Instructions regarding the SCS Method Excel spreadsheet.

This Excel spreadsheet implements the method described in "Computing Flood Discharges For Small Ungaged Watersheds."

The spreadsheet is set up with worksheets that perform calculations for specific aspects of the SCS Method. Throughout the spreadsheet, the green cells indicate where information may be entered. A description of what information is required for each worksheet follows.

Discharge Worksheet:

Calculates the swamp adjustment and flows using the SCS method.

	Spreadsheet Cells	Explanation
Required Fields:	B5	Contributing Drainage Area in square miles.
	B13	County : used to determine precipitation amounts.
Optional Fields:	B24:B26	Percent ponds and swamps.
Information Fields:	B3:B4,B6:B12,B14:B17	Location information not required for computations.
Resource Fields:	U1:V81	Associates the Basin Number with the Basin Name.
	L22:T64	Tables for calculating the swamp adjustment.
	N2:P19	Calculations for discharge extrapolation.

Time of Concentration Worksheet:

Calculates the time of concentration and unit hydrograph peak using the SCS method.

	Spreadsheet Cells	Explanation
Required Fields:	I18	If the time of concentration is already known, enter the value here.
	or	
	D5 and B5:C17 as needed	Begin with the downstream elevation in D5. Length and elevations must be in feet for correct results.
Optional Fields:	A5:A17	Pick the appropriate flow type for each reach from the drop down box.
	H5:H17	Place an asterisk in any of these cells and the corresponding length and travel time is omitted from the time of concentration calculation.
Resource Fields:	Columns M and N	Information for assigning the flow type in A5:A17 (see optional fields).
	Columns P through R	Calculations for the time of concentration if any asterisks are used in H5:H17 (see optional fields).
Buttons:	Convert elevations from meters to feet	Allows the user to enter the elevations in meters and then click this button to convert the elevations to feet. The length field is not adjusted.
	Undo conversion	The user may undo the conversion of elevations.

Curve Number Worksheet:

Calculates the curve number and precipitation using the SCS method.

	Spreadsheet Cells	Explanation
Required Fields:	N4:P4	These cells will be filled automatically when a county name is entered into **Discharge Worksheet** cell B13.
	N25	If the curve number is known, enter the value here.
	or	
	B5, B10, B15, B20	One or more of these cells must contain the percent soil type.
	D5:D8, D10:D13, D15:D18, D20:D23	Landuse in the associated soil type. Landuse values are listed in the comment of cell D5.
	E5:E8, E10:E13, E15:E18, E20:E23	Percent of landuse coverage for the associated soil type.
Resource Fields:	G5:G23	The curve numbers are automatically assigned by matching the associated landuse type with the curve number found in table V1:Z20. A landuse type other than those listed in the comment box in D5 may be used. However, then the specific curve number will have to be entered manually in column G.
	V1:Z20	Associates the landuse type with a curve number for a given soil type.
	V23:W106	Table which associates each county with a precipitation region.
	Y23:AB40	Precipitation amounts for each region.
	R3:T27	Calculations for the adjustment of point rainfall distributed over drainage areas greater than 10 square miles.
	N22:P22	Display the adjusted rainfall amounts.

Summary Worksheet:

Provides a summary of the results of the SCS method.

All the values on the Summary Worksheet come from other worksheets. Therefore if a change needs to be made, it is advised to change the value of the originating cell.

The curve number display area (N5:R21) is formatted in one of two ways:

1. If the **Curve Number Worksheet** cell N25 is empty, then the soil type and percentages are listed in N6:O6, N10:O10, N14:O14, N18:O18. The landuse type percentages are considered to be totals for each individual soil type and are grouped accordingly.

2. If there is a curve number value in the **Curve Number Worksheet** cell N25, then the soil type and percentage are listed in cells N6:O9. The landuse type percentages are considered to be totals for the basin (not for the individual soil types).

SCS Hgraph Plot Worksheet:

Provides a large plot of the 1% frequency hydrograph.

The ordinates for the graph come from the **SCS Hydrograph Worksheet** cells D13:E50.

SCS Hydrograph Worksheet:

Calculates the hydrograph ordinates.

The method used to calculate the hydrograph ordinates is described in the National Engineering Handbook by the Natural Resources Conservation Service (NRCS). A copy of this publication can be found at https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17755.wba on the Internet. In the chapter on hydrographs, Chapter 16, the procedure for developing a synthetic hydrograph is described. There is a slight difference between the Handbook calculations and those used by the State of Michigan however. Where the Handbook states that 37.5% of the runoff volume is in the rising side, it has been found in Michigan that the rising side only consists of 28.5% of the volume.

Therefore the relationship between Tr and Tp is Tr = 2.57 x Tp. The calculations begin with page 16.6 in the National Engineering Handbook. The change made by the State of Michigan causes K in equation 16.3 to be 0.57 instead of the Handbook K value of 0.75 (The K value of 0.57 can be found in the Excel spreadsheet on the SCS Hydrograph worksheet in cell J4). Therefore the coefficient in equation 16.6 is 368.0 not 484.0. Equation 16.5 is used to calculate Tp in the Excel Spreadsheet (SCS Hydrograph worksheet cell B4) using the values for area, peak flow, and surface runoff (Q in the Handbook and SRO in the Excel spreadsheet) already calculated using the SCS method.

Translating between the National Engineering Handbook and the SCS Excel Spreadsheet can be confusing because the Handbook uses the symbol Q as a volume per area where as the Excel spreadsheet uses the symbol Q as a flow rate. Also the Handbook uses the symbol Qp as the peak discharge where as the Excel spreadsheet uses the symbol Qp to represent the unit hydrograph peak.

Values are automatically taken from other worksheets so no entries are required on this worksheet. However, optional fields are provided so that alternative values may be used.

	Spreadsheet Cells	**Explanation**
Required Fields:	None	
Optional Fields:	D7	Enter an alternative drainage area.
	D8	Enter a different value than the 1% peak flow.
	D9	Enter an alternative curve number.
	D10	Enter a precipitation amount.
Resource Fields:	Columns H through T	Adjusts the hydrograph volume to be consistent with the volume calculated using the SCS method.