

Hydrology Study Sample Calculations

Proposed Q-Values

Rational Method --> Q=CIA

Basin ID	C	10-year, 24-hour			A (ac)	10-year, 24-hour		
		I (in/hr)	I (in/hr)	I (in/hr)		Q (cfs)	Q (cfs)	Q (cfs)
Basin A								
Pre-development	0.24	1.12	1.56	1.76	40.30	10.8	15.1	17.0
Basin B								
Pre-development	0.24	1.12	2.21	2.49	13.50	3.6	7.2	8.1

Table 4: Pre-development Vs. Post Development Areas

Land Use Description	Pre-Development		Runoff Coef	Area (sf)	Area (acres)
	Area (sf)	Area (acres)			
Basin A - Wash Rack Area					
Pervious Area	1,516,704	34.83	0.125	189587.98	
Impervious Area	238,273	5.47	0.950	226359.54	
Total	1,754,977	40.30			0.24
Basin B - Aircraft Paint Complex Area					
Pervious Area	507,316	11.65	0.125	63414.50	
Impervious Area	80,586	1.85	0.950	76556.7	
Total	587,902	13.50			0.24

Runoff coefficient of pervious area

Runoff coefficient of concrete areas

	Basin A	Basin B
Rainfall Intensity		
10 Year 24-Hour Rainfall	0.145	0.145 in
50 Year 24-Hour Rainfall	0.176	0.176 in
100 Year 24-Hour Rainfall	0.227	0.227 in

	Basin A	Basin B
Runoff Coef	0.125	0.125
Flow Length	2992	1092 ft
10 Year 24-Hour Rainfall	3.5	3.5 in
50 Year 24-Hour Rainfall	5	5 in
100 Year 24-Hour Rainfall	5.5	5.5 in
Land Slope	0.12	0.12 ft/ft

	Basin A	Basin B
Travel Time (Sheet)		
10 Year 24-Hour Rainfall	0.1587	0.1587 hr
50 Year 24-Hour Rainfall	0.1328	0.1328 hr
100 Year 24-Hour Rainfall	0.1266	0.1266 hr

	Basin A	Basin B
Travel Time (Channel)		
10 Year 24-Hour Rainfall	0.4532	0.2200 hr
50 Year 24-Hour Rainfall	0.4532	0.2200 hr
100 Year 24-Hour Rainfall	0.4532	0.2200 hr

	Basin A	Basin B
Travel Time (Sum)		
10 Year 24-Hour Rainfall	0.6119	0.3787 hr
50 Year 24-Hour Rainfall	0.5860	0.3528 hr
100 Year 24-Hour Rainfall	0.5798	0.3466 hr

	Basin A	Basin B
Rainfall Intensity		
10 Year 24-Hour Rainfall	1.12	1.12 in/hr
50 Year 24-Hour Rainfall	1.56	2.21 in/hr
100 Year 24-Hour Rainfall	1.76	2.49 in/hr

$$T_1 = \frac{L}{3600V} \quad [eq. 3-1]$$

where:

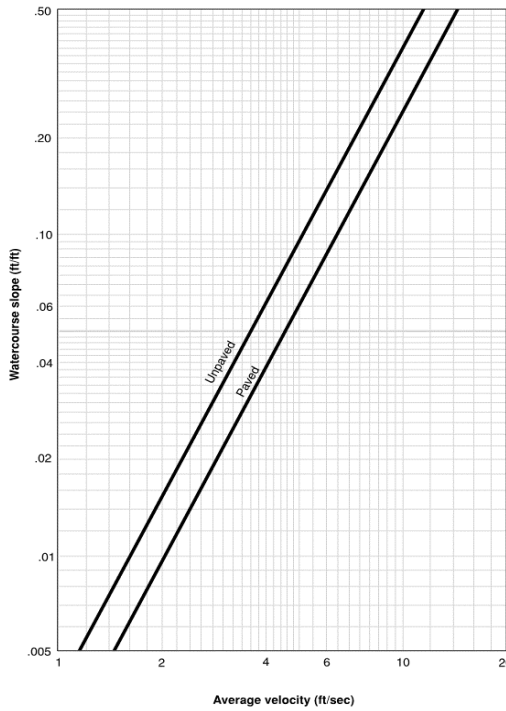
T_1 = travel time (hr)
 L = flow length (ft)
 V = average velocity (ft/s)
 3600 = conversion factor from seconds to hours.

$$T_1 = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5} s^{0.4}} \quad [eq. 3-3]$$

where:

T_1 = travel time (hr)
 n = Manning's roughness coefficient (table 3-1)
 L = flow length (ft)
 P_2 = 2-year, 24-hour rainfall (in)
 s = slope of hydraulic grade line (land slope, ft/ft)

$$T_c = T_{11} + T_{12} + \dots + T_{1n}$$



Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.45 (1.22-1.74)	1.82 (1.54-2.20)	2.33 (1.96-2.81)	2.76 (2.29-3.35)	3.35 (2.69-4.22)	3.82 (3.00-4.92)	4.31 (3.30-5.70)	4.84 (3.59-6.59)	5.57 (3.95-7.93)	6.16 (4.21-9.10)
10-min	1.04 (0.876-1.25)	1.31 (1.10-1.57)	1.67 (1.40-2.01)	1.97 (1.64-2.40)	2.40 (1.93-3.02)	2.74 (2.15-3.53)	3.09 (2.36-4.09)	3.46 (2.57-4.72)	3.99 (2.83-5.68)	4.41 (3.01-6.52)
15-min	0.836 (0.704-1.00)	1.06 (0.888-1.27)	1.35 (1.13-1.62)	1.59 (1.32-1.94)	1.94 (1.55-2.44)	2.21 (1.73-2.84)	2.49 (1.90-3.30)	2.79 (2.07-3.81)	3.22 (2.28-4.58)	3.56 (2.43-5.26)
30-min	0.590 (0.498-0.708)	0.744 (0.626-0.892)	0.950 (0.796-1.14)	1.12 (0.932-1.36)	1.36 (1.09-1.72)	1.56 (1.22-2.00)	1.76 (1.34-2.32)	1.97 (1.46-2.68)	2.27 (1.61-3.23)	2.50 (1.71-3.70)
60-min	0.447 (0.377-0.536)	0.563 (0.474-0.676)	0.719 (0.603-0.866)	0.850 (0.707-1.03)	1.03 (0.829-1.30)	1.18 (0.924-1.52)	1.33 (1.02-1.76)	1.49 (1.11-2.03)	1.72 (1.22-2.45)	1.90 (1.30-2.81)
2-hr	0.319 (0.269-0.383)	0.399 (0.336-0.479)	0.508 (0.426-0.612)	0.600 (0.500-0.730)	0.732 (0.587-0.922)	0.838 (0.656-1.08)	0.949 (0.725-1.25)	1.07 (0.792-1.46)	1.24 (0.878-1.76)	1.38 (0.940-2.03)
3-hr	0.258 (0.218-0.310)	0.322 (0.271-0.387)	0.410 (0.344-0.494)	0.485 (0.403-0.589)	0.591 (0.475-0.745)	0.678 (0.531-0.873)	0.769 (0.588-1.02)	0.868 (0.643-1.18)	1.01 (0.716-1.44)	1.13 (0.769-1.66)
6-hr	0.179 (0.150-0.214)	0.223 (0.187-0.267)	0.283 (0.238-0.341)	0.335 (0.279-0.407)	0.409 (0.328-0.515)	0.469 (0.368-0.604)	0.533 (0.407-0.704)	0.601 (0.446-0.819)	0.699 (0.496-0.996)	0.779 (0.533-1.15)
12-hr	0.121 (0.102-0.145)	0.151 (0.127-0.182)	0.193 (0.162-0.232)	0.228 (0.189-0.277)	0.277 (0.223-0.349)	0.317 (0.249-0.408)	0.359 (0.274-0.474)	0.403 (0.299-0.549)	0.466 (0.330-0.663)	0.516 (0.353-0.763)
24-hr	0.076 (0.067-0.088)	0.096 (0.084-0.111)	0.123 (0.108-0.142)	0.145 (0.127-0.170)	0.176 (0.149-0.213)	0.201 (0.167-0.248)	0.227 (0.184-0.286)	0.254 (0.201-0.329)	0.292 (0.222-0.393)	0.323 (0.237-0.448)
2-day	0.047 (0.041-0.054)	0.060 (0.052-0.069)	0.077 (0.068-0.089)	0.091 (0.080-0.107)	0.112 (0.095-0.135)	0.128 (0.106-0.157)	0.145 (0.117-0.182)	0.162 (0.128-0.210)	0.187 (0.142-0.252)	0.207 (0.152-0.288)

Pulled From NOAA Atlas 14 Precipitation Frequency Data Server