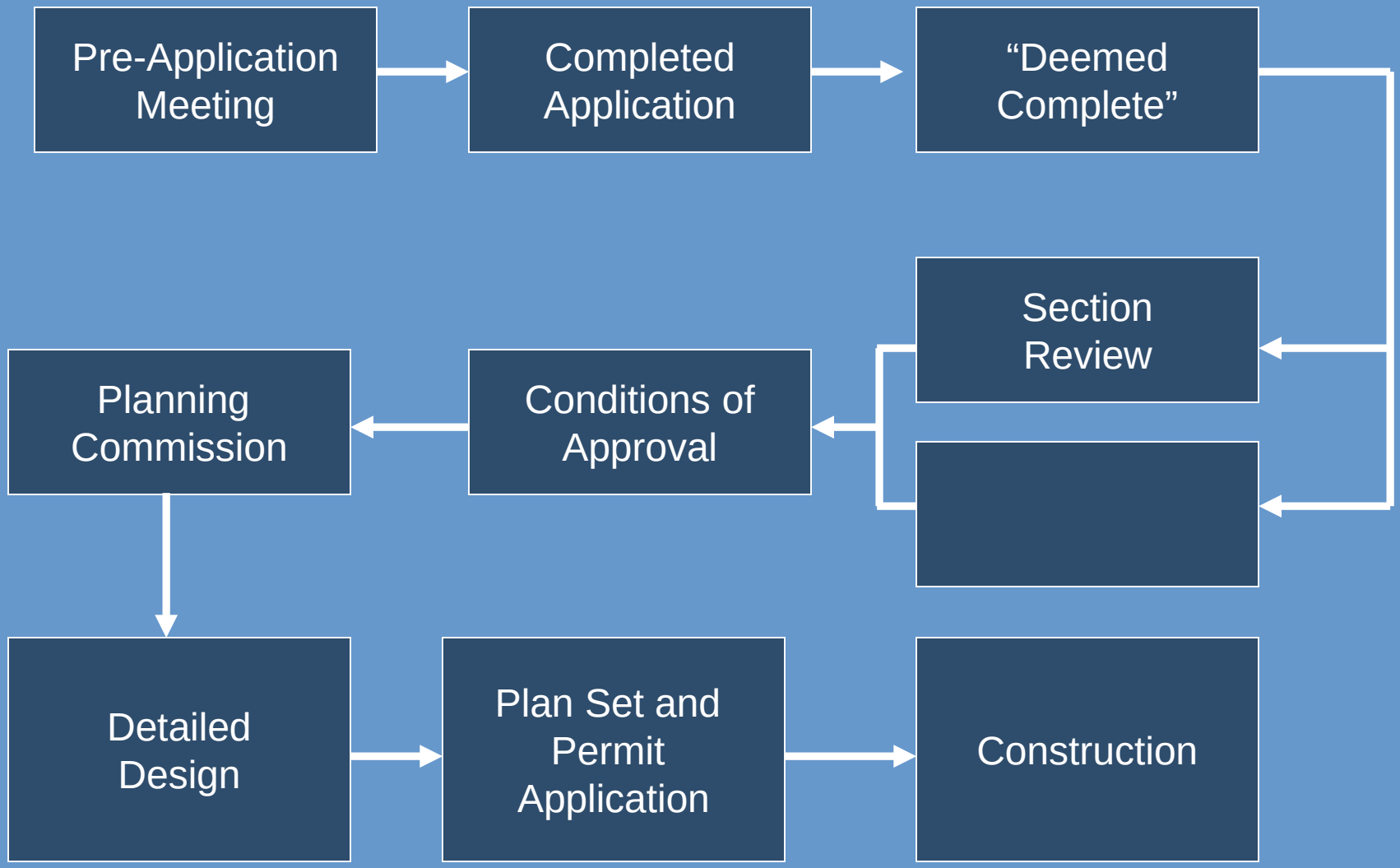
- Filtration and pollutant sequestration
- Biological processing and renewal
- No mosquito problems
- Mimic natural hydrology
- Attractive landscape amenity
- Potential use as park or playground
- Low maintenance
- Easy to inspect

Methods – Bioretention

Methods – Bioretention



Compliance Process



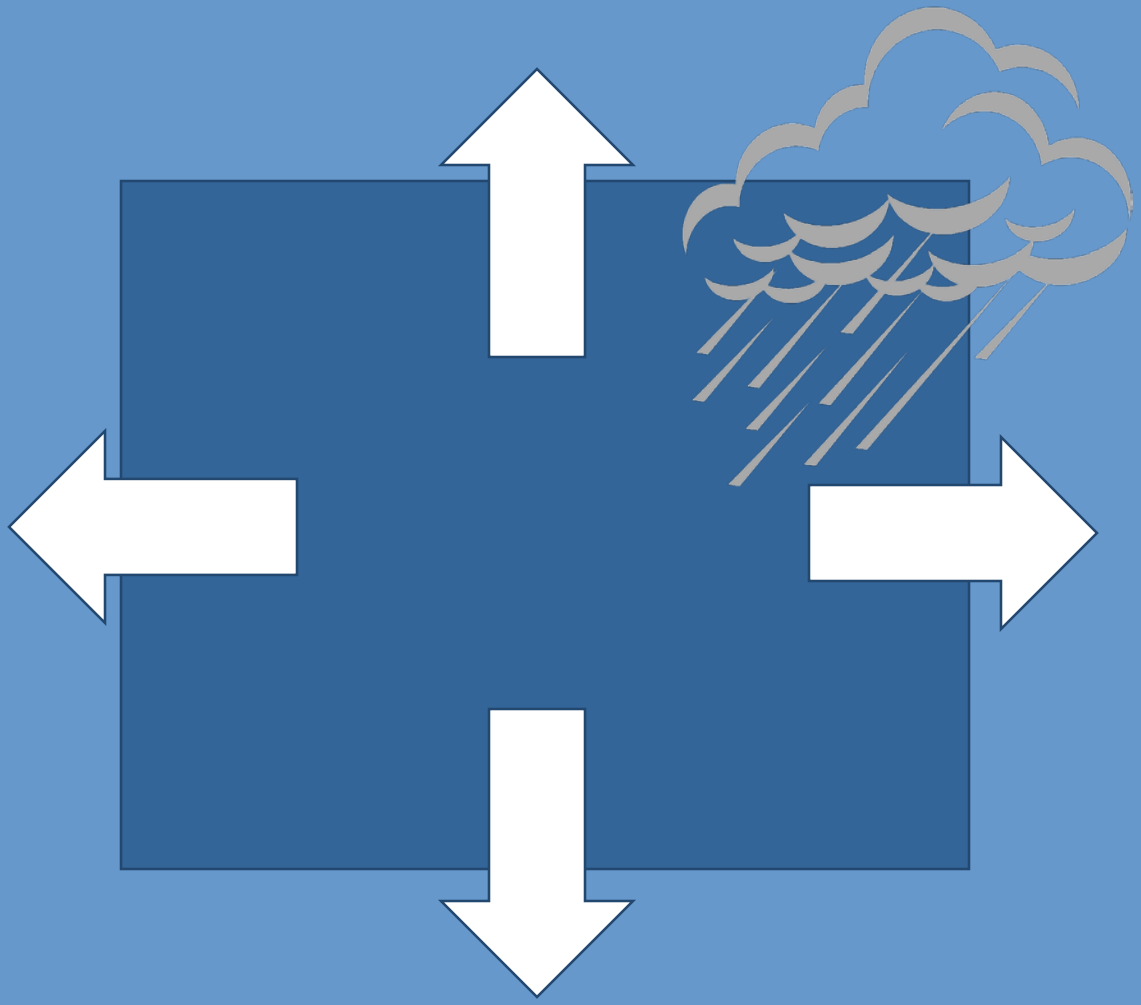
Compliance – Drainage Design

1. Delineate entire site into Drainage Management Areas (DMAs).
2. Categorize and tabulate DMAs. Minimize impervious area and disperse runoff.
3. Select and lay out LID facilities.
4. Use the sizing calculator to evaluate facility footprints.
5. Iterate until all facilities meet or exceed the minimum required area.

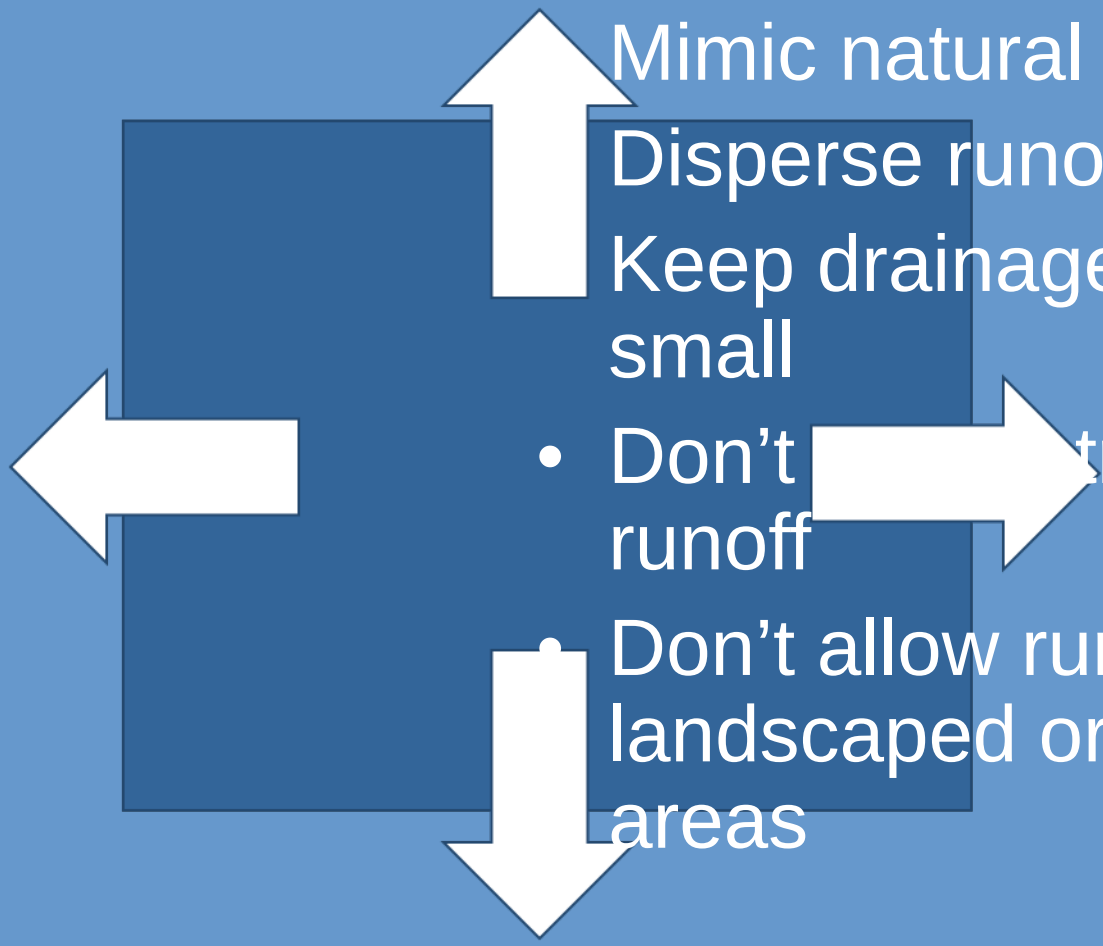
Documenting LID Site Design

Paved or
Roofed Area

LID Site Design Principles

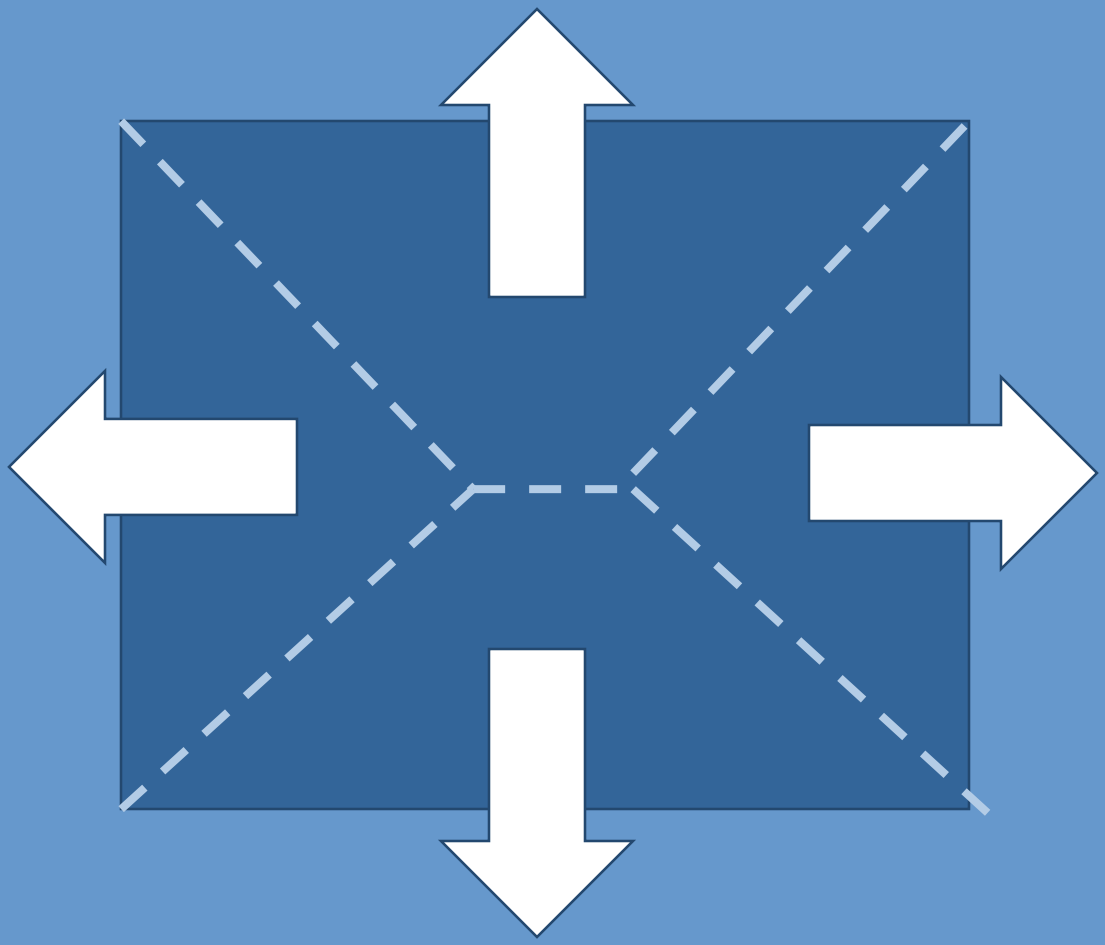


LID Site Design Principles

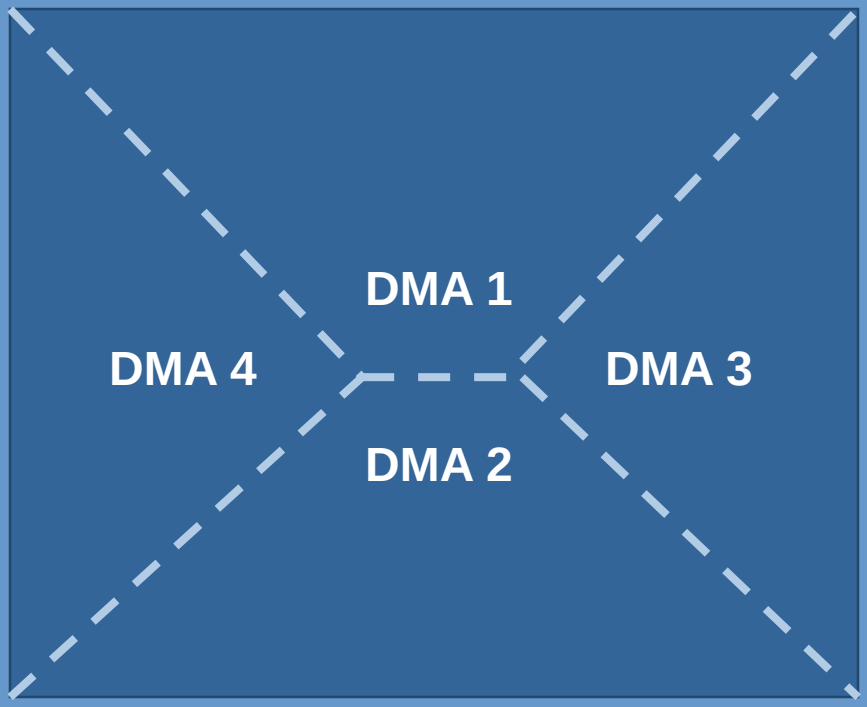


- Mimic natural hydrology
- Disperse runoff
- Keep drainage areas small
- Don’t [illegible]trate runoff
- Don’t allow run-on from landscaped or natural areas

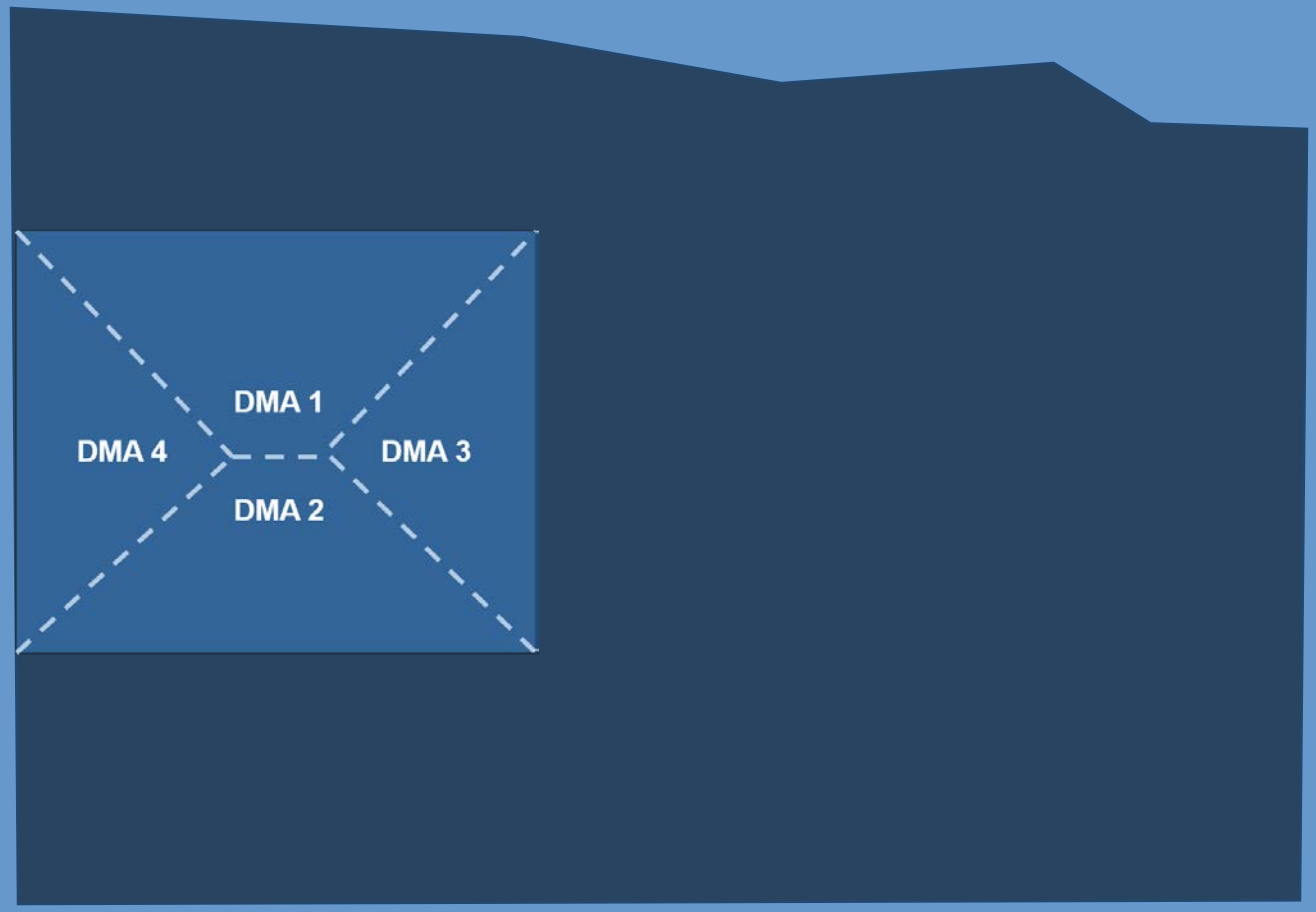
Drainage Management Areas



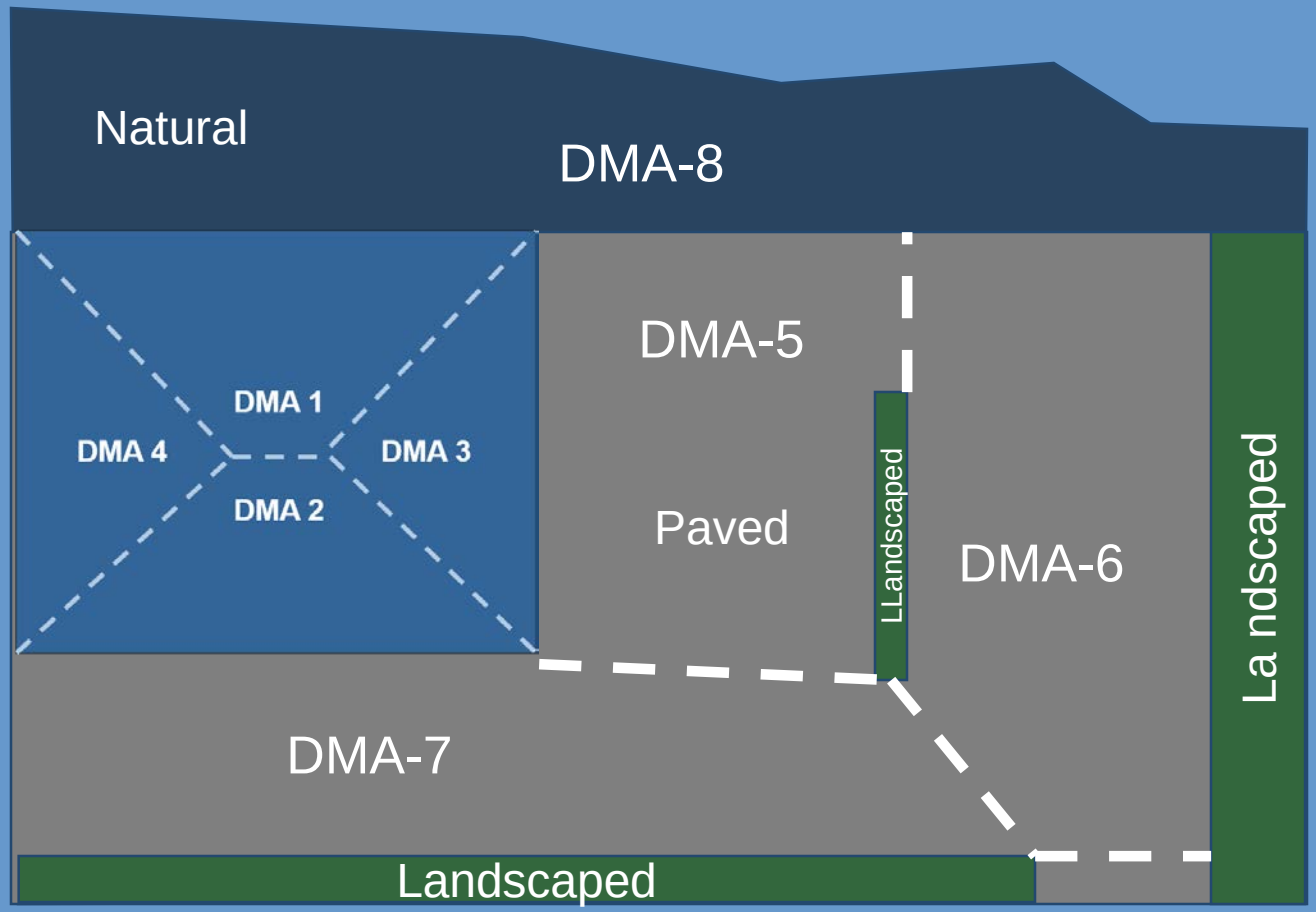
Drainage Management Areas



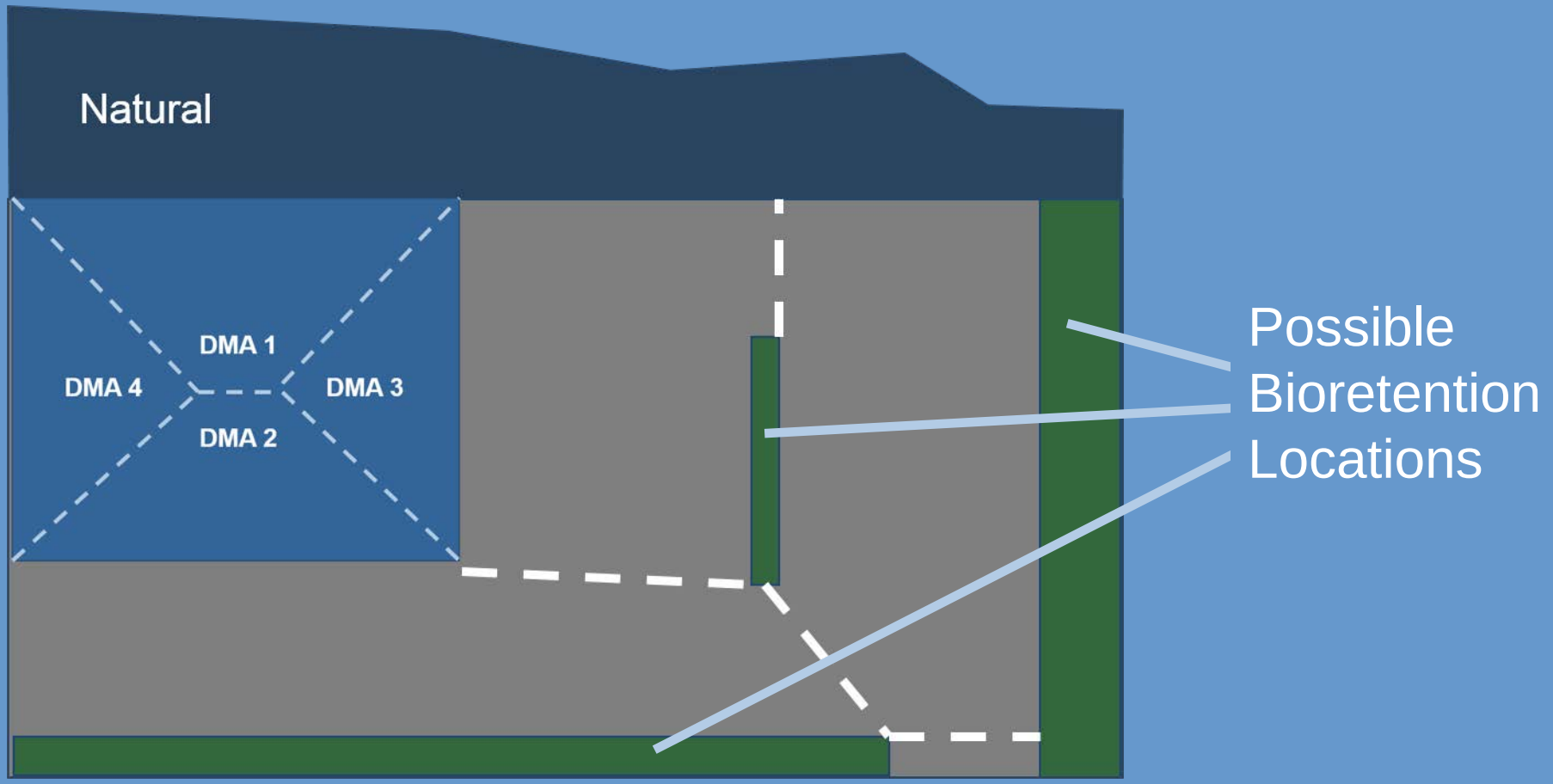
Drainage Management Areas



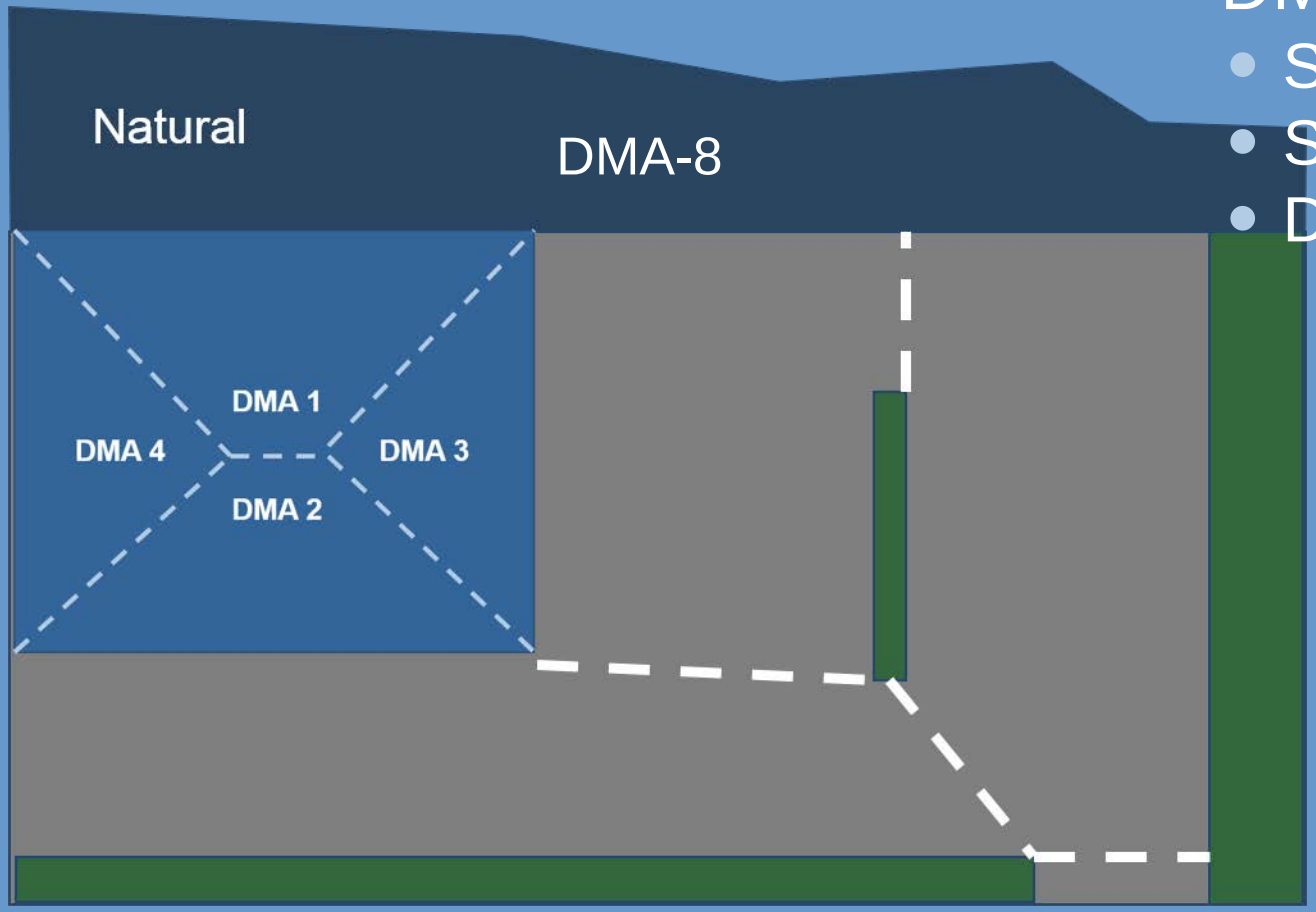
Drainage Management Areas



Drainage Management Areas

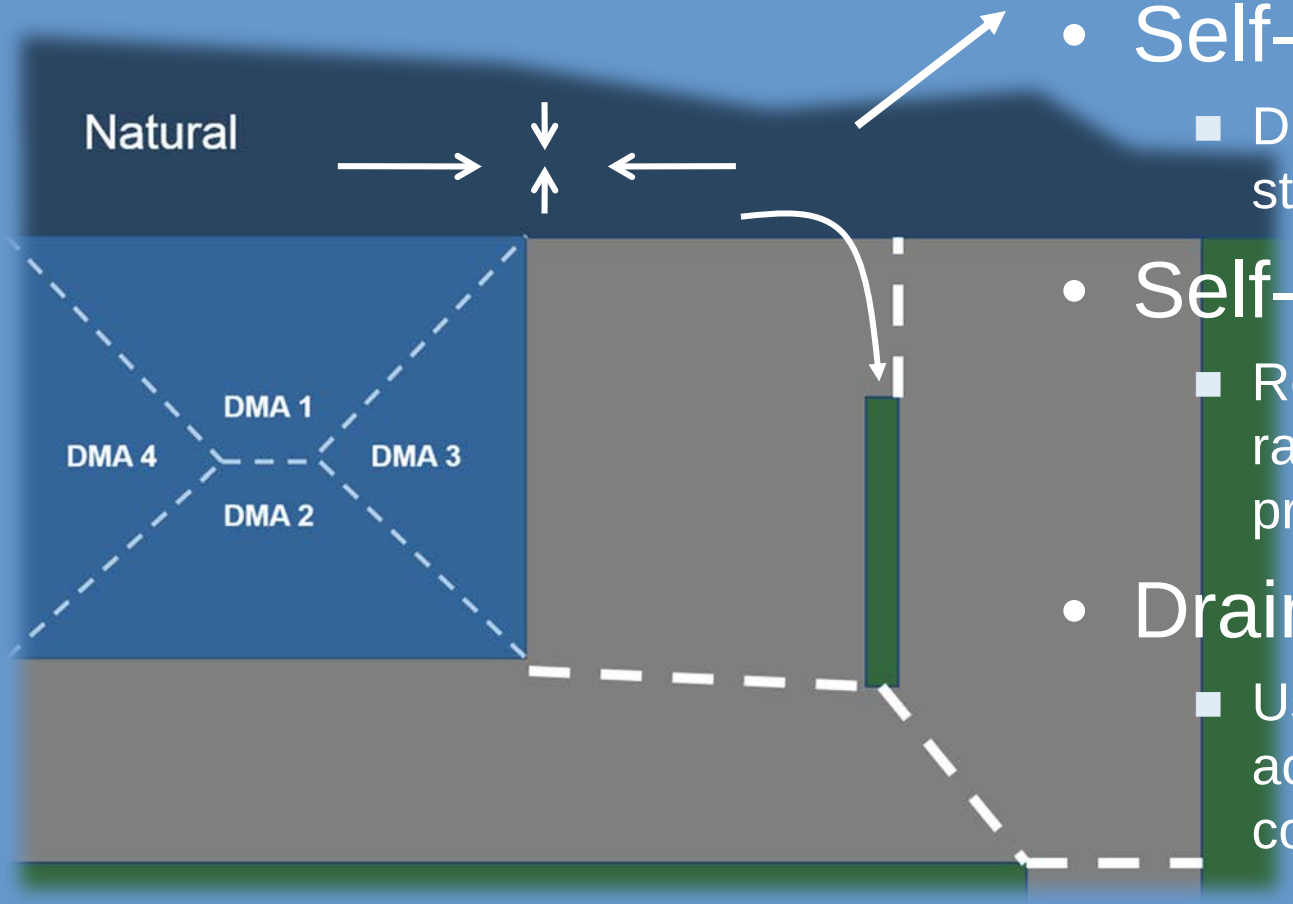


Options – Pervious DMAs



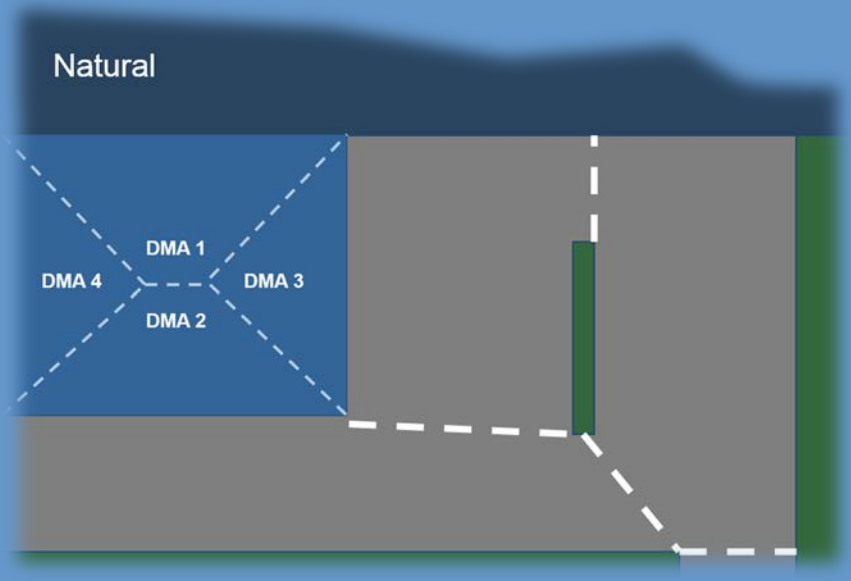
- DMA-8
  - Self-treating?
  - Self-retaining?
  - Drain to Facility?

DMA 8

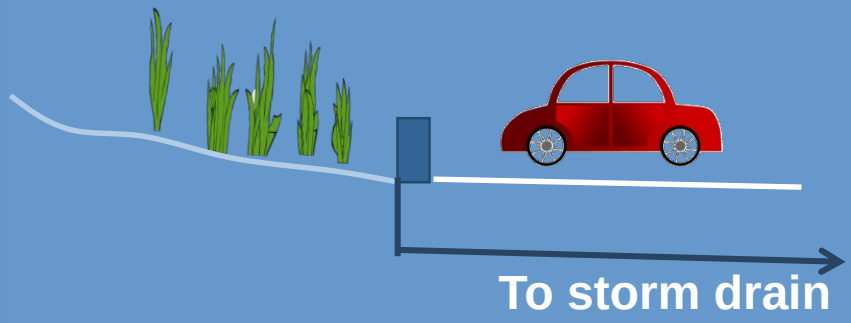


- Self-Treating
  - Drain directly to storm drain system
- Self-Retaining
  - Retain first inch of rainfall without producing runoff
- Drain to Facility
  - Use runoff factor to account for contribution

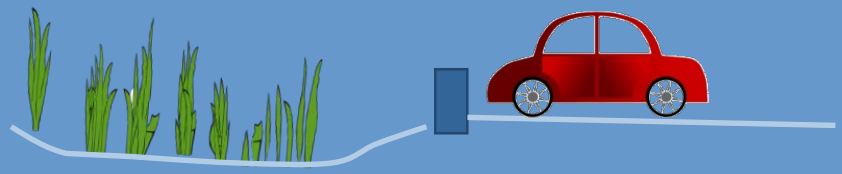
Self treating and self-retaining

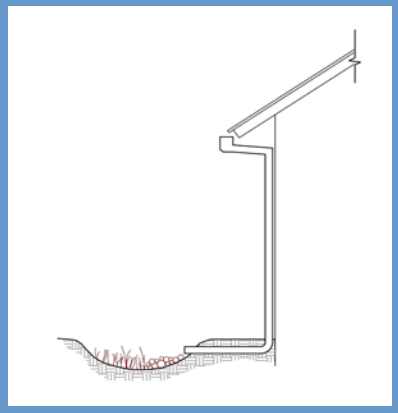


Use a curb to avoid run-on from self-treating areas



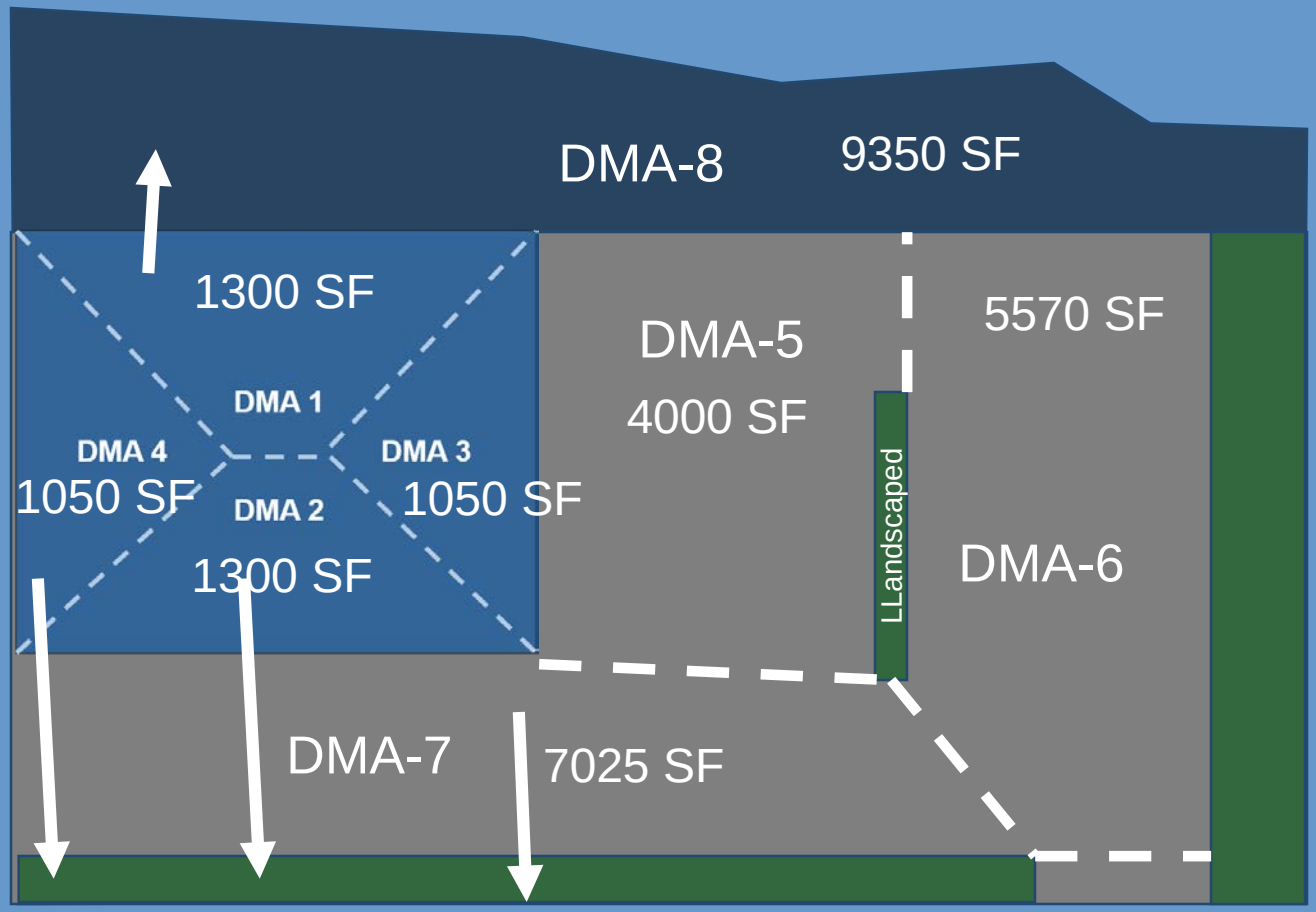
Grade self-retaining areas to drain inward. Set any area drains to pond 3"-4"





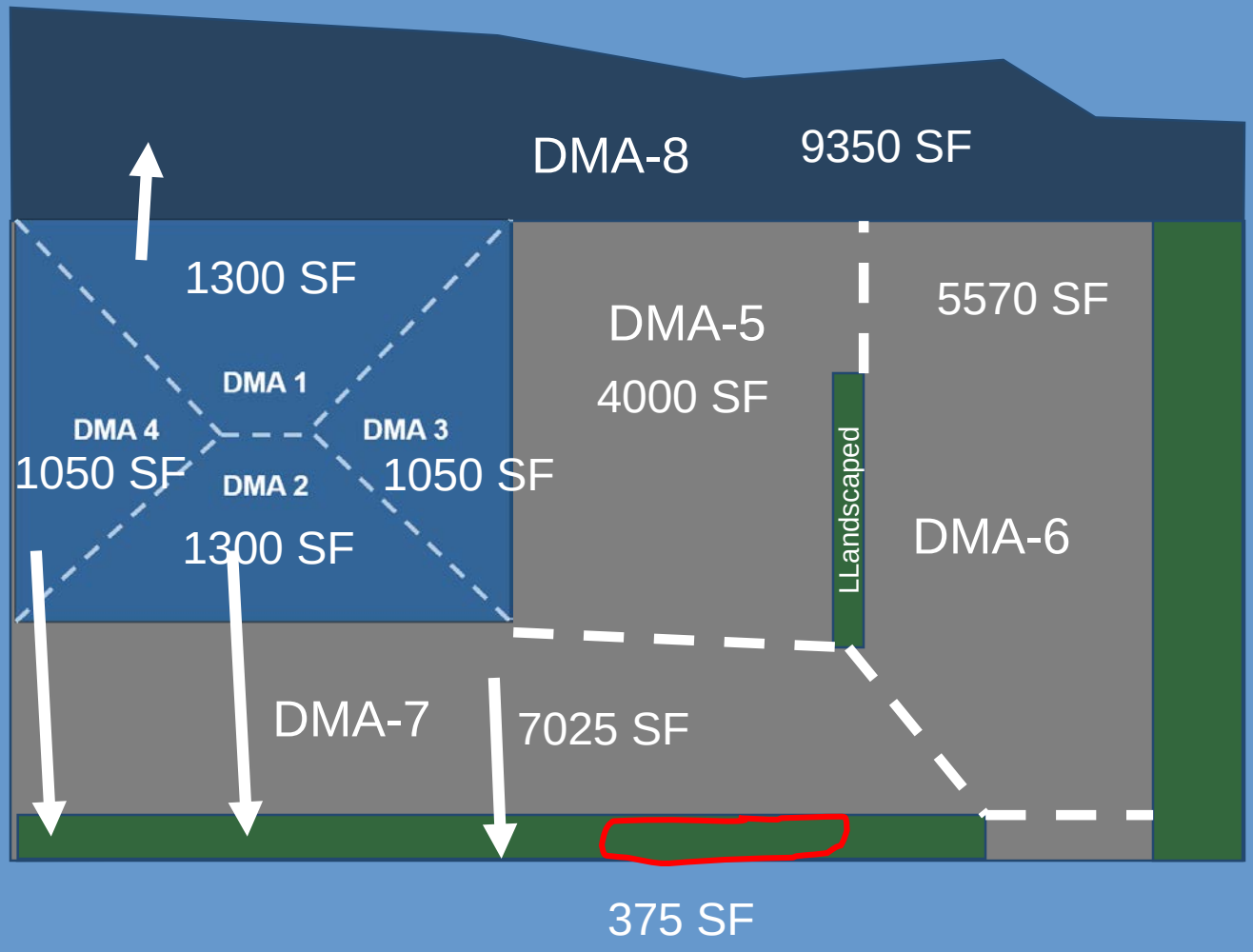
Consider that adjacent roofs or paved areas could drain to self-retaining areas (not to exceed 2:1)

2. Tabulate DMAs



DMA	SF
1	1300
2	1050
3	1300
4	1050
5	4000
6	5570
7	7025
8	9350
Total	**30645**

3. Select and Lay Out Facilities



	SF
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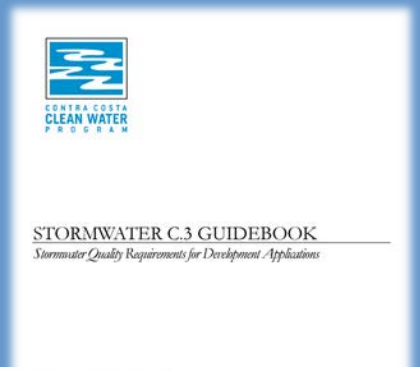
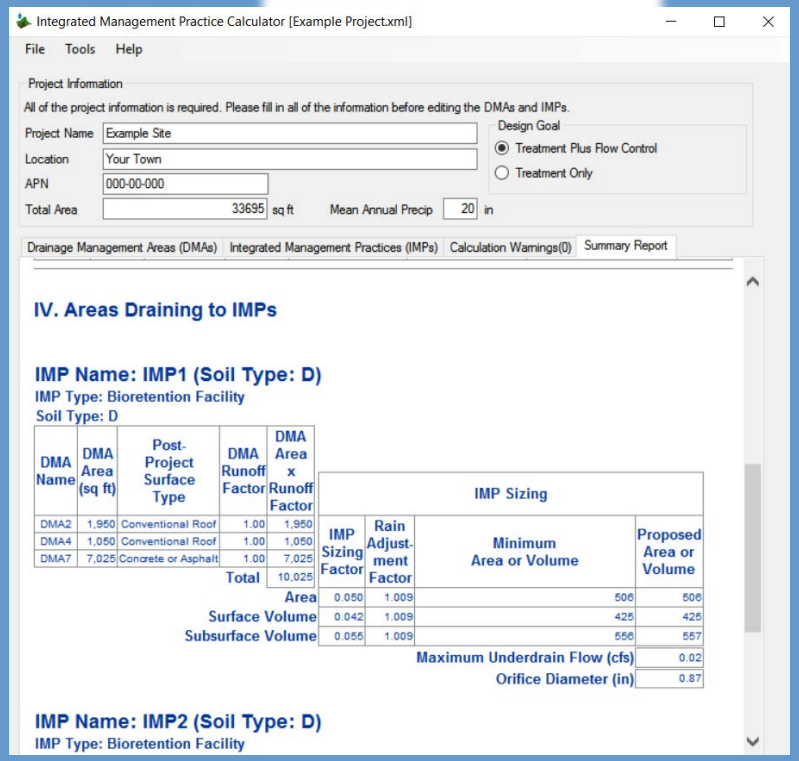
Tools and Assistance

- *Stormwater C.3 Guidebook*
  - Template for a Stormwater Control Plan
    - Small Project
    - Regulated Project
  - IMP Sizing Calculator
- Workshops
- Technical Assistance





C.3 and LID Basics

- Mandate
- Development Review
- Elegance
- Bioretention
- Drainage Management Areas
- Calculations
- *Guidebook*

Provision C.3 Changes

In MRP 2.0, effective January 1, 2016

Changes to Provision C.3

- Grandfathering
- Pervious Pavements
  - Design Specifications
  - Inspect installations ≥3,000 SF (contiguous)
- Special Projects/Non-LID Treatment
  - Changes to density criteria (definitions)
  - Must show infeasibility of using LID

Changes to Provision C.3

- Hydromodification Management
  - Made requirements regionally consistent
  - Applicability Map
  - Contra Costa update in January 2018

Changes to Provision C.3

- Green Infrastructure
  - Means streets and storm drains, plus development on previously developed sites
  - Load reductions for PCBs and Mercury
  - Looking for opportunities to implement LID

Guidebook Updates

In the 7th Edition

Guidebook Updates

- Chapter 1: Policies and Procedures
- Chapter 2: Preparing Your Plan
- Chapter 3: LID Site Design Guide
- Chapter 4: Design and Construction
- Chapter 5: Operation and Maintenance

Page #s

Guidebook Updates – Chapter 1

- Pavement resurfacing—when does it count as replaced impervious area? **3**
- Impervious surfaces constructed in adjacent ROW are part of the project **6**
- Grandfathering **7**
- Subdivisions
- Hydromodification Management **10**
  - options for compliance

Guidebook Updates – Chapter 2

- Using the template
- Stormwater Control Plan Exhibit
- Integrating Stormwater Facilities into the Project
- Example Stormwater Control Plans

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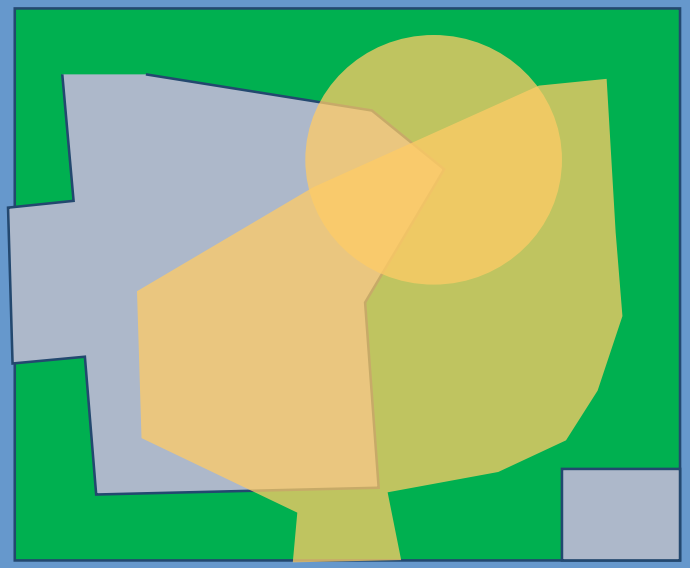
Chapter 2 - Project Data Form

A. New Impervious Area
B. Replaced Impervious Area
C. Pre-Project Impervious Area
D. Post-Project Impervious Area



Guidebook Updates – Chapter 3

- Hydromodification requirements on sites that were already partially developed
- No analysis of harvesting and use
- More on LID site planning and placement of bioretention facilities within the site
- Use the calculator to show calculation
- Special Projects and Non-LID treatme

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30

44

Guidebook Updates – Chapter 4

- Show DMAs in Construction Documents
- Bioretention Facilities
  - Call out key elevations on civil plans
  - Call out top of soil on landscape plans
  - Bioretention facilities must be unlined except…
- Pervious pavements

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Hot Topics

Implementing Low Impact Development Drainage Design in Land Development Projects

Hot Topics

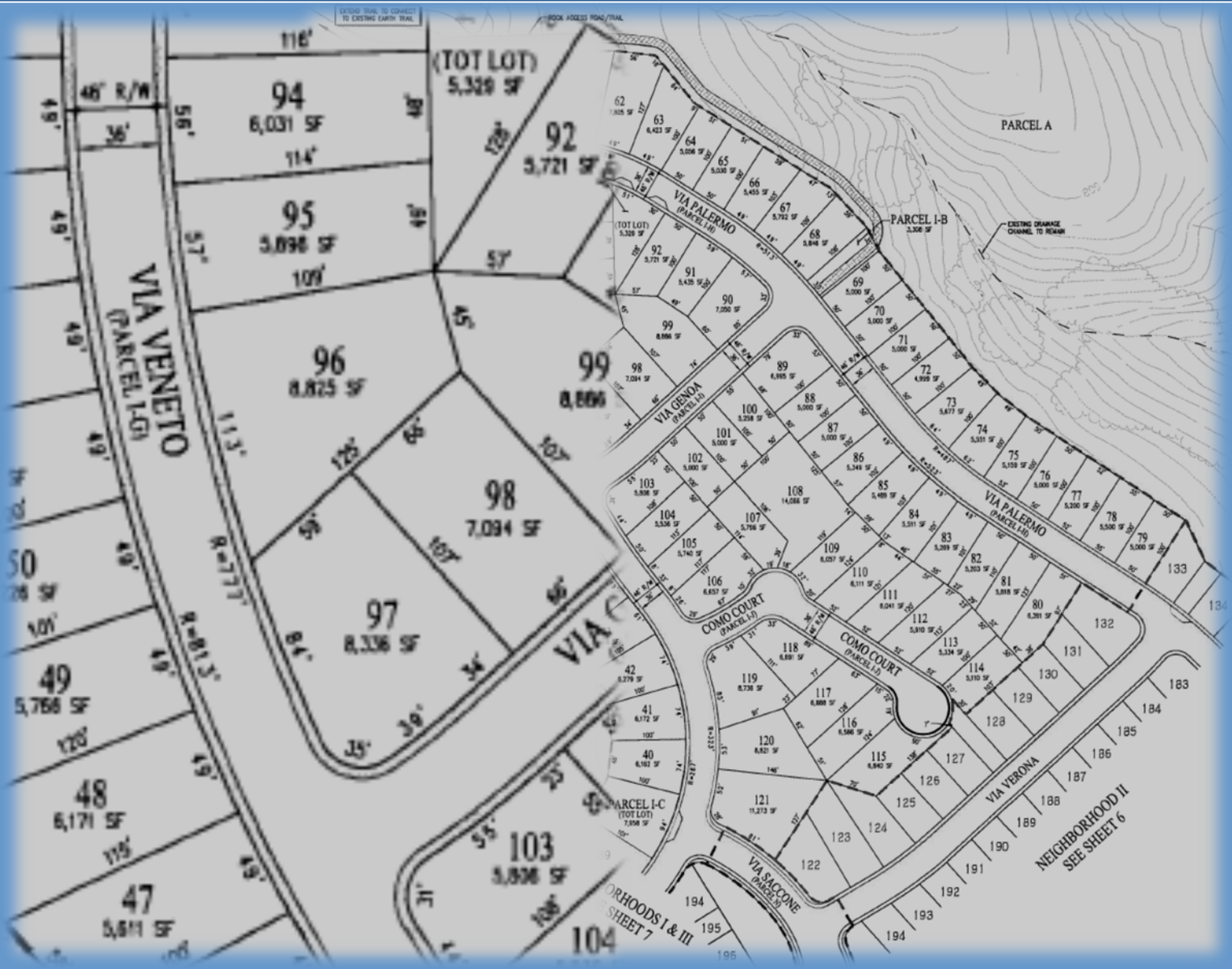
- C.3 and Project Entitlement Process
- Pervious Pavements
- Self-Treating and Self-Retaining Areas
- Bioretention Facility Placement
- Special Projects/High Density Projects
- Bioretention Facility Design
- Green Infrastructure

Issues: C.3 & Project Entitlements

- Approval of Subdivision Tentative Maps
  - Bioretention not integrated into neighborhood
  - Bioretention on individual lots
  - Bioretention not visible or accessible; limited aesthetic benefit
- Higher density projects
  - Townhomes
  - Multi-family
- Lot line changes without improvement plans

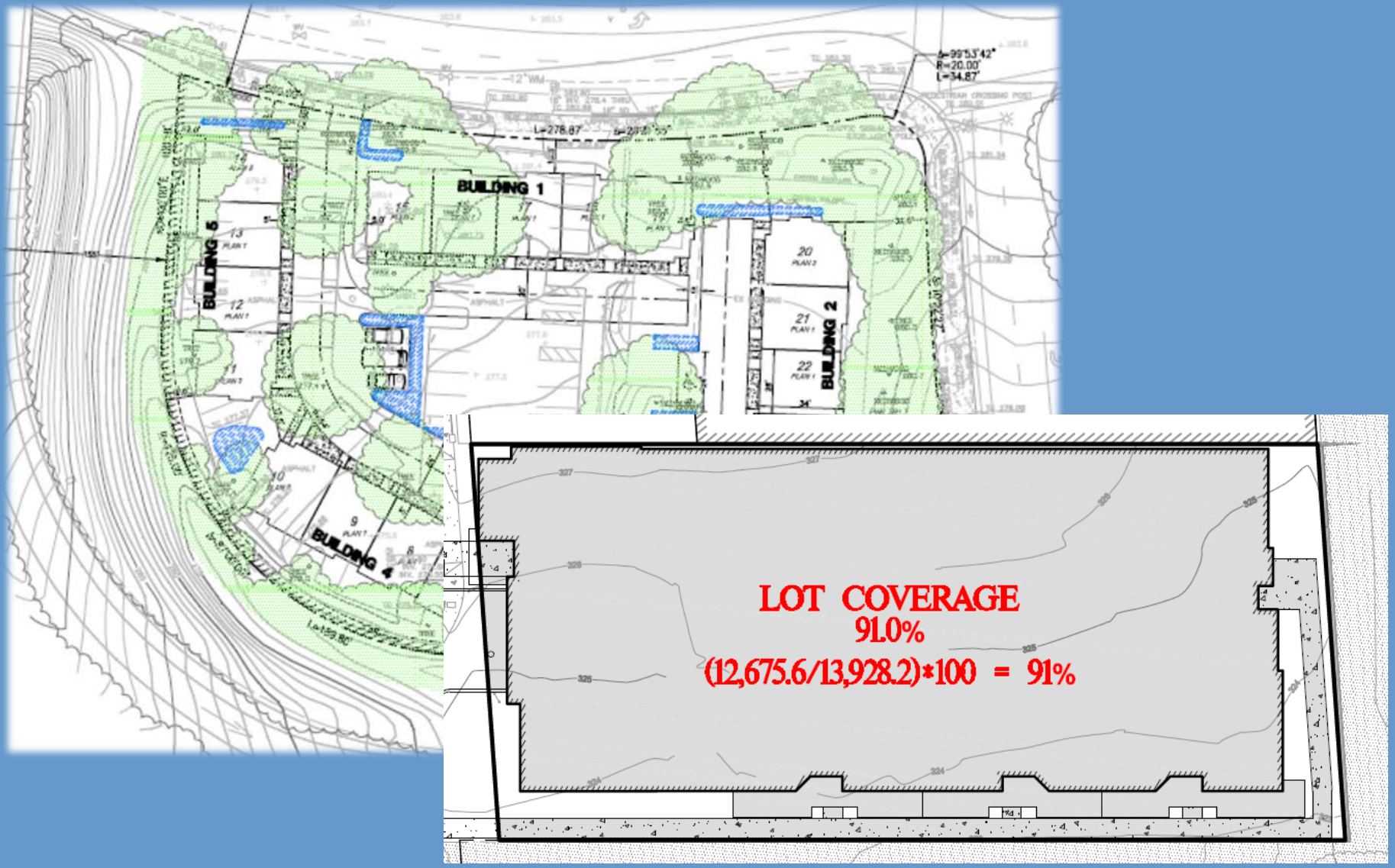
6-9

Integrating Bioretention into Layout



Accessibility

Townhomes and Higher Density



Issues: Pervious Pavements

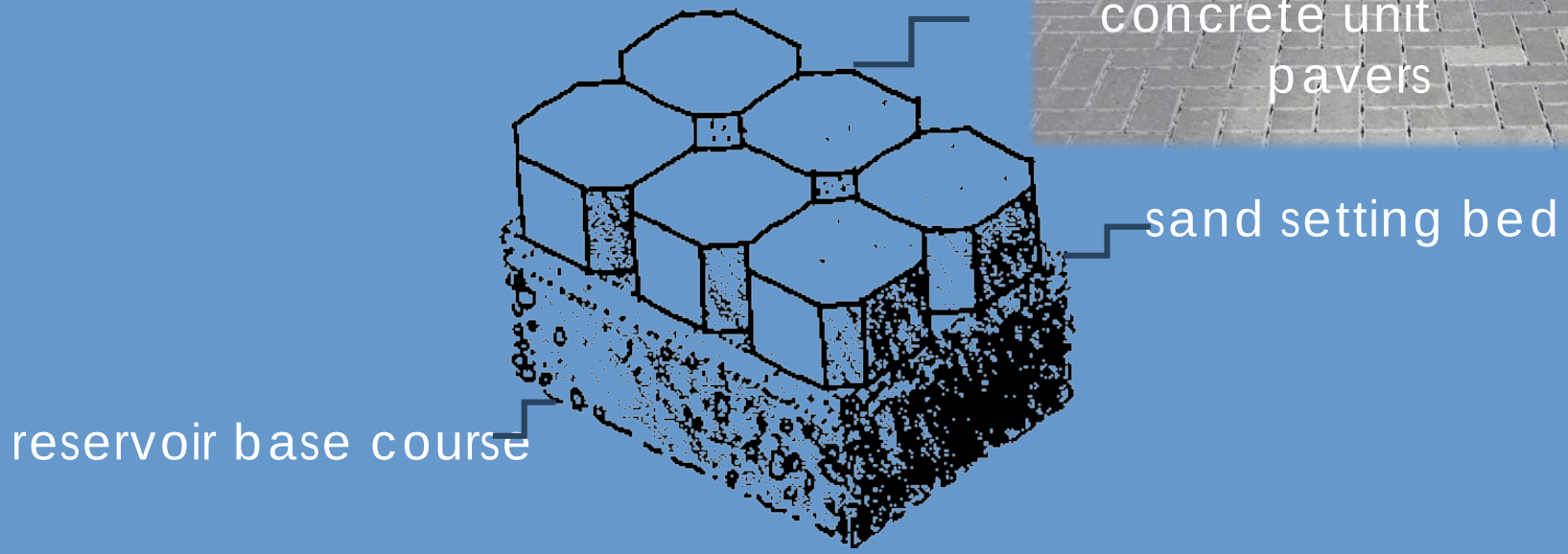
- Not suitable in many locations
- High cost
- How long will they last?
  - Structural stability
  - Surface raveling
  - Patching or replacing small areas

Issues: Pervious Pavements

- As proposed in Stormwater Control Plans
  - On steep slopes and at base of slopes
  - Where not economic to use

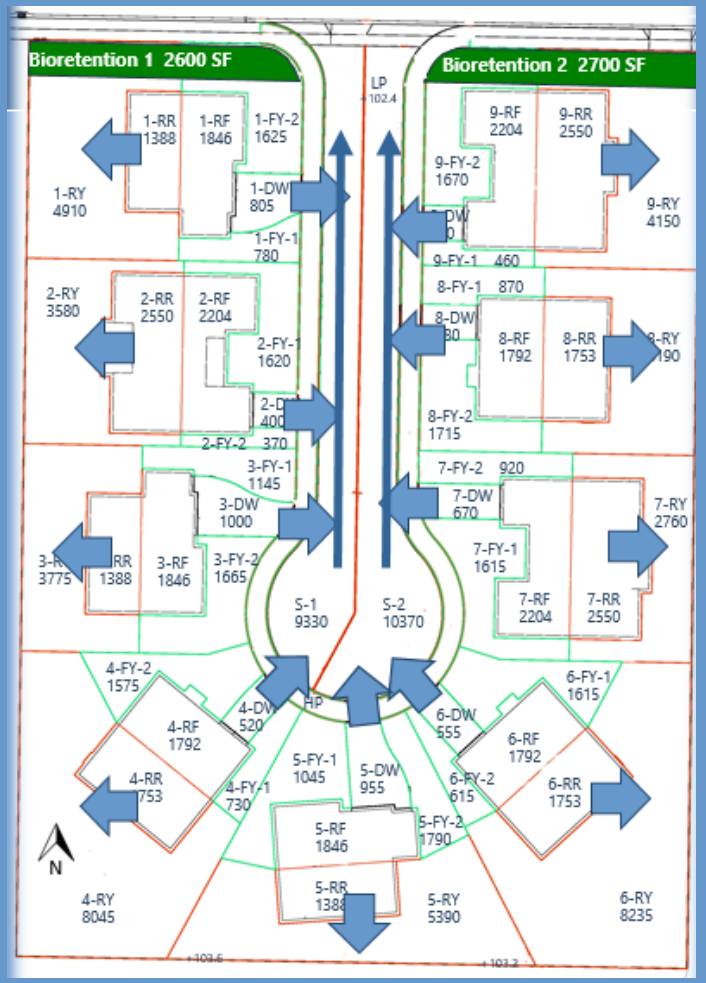
Issues: Pervious Pavements

- In Construction Plans
  - Need engineering criteria
  - Need expertise to review



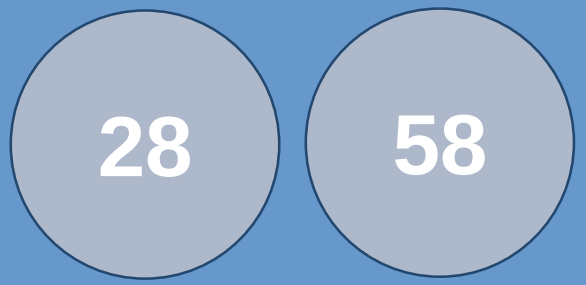
Issues: Self-Treating/Self-Retaining

- Not always used optimally
- Confusion over terms
- Especially important for projects with hydromodification management
- Using judgment when applying criteria for self-retaining areas



Issues: Bioretention Placement

- High-visibility, well-trafficked areas
- In common areas of subdivisions
- Drainage
  - Only impervious roofs and pavement
  - Keep ‘em high; use short drainage runs
- Integrate with site landscaping
- Flat and level
- Adjacent to buildings



Issues: Special Projects

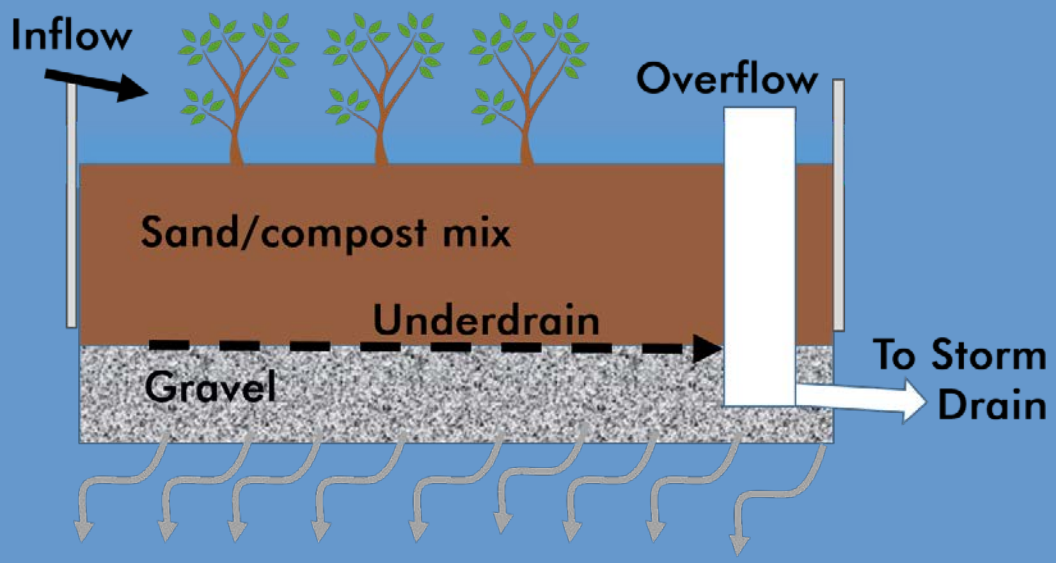
- Need to review feasibility for LID
- Locations for bioretention facilities

Issues: Special Projects

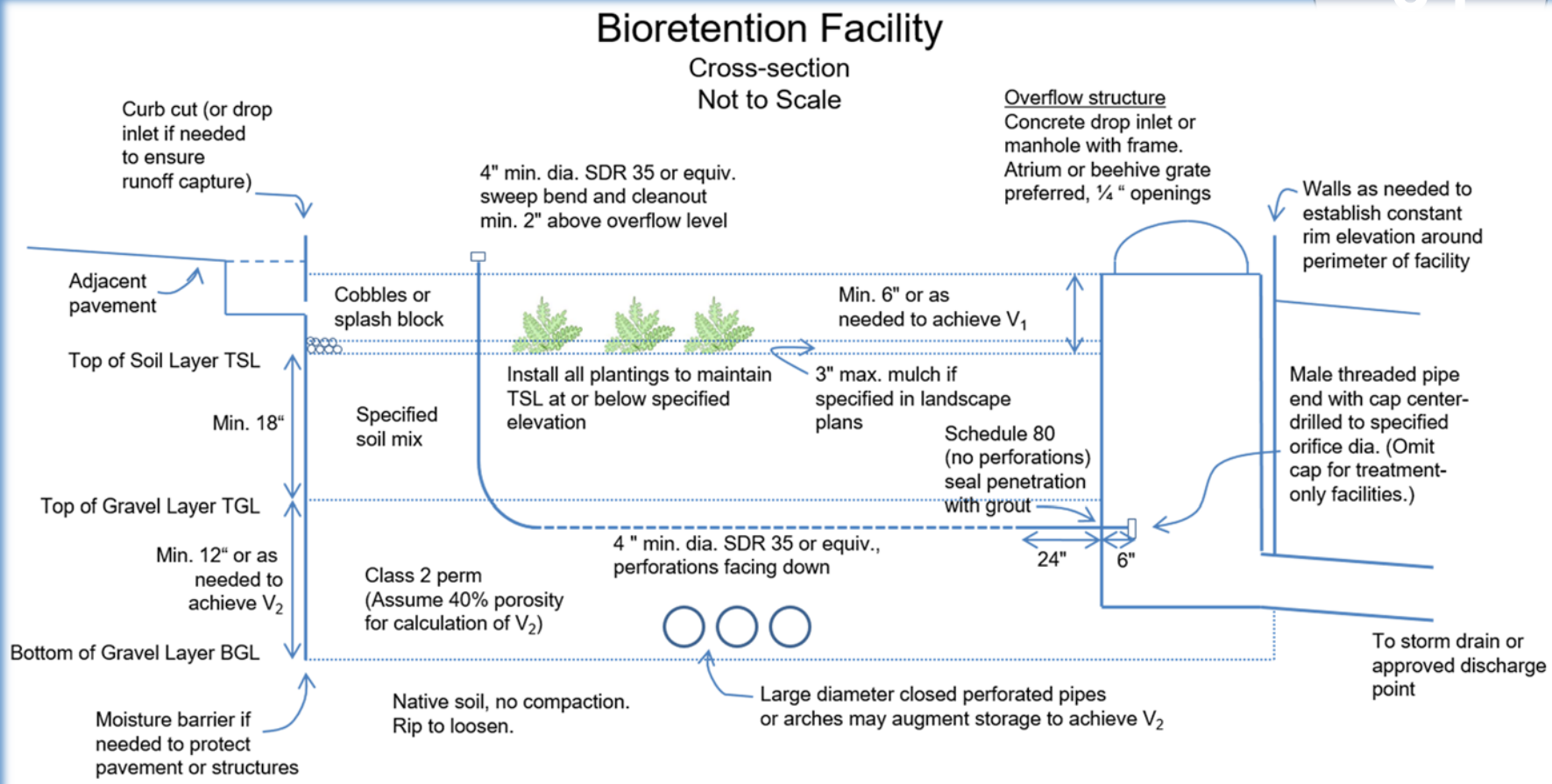
- Criteria for non-LID

Issues: Bioretention Design

- Using the current design standard
  - Each layer is flat
  - Underdrain discharge is at top of gravel layer
  - Overflow structure is a catch basin
- Open bottom (allow infiltration)



Illustrative cross-section



Notes:

- No liner, no filter fabric, no landscape cloth.
- Maintain BGL. TGL, TSL throughout facility area at elevations to be specified in plan.
- Class 2 perm layer may extend below and underneath drop inlet.
- Elevation of perforated pipe underdrain is at top of gravel layer.
- See Appendix B for soil mix specification, planting and irrigation guidance.
- See Chapter 3 for factors and equations used to calculate V_1, V_2, and orifice diameter.

Don’t create pits

Don’t create pits

That’s better

Make This Happen

- Bioretention facilities are level so they “fill up like a bathtub.”

Flat, Flat, Flat

Flat, Flat, Flat

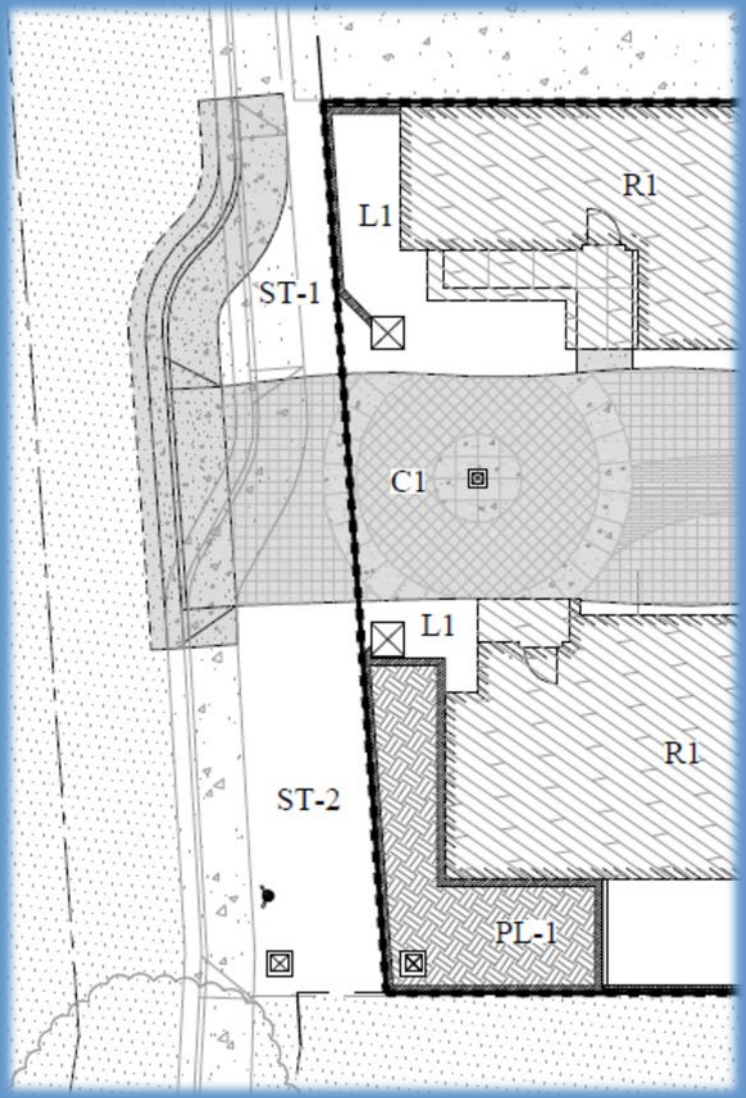
Foundations and Pavement

Geotechnically Difficult Sites

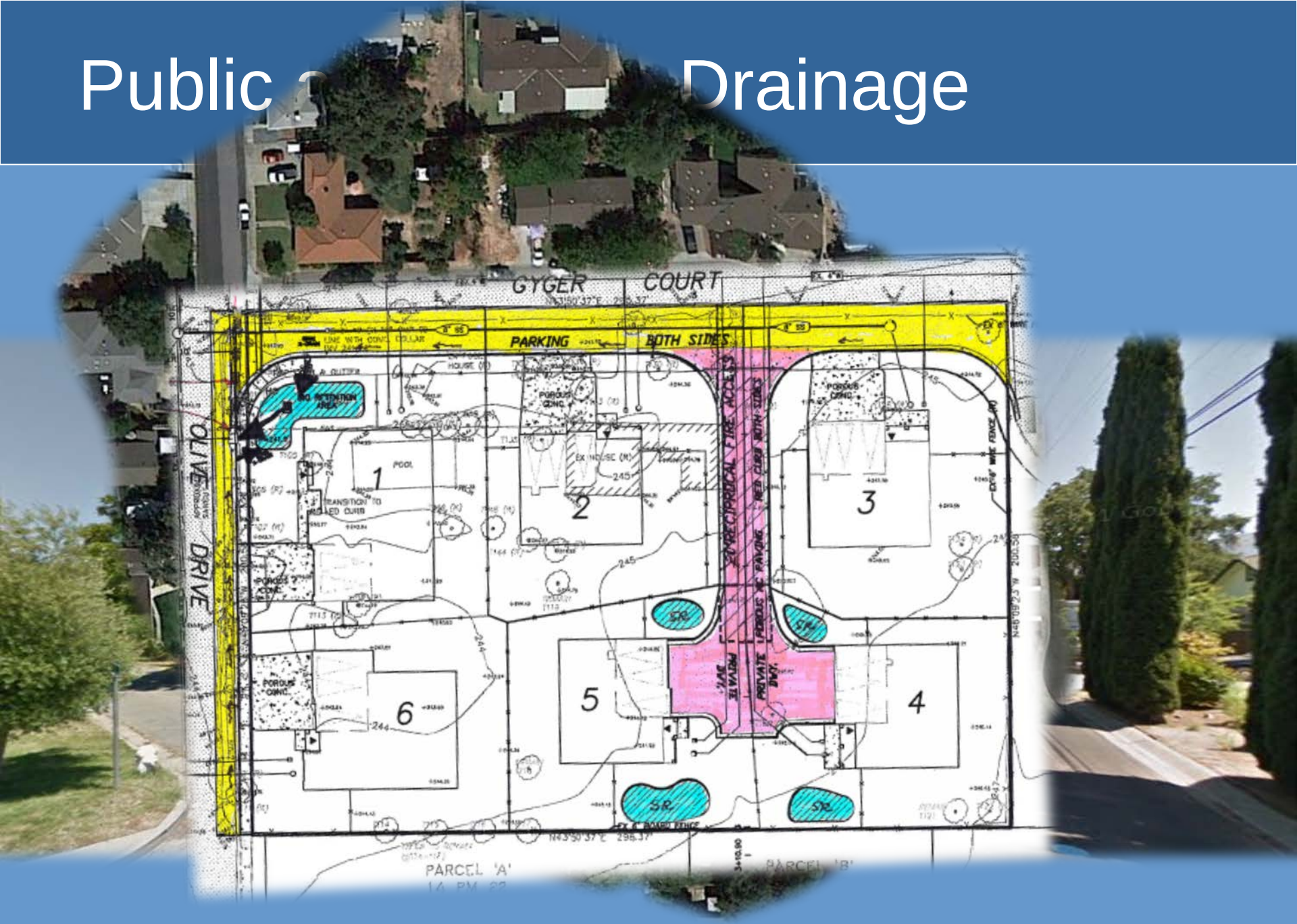
Issues: Green Infrastructure

- Municipalities are looking for opportunities to treat street drainage
- Policies for street frontage improvements
- Opportunities to offset untreated areas within private development
- Draining and treating runoff from public ROW on a private site
- Draining and treating runoff from private site within public ROW

Green Infrastructure in Frontage



Public [illegible] Drainage



Workshop Summary