Module 5f: Swales in WinSLAMM

Problem Description

You are the stormwater engineer for a commercial site that must reduce its pollution load by 40 percent. The site is fully developed with silty soils. Determine the site's pollution load if swales were used for drainage instead of curb and gutter. Instructions for modifying the file begin on page 2.

How much runoff and pollution does the site generate (Answers to be filled in throughout the example)?

i. Runoff (cu ft): _____
ii. TSS (mg/L): _____
iii. TSS (lbs): _____
iv. Total Copper (lbs): _____
v. Particulate Lead (lbs): _____

What is the percent reduction of TSS (lbs)? _____

Steps:
1) Fill in the data regarding swales
2) Save the file as another name and update the site description
3) Enter the swale data
4) Run the model
5) View the output
6) Save the output

Problem

1) Fill in the data regarding swales

Change the site's drainage from 100 percent curb and gutter to 100 percent swales. Enter data describing the swale. Assume soil is silt loam and site is classified as Shopping Center Commercial. Follow the steps starting on page 2 to enter the data. Some data has been filled in for you. The answers to (1) can be found on page 2.

Swale infiltration rate (in/hr): _____ _____
Swale density (ft/ac): _____ (Total Swale Length/Total Area of Site)
Total Swale Length (ft): _____
Total Area of Site (ac): _____
Typical Bottom Width (ft): _____3 feet_____
Typical Swale Side Slope (H ft / V ft): _____3:1_____
Typical Longitudinal Slope (ft/ft): _____0.01 ft/ft_____
Swale Manning's n: _____0.027_____

Answer

Swale Data

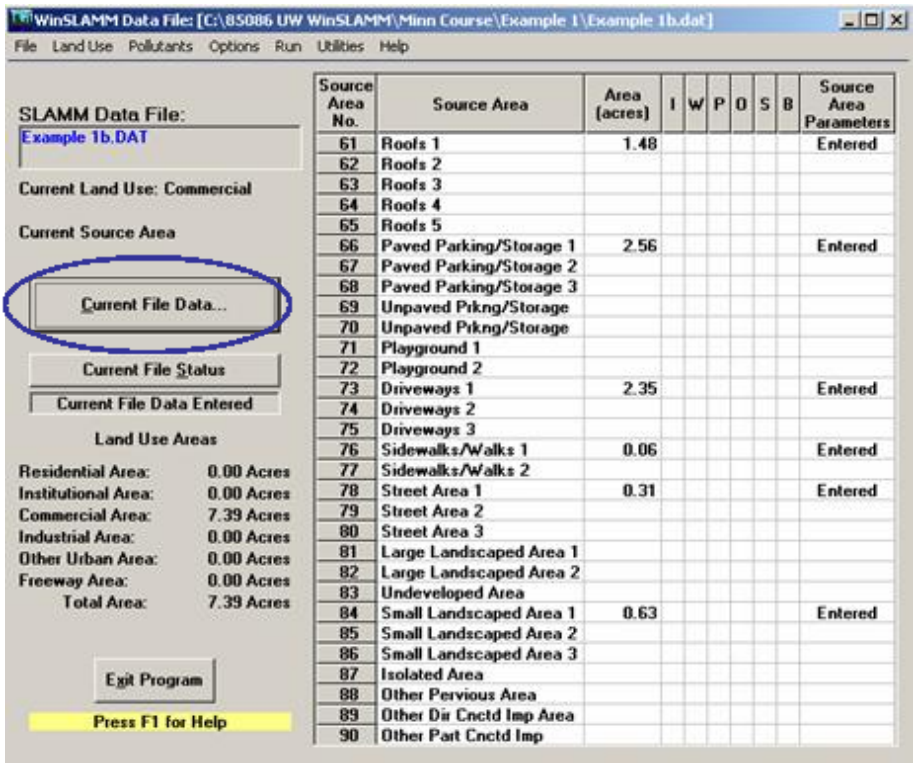
Swale infiltration rate (in/hr): ***0.15 inches/hr***
Swale density (ft/ac): ***102 ft/ac***
Total Swale Length (ft): ***757 ft***

Total Area of Site (ac): ***7.39 acres***
Typical Bottom Width (ft): ***3 feet***
Typical Swale Side Slope (H ft : V ft): ***3:1***
Typical Longitudinal Slope (ft/ft): ***0.01 ft/ft***
Swale Manning's n: ***0.027***

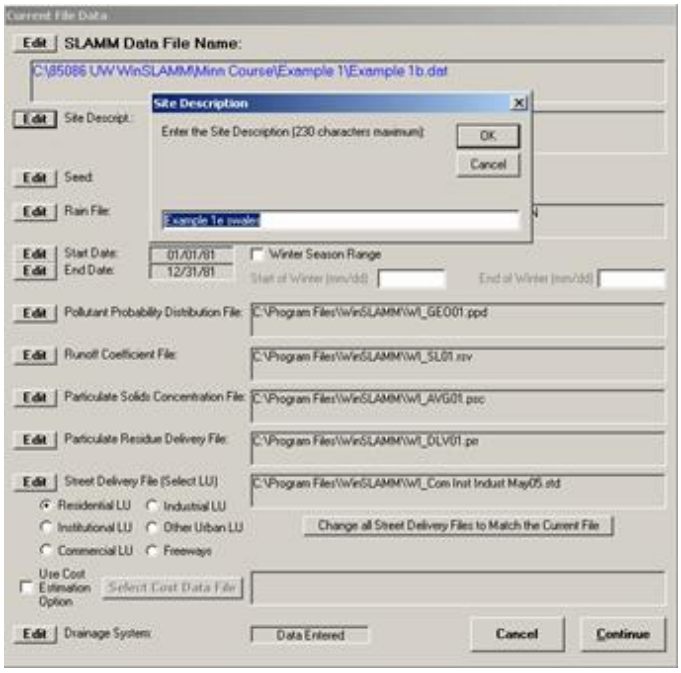
2) Save the file as another name and update the site description

Save Example 1a as "Example 1b". Save the File in the same location as Example 1a. Click **File***, then* **Save As** *to save the file with another name.*

Click **Current File Data** *to enter in swale data*

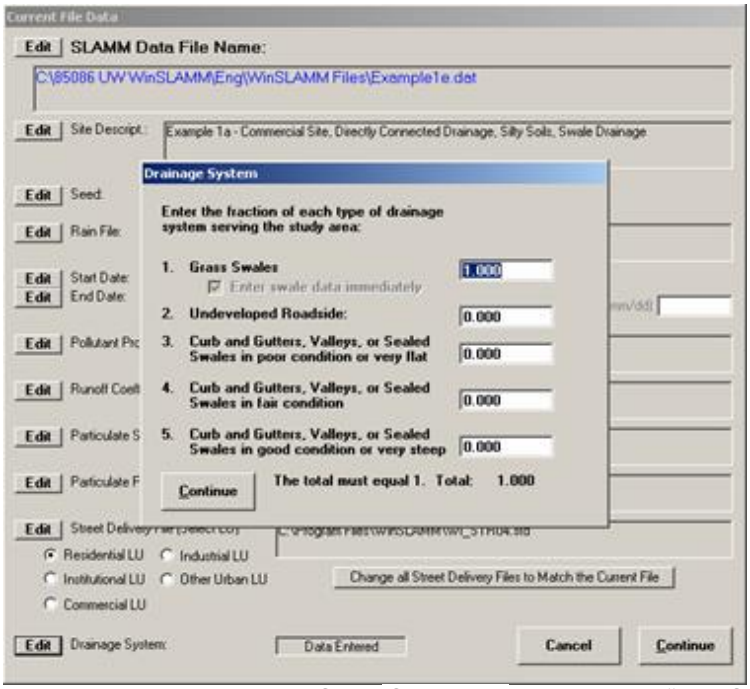


Change File Description to reflect swale drainage – Select **Edit** *next to "Site Descrip:" – Enter swales to reflect drainage system – Click* **OK**

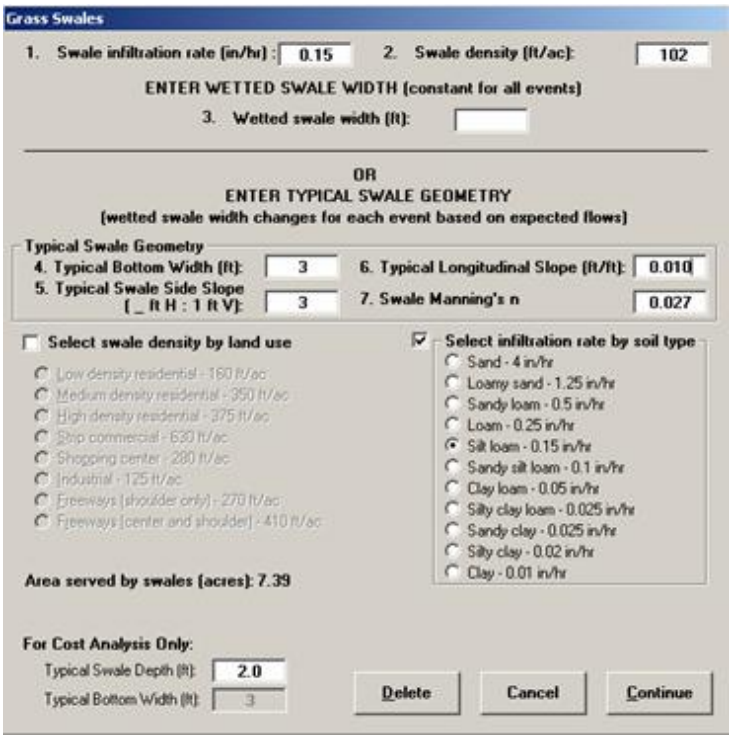


3) Enter the swale data

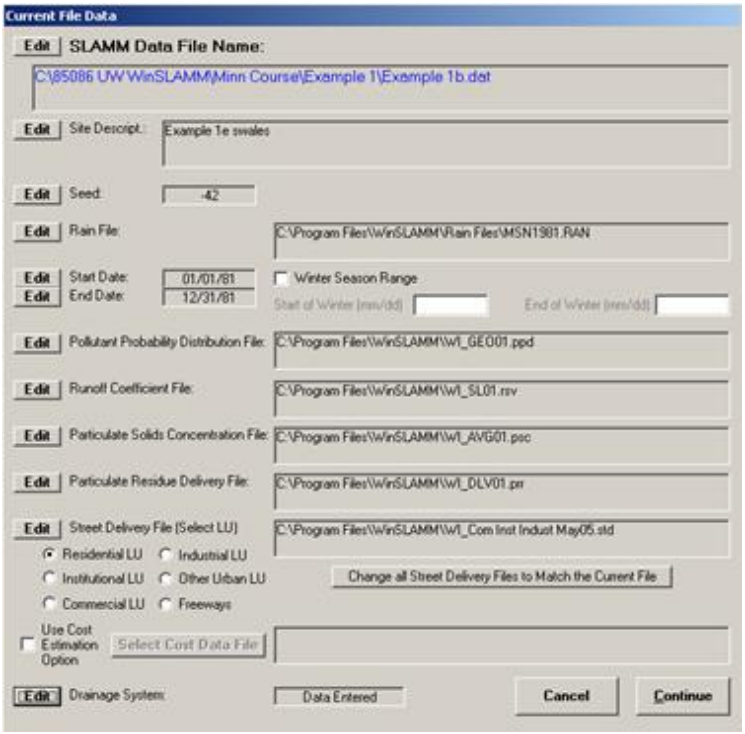
Select **Edit** *next to "Drainage System" – Enter "1" by "Grass Swales" and "0" by "Curb and Gutters, Valleys or Sealed Swales in fair condition" – Click* **Continue**



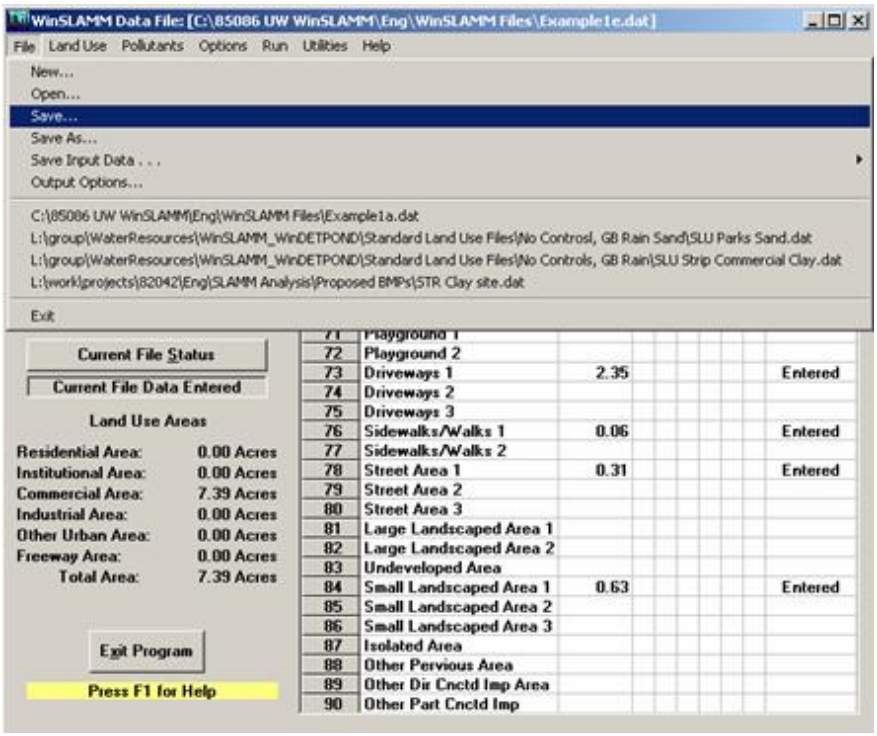
Enter the data describing the swales – Click ***Continue*** *Ignore the "For Cost Analysis Only" section. We will be working with that later in the course.*



Click **Continue** *again to get back to the main screen*

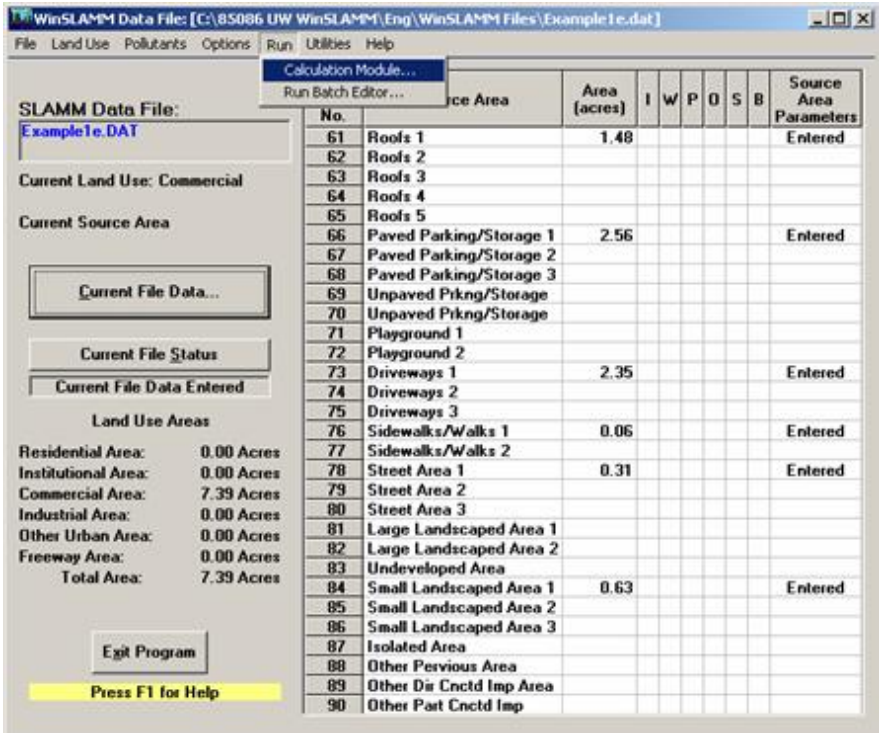


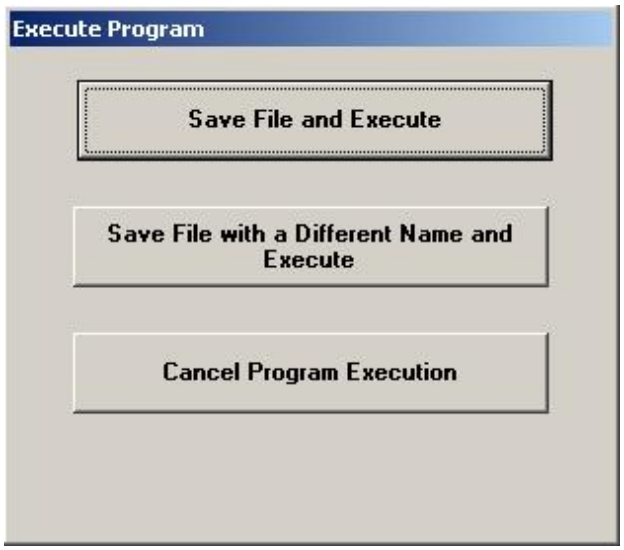
Save your changes



4) Run the model

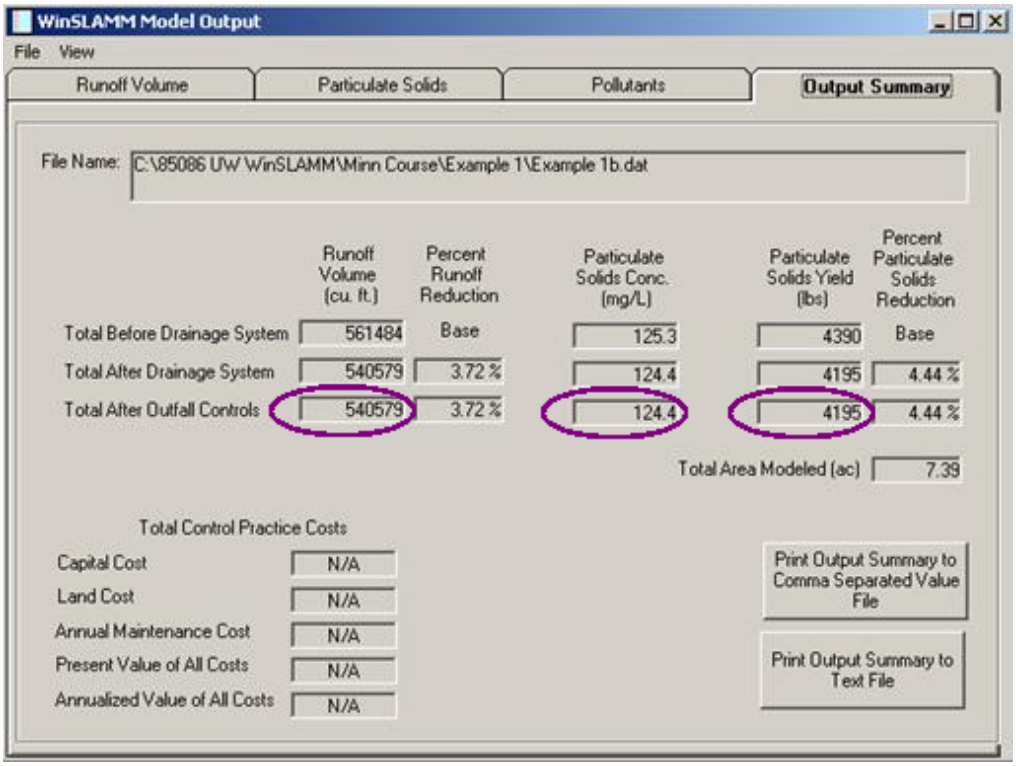
Run the file



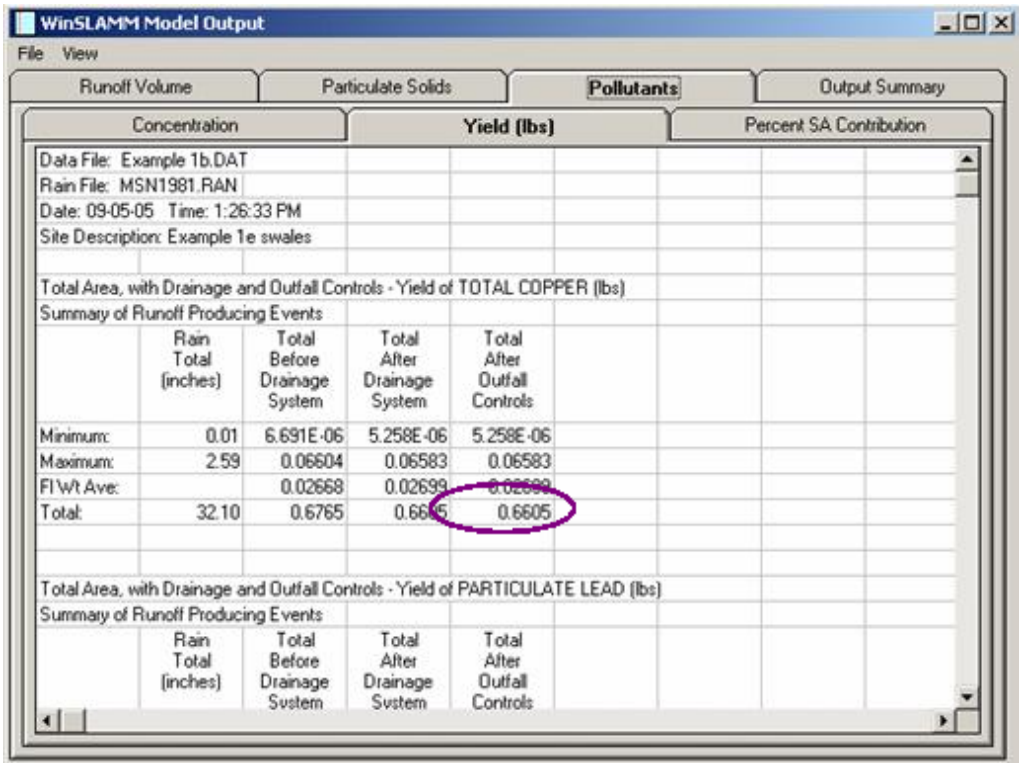


5) View the output

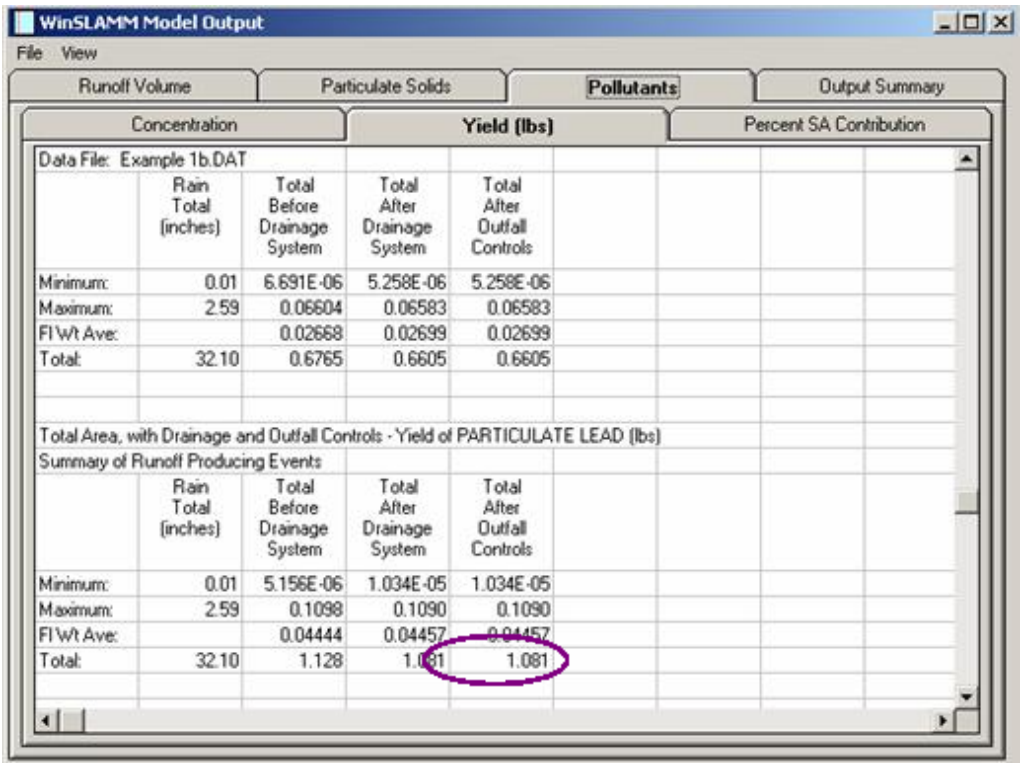
How much runoff and pollution does the site generate (fill in summary table on page 1)?



i. Runoff (cu ft): ***540,579 cu. ft.***
ii. TSS (mg/L): ***124.4 mg/L***
iii. TSS (lbs): ***4,195 lbs***

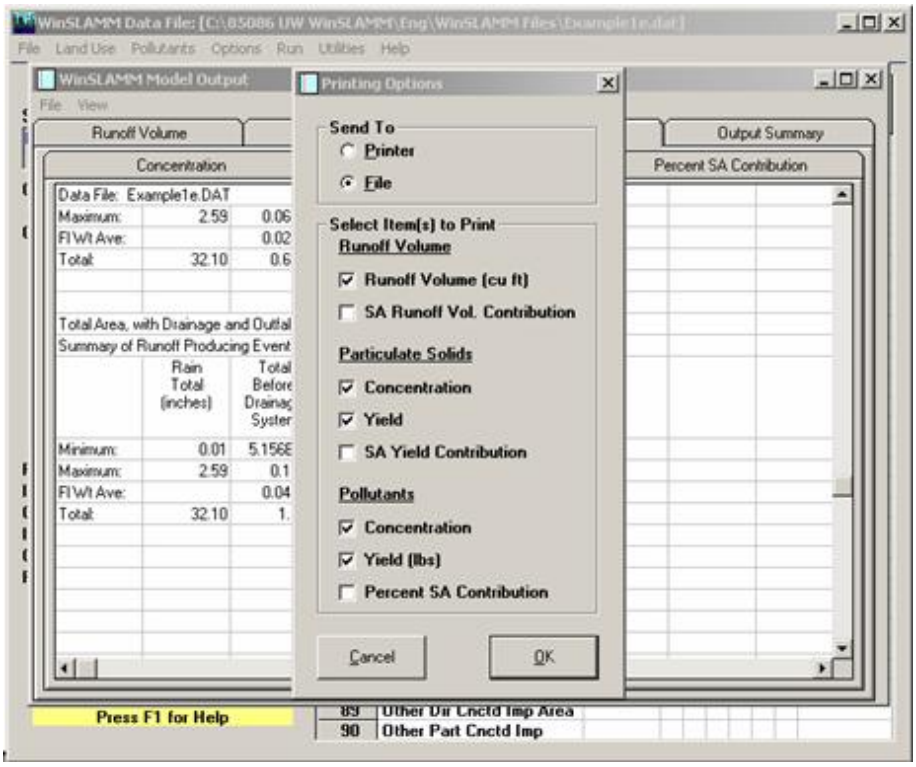


iv. Total Copper (lbs): ***0.6605 lbs***



v. Particulate Lead (lbs): ***1.081 lbs***

6) Save the output



What is the percent reduction from swales of TSS(%)? ***4.44 %***

Alternative Scenarios (if available time)

a. Question: You have chosen to use engineered soil with an infiltration rate of 2 in/hr. What happens to the runoff and pollution results? Why?

Answer: Runoff and pollution are decreased. The engineered soil has a higher infiltration rate than the native soil, thus allowing additional runoff to infiltrate.

b. Question: You have chosen to increase the swale bottom width by 2 feet using the native soil. What happens to the runoff and pollution results? Why?

Answer: Runoff and pollution are decreased. The wider swale allows for more surface area for runoff to spread out and infiltrate. The decrease is not a linear relationship because the smallest storms are infiltrated completely – only the slightly larger storms and above are affected by the wider bottom width.