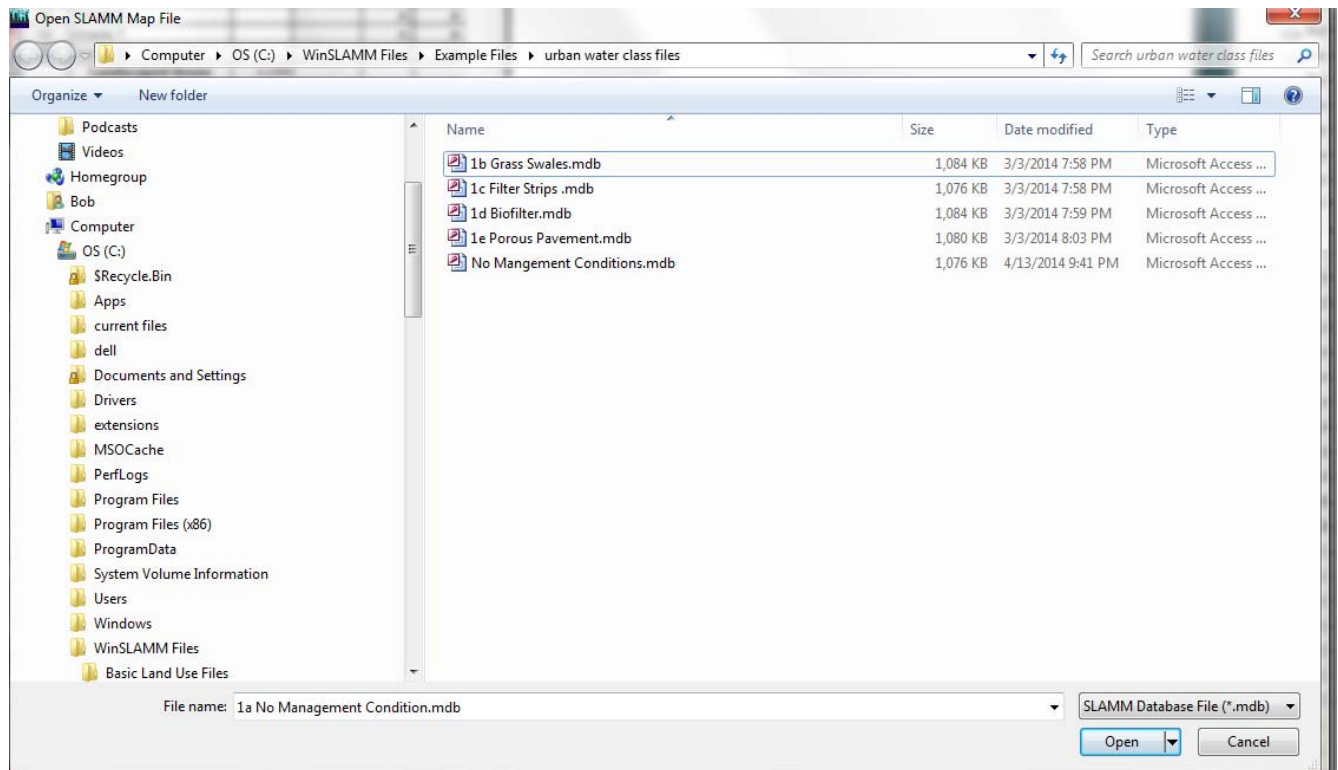


Grass Swale Example

Grass Swale Example

For this example, we will start with the model file we created for No Controls and add grass swales. All of the source areas in the Commercial 1 Land Use will be routed to the grass swales.

Open the No Controls model file and Save the File with a new name.



Change the Site Description in the Current File Data to reflect the grass swales.

Grass Swale Example

Current File Data

SLAMM Data File Name:
C:\WinSLAMM Files\Example Files\urban water class files\Grass swales.mdb

Site Descript.: Grass swales, commercial development

Edit Seed: -42

Edit Rain File: C:\WinSLAMM Files\Rain Files\AL Birmingham 8799.RAN

Edit Start Date: 01/01/94 ☐ Winter Season Range
Edit End Date: 12/31/98 Start of Winter (mm/dd) End of Winter (mm/dd)

Edit Pollutant Probability Distribution File: C:\WinSLAMM Files\SouthEast April 05 2014.ppd

Edit Runoff Coefficient File: C:\WinSLAMM Files\SouthEast April 05 2014.rsvx

Edit Particulate Solids Concentration File: C:\WinSLAMM Files\SouthEast April 05 2014.pscx

Edit Street Delivery File (Select LU)
☒ Residential LU ☐ Other Urban LU
☐ Institutional LU ☐ Freeways
☐ Commercial LU
☐ Industrial LU
Change all Street Delivery Files to Match the Current File

Edit Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\PSD source area SSC.csv

Use Cost Estimation Option ☒ **Select Cost Data File** C:\WinSLAMM Files\Birmingham Cost Data.csv

Replace Default Values with these Current File Data Values Use Default Values Replace all Particle Size Distribution Files with the Program Default file(s) Cancel Continue

Disconnect the map network and add the Grass Swale control measure. Reconnect the network.

Grass Swale Example

WinSLAMM v 10 Data File: [C:\WinSLAMM Files\Example Files\urban water class files\Grass swales.mdb] - [Land Use Model]

File Current File Data Pollutants Tools Run Utilities Help

RES INS COM IND OU FRE GS CB WP BF MF HD OD FS

Land Use:

Commercial 1

Source Area #	Source Area	Area (acres)	Source Area Parameters	First Control Practice	Second Control Practice
39	Streets 3				
40	Streets 4				
41	Streets 5				
42	Streets 6				
43	Streets 7				
44	Streets 8				
Landscaped Areas		3.270			
45	Large Landscaped Areas 1	2.140	Entered	--	--
46	Large Landscaped Areas 2				
47	Large Landscaped Areas 3				
48	Large Landscaped Areas 4				
49	Large Landscaped Areas 5				
50	Large Landscaped Areas 6				
51	Small Landscaped Areas 1	0.630	Entered	--	--
52	Small Landscaped Areas 2	0.500	Entered	--	--
53	Small Landscaped Areas 3				
54	Small Landscaped Areas 4				
55	Small Landscaped Areas 5				
56	Small Landscaped Areas 6				
57	Undeveloped Areas 1				
58	Undeveloped Areas 2				
59	Undeveloped Areas 3				
60	Undeveloped Areas 4				
61	Undeveloped Areas 5				
62	Undeveloped Areas 6				
Other Areas		0.000			
63	Paved Playground 1				
64	Paved Playground 2				
65	Paved Playground 3				
66	Paved Playground 4				
67	Paved Playground 5				

Land Use #	Land Use Type	Land Use Label	Land Use Area (acres)
1	Commercial	Commercial 1	7.290

CP #	Control Practice Type	Control Practice Name or Location
1	Grass Swales	DS Grass Swales # 1

Current File Data Entered Total Area = 7.290 acres No Upstream Source Areas LU# = 1 Index Number = 1 Remaining Icons = 253 Start Date: 01/01/94 End Date: 12/31/98


```

graph TD
    Commercial1[Commercial 1] --> Junction2((Junction 2))
    Junction2 --> GS[DS Grass Swales #1]
    GS --> Junction1((Junction 1))
    Junction1 --> Outfall[Outfall]
  
```

Grass Swale Example

Double click on the Grass Swale label to open the form. Enter the data shown below.

Note: when moving through the Grass Swale form, press the "Enter" key to move to the next cell, not the "Tab" key.

 **Grass Swales** X

Drainage System Control Practice **Grass Swale Number 1**

Grass Swale Data	
Total Drainage Area (ac)	7.290
Fraction of Drainage Area Served by Swales (0-1)	1.00
Swale Density (ft/ac)	230.86
Total Swale Length (ft)	1683
Average Swale Length to Outlet (ft)	313
Typical Bottom Width (ft)	3.0
Typical Swale Side Slope (__ ft H : 1 ft V)	4.0
Typical Longitudinal Slope (ft/ft, V/H)	0.010
Swale Retardance Factor	D ▼
Typical Grass Height (in)	4.0
Swale Dynamic Infiltration Rate (in/hr)	0.250
Typical Swale Depth (ft) for Cost Analysis (Optional)	2.0

☒ Use Total Swale Length Instead of Swale Density for Infiltration Calculations

Total area served by swales (acres): 7.290
Total area (acres): 7.290

Select Particle Size Distribution File

Particle Size Distribution File Name

Not needed - calculated by program

View Retardance Table

Select Swale Density by Land Use

☐ Low density residential - 240 ft/ac
☐ Medium density residential - 350 ft/ac
☐ High density residential - 375 ft/ac
☐ Strip commercial - 410 ft/ac

☐ Shopping center - 90 ft/ac
☐ Industrial - 260 ft/ac
☐ Freeways (shoulder only) - 480 ft/ac
☐ Freeways (center and shoulder) - 540 ft/ac

Copy Swale Data

Paste Swale Data

Delete

Cancel

Continue

Control Practice # : 1 CP Index # : 1

Grass Swale Example

Please Note: There must be no spaces prior to the filename and path shown in the Particle Size Distribution cell. Since the particle sizes are being routed through the drainage system, this field is greyed out and not used.

Run the model.

Results

Years in model run: 4.98 (5 years)
 Runoff Volume without controls: 3,181,000 ft³ for 5 years
 Outfall Total with controls: 2,541,000 ft³ for 5 years (510,625 ft³ per year)
 Runoff Volume Percent Reduction: 20.1%
 Particulate Solids Concentration (with controls): 40 mg/L
 Particulate Solids Yield (with controls): 1,269 lbs/yr
 Particulate Solids Percent Reduction: 53.0%
 Rv (with controls): 0.35
 Approx. Urban Stream Classification: Poor (even with runoff volume reduction)
 Total Phosphorus Concentration (with controls): 0.89
 Total Phosphorus Yield (with controls): 143 lbs/5 yrs
 Total Phosphorus Yield Percent Reduction: 44.6%
 Annualized Value of all costs: \$4,583

Land Uses	Junctions	Control Practices	Outfall	Output Summary
File Name: C:\WinSLAMM Files\Example Files\urban water class files\Grass swales.mdb				
Outfall Output Summary				
	Runoff Volume (cu. ft.)	Percent Runoff Reduction	Runoff Coefficient (Rv)	Particulate Solids Conc. (mg/L)
Total of All Land Uses without Controls	3.181E+06		0.43	67.67
Outfall Total with Controls	2.541E+06	20.12 %	0.35	39.81
				Particulate Solids Yield (lbs)
				13439
				Percent Particulate Solids Reduction
				53.02 %
Current File Output: Annualized Total After Outfall Controls		510625	Years in Model Run:	4.98
				1269
Pollutant	Concen- tration - No Controls	Concen- tration - With Controls	Concen- tration Units	Pollutant Yield - No Controls
Particulate Solids	67.67	39.81	mg/L	13439
Total Phosphorus	1.294	0.8982	mg/L	257.0
				Pollutant Yield - With Controls
				6313 lbs
				Percent Yield Reduction
				53.02 %
				44.58 %
Print Output Summary to Text File		Print Output Summary to .csv File		Total Area Modeled (ac) 7.290
Total Control Practice Capital Cost: \$ 25234 Land Cost: \$ 18351 Annual Maintenance Cost: \$ 1085 Present Value of All Costs: \$ 57115 Annualized Value of All Costs: \$ 4583				
Perform Outfall Flow Duration Curve Calculations				
Receiving Water Impacts Due To Stormwater (CWP Impervious Cover Model)				
	Calculated Rv	Approximate Urban Stream Classification		
Without Controls	0.43	Poor		
With Controls	0.35	Poor		

Grass Swale Example

The pollution reduction reported at the outfall is the overall pollution reduction for the entire site.

To see the pollution reduction from just the grass swales, select the “Control Practices” tab.

Land Uses			Junctions		Control Practices							
Runoff Volume			Part. Solids Yield (lbs)						Part. Solids Conc. (m			
Data File: C:\WinSLAMM Files\Example Files\urban water class files\Grass swales.mdb												
Rain File: AL Birmingham 8799.RAN												
Date: 04-13-14 Time: 9:51:33 PM												
Site Description: Grass swales, commercial development												
Control Practice No.	Control Practice Type	Control Practice Name or Location	Total Inflow Volume (cf)	Total Outflow Volume (cf)	Percent Volume Reduction	Total Influent Load (lbs)	Total Effluent Load (lbs)	Percent Load Reduction	Flow Weighted Influent Conc (mg/L)	Flow Weighted Effluent Conc (mg/L)	Percent Conc. Reduction	
1	Grass Swales	DS Grass Swales # 1	3.181E+06	2.541E+06	20.12	13439	6313	53.02	67.67	39.81	41.173	

Outfall				Output Summary			
(mg/L)				Summary Table			
Influent Median Part. Size (microns)	Effluent Median Part. Size (microns)	Notes	Maximum Stage (ft)	Treated Volume (cf)	Volume Infiltrated (cf)	Maximum Velocity (ft/s)	Runoff Producing Events/ Ttl. Rains
35.17	12.71		0.80	2540534	640770	1.25	511/511

The grass swales are reducing the runoff volume by 20% and the TSS load by 53%. The reductions would obviously be larger if the infiltration rate was larger. Because there is only one control practice in the model and it is treating all of the source areas, the individual control practice output matches the output summary. The Control Practices summary tab also shows other features of the swales, such as the particle size changes for the flowing water, the maximum stage in the swale, the water mass balance, maximum water velocity, and the number of runoff producing events during the study period.

Grass Swale Example

