# Preparing and Documenting Your LID Design

# For Stormwater Treatment and Flow Control

Dan Cloak Environmental Consulting December 14, 2010

Contra Costa Clean Water Program



#### **Topics**

- Principles for LID Site Design
- Drainage Management Areas
  - Delineation
  - Definition
  - Self-treating and Self-retaining DMAs
  - DMAs draining toIntegrated Management Practices
- IMP Selection and Design
- Setting up Calculations
- Using the IMP Calculator

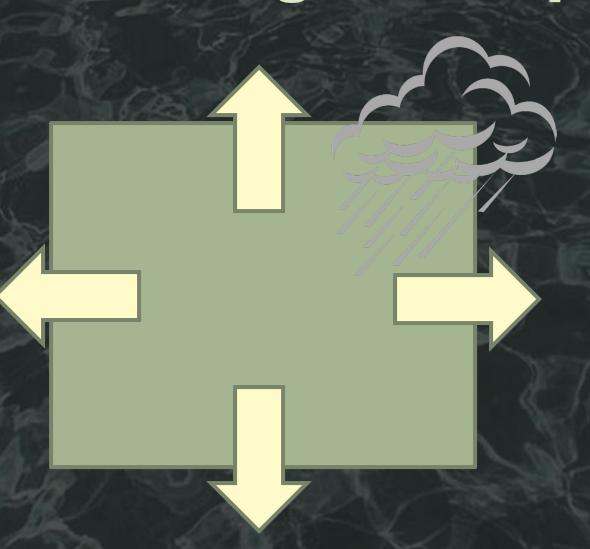


# LID Site Design Principles

Paved or Roof Area

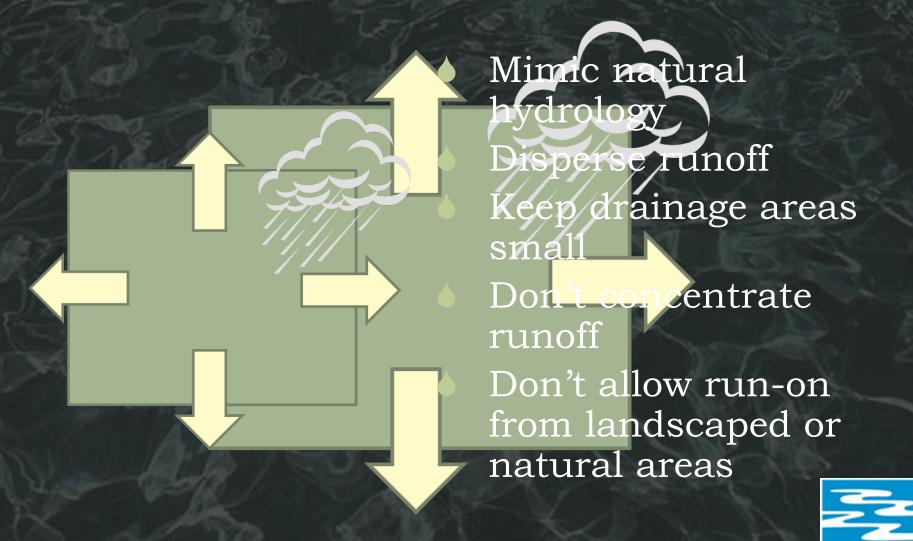


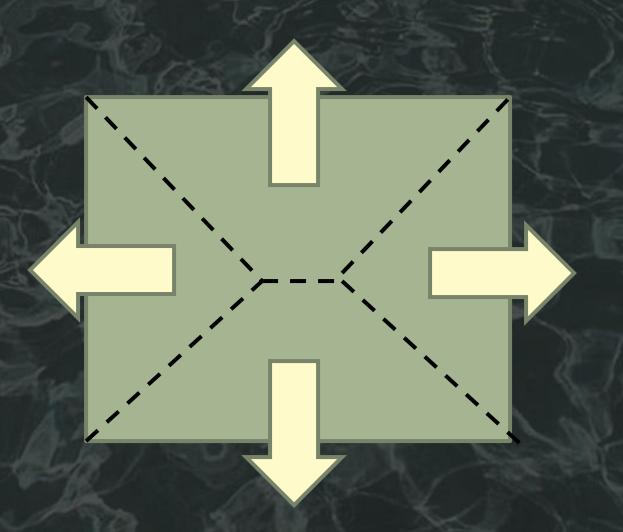
# LID Site Design Principles



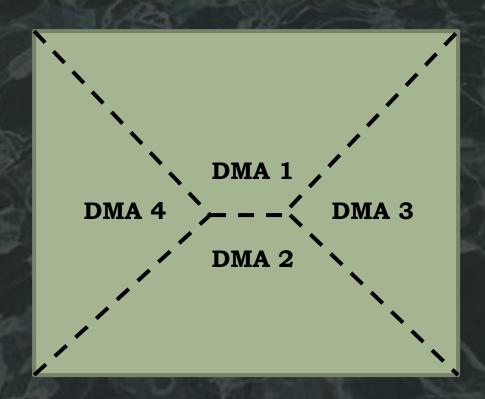


## LID Site Design Principles

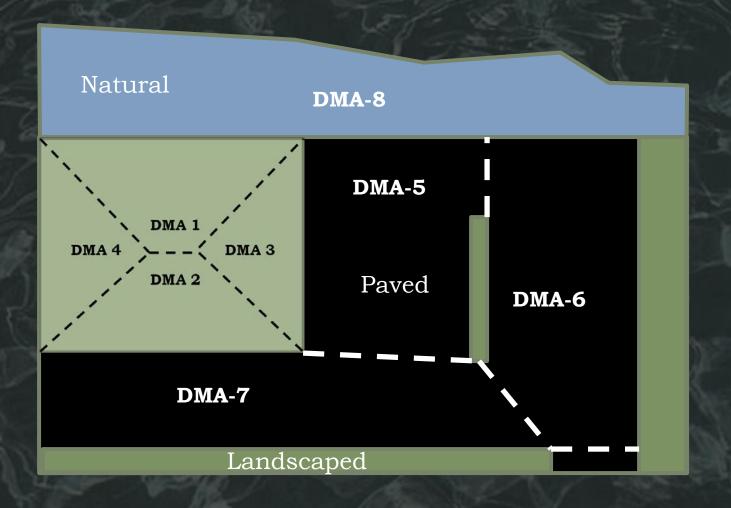




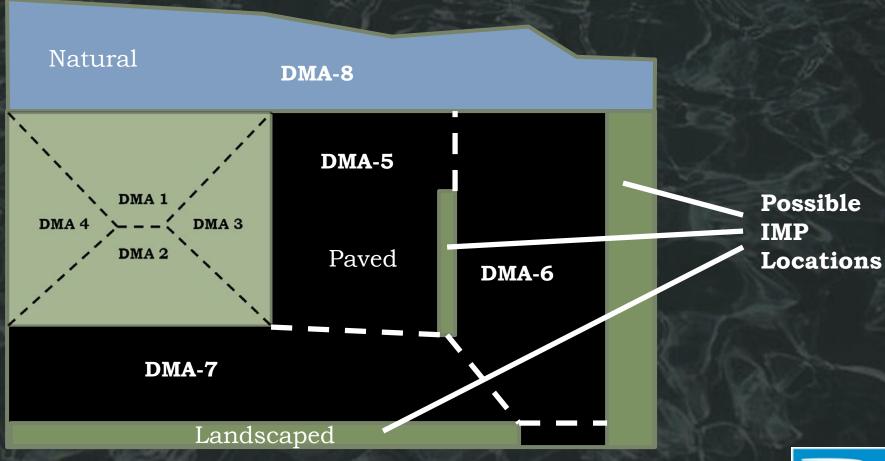






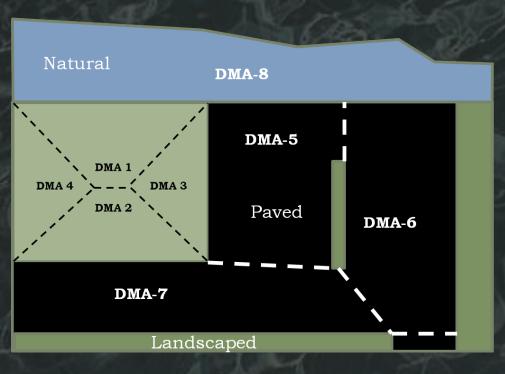








#### **Options – Pervious DMAs**

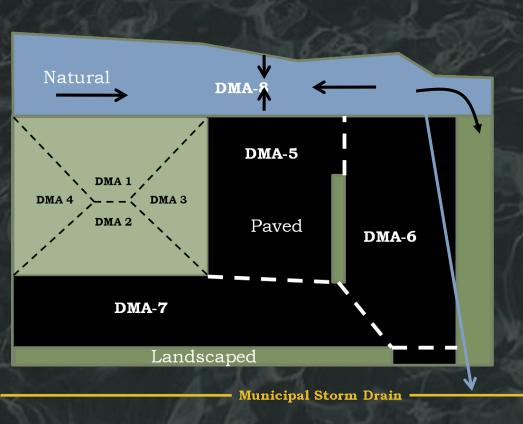


**Municipal Storm Drain** 

- ♦ DMA-8
  - Self-treating?
  - Self-retaining?
  - Drain to IMP?



#### DMA 8

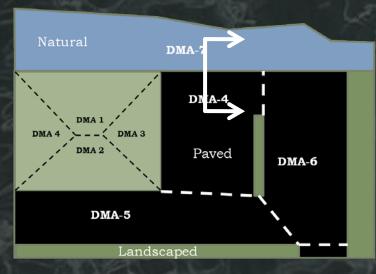


- Self-Treating
  - Drain directly to storm drain system
- Self-Retaining
  - Retain first inch of rainfall without producing runoff
- Drain to IMP
  - Use runoff factor to account for contribution

Best choice may depend on slope and relative elevation



#### **Details**



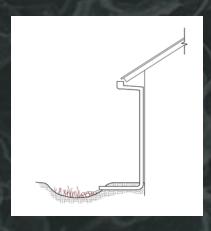
· Municipal Storm Drain

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"

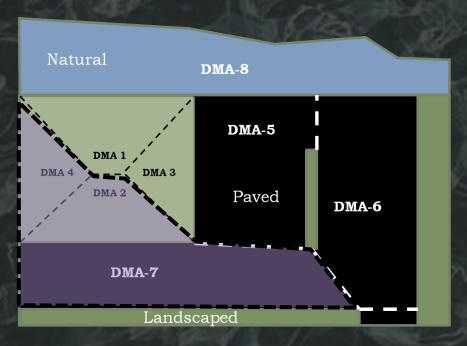




Consider that adjacent roofs or paved areas could drain to self-retaining areas (not to exceed 1:1)



### **Options – Combining DMAs**



**Municipal Storm Drain** 

Carefully follow grade breaks and roof ridges to delineate DMAs Option to combine DMAs if they have identical runoff factors (for example, roofs and paving) and drainage is routed to the same location.





#### Plan-checking DMAs

- Consistency with grading, paving, and architectural plans
  - Some municipalities require the stormwater compliance exhibit be drawn over a screen of the grading plan
- Sufficient head to ensure drainage across the DMA and from the DMA to the receiving IMP
- Follow-through in final design and during construction



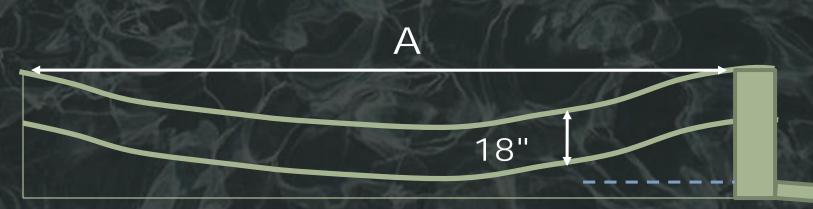
#### **IMPs**

- Integrated Management Practices
- Bioretention facilities
  - Applicable to most sites
- Flow-through planters
  - Bioretention without infiltration
  - Use on elevated plazas and near foundations
- Dry wells and infiltration basins
  - Good solution where soils are highly permeable
- Cisterns and vaults
  - Used in combination with bioretention



## Sizing Bioretention

- Treatment only
  - Sized to 4% of equivalent impervious area
  - Design to ensure entire treatment area is flooded prior to overflow
  - Class 2 perm layer provides some storage
  - Underdrain discharges directly to storm drain

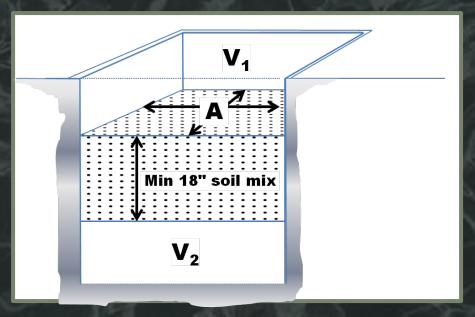




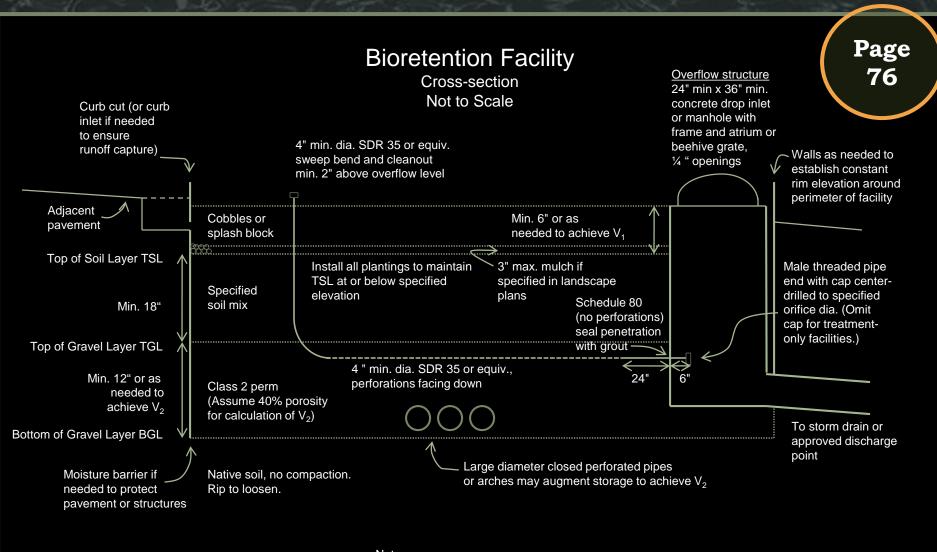
### Sizing Bioretention



- ♦ Treatment + Flow Control
  - $\blacksquare$  A, V<sub>1</sub> and V<sub>2</sub>
  - 12" surface depth and 18" deep gravel layer
  - Design flexibility if same volumes are achieved
  - Orifice limits maximum underdrain discharge







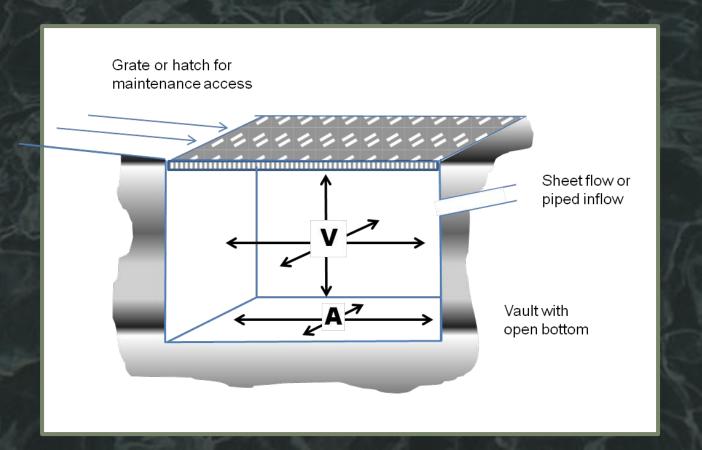
#### Notes:

- 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.
- Preferred elevation of perforated pipe underdrain is near top of gravel layer.
- See Appendix B for soil mix specification, planting and irrigation guidance.
- $\bullet\,$  See Chapter 4 for factors and equations used to calculate V<sub>1</sub>, V<sub>2</sub> and orifice diameter.

## Sizing Dry Wells

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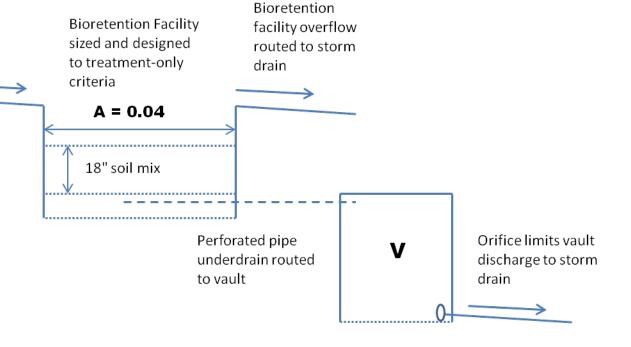
- ♦ Treatment + Flow Control
  - A and V





#### **Bioretention + Vault**

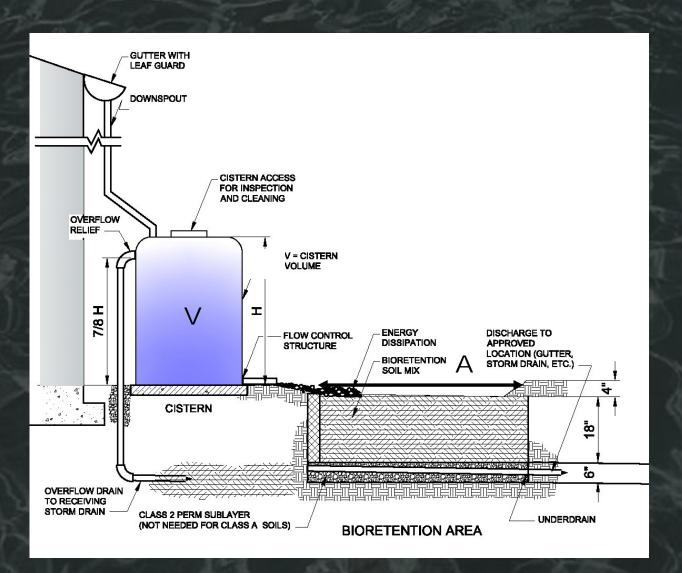
#### Bioretention + Vault Schematic



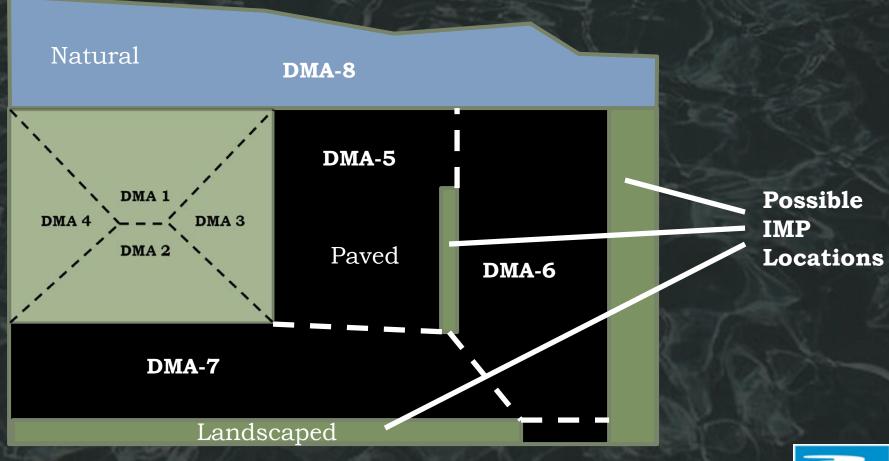


#### Cistern + Bioretention

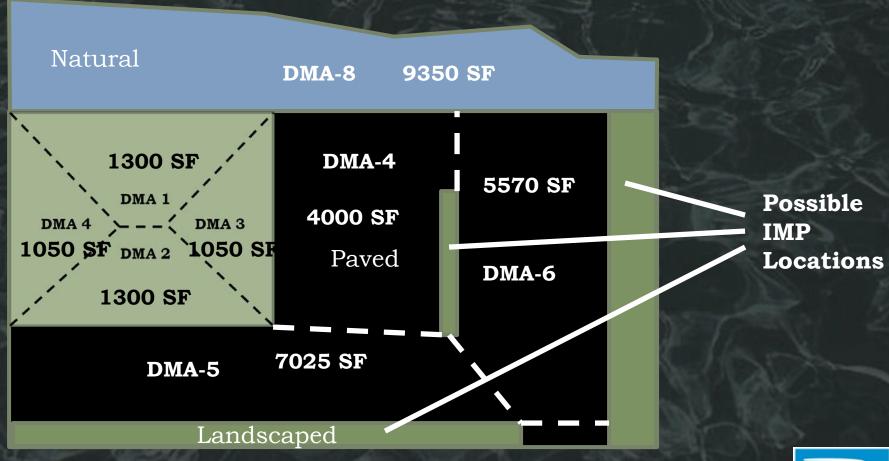
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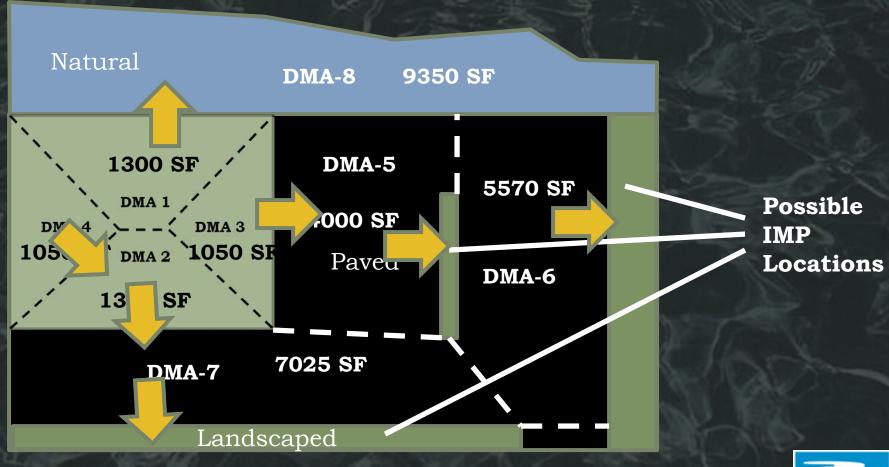














Self-retaining Area

DMA Name	Square Feet
DMA-8	9350

Area Draining to Self-retaining Area

DMA	Square Feet	Surface	Runoff Factor	Receiving DMA	Receiving Area
DMA-1	1300	Roof	1.0	DMA-8	9350

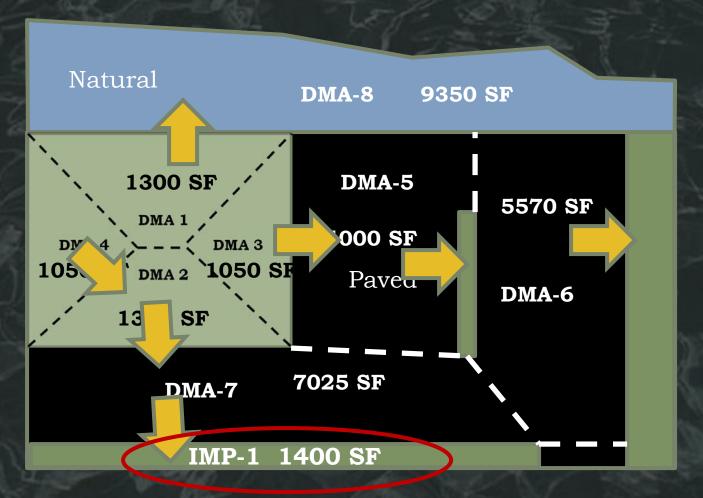


#### Areas Draining to IMPs

DMA	Area	Surfac e	Runoff Factor	Area × Runoff Factor	Soil Type			
DMA-2	1050	Roof	1.0	1050	D			
DMA-4	1300	Roof	1.0	1300				
DMA-7	7025	Paved	1.0	7025				
					IMP Sizing Factor	Rain Adjust Factor	Min Area or Volume	Proposed Area or Volume
				A				
				V1				
				V2				
				Orifice Si	ize:			

#### Areas Draining to IMPs

DMA	Area	Surface	Runoff Factor	Area x Runoff Factor	Soil Type			
DMA-2	1050	Roof	1.0	1050	D			
DMA-4	1300	Roof	1.0	1300				
DMA-7	7025	Paved	1.0	7025				
				9375	IMP Sizing Factor	Rain Adjust Factor	Min Area or Volume	Proposed Area or Volume
				A	0.06	1.0	562.5	
				V1	0.04	1.0	375.0	
				V2	0.05	1.0	468.8	
				Orifice Siz	e:			

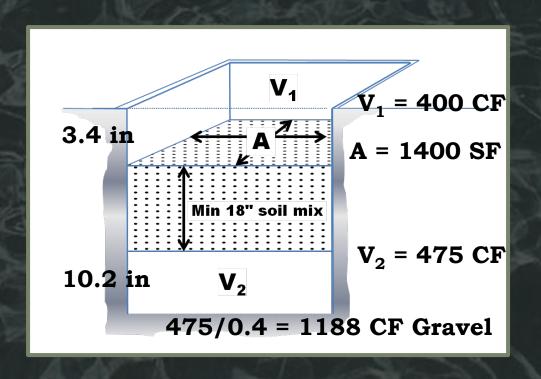




#### Areas Draining to IMPs

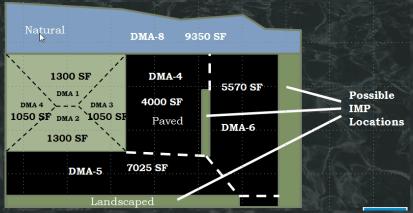
DMA	Area	Surface	Runoff Factor	Area x Runoff Factor	Soil Type			
DMA-2	1050	Roof	1.0	1050	D			
DMA-4	1300	Roof	1.0	1300				
DMA-7	7025	Paved	1.0	7025				
				9375	IMP Sizing Factor	Rain Adjust Factor	Min Area or Volume	Proposed Area or Volume
				A	0.06	1.0	562.5	1400
				V1	0.04	1.0	375.0	400
				V2	0.05	1.0	468.8	475
				Orifice Si		0.6 in.		

## Sizing Bioretention





	Α	В	С	
1				
2	DMA	SF	Surface	
3				
4	1	1300	Roof	
5	2	1050	Roof	
6	3	1300	Roof	
7	4	1050	Roof	
8	5	4000	Paved	
9	6	5570	Paved	
10	7	7025	Paved	
11	8	9350	Landscape	
12				
13				



File Tools Help				
Project Information				
All of the project information is required.	Please fill in all of the informa	ation before editing the	e DMAs and IMPs.	
Project Name			Design Goal	
Location			<ul><li>Treatment Plus Flow</li></ul>	Control
APN			Treatment Only	
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Location	ion	Your Town					Treatment Plus Flow	Control
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Location Your To		Treatment Only
APN 000-00-0		
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Drainage Management	Areas (DMAs) Integrated Management Practices (IMPs) Cal	culation Warnings(8)   Summary Report
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		NOTE: The DMA can drain only
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Post-project Surfac	ce Type Conventional Roof	•
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IM	P Type Bioretenti	on Facility	•			
Para	ameter Mini		Proposed			
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	cubic ft)	0	0			
	cubic ft)	0	0			Touris -
Orifice D	iameter (în)					
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