# The Contra Costa Approach: Low Impact Development for Stormwater NPDES Compliance

Dan Cloak, P.E.
Dan Cloak Environmental Consulting

# Topics

- Objectives of our approach
- Submittal requirements and resources for applicants
- Example LID design using the IMP Sizing Calculator

# Objectives of our approach

- Make it easier for applicants to prepare submittals
- Make it easier for municipal staff to review submittals for compliance
- Promote consistent and fair implementation countywide
- Integrate LID, treatment, and hydrograph modification management requirements

# *Stormwater C.3 Guidebook*

- Ordinances require a Stormwater Control Plan be submitted consistent with *Guidebook* criteria
- Resources to assist applicants
  - Step-by-step design procedure
  - Checklist for plan contents
  - Table of contents and format
  - Examples

# Recent Additional Resources

- Soils, plantings, and irrigation for bioretention facilities
- Construction checklist
- Sample O&M inspection report
- Two new Integrated Management Practice (IMP) designs
- Updated IMP Sizing Calculator

# LID Design Process

**Analyze Project for LID**

**Develop and Document LID Drainage Design**

**Specify LID Preliminary Design Details**

**Coordinate with Site Design and Landscape Design**

# Analyzing Projects for LID

1. Optimize the site layout
2. Use pervious surfaces
3. Disperse runoff
4. Drain to Facilities
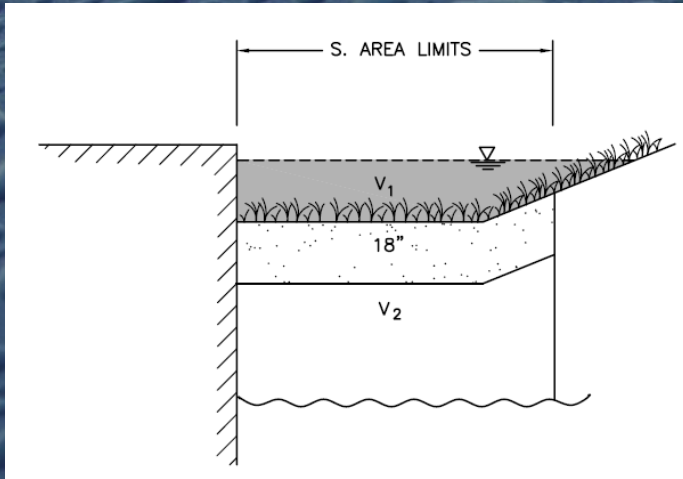   - Infiltration in "A" and "B" soils
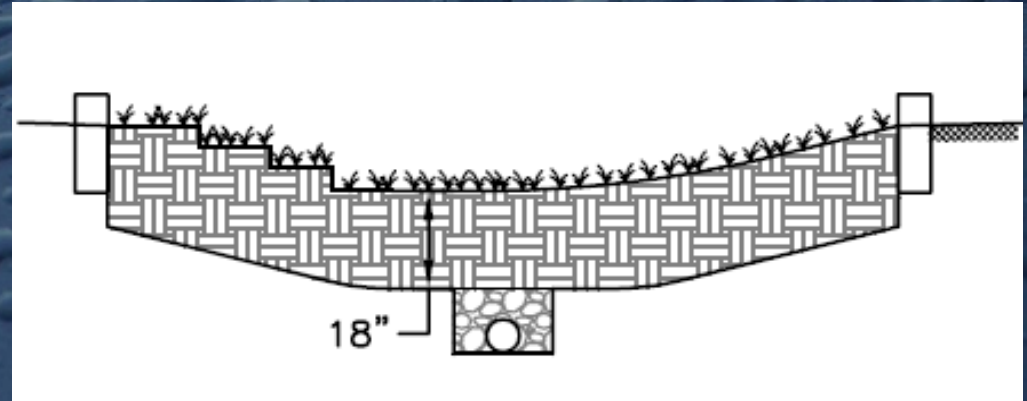   - Bioretention in "C" and "D" soils

# Bioretention for Flow Control
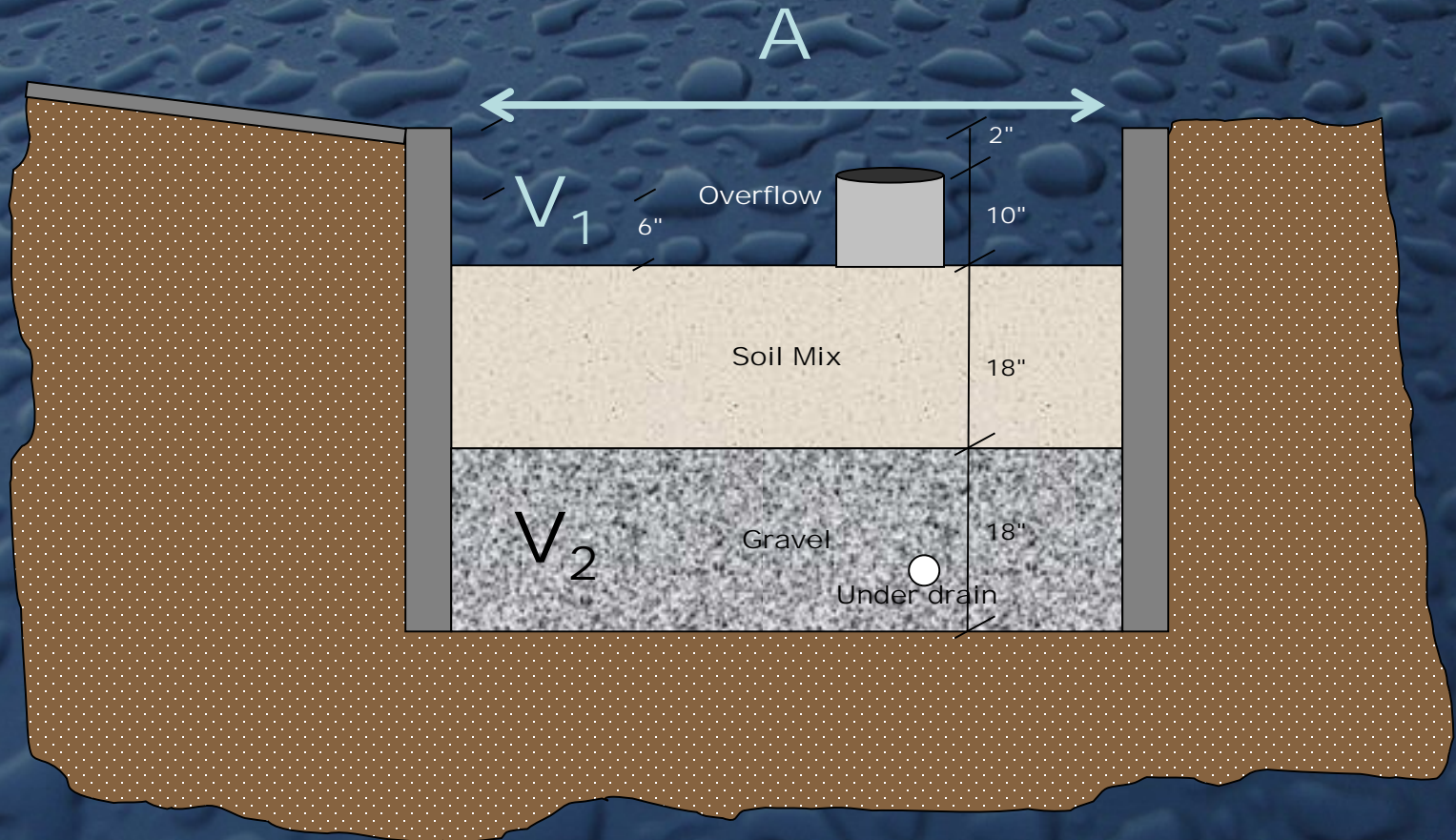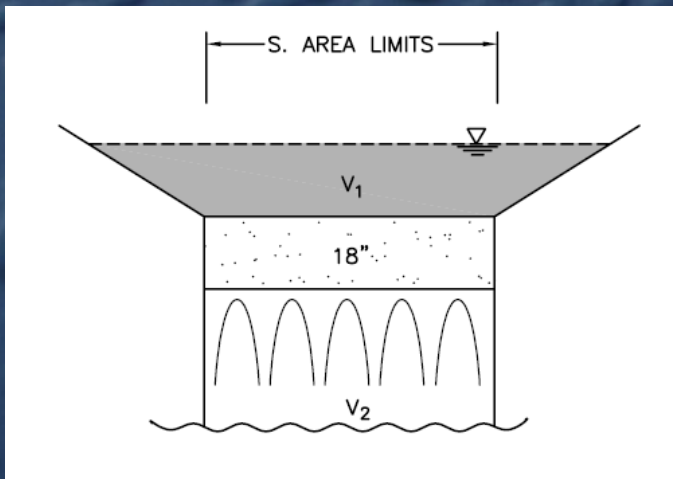
# Bioretention Design Options

Edge Treatments

Stepped-back side slope
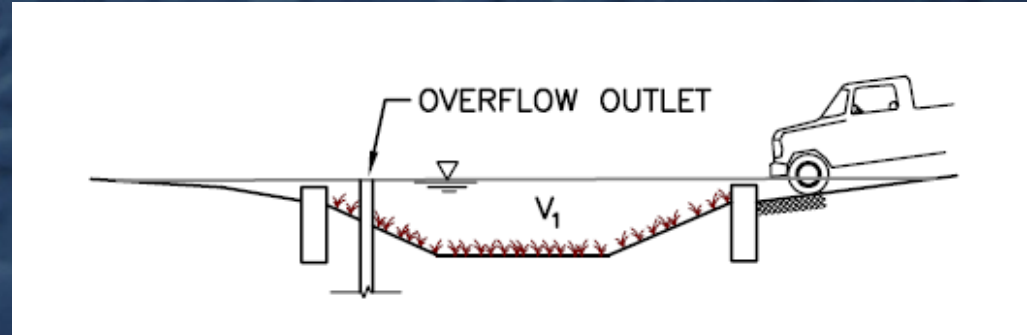


Subsurface Storage Options

Using Shallow Flooding for Storage

# Two New IMPs



BIORETENTION AREA



BIORETENTION WITH VAULT
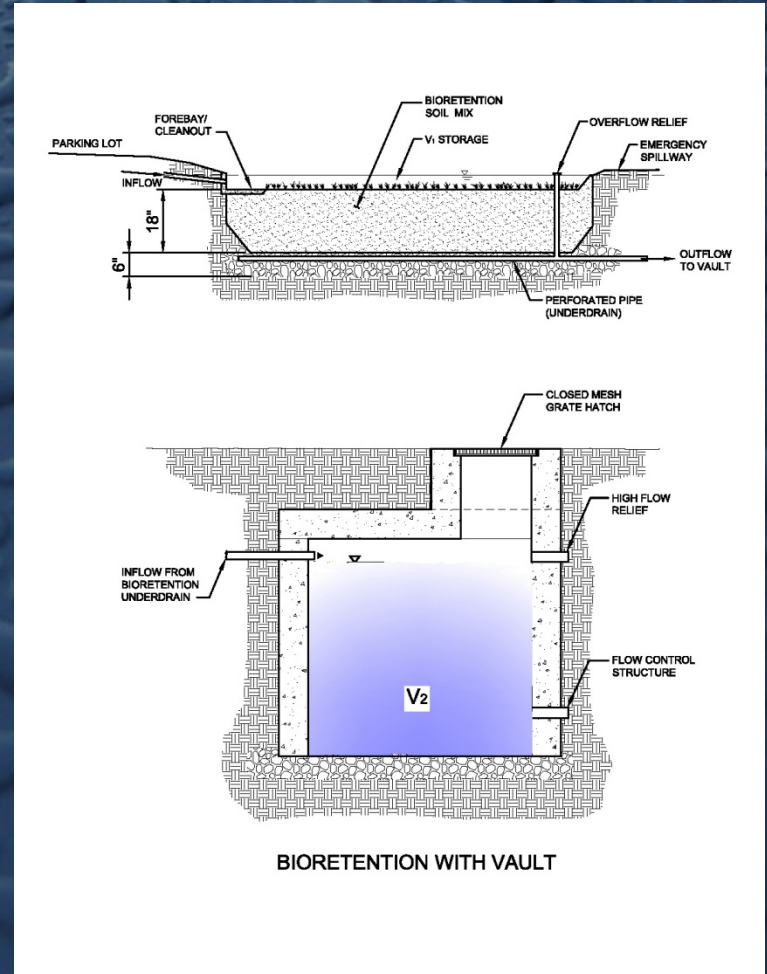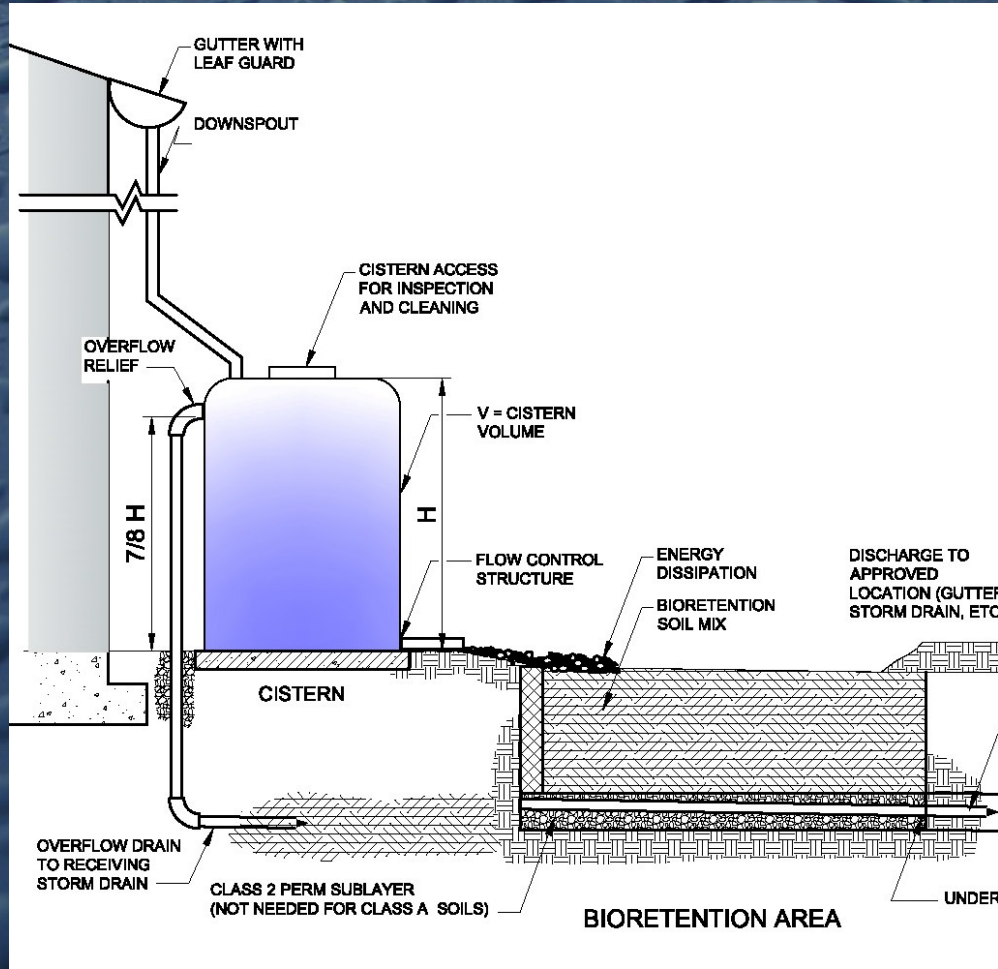
# Document Drainage Design

- Divide the entire site into drainage management areas (DMAs)

- Show how runoff from each DMA is routed

- Show facilities are sized adequately

# Sizing Calculator

- Used to design IMPs for treatment or treatment plus flow control (HMP compliance)
- Tracks Drainage Management Areas and IMPs
- Facilitates iterative calculations and "what if" scenarios
- Produces summary calculation report

Integrated Management Practice Calculator [Commercial.xml]

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   Commercial

Location   Base of Slope

APN   000-00-0000

Total Area   30530   sq ft      Mean Annual Precip   19   in

**Design Goal**
- ◉ Treatment Plus Flow Control
- ○ Treatment Only

Drainage Management Areas (DMAs) | Integrated Management Practices (IMPs) | Calculation Warnings(0) | Summary Report

| B1 | B2 | B3 | B4 |

NRCS Soil Group   D

IMP Type   Bioretention Facility

| Parameter | Minimum | Proposed |
|---|---|---|
| Area (sq ft) | 139 | 280 |
| Surface Volume, V1 (cubic ft) | 117 | 200 |
| Subsurface Volume, V2 (cubic ft) | 153 | 168 |
| Orifice Diameter (in) |  | 0.43 |

**Connected**

PAVE-2 ROOF-2

Add New IMP   Remove Current IMP   Rename Current IMP

**Total Area (Calculated)**

| Drainage Management Areas | 29445 | sq. ft. |
|---|---|---|
| Integrated Management Practices | 1085 | sq. ft. |
| Total | 30530 | sq. ft. |

Pave2

GB

Roof2

Pave1

of4   Roof1

Roof3

B4

e4

GB

B3
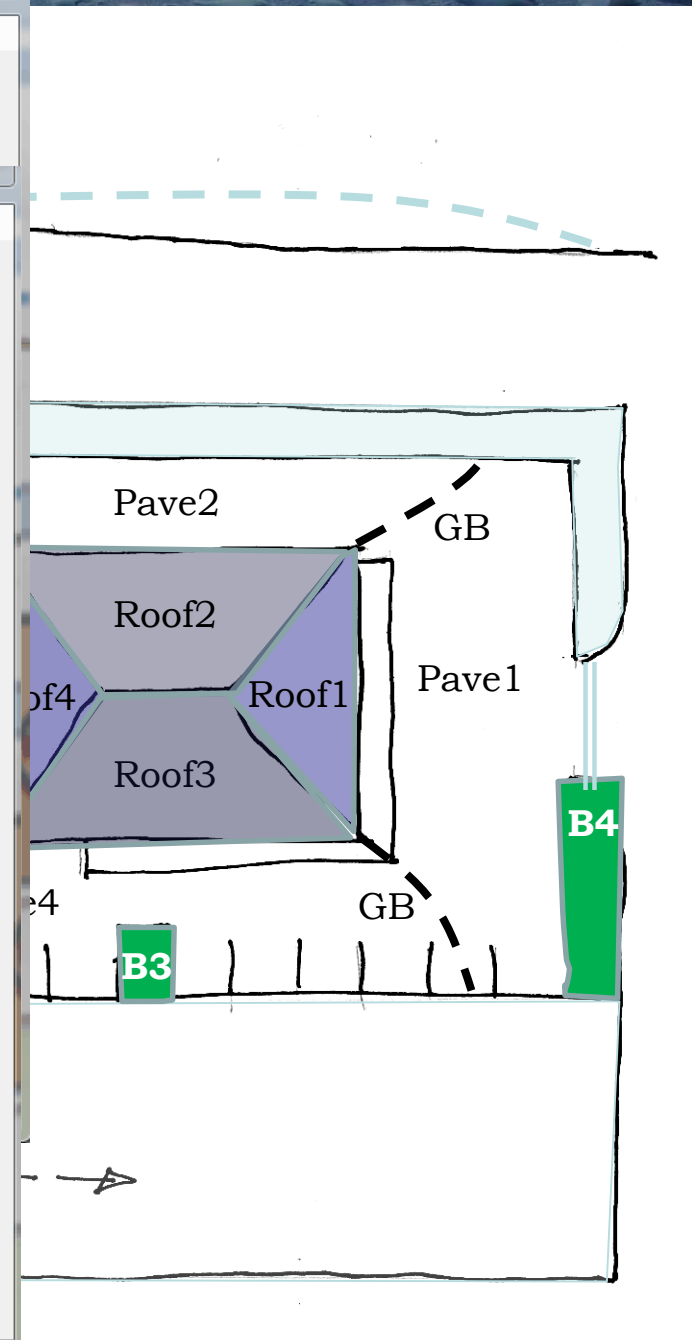
**Project Name: Commercial**
**Project Type: Treatment and Flow Control**
**APN: 000-00-0000**
**Drainage Area: 30,530**
**Mean Annual Precipitation: 19.0**

## Self-Treating DMAs

| DMA Name | Area (sq ft) |
|---|---|
| ST-1 | 11,600.0 |

## II. Self-Retaining Areas

| Self-Retaining DMA | |
|---|---|
| DMA Name | Area (sq ft) |
| SR-1 | 2,750 |
| SR-2 | 2,320 |

## IV. Areas Draining to IMPs

**IMP Name: B1**
**IMP Type: Bioretention Facility**
**Soil Group: B1**

| DMA Name | Area (sq ft) | Post Project Surface Type | DMA Runoff Factor | DMA Area x Runoff Factor |
|---|---|---|---|---|
| PAVE-2 | 1,950 | Concrete or Asphalt | 1.00 | 1,950 |
| ROOF-2 | 700 | Conventional Roof | 1.00 | 700 |
| | | | Total | 2,650 |

**IMP Sizing**

| | IMP Sizing Factor | Rain Adjustment Factor | Minimum Area or Volume | Proposed Area or Volume |
|---|---|---|---|---|
| Area | 0.050 | 1.053 | 139 | 280 |
| Surface Volume | 0.042 | 1.053 | 117 | 200 |
| Subsurface Volume | 0.055 | 1.053 | 153 | 168 |
| Maximum Underdrain Flow (cfs) | | | | 0.00 |
| Orifice Diameter (in) | | | | 0.43 |

**IMP Name: B2**
**IMP Type: Bioretention + Vault**
**Soil Group: B2**

| DMA Name | Area (sq ft) | Post Project | DMA Runoff | DMA Area x |
|---|---|---|---|---|

| | | Surface Type | Factor | Runoff Factor | IMP Sizing | | | |
|---|---|---|---|---|---|---|---|---|
| LS-1 | 537 | Landscape | 0.70 | 376 | **IMP Sizing Factor** | **Rain Adjustment Factor** | **Minimum Area or Volume** | **Proposed Area or Volume** |
| PAVE-3 | 2,690 | Concrete or Asphalt | 1.00 | 2,690 | | | | |
| ROOF-4 | 550 | Conventional Roof | 1.00 | 550 | | | | |
| | | | **Total** | 3,616 | | | | |
| | | | | **Area** | 0.040 | 1.000 | 145 | 250 |
| | | | | **Volume** | 0.064 | 1.053 | 244 | 244 |
| | | | | | | | **Maximum Underdrain Flow (cfs)** | 0.01 |
| | | | | | | | **Orifice Diameter (in)** | 0.37 |

**IMP Name: B3**
**IMP Type: Bioretention + Vault**
**Soil Group: B3**

| DMA Name | Area (sq ft) | Post Project Surface Type | DMA Runoff Factor | DMA Area x Runoff Factor | IMP Sizing | | | |
|---|---|---|---|---|---|---|---|---|
| PAVE-4 | 2,310 | Concrete or Asphalt | 1.00 | 2,310 | **IMP Sizing Factor** | **Rain Adjustment Factor** | **Minimum Area or Volume** | **Proposed Area or Volume** |
| ROOF-3 | 700 | Conventional Roof | 1.00 | 700 | | | | |
| | | | **Total** | 3,010 | | | | |
| | | | | **Area** | 0.040 | 1.000 | 120 | 150 |
| | | | | **Volume** | 0.064 | 1.053 | 203 | 220 |
| | | | | | | | **Maximum Underdrain Flow (cfs)** | 0.01 |
| | | | | | | | **Orifice Diameter (in)** | 0.33 |

**IMP Name: B4**
**IMP Type: Bioretention Facility**
**Soil Group: B4**

| DMA Name | Area (sq ft) | Post Project Surface Type | DMA Runoff Factor | DMA Area x Runoff Factor | IMP Sizing | | | |
|---|---|---|---|---|---|---|---|---|
| PAVE-1 | 2,788 | Concrete or Asphalt | 1.00 | 2,788 | **IMP Sizing Factor** | **Rain Adjustment Factor** | **Minimum Area or Volume** | **Proposed Area or Volume** |
| ROOF-1 | 550 | Conventional Roof | 1.00 | 550 | | | | |
| | | | **Total** | 3,338 | | | | |

|  | | | |
|---|---|---|---|
| **Area** | 0.050 | 1.053 | 176 | 405 |
| **Surface Volume** | 0.042 | 1.053 | 148 | 200 |
| **Subsurface Volume** | 0.055 | 1.053 | 193 | 246 |
| **Maximum Underdrain Flow (cfs)** | | | | 0.01 |
| **Orifice Diameter (in)** | | | | 0.49 |

Report generated on 10/26/2009 12:00:00 AM by the Contra Costa Clean Water Program IMP Sizing Tool software (version 1.2.1.0).

# Some Lessons Learned

- Use the expertise of municipal staff and the land development community
- Adopt an iterative approach to creating guidance and criteria
- People like rules and puzzles that can be solved