Contents

SCS Engineering Field Handbook, Chapter 2, Amendment

Exhibits

Figures

Tables

Worksheets

General

Time of concentration (T_c) is the time it takes for runoff to travel from the hydraulically most distant point of the watershed to the outlet. T_c influences the peak discharge. For the same size watershed, the shorter the T_c, the larger the peak discharge. This means that peak discharge has an inverse relationship with T_c.

Estimating time of concentration

T_c can be estimated for small rural watersheds using the following empirical relationship:

$$T_c = \frac{\ell^{0.8}\left[\left(\frac{1000}{CN}\right) - 9\right]^{0.7}}{1140\ Y^{0.5}} \qquad \text{(Eq. 2-5)}$$

Where T_c = time of concentration in hours,
ℓ = flow length in feet,
CN = runoff curve number, and
Y = average watershed slope in percent.

Figure 2-27 is a nomograph for solving equation 2-5. T_c is determined using watershed parameters ℓ, CN, and Y. Worksheet 2 can be used to compute T_c. Example 2-2 demonstrates this procedure. For watersheds where hydraulic conditions are such that velocities of water flow need to be estimated (urban areas, etc.), then T_c should be estimated using TR-55 methods.

Average watershed slope

The average watershed slope (Y) is the slope of the land and not the watercourse. It can be determined from soil survey data or topographic maps. Hillside slopes can be measured with a hand level, Locke level, or clinometer in the direction of overland flow. Average watershed slope is an average of individual land slope measurements.

The average watershed slope can be determined using the following relationship:

$$Y = \frac{100CI}{A} \qquad \text{(Eq. 2-6)}$$

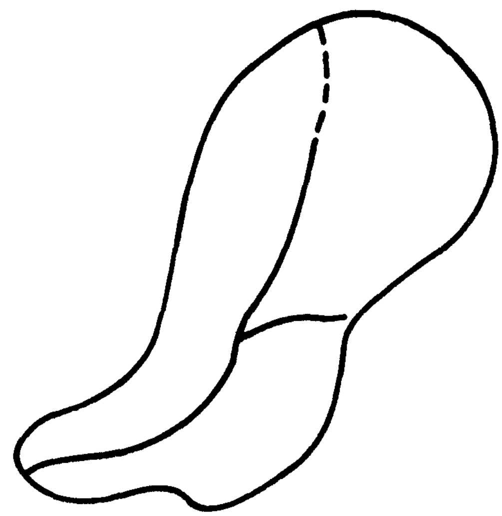
where Y = average watershed slope in percent,
C = total contour length in feet,
I = contour interval in feet, and
A = drainage area in square feet.

Flow length

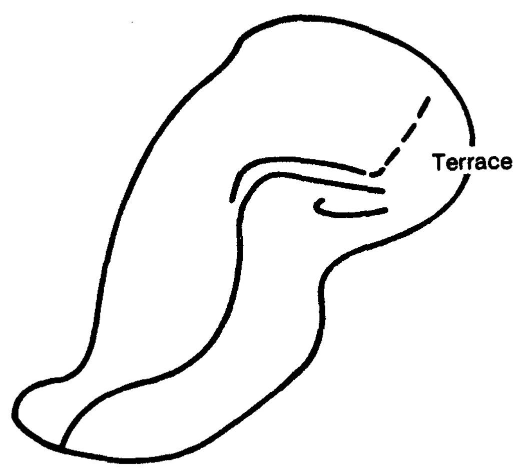
Flow length (ℓ) is the longest flow path in the watershed from the watershed divide to the outlet. It is the total path water travels overland and in small channels on the way to the outlet. The flow length can be determined using a map wheel or it can be marked along the edge of a paper and converted to feet.

Some typical examples of determining the flow length are shown below.

Natural Watershed. In this case, water flows from the watershed divide to a small channel, down the small channel to the main stream, and from there to the watershed outlet.



Watershed with Terraces. In this case, water flows from the divide to the terrace, along the terrace to the outlet or main stream, and then along the main stream to the outlet.



General
Using runoff, I_a/P, time of concentration, and drainage area, the peak discharge can be estimated using exhibits 2-IA, 2-I, 2-II, and 2-III.

I_a/P Ratio
The watershed CN is used to determine the initial abstraction (I_a) from table 2-4. I_a/P ratio is a parameter that indicates how much of the total rainfall is needed to satisfy the initial abstraction. The larger the I_a/P ratio, the lower the unit peak discharge (q_u) for a given T_c. This indicates that if initial abstraction is a high portion of rainfall, the peak discharge will be lower. Thus, the I_a/P ratio is greater for smaller storms.

If the computed I_a/P ratio is outside the range shown (0.1 to 0.50) in exhibits 2-I through 2-III, then the limiting values should be used; i.e., use 0.1 if less than 0.1 and use 0.5 if greater than 0.5. If the ratio falls between the limiting values, use linear interpolation.

Estimating peak discharge
The unit peak discharge (q_u) is obtained from exhibits 2-I, 2-IA, 2-II, or 2-III, depending on the rainfall type. Figure 2-1 shows the approximate geographic boundaries for the four rainfall distributions. T_c and I_a/P values are needed to obtain a value for q_u from the exhibit. The peak discharge (q_p) is computed as the product of the unit peak discharge (q_u), the drainage area (A), and the runoff (Q).

$$q_p = q_u \times A \times Q \qquad \text{(Eq. 2-7)}$$

Worksheet 2 can be used to determine q_p as shown in example 2-2.

6. Limitations

The watershed drainage area must be greater than 1.0 acre and less than 2,000 acres. If the drainage area is outside these limits, another procedure such as TR-55 or TR-20, Project Formulation–Hydrology, should be used to estimate peak discharge.

- The watershed should have only one main stream. If more than one exists, the branches must have nearly equal T_c's.
- The watershed must be hydrologically similar; i.e., able to be represented by a weighted CN. Land use, soils, and cover are distributed uniformly throughout the watershed. The land use must be primarily rural. If urban conditions are present and not uniformly distributed throughout the watershed, or if they represent more than 10 percent of the watershed, then TR-55 or other procedures must be used.
- If the computed T_c is less than 0.1 hour, use 0.1 hour. If the computed T_c is greater than 10 hours, peak discharge should be estimated by using the NEH-4 procedures, which are automated in the TR-20 computer program.
- When the flow length is less than 200 feet or greater than 26,000 feet, use another procedure to estimate T_c. TR-55 provides an alternative procedure for estimating T_c and peak discharge.
- Runoff and peak discharge from snowmelt or rain on frozen ground cannot be estimated using these procedures. NEH-4 provides a procedure for estimating peak discharge in these situations.
- If potholes constitute more than one-third of the total drainage area or if they intercept the drainage, the procedures in NEH-4 should be used.
- When the average watershed slope is less than 0.5 percent, a different unit hydrograph shape can be used. Contact the State Conservation Engineer for necessary information.
- When the weighted CN is less than 40 or more than 98, use another procedure to estimate peak discharge.
- When the average watershed slope is greater than 64 percent or less than 0.5 percent, use another procedure to estimate T_c. An alternative procedure is shown in TR-55 for estimating T_c and peak discharge.

Accuracy of peak discharge estimated by this method will be reduced if I_a/P ratio used is outside the range given in exhibits 2-I, 2-II, 2-IA, and 2-III. The limiting I_a/P ratios are to be used; i.e., if I_a/P in the exhibit 2-II is less than 0.1, use 0.1; and if I_a/P is greater than 0.5, use 0.5.

7. Example 2-1—Estimating Weighted CN

Given a 90-acre watershed in the Type II storm distribution area, determine the weighted curve number for the drainage area above a proposed waterway. The available soils map shows that the major soils are Dover, Berks, and Easton in field #2 of A.B. Smith's farm in Adams County, MD. By soil, the cover description breaks down as 25 acres of pasture in good condition on Dover, 55 acres of row crop in straight rows in good condition on Berks, and 10 acres of woods in poor condition on Easton. Use worksheet 1 to develop the weighted curve number for the watershed.

Example 2.1 —Worksheet 1: Runoff curve number (CN)

Client: AB SMITH (FIELD #2) By: DEW Date: 6/6/87

County: ADAMS State: MD Checked: KO Date: 6/6/87

Practice: WATERWAY

Soil name and hydrologic group (table 2-1)	Cover description (cover type, treatment, and hydrologic condition)	CN (table 2-3)	Area (acres or %)	Product of CN × area
DOVER B	PASTURE IN GOOD CONDITION	61	25	1525
BERKS C	STRAIGHT ROW CROPS, GOOD	85	55	4675
EASTON D	WOODS, POOR	83	10	830
		Totals =	90	7030

CN (weighted) = $\frac{7030}{90} = 78.1$; Use CN = 78

8. Example 2-2—Estimating Peak Discharge

Given a 90-acre watershed in the Type II storm distribution area, determine the peak discharges for the 2-, 5-, and 10-year events. The available soils map shows Dover, Berks, and Easton soils in the drainage area above the proposed waterway in field #2 of A.B. Smith's farm in Adams County, MD. The cover by soil types and weighted CN is shown in example 2-1. The average watershed slope is 1 *percent*, and the flow length is 3,400 feet. The 2-year, 24-hour precipitation is 3.4 inches; the 5-year, 24-hour precipitation is 4.5 inches; and the 10-year, 24-hour precipitation is 5.5 inches. Use worksheet 2 to develop the desired peak discharge estimates.

Example 2.2 —Worksheet 2: Time of concentration and peak discharge

Client AB SMITH (FIELD #2) By DEW Date 6/6/87

County ADAMS State MD Checked TAS Date 6/7/87

Practice WATERWAY

Estimating time of concentration

1. Data:

Rainfall distribution type .... = II (I, IA, II, III)

Drainage area .... A = 90 ac

Runoff curve number .... CN = 78 (Worksheet 1)

Watershed slope .... Y = 1 %

Flow length .... ℓ = 3400 ft

2. T_c using ℓ, Y, CN and figure 2-27 .... = ____ hrs

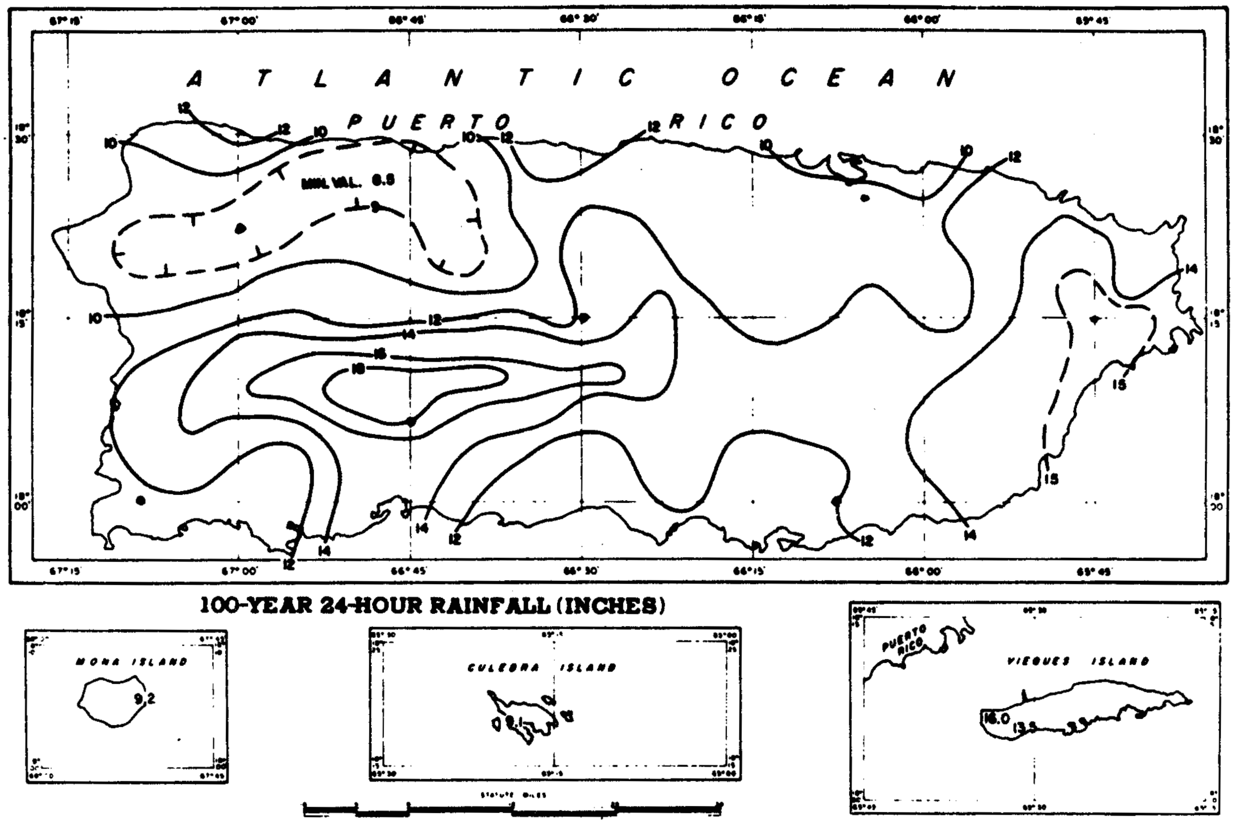
or using equation 2-5

$$T_c = \frac{\ell^{0.8}\left[\left(\frac{1000}{CN}\right) - 9\right]^{0.7}}{1140\ Y^{0.5}} = \frac{(3400)^{0.8}(3.82)^{0.7}}{1140\ (1)^{0.5}} = 1.5 \text{ hrs}$$

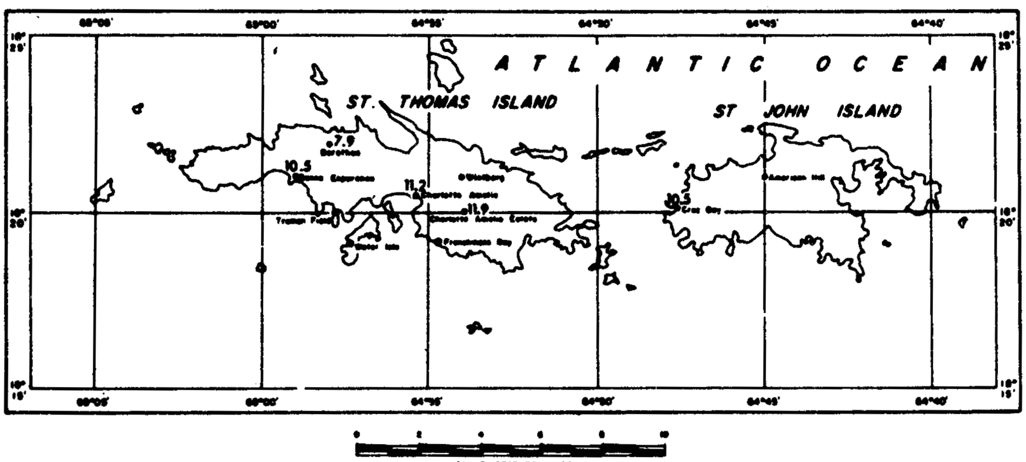
Estimating peak discharge

			Storm #1	Storm #2	Storm #3
1.	Frequency	yr	2	5	10
2.	Rainfall, P (24-hour)	in	3.4	4.5	5.5
3.	Initial abstraction, I_a .... (Use CN with table 2-4)	in	.564	.564	.564
4.	Compute I_a/P ratios		.17	.13	.10
5.	Unit peak discharge q_u .... (Use T_c and I_a/P with exhibit 2-11)	cfs/ac/in	.40	.42	.43
6.	Runoff, Q .... (Use P and CN with figure 2-26 or table 2-2)	in	1.42	2.3	3.1
7.	Peak discharge, q_p .... (Where $q_p = q_u AQ$)	cfs	51	87	120

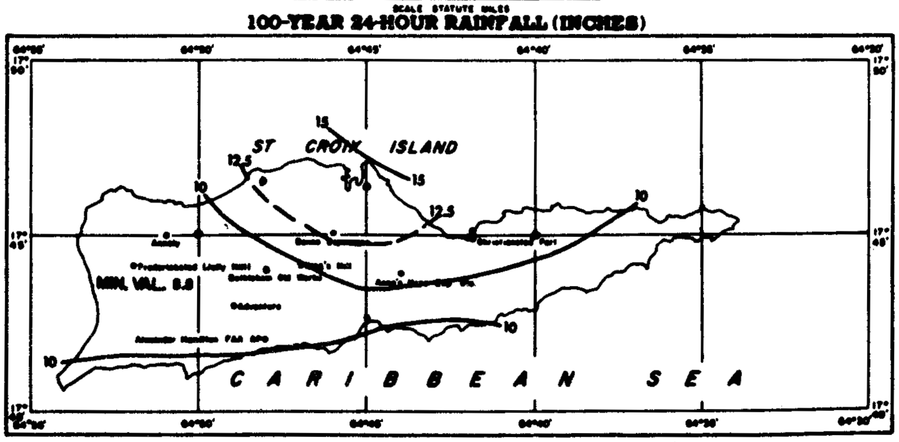
Figure 2-25—**Precipitation values for Puerto Rico and the U.S. Virgin Islands—100-year 24-hour rainfall (inches)**



100-YEAR 24-HOUR RAINFALL (INCHES)



100-YEAR 24-HOUR RAINFALL (INCHES)



Prepared by U.S. Weather Bureau

Figure 2-26—**Solution for runoff equation**

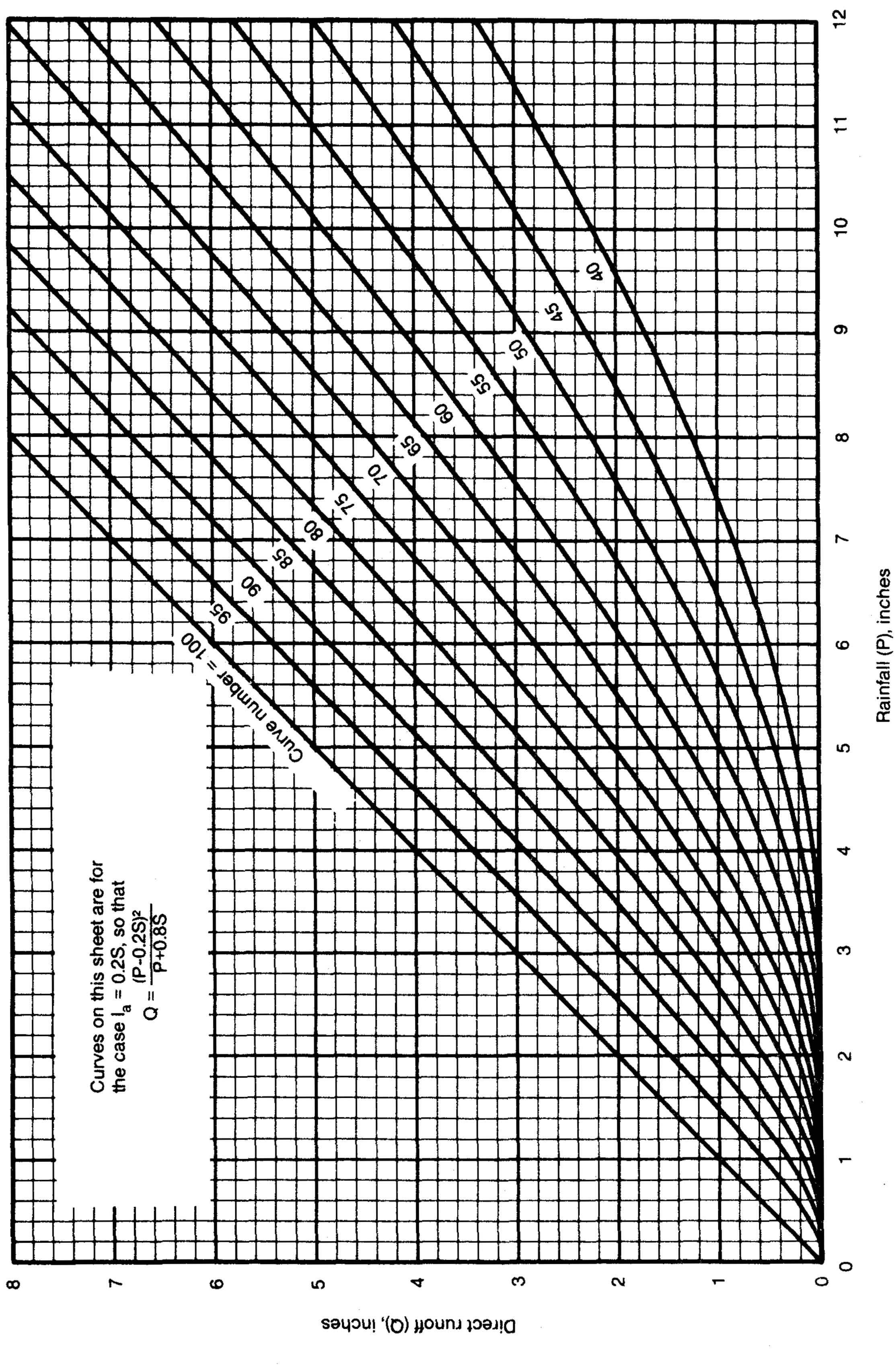
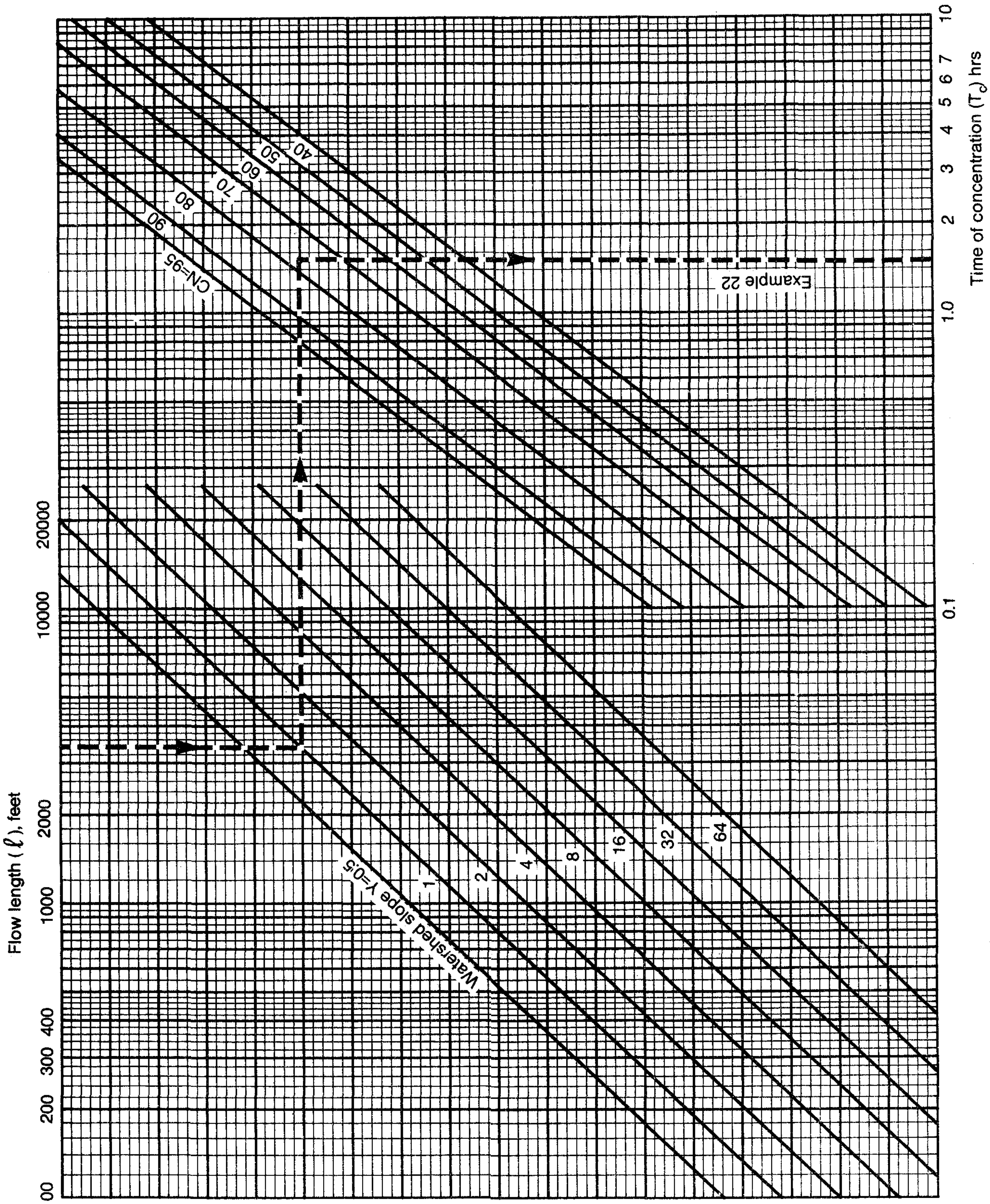


Figure 2-27.—**Time of concentration (T_c) nomograph**



AABAB	D	ADAVEN	C	AHREN	B	ALDING	D	ALSEA	B
AABERG	D	ADDICKS	D	AHRNKLIN	C	ALDINO	C	ALSPAUGH	C
AARON	C	ADDIELOU	B	AHRS	B	ALEDO	C	ALSTAD	C
AASTAD	B	ADE	B	AHTANUM	D	ALEGROS	C	ALSTONY	B
AAZDAHL	B	ADEK	B	AHTANUM, DRAINED	C	ALEKNAGIK	C	ALSUP	C
ABAC	D	ADEL	B	AHWAHNEE	B	ALEMEDA	C	ALTAMONT	D
ABAJO	C	ADEL, WET	D	AIBONITO	C	ALEX	B	ALTAPEAK	B
ABALOBADIAH	B	ADELAIDE	D	AIDO	D	ALEXANDER	C	ALTAR	B
ABARCA	B	ADELANTO	B	AIKEN	B	ALEXANDRIA	C	ALTAVISTA	C
ABBAYE	B	ADELINO	B	AIKMAN	D	ALFIR	B	ALTDORF	D
ABBIE	B	ADELINO,	C	AIKMAN, STONY	C	ALFLACK	C	ALTHOUSE	B
ABBOTT	D	SALINE-ALKALI		AILEY	B	ALFORD	B	ALTICREST	B
ABBOTTSTOWN	C	ADELPHIA	B/C	AIVELIIN	B	ALGANSEE	B	ALTITA	C
ABCAL	D	ADEN	C	AINAKEA	B	ALGARROBO	A	ALTMAR	B
ABEGG	B	ADENA	C	AINSLEY	B	ALGERITA	B	ALTO	C
ABELA	B	ADGER	D	AINSWORTH	B	ALGIERS	C/D	ALTOGA	C
ABELL	B	ADIEUX	B	AIRMONT	C	ALGOA	C	ALTON	A
ABERDEEN	C	ADILIS	B	AIRPORT	D	ALGOMA	B/D	ALTOONA	C
ABERONE	B	ADIN	D	AITS	B	ALHAMBRA	B	ALTUDA	D
ABERSITO	C	ADIOS	D	AJO	C	ALHARK	B	ALTURAS	C
ABERT	B	ADJUNTAS	C	AJOLITO	D	ALICE	B	ALTUS	B
ABES	D	ADKINS	B	AKAD	C	ALICEL	B	ALTVAN	B
ABGESE	B	ADKINS, ALKALI	C	AKAKA	A	ALICIA	B	ALUF	A
ABILENE	C	ADKINS, WET	C	AKAN	B/D	ALIDA	B	ALUM	B
ABIQUA	B	ADLER	C	AKASKA	B	ALIKCHI	B	ALUSA	D
ABIQUA, FLOODED	C	ADMAN	D	AKELA	D	ALINE	A	ALVARADO	B
ABITA	C	ADOBE	C	AKERCAN	B	ALKIRIDGE	C	ALVIN	B
ABO	C	ADOLPH	B/D	AKERUE	D	ALKO	D	ALVIRA	C
ABOR	D	ADOS	C	AKINA	B	ALLAGASH	B	ALVISO	D
ABORIGINE	D	ADRIAN	A/D	AKLEF	D	ALLAMORE	D	ALVODEST	D
ABOTEN	D	ADVOKAY	D	ALADDIN	B	ALLANTON	B/D	ALVOR	D
ABRA	B	AECET	C	ALADSHI	B	ALLANTON,	D	ALVOR, DRAINED	C
ABRAHAM	B	AENEAS	B	ALAE	A	DEPRESSIONAL		ALVOR, PROTECTED	C
ABRAZO	D	AFFEY	C	ALAELOA	B	ALLARD	B	ALWILDA	B
ABRAZO, GRAVELLY	C	AFLEY	B	ALAGA	A	ALLDOWN	B	ALYAN	C
ABREU	D	AFTADEN	D	ALAKAI	C	ALLEGHENY	B	ALZADA	D
ABRIGO	B	AFTON	C/D	ALAMA	B	ALLEMANDS	D	ALZOLA	C
ABSAROKEE	C	AGA	B	ALAMADITAS	C	ALLEN	B	AMADOR	D
ABSCOTA	A	AGAIPAH	D	ALAMANCE	B	ALLENDALE	B	AMAGON	D
ABSHER	D	AGAN	D	ALAMBIQUE	B	ALLENDORF	B	AMALIA	B
ABSTED	C	AGAR	B	ALAMO	D	ALLENS PARK	B	AMALU	D
ABSTED, FLOODED	D	AGASSIZ	D	ALAMOGORDO	B	ALLENS PARK, STONY	C	AMANA	B
ABSTON	C	AGATE	D	ALAMOSA	D	ALLENTINE	D	AMANDA	C
ACACIO	B	AGATHA	B	ALAMOSA, DRAINED	B	ALLENWOOD	B	AMARILLO	B
ACADEMY	C	AGAWAM	B	ALAMUCHEE	B	ALLEY	B	AMASA	B
ACADIA	D	AGENCY	C	ALANOS	B	ALLHANDS	D	AMASA, MODERATELY	C
ACANA	D	AGER	D	ALAPAHA	D	ALLIANCE	B	WET, SANDY	
ACANOD	C	AGFAYAN	D	ALAPAI	A	ALLIGATOR	D	SUBSTRATUM	
ACASCO	D	AGNAL	D	ALAZAN	B	ALLIS	D	AMBER	B
ACCELERATOR	B	AGNESTON	B	ALBAN	B	ALLISON	B	AMBIA	D
ACEITUNAS	B	AGNESTON, COBBLY	C	ALBANO	D	ALLKER	B	AMBOAT	C
ACEL	C	SUBSTRATUM		ALBANY	C	ALLOR	B	AMBOY	C
ACHIMIN	C	AGNESTON, COBBLY	C	ALBATON	D	ALLOUEZ	B	AMBRANT	B
ACKER	B	AGNESTON,	C	ALBEE	C	ALMAC	B	AMBRAW	B/D
ACKERMAN	A/D	NONGRAVELLY		ALBEMARLE	B	ALMANOR	B	AMELIA	C
ACKERVILLE	C	AGNEW	C	ALBERTON	B	ALMAVILLE	D	AMENE	D
ACKETT	D	AGNOS	D	ALBERTVILLE	C	ALMENA	C	AMENIA	B
ACKLEY	B	AGON	C	ALBINAS	B	ALMERIA	D	AMENSON	D
ACKMEN	B	AGORT	C	ALBION	B	ALMIRANTE	B	AMERICANOS	B
ACKMORE	B	AGRA	D	ALBRIGHTS	C	ALMO	D	AMERICUS	A
ACKWATER	D	AGUA	B	ALBURZ	C	ALMONT	D	AMERY	B
ACME	C	AGUA DULCE	B	ALBURZ, DRAINED	B	ALMOTA	C	AMES	C/D
ACO	B	AGUA FRIA	C	ALBUS	B	ALMY	B	AMESHA	B
ACOMA	C	AGUA FRIA, HIGH	B	ALCAN	D	ALNITE	D	AMESMONT	C
ACORD	C	RAINFALL		ALCESTER	B	ALO	D	AMHERST	D
ACOVE	C	AGUA FRIA, STONY	D	ALCOA	B	ALOHA	C	AMISTAD	D
ACREDALE	D	AGUADILLA	A	ALCONA	B	ALOMAX	D	AMITY	D
ACREE	C	AGUALT	B	ALCOT	A	ALONA	B	AMMON	B
ACRELANE	C	AGUEDA	B	ALCOVA	B	ALONSO	B	AMOOAC	C
ACTON	B	AGUILARES	B	ALDA	C	ALOVAR	C	AMOLE	A
ACUFF	B	AGUILITA	B	ALDA, SALINE	B/D	ALPENA	A	AMOR	B
ACUNA	C	AGUIRRE	D	ALDAX	D	ALPHA	B	AMORUS	D
ACY	C	AGUSTIN	B	ALDEN	D	ALPIN	A	AMOS	C
ADA	C	AHART	C	ALDER	C	ALPON	B	AMOSTOWN	C
ADAIR	C	AHL	C	ALDERDALE	C	ALPOWA	B	AMPAD	C
ADAMS	A	AHLSTROM	D	ALDERMAND	B	ALRED	B	AMPHION	C
ADAMSON	B	AHMEEK	C	ALDERWOOD	C	ALROS	C	AMSDEN	B
ADAMSVILLE	C	AHOLT	D	ALDI	C	ALS	A	AMSTERDAM	B
ADATON	D	AHPAH	B	ALDINE	D	ALSCO	B	AMTOFT	D

NOTES: TWO HYDROLOGIC SOIL GROUPS SUCH AS B/C INDICATE THE DRAINED/UNDRAINED SITUATION.
MODIFIERS SHOWN, E.G., BEDROCK SUBSTRATUM, REFER TO A SPECIFIC SOIL SERIES PHASE FOUND IN SOIL MAP LEGEND.

Table 2-3c.—Runoff curve numbers for arid and semiarid rangelands[1]

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition[2]	A[3]	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

[1] Average runoff condition. For rangelands in humid regions, use table 2-3b.
[2] *Poor:* <30% ground cover (litter, grass, and brush overstory).
Fair: 30% to 70% ground cover.
Good: >70% ground cover.
[3] Curve numbers for group A have been developed only for desert shrub.

Table 2-3d.—Runoff curve numbers for urban areas[1]

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area[2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)[5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2a).					

[1] Average runoff condition.

[2] The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition.

[3] CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

[4] Composite CN's for natural desert landscaping should be computed based on the impervious area (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

[5] Composite CN's to use for the design of temporary measures during grading and construction should be computed using the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-4.—I_a values for runoff curve numbers

Curve number	I_a (in)	Curve number	I_a (in)
40	3.000	68	0.941
41	2.878	69	0.899
42	2.762	70	0.857
43	2.651	71	0.817
44	2.545	72	0.778
45	2.444	73	0.740
46	2.348	74	0.703
47	2.255	75	0.667
48	2.167	76	0.632
49	2.082	77	0.597
50	2.000	78	0.564
51	1.922	79	0.532
52	1.846	80	0.500
53	1.774	81	0.469
54	1.704	82	0.439
55	1.636	83	0.410
56	1.571	84	0.381
57	1.509	85	0.353
58	1.448	86	0.326
59	1.390	87	0.299
60	1.333	88	0.273
61	1.279	89	0.247
62	1.226	90	0.222
63	1.175	91	0.198
64	1.125	92	0.174
65	1.077	93	0.151
66	1.030	94	0.128
67	0.985	95	0.105

Worksheet 1: Runoff curve number (CN)

Client ______________________ By ________ Date ________

County ____________ State ________ Checked ______ Date ________

Practice ______________________

Soil name and hydrologic group (table 2-1)	Cover description (cover type, treatment, and hydrologic condition)	CN (table 2-3)	Area (acres or %)	Product of CN × area
		Totals =		

CN (weighted) = ——— = ______ ; Use CN = [ ]

Worksheet 2: Time of concentration and peak discharge

Client ______________________ By __________ Date __________

County ______________ State __________ Checked ______ Date __________

Practice ______________________

Estimating time of concentration

1. Data:

   Rainfall distribution type .... = ______ (I, IA, II, III)

   Drainage area .... A = ______ ac

   Runoff curve number .... CN = ______ (Worksheet 1)

   Watershed slope .... Y = ______ %

   Flow length .... ℓ = ______ ft

2. T_c using ℓ, Y, CN and figure 2-27.................... = ______ hrs

   or using equation 2-5

$$T_c = \frac{\ell^{0.8}\left[\left(\frac{1000}{CN}\right) - 9\right]^{0.7}}{1140\ Y^{0.5}} = \frac{(\quad)^{0.8}(\quad)^{0.7}}{1140\ (\quad)^{0.5}} = \text{\_\_\_\_\_\_ hrs}$$

Estimating peak discharge

		Storm #1	Storm #2	Storm #3
1. Frequency	yr			
2. Rainfall, P (24-hour)	in			
3. Initial abstraction, I_a .... (Use CN with table 2-4)	in			
4. Compute I_a/P ratios				
5. Unit peak discharge q_u .... (Use T_c and I_a/P with exhibit 2-11)	cfs/ac/in			
6. Runoff, Q .... (Use P and CN with figure 2-26 or table 2-2)	in			
7. Peak discharge, q_p .... (Where $q_p = q_u AQ$)	cfs			

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