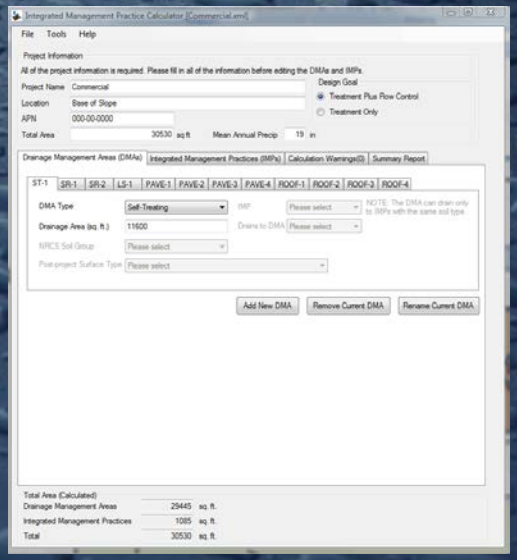


Using the IMP Sizing Calculator

Dan Cloak, P.E.
Principal
Dan Cloak Environmental Consulting

Topics

- Resources
- Approach and Sizing Equations
- Example Project
- Practice Session

Resources

- *Stormwater C.3 Guidebook* (4th Edition)
- October 2009 Supplement
  - Design sheets for two new IMPs
  - Sizing factors and equations for all IMPs
- IMP Sizing Calculator Help File
- IMP Sizing Calculator
- Example Design

Sizing IMPs Manually

DMA Name	*DMA Area (square feet)*	*Post-project surface type*	*DMA Runoff factor*	*DMA Area × runoff factor*
			Total	

Soil Type:	*IMP Name*

IMP Sizing factor	*Rain Adjustment Factor*	*Minimum Area or Volume*	*Proposed Area or Volume*	
				IMP Area
				V or V1
				V2
			Orifice Size:	

Factors and Equations

Help File

- Background on IMPs and Sizing
- Preliminary LID Design
- How to Enter Project Information
  - Project Name, Location, Total Area
  - Drainage Management Areas
  - Integrated Management Practices
- Saving and Opening Projects
- Using the Calculator as a Design Aid

Example Project

Commercial development at the base of a slope

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: 30535 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(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: Drains to IMP

IMP: B2

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

Drainage Area (sq. ft.): 537

Drains to DMA: Please select

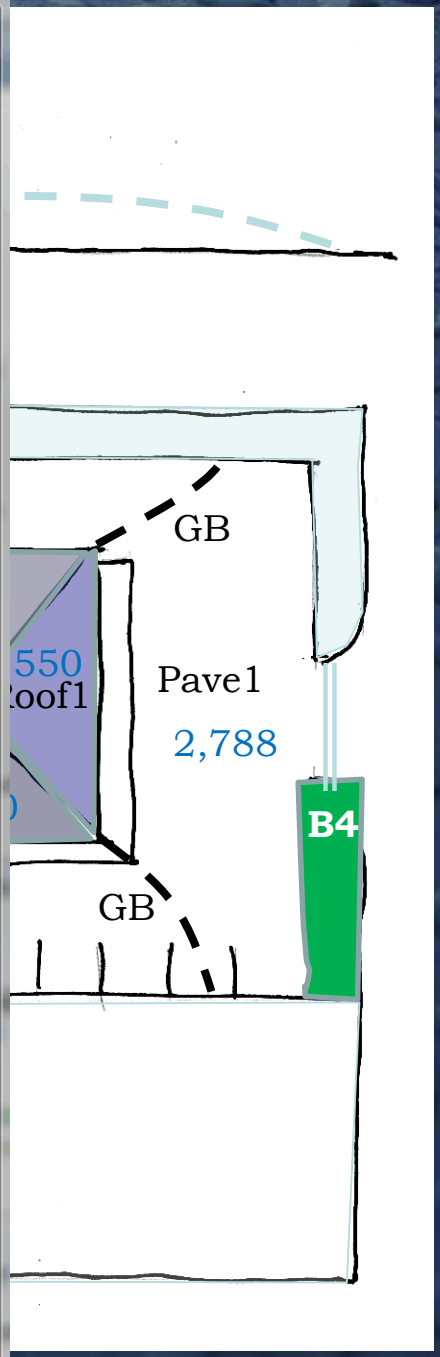
NRCS Soil Group: D

Post-project Surface Type: Landscape

Add New DMA | Remove Current DMA | Rename Current DMA

Total Area (Calculated)

Drainage Management Areas	29445	sq. ft.
Integrated Management Practices	1015	sq. ft.
Total	30460	sq. ft.



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: 30535 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(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: Drains to IMP

IMP: B2

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

Drainage Area (sq. ft.): 550

Drains to DMA: Please select

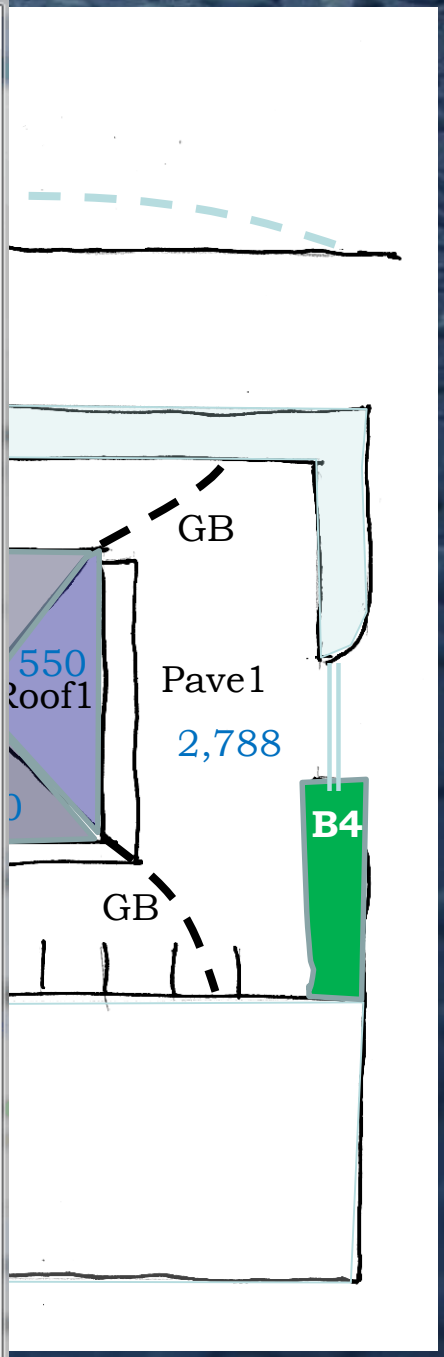
NRCS Soil Group: D

Post-project Surface Type: Conventional Roof

Add New DMA | Remove Current DMA | Rename Current DMA

Total Area (Calculated)

Drainage Management Areas	29445	sq. ft.
Integrated Management Practices	1015	sq. ft.
Total	30460	sq. ft.



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: 30535 sq ft

Mean Annual Precip: 19 in

Design Goal

- (•) Treatment Plus Flow Control
- ( ) Treatment Only

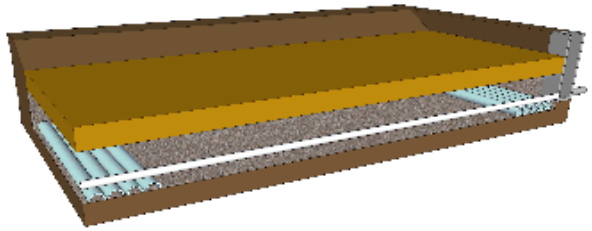
Drainage Management Areas (DMAs) | Integrated Management Practices (IMPs) | Calculation Warnings(6) | Summary Report

B1 | B2 | B3 | B4

NRCS Soil Group: D

IMP Type: Bioretention Facility

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



Connected

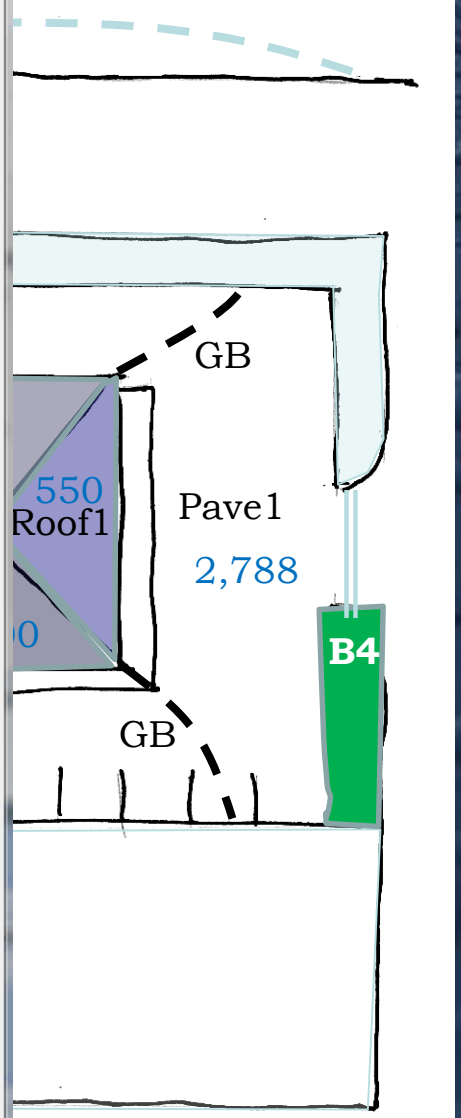
ROOF-2 PAVE-2

Connect IMP | Disconnect Selected IMP

Add New IMP | Remove Current IMP | Rename Current IMP

Total Area (Calculated)

Drainage Management Areas	29445	sq. ft.
Integrated Management Practices	1015	sq. ft.
Total	30460	sq. ft.



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: 30535 sq ft

Mean Annual Precip: 19 in

Design Goal

- (•) Treatment Plus Flow Control
- ( ) Treatment Only

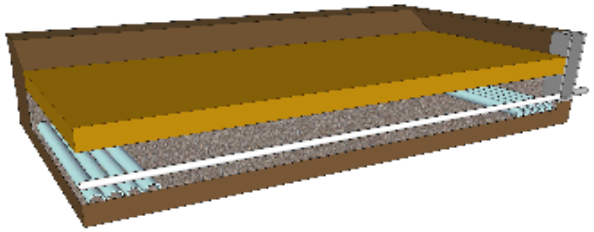
Drainage Management Areas (DMAs) | Integrated Management Practices (IMPs) | Calculation Warnings(6) | Summary Report

B1 | B2 | B3 | B4

NRCS Soil Group: D

IMP Type: Bioretention Facility

Parameter	Minimum	Proposed
Area (sq ft)	190	180
Surface Vol, V1 (cubic ft)	160	90
Subsurface Vol, V2 (cubic ft)	209	108
Orifice Diameter (in)		0.52



Connected

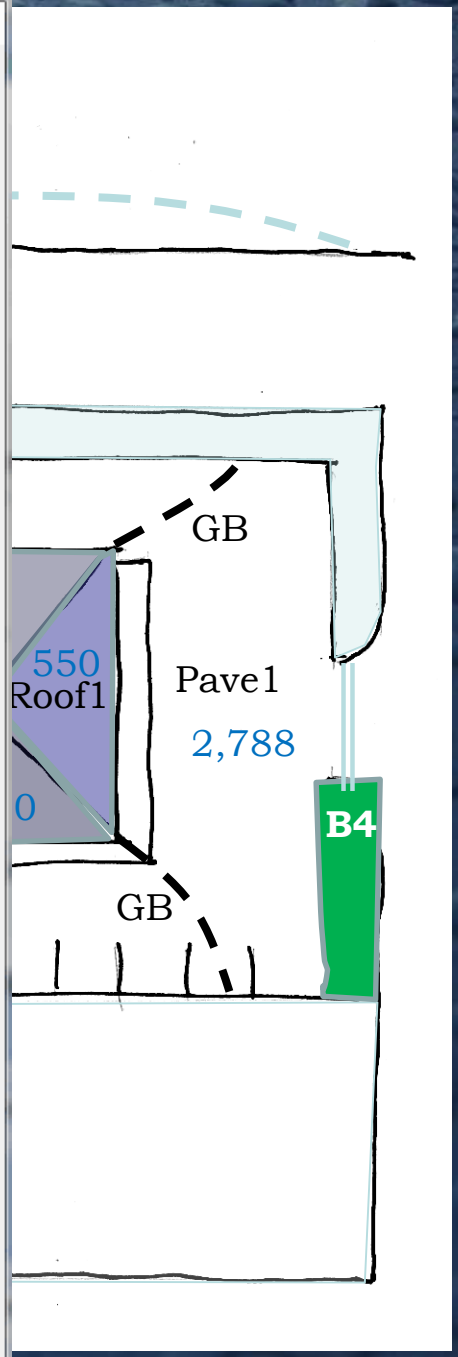
LS-1 PAVE-3 ROOF-4

Connect IMP | Disconnect Selected IMP

Add New IMP | Remove Current IMP | Rename Current IMP

Total Area (Calculated)

Drainage Management Areas	29445	sq. ft.
Integrated Management Practices	1015	sq. ft.
Total	30460	sq. ft.



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**
0.050	1.053	139	280
0.042	1.053	117	200
0.055	1.053	153	168

Area
Surface Volume
Subsurface Volume

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

Exercises

1. Identify and execute one or more solutions to the B3 warning that involve changing the connectivity of drainage areas to IMPs.
2. Identify and execute one or more solutions to the B2 warning that involve changing IMP types.

Solution to Exercise #1

- Remove grade break and redesign grading
- Redirect runoff from DMAs ROOF-3 and PAVE-4 to IMP B4

Integrated Management Practice Calculator [Commercial_Solutions.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: 30535 sq ft Mean Annual Precip: 19 in

Design Goal
- (•) Treatment Plus Flow Control
- ( ) Treatment Only

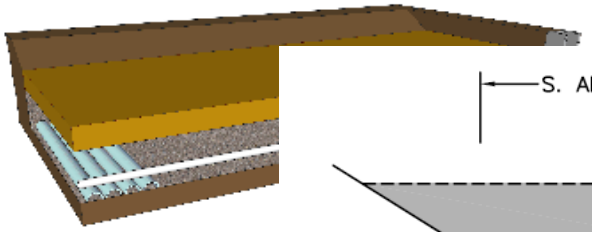
Drainage Management Areas (DMAs) | Integrated Management Practices (IMPs) | Calculation Warnings(4) | Summary Report

B1 | B2 | B4

NRCS Soil Group: D

IMP Type: Bioretention Facility

Parameter	Minimum	Proposed
Area (sq ft)	334	405
Surface Vol, V1 (cubic ft)	281	300
Subsurface Vol, V2 (cubic ft)	368	350
Orifice Diameter (in)		0.67

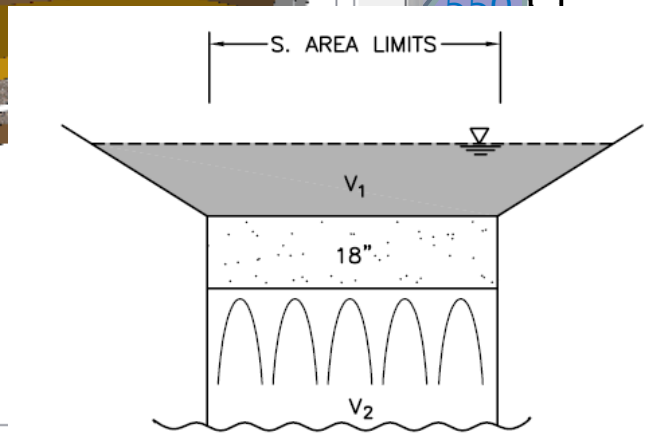


Connected

PAVE-1 ROOF-1 PAVE-4 ROOF-3

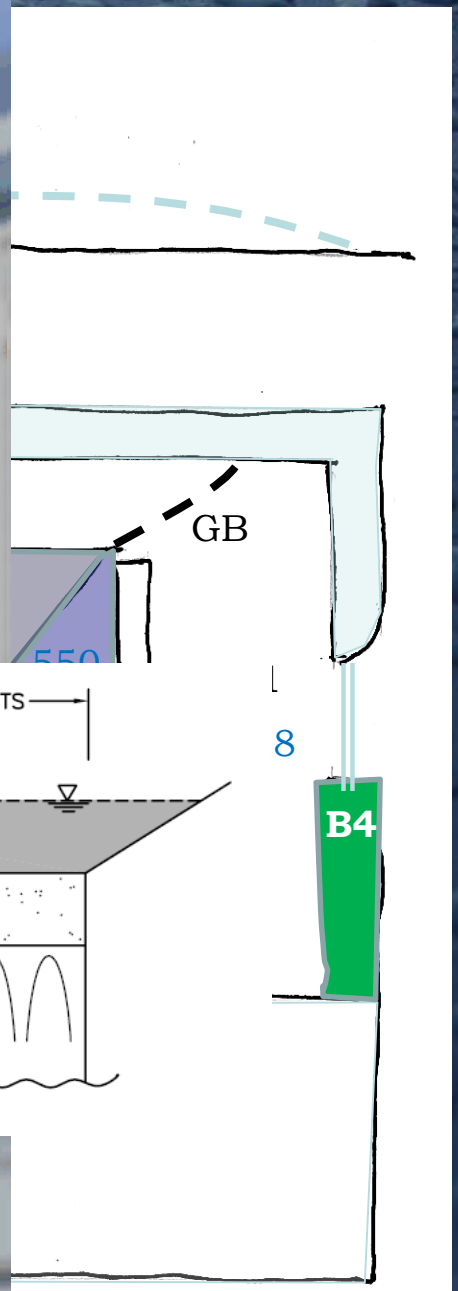
Connect IMP | Disconnect Selected IMP

Add New IMP | Remove Cur



Total Area (Calculated)

Drainage Management Areas	29445	sq. ft.
Integrated Management Practices	865	sq. ft.
Total	30310	sq. ft.



Solution to Exercise #2

- Change IMP B2 type to Bioretention + Vault

Integrated Management Practice Calculator [Commercial_Solutions.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: 30535 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(1) | Summary Report

B1 | B2 | B4

NRCS Soil Group: D

IMP Type: Bioretention + Vault

Parameter	Minimum	Proposed
Bioretention Area (sq ft)	145	180
Vault Volume (cubic ft)	244	244
Orifice Diameter (in)		0.37

Connected

LS-1 PAVE-3 ROOF-4

Connect IMP | Disconnect Selected IMP

Add New IMP

Total Area (Calculated)

Drainage Management Areas	29445	sq. ft.
Integrated Management Practices	865	sq. ft.
Total	30310	sq. ft.