Preliminary Hydrology Study

For

Troutdale Village, LLC

Parcel 1 of MB 23/99

Washington & Avenue 50

La Quinta, CA 92253

APN# 646-070-016

Prepared for:

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Prepared 01/22/2023

Project Location and Surroundings

The project consists of 14.03 acres of level terrain located on Avenue 50 just east of Washington Street in La Quinta, CA. The site is bounded on the East by the Coachella Valley Water District Storm Channel industrial land, on the North by single family homes, on the West by Washington Street, and on the south by Avenue 50. The site is not in the vicinity of any hillside or alluvial fan which would contribute any offsite runoff to the site.

Method and Approach

This is a preliminary study, strictly to evaluate the 100 year design storm runoff from the site with proposed improvements and to size an appropriate storm water retention basin to store 100% of all storm water runoff from this design storm. To analyze required on site storage, the Synthetic Unit Hydrograph method as outlined in the Riverside County Flood Control and Water Conservation District Hydrology Manual of 1978 was used for retention basin sizing. Site area was developed from surveys and the approved site plan, retention basin sizing was developed from the attached preliminary grading plan, and rainfall data was collected from the NOAA 14 online atlas.

The site has moderately draining silty/sandy soils, but no infiltration testing was available at the time of the preparation of this report. Therefore, to ensure the basin is adequately sized, and an average percolation rate of 0 inches per hour for losses in the retention basin was used in the calculations. Analysis was completed utilizing a spreadsheet set up to correspond to the plates provided in the 1978 manual.

The site is broken down as follows, there is proposed 13.42 acres of apartment building development, 0.61 acres of retention basin, and off-site area of 1.28 acres of Washington Street and Avenue 50 that front the project as shown on the attached hydrology map.

Notes about the CVWD Wash

Early in planning, the Coachella Valley Water District was contacted about the Wash on the eastern side of the property. The two concerns were as follows: First, what is the HGL of the wash and flood state and what protection or mitigation may be required near the wash, and Second, is lining required. CVWD responded and clarified the HGL of the Wash is 48 feet above sea level, and freeboard requirements apply within 75 feet of the channel right-of-way. The project has therefore been designed not only to keep all buildings out of the setback zone, but also to elevate all buildings on the site with substantial freeboard. CVWD also clarified that no slope protection is required to be installed on the channel as long as no structures are built within the 75 foot setback, with the exception of carports.

Since the site design has been developed to accommodate all of CVWD's required constraints, no further analysis of the channel hydraulics or further flood plain review is required at this time.

Hydrology and Retention Basin Sizing

The 100 year recurrence, 3, 6 and 24 hour storms produce runoff as follows:

DURATION	1 HOUR	3 HOUR	6 HOUR	24 HOUR
EFF. RAIN	1.38 IN	1.58 IN	1.52 IN	1.57 IN
REQ. STORAGE	68,819 FT^3	77,007 FT^3	71,606 FT^3	65,949 FT^3
PEAK FLOW	44.47 CFS	27.97 CFS	23.54 CFS	5.88 CFS

Therefore, the size of the retention basin is controlled by the 100 year recurrence, 3 hour design storm from the 1978 RCFC&WCD Hydrology Manual, modified to use the NOAA 14 rainfall data values. Said storm requires that 77,007 cubic feet of runoff be stored in the retention basin. The proposed retention basin consists of a depressed turfed area. The basin has a bottom elevation of 42 feet, and an upper contour elevation of 48 feet. There is no specific freeboard requirement, but the lowest building is located at a pad elevation 2 feet higher than the basin, and the basin is designed to overflow into Washington Street. The basin has a designed capacity of 106,998 cubic feet therefore has adequate capacity to retain all of the runoff from the controlling 100 year 3 hour design storm. Calculations indicate that after rain events the basin should fully percolate all water stored within 48 hours as required by City policy.

The off-site tributary areas of Washington Street and Avenue 50 have existing drainage facilities to handle runoff. These drainage facilities are shown and detailed on city of La Quinta Improvement Plan number 99044. There is a catch basin located at the southeast end of the northeast curb return at the intersection of Washington Street and Avenue 50 to collect surface flows and an 18” diameter storm drain pipe conveys flows east to an outlet in the CVWD Stormwater Channel. There is a highpoint in Avenue 50 approximately 400 feet east of the intersection with Washington street. Runoff flowing to the west is collected in the aforementioned catch basin and runoff flowing to the east is directed into the CVWD Stormwater Channel at the existing channel crossing. The engineer and the developer see no need to alter these improvements. However, if the city wishes to redirect some of the 1.28 acre drainage area of Washington Street and Avenue 50 to the project, the proposed on-site retention basin has excess capacity.

Rational Hydrology

The project has 2 storm drain inlets for connection to drywells placed in the retention basins and minimal lengths of underground pipe, all runoff is surface drained to these structures. From the hydrology map, subareas are defined, and peak flows developed utilizing the rational method in the RCFC&WCD 1978 Hydrology Manual. The conveyance structures consist of ribbon gutters on inverted drive aisle sections, 2 catch basins and approximately 105 LF of 30” diameter underground pipe. Hydraulic Capacity Calculations for these improvements are included in **Appendix “C”.**

Summary

The preliminary design provides adequate onsite storage for the 100 year design storm in accordance with the recommendations of the RCFC&WCD Hydrology Manual and “first flush” rain events in compliance with currently adopted water quality management practices. The design concept is sound and should upon agency approval be moved forward to final engineering design.

Appendix A – NOAA Rainfall Data

NOAA Atlas 14, Volume 6, Version 2
Location name: La Quinta, California, USA*
Latitude: 33.6863°, Longitude: -116.2934°
Elevation: 46 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.068 (0.056-0.082)	0.104 (0.086-0.126)	0.159 (0.132-0.193)	0.210 (0.173-0.257)	0.292 (0.232-0.370)	0.364 (0.284-0.472)	0.449 (0.342-0.597)	0.549 (0.406-0.750)	0.709 (0.502-1.01)	0.856 (0.585-1.27)
10-min	0.097 (0.081-0.117)	0.149 (0.124-0.180)	0.228 (0.189-0.277)	0.301 (0.248-0.369)	0.418 (0.333-0.530)	0.522 (0.407-0.677)	0.644 (0.490-0.855)	0.787 (0.581-1.08)	1.02 (0.719-1.45)	1.23 (0.839-1.81)
15-min	0.117 (0.098-0.142)	0.180 (0.150-0.218)	0.275 (0.229-0.334)	0.364 (0.300-0.446)	0.505 (0.403-0.641)	0.632 (0.493-0.818)	0.779 (0.592-1.03)	0.952 (0.703-1.30)	1.23 (0.870-1.75)	1.48 (1.01-2.19)
30-min	0.171 (0.143-0.207)	0.263 (0.219-0.319)	0.403 (0.335-0.489)	0.533 (0.439-0.653)	0.739 (0.589-0.938)	0.925 (0.721-1.20)	1.14 (0.867-1.51)	1.39 (1.03-1.90)	1.80 (1.27-2.56)	2.17 (1.49-3.21)
60-min	0.242 (0.202-0.292)	0.371 (0.309-0.449)	0.568 (0.472-0.690)	0.751 (0.619-0.920)	1.04 (0.830-1.32)	1.30 (1.02-1.69)	1.61 (1.22-2.13)	1.96 (1.45-2.68)	2.53 (1.79-3.61)	3.06 (2.09-4.53)
2-hr	0.336 (0.281-0.407)	0.493 (0.411-0.598)	0.732 (0.609-0.890)	0.954 (0.787-1.17)	1.30 (1.04-1.65)	1.61 (1.26-2.09)	1.97 (1.50-2.62)	2.38 (1.76-3.26)	3.03 (2.15-4.32)	3.62 (2.47-5.35)
3-hr	0.403 (0.337-0.488)	0.583 (0.486-0.706)	0.856 (0.711-1.04)	1.11 (0.914-1.36)	1.51 (1.20-1.91)	1.86 (1.45-2.40)	2.26 (1.72-3.00)	2.72 (2.01-3.72)	3.45 (2.44-4.91)	4.09 (2.80-6.05)
6-hr	0.528 (0.441-0.639)	0.759 (0.633-0.919)	1.11 (0.918-1.34)	1.42 (1.17-1.74)	1.92 (1.53-2.43)	2.35 (1.83-3.05)	2.84 (2.16-3.78)	3.41 (2.52-4.66)	4.29 (3.04-6.12)	5.06 (3.46-7.48)
12-hr	0.640 (0.534-0.774)	0.942 (0.785-1.14)	1.39 (1.15-1.69)	1.79 (1.48-2.19)	2.41 (1.92-3.05)	2.94 (2.29-3.81)	3.54 (2.69-4.70)	4.21 (3.11-5.76)	5.24 (3.71-7.48)	6.14 (4.20-9.07)
24-hr	0.791 (0.700-0.912)	1.20 (1.06-1.38)	1.79 (1.58-2.07)	2.32 (2.03-2.71)	3.12 (2.64-3.75)	3.79 (3.15-4.66)	4.54 (3.69-5.72)	5.39 (4.25-6.96)	6.65 (5.05-8.95)	7.74 (5.68-10.8)
2-day	0.910 (0.805-1.05)	1.40 (1.24-1.62)	2.11 (1.86-2.44)	2.74 (2.40-3.20)	3.68 (3.12-4.44)	4.48 (3.72-5.51)	5.36 (4.35-6.74)	6.34 (5.01-8.20)	7.81 (5.92-10.5)	9.05 (6.64-12.6)
3-day	0.975 (0.863-1.12)	1.51 (1.33-1.74)	2.28 (2.01-2.64)	2.97 (2.60-3.47)	4.00 (3.39-4.81)	4.86 (4.04-5.97)	5.82 (4.72-7.32)	6.89 (5.44-8.90)	8.48 (6.43-11.4)	9.84 (7.22-13.7)
4-day	1.03 (0.914-1.19)	1.60 (1.42-1.85)	2.43 (2.14-2.81)	3.16 (2.76-3.68)	4.25 (3.60-5.12)	5.17 (4.29-6.35)	6.18 (5.01-7.78)	7.32 (5.78-9.46)	9.01 (6.84-12.1)	10.5 (7.67-14.5)
7-day	1.10 (0.969-1.26)	1.70 (1.50-1.96)	2.57 (2.26-2.97)	3.34 (2.92-3.90)	4.49 (3.81-5.41)	5.46 (4.54-6.71)	6.52 (5.29-8.21)	7.71 (6.09-9.96)	9.46 (7.18-12.7)	11.0 (8.04-15.2)
10-day	1.12 (0.994-1.30)	1.74 (1.54-2.01)	2.65 (2.33-3.06)	3.44 (3.01-4.02)	4.63 (3.93-5.58)	5.63 (4.68-6.92)	6.72 (5.45-8.46)	7.93 (6.26-10.2)	9.72 (7.38-13.1)	11.2 (8.24-15.6)
20-day	1.20 (1.06-1.38)	1.89 (1.67-2.18)	2.90 (2.56-3.36)	3.79 (3.32-4.42)	5.12 (4.34-6.17)	6.23 (5.17-7.65)	7.43 (6.03-9.35)	8.76 (6.92-11.3)	10.7 (8.11-14.4)	12.3 (9.03-17.1)
30-day	1.27 (1.12-1.46)	2.03 (1.80-2.35)	3.16 (2.78-3.65)	4.15 (3.63-4.84)	5.64 (4.78-6.79)	6.87 (5.70-8.44)	8.20 (6.65-10.3)	9.65 (7.62-12.5)	11.7 (8.91-15.8)	13.5 (9.88-18.7)
45-day	1.36 (1.21-1.57)	2.23 (1.97-2.58)	3.50 (3.09-4.06)	4.64 (4.05-5.41)	6.33 (5.36-7.62)	7.73 (6.42-9.50)	9.24 (7.50-11.6)	10.9 (8.58-14.0)	13.2 (10.0-17.8)	15.1 (11.1-21.0)
60-day	1.44 (1.27-1.66)	2.40 (2.12-2.77)	3.81 (3.36-4.41)	5.06 (4.43-5.91)	6.93 (5.87-8.34)	8.48 (7.04-10.4)	10.2 (8.23-12.8)	11.9 (9.43-15.4)	14.5 (11.0-19.5)	16.6 (12.2-23.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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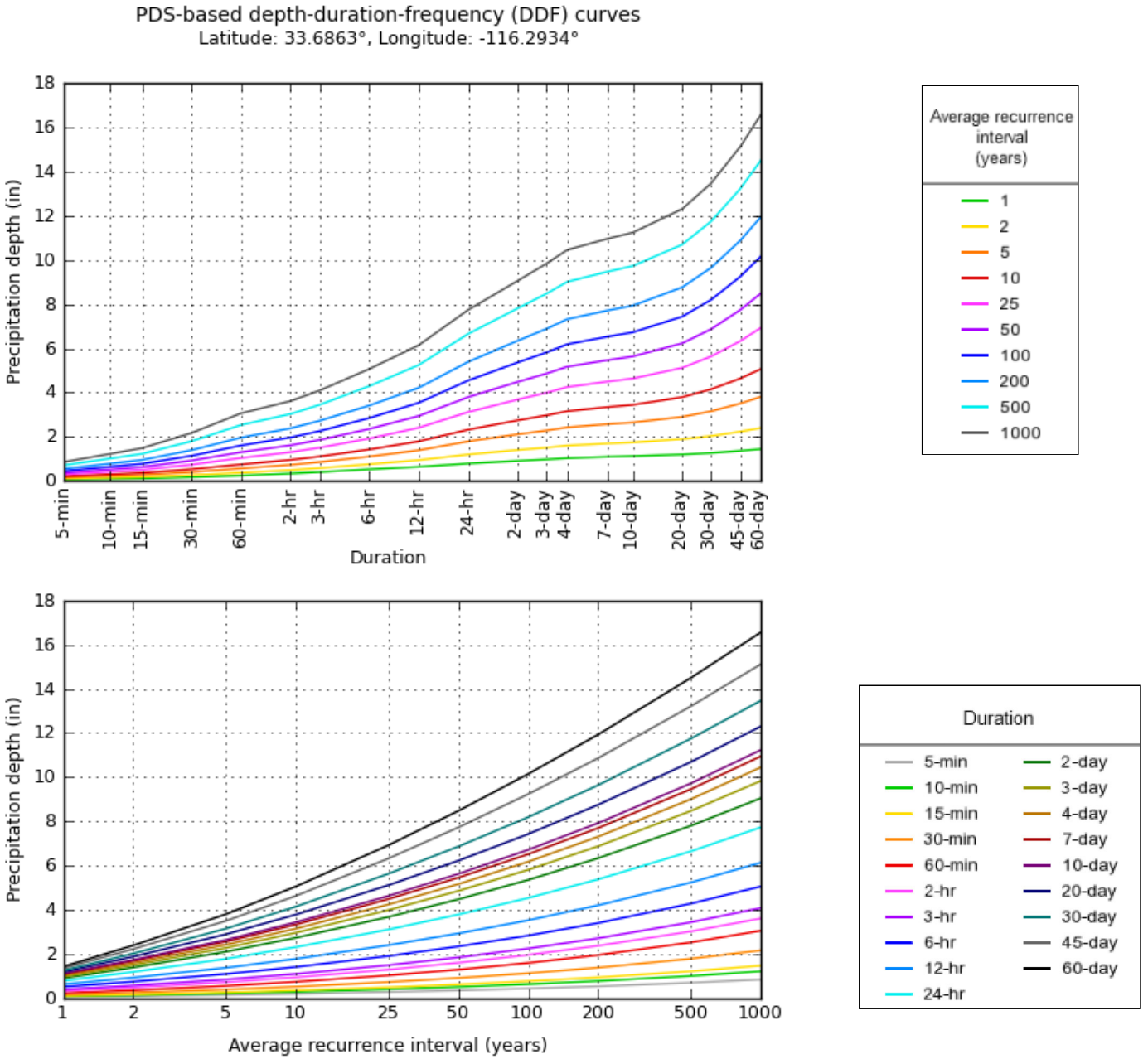
PF graphical



NOAA Atlas 14, Volume 6, Version 2

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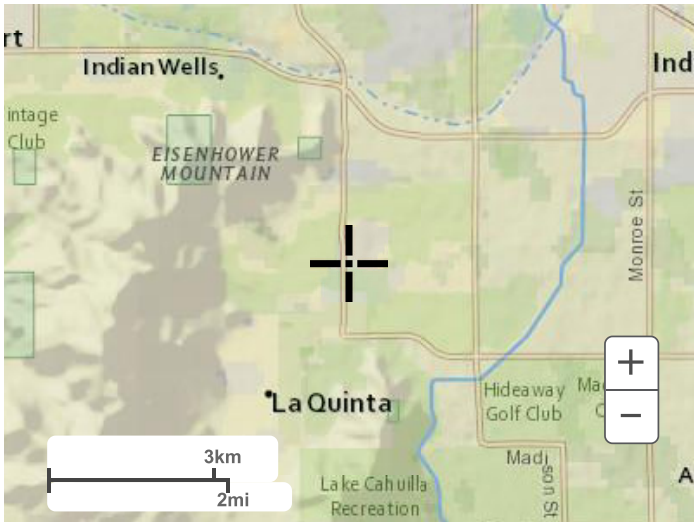
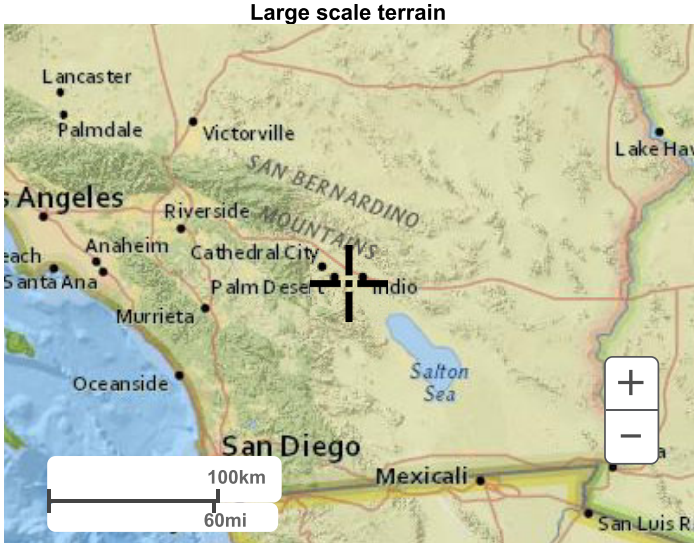
Maps & aerials

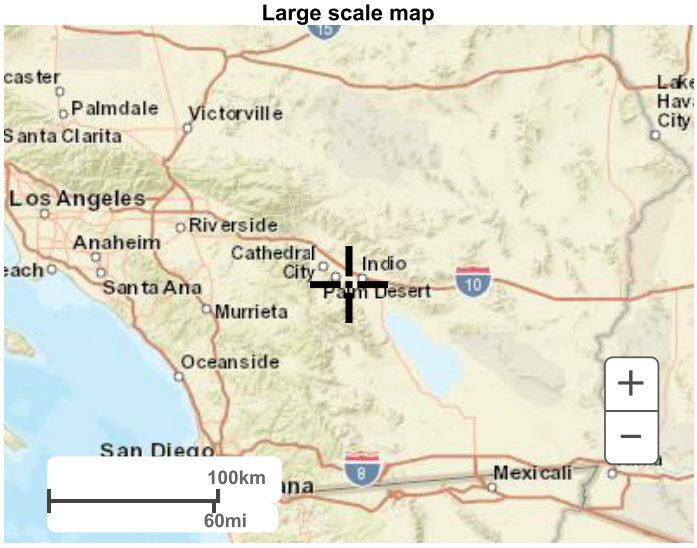
Small scale terrain



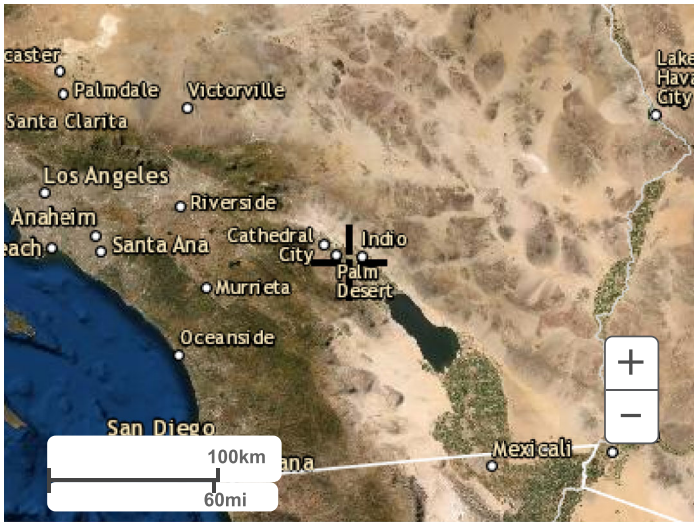
Large scale terrain



Large scale map



Large scale aerial



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Disclaimer

Appendix B – Synthetic Unit Hydrograph Calculations

	A	B	C	D
1	**RCFCD SYNTHETIC UNIT HYDROGRAPH**			
2	DATA INPUT SHEET			
3				
4	WORKSHEET PREPARED BY:	SPE		
5				
6	PROJECT NAME	LA QUINTA APARTMENTS		
7	ECI Job #	20210635		
8				
9	CONCENTRATION POINT DESIGNATION	SITE RETENTION BASIN		
10	AREA DESIGNATION	ONSITE FLOWS		
11				
12	TRIBUTARY AREAS	ACRES		
13				
14	COMMERCIAL			
15	PAVING/HARDSCAPE			
16	SF - 1 ACRE			
17	SF - 1/2 ACRE			
18	SF - 1/4 ACRE			
19	MF - CONDOMINIUMS			
20	MF - APARTMENTS	13.42		
21	MOBILE HOME PARK			
22	LANDSCAPING			
23	RETENTION BASIN	0.61		
24	GOLF COURSE			
25	MOUNTAINOUS			
26	LOW LOSS RATE (PERCENT)	90%		
27				
28	LENGTH OF WATERCOURSE (L)	1000		
29	LENGTH TO POINT OPPOSITE CENTROID (Lca)	240		
30				
31	ELEVATION OF HEADWATER	53.4		
32	ELEVATION OF CONCENTRATION POINT	48		
33				
34	AVERAGE MANNINGS 'N' VALUE	0.02		
35				
36	STORM FREQUENCY (YEAR)	100		
37				
38	POINT RAIN			
39	1 HOUR	1.61		
40	3-HOUR	2.26		
41	6-HOUR	2.84		
42	24-HOUR	4.54		
43				
44	BASIN CHARACTERISTICS:	ELEVATION	AREA	
45		42	8867	
46		43	11683	
47		44	14612	
48		45	17654	
49		46	20809	
50		47	24077	
51		48	27458	
52				
53	PERCOLATION RATE (in/hr)	0		
54				
55	DRYWELL DATA			
56	NUMBER USED	2		
57	PERCOLATION RATE (cfs)	0.12		

RCFCD SYNTHETIC UNIT HYDROGRAPH METHOD
BASIC DATA CALCULATION FORM
SHORTCUT METHOD

PROJECT: LA QUINTA APARTMENTS
ECI JOB# 20210635
BY SPE DATE 10/25/2022

PHYSICAL DATA

[1] CONCENTRATION POINT	SITE RETENTION BASIN
[2] AREA DESIGNATION	ONSITE FLOWS
[3] AREA - ACRES	14.030
[4] L-FEET	1000
[5] L-MILES	0.189
[6] La-FEET	240.00
[7] La-MILES	0.045
[8] ELEVATION OF HEADWATER	53.4
[9] ELEVATION OF CONCENTRATION POINT	48
[10] H-FEET	5.4
[11] S-FEET/MILE	28.5
[12] S^0.5	5.34
[13] L*LCA/S^0.5	0.002
[14] AVERAGE MANNINGS 'N'	0.02
[15] LAG TIME-HOURS	0.04
[16] LAG TIME-MINUTES	2.5
[17] 100% OF LAG-MINUTES	2.5
[18] 200% OF LAG-MINUTES	5.0
[19] UNIT TIME-MINUTES (100%-200% OF LAG)	5
[24] TOTAL PERCOLATION RATE FOR DRYWELLS (cfs)	0.24

RAINFALL DATA

[1] SOURCE
[2] FREQUENCY-YEARS 100
[3] DURATION:

3-HOURS				6-HOURS				24-HOURS			
[4] POINT RAIN INCHES PER NOAA	[5] AREA	[6]	[7] AVERAGE POINT RAIN INCHES	[8] POINT RAIN INCHES PER NOAA	[9] AREA	[10]	[11] AVERAGE POINT RAIN INCHES	[12] POINT RAIN INCHES PER NOAA	[13] AREA	[14]	[15] AVERAGE POINT RAIN INCHES
2.26	14.030	1.00	2.26	2.84	14.030	1.00	2.84	4.54	14.030	1.00	4.54
		0.00	0.00			0.00	0.00			0.00	0.00
		0.00	0.00			0.00	0.00			0.00	0.00
		0.00	0.00			0.00	0.00			0.00	0.00
SUM [5]	14.03	SUM [7]	2.26	SUM [9]	14.03	SUM [11]	2.84	SUM [13]	14.03	SUM [15]	4.54
[16] AREA ADJ FACTOR			1.000				1.000				1.000
[17] ADJ AVG POINT RAIN			2.26				2.84				4.54

STORM EVENT SUMMARY

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.38	1.58	1.52	1.57
FLOOD VOLUME	(cu-ft)	70,264	80,259	77,186	80,099
	(acre-ft)	1.61	1.84	1.77	1.84
ADJ FLOOD VOLUME (FLOOD VOLUME LESS LOSS RATES)	(cu-ft)	68,819	77,007	71,662	66,166
	(acre-ft)	1.58	1.77	1.65	1.52
BASIN PERC LOSSES	(cu-ft)	-	-	56	217
	(acre-ft)	(0.00)	0.00	0.00	0.00
REQ BASIN STORAGE	(cu-ft)	68,819	77,007	71,606	65,949
	(acre-ft)	1.58	1.77	1.64	1.51
PEAK FLOW	(cfs)	44.47	27.97	23.54	5.88
MAXIMUM WSEL	(ft)	46.48	46.83	46.60	46.33

1-HOUR			
[16] POINT RAIN INCHES PER NOAA	[17] AREA	[18]	[19] AVERAGE POINT RAIN INCHES
1.61	14.030	1.00	1.61
		0.00	0.00
		0.00	0.00
		0.00	0.00
SUM [5]	14.03	SUM [19]	1.61
[16] AREA ADJ FACTOR			1.000
[17] ADJ AVG POINT RAIN			1.61

RCFCD SYNTHETIC UNIT HYDROGRAPH METHOD

PROJECT LA QUINTA APARTMENTS
CONCENTRATION POINT: SITE RETENTION BASIN
BY SPE DATE 10/25/2022

ADJUSTED LOSS RATE

SOIL GROUP [Plate C-1]	LAND USE	RI NUMBER [Plate E-6.1]	PERVIOUS AREA INFILTRATION RATE (in/hr) [Plate E-6.2]	DECIMAL PERCENT OF AREA IMPERVIOUS [Plate E-6.3]	ADJUSTED INFILTRATION RATE (in/hr)	AREA		AVERAGE ADJUSTED INFILTRATION RATE (in/hr)
A	COMMERCIAL	32	0.74	90%	0.14	0.00	0.000	0.0000
A	PAVING/HARDSCAPE	32	0.74	100%	0.07	0.00	0.000	0.0000
A	SF - 1 ACRE	32	0.74	20%	0.61	0.00	0.000	0.0000
A	SF - 1/2 ACRE	32	0.74	40%	0.47	0.00	0.000	0.0000
A	SF - 1/4 ACRE	32	0.74	50%	0.41	0.00	0.000	0.0000
A	MF - COND0MINIUMS	32	0.74	65%	0.31	0.00	0.000	0.0000
A	MF - APARTMENTS	32	0.74	80%	0.21	13.42	0.957	0.1982
A	MOBILE HOME PARKS	32	0.74	75%	0.24	0.00	0.000	0.0000
A	LANDSCAPING	32	0.74	0%	0.74	0.00	0.000	0.0000
A	RETENTION BASINS	32	0.74	0%	0.74	0.61	0.043	0.0322
A	GOLF COURSE	32	0.74	0%	0.74	0.00	0.000	0.0000
D	MOUNTAINOUS	93	0.95	90%	0.18	0.00	0.000	0.0000
					0.00		0.000	0.0000
					0.00		0.000	0.0000
					0.00		0.000	0.0000
					0.00		0.000	0.0000
					0.00		0.000	0.0000
					0.00		0.000	0.0000
					0.00		0.000	0.0000
					0.00		0.000	0.0000
					0.00		0.000	0.0000
					SUM	14.03	SUM	0.2304

VARIABLE LOSS RATE CURVE (24-HOUR STORM ONLY)

Fm= 0.115182609

C= 0.00213

Ft=C(24-(T/60))^1.55 = 0.00213 (24-(T/60))^1.55 + 0.12 in/hr

LOW LOSS RATE (80-90 PERCENT) = 90%

Where:

T=Time in minutes. To get an average value for each unit time period, Use T=1/2 the unit time for the first time period,
T=1 1/2 unit time for the second period, etc.

RCFCD SYNTHETIC UNIT HYDROGRAPH METHOD
100 YEAR - 3 HOUR STORM EVENT

PROJECT: LA QUINTA APARTMENTS
CONCENTRATION POINT: SITE RETENTION BASIN

BY: SPE DATE 10/25/2022

EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	14.03
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	2.50
UNIT TIME-PERCENT OF LAG	199.9
TOTAL ADJUSTED STORM RAIN-INCHES	1.61
CONSTANT LOSS RATE-in/hr	0.23
LOW LOSS RATE - PERCENT	90%

TOTAL PERCOLATION RATE (cfs) 0.24 cfs

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs	Required Storage cf
1	5	0.08	3.7	0.715	0.23	0.64	0.48	6.80	1967.15
2	10	0.17	4.8	0.927	0.23	0.83	0.70	9.78	2861.65
3	15	0.25	5.1	0.985	0.23	0.89	0.75	10.59	3105.60
4	20	0.33	4.9	0.947	0.23	0.85	0.72	10.05	2942.97
5	25	0.42	6.6	1.275	0.23	1.15	1.04	14.66	4325.37
6	30	0.50	7.3	1.410	0.23	1.27	1.18	16.56	4894.60
7	35	0.58	8.4	1.623	0.23	1.46	1.39	19.54	5789.09
8	40	0.67	9.0	1.739	0.23	1.56	1.51	21.16	6277.00
9	45	0.75	12.3	2.376	0.23	2.14	2.15	30.11	8960.49
10	50	0.83	17.6	3.400	0.23	3.06	3.17	44.47	13270.34
11	55	0.92	16.1	3.111	0.23	2.80	2.88	40.41	12050.57
12	60	1.00	4.2	0.811	0.23	0.73	0.58	8.15	2373.74

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

EFFECTIVE RAIN (in)	1.38
FLOOD VOLUME (acft)	1.61
FLOOD VOLUME (cuft)	70263.56
REQUIRED STORAGE (acft)	1.58
REQUIRED STORAGE (cuft)	68818.59
PEAK FLOW RATE (cfs)	44.47

RCFCD SYNTHETIC UNIT HYDROGRAPH METHOD
100 YEAR - 3 HOUR STORM EVENT

PROJECT: LA QUINTA APARTMENTS
CONCENTRATION POINT: SITE RETENTION BASIN

BY: SPE DATE 10/25/2022

EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	14.03
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	2.50
UNIT TIME-PERCENT OF LAG	199.9
TOTAL ADJUSTED STORM RAIN-INCHES	2.26
CONSTANT LOSS RATE-in/hr	0.23
LOW LOSS RATE - PERCENT	90%

TOTAL PERCOLATION RATE (cfs) 0.24 cfs

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs	Required Storage cf
1	5	0.08	1.3	0.353	0.23	0.32	0.12	1.71	442.32
2	10	0.17	1.3	0.353	0.23	0.32	0.12	1.71	442.32
3	15	0.25	1.1	0.298	0.23	0.27	0.07	0.95	214.02
4	20	0.33	1.5	0.407	0.23	0.37	0.18	2.48	670.61
5	25	0.42	1.5	0.407	0.23	0.37	0.18	2.48	670.61
6	30	0.50	1.8	0.488	0.23	0.44	0.26	3.62	1013.06
7	35	0.58	1.5	0.407	0.23	0.37	0.18	2.48	670.61
8	40	0.67	1.8	0.488	0.23	0.44	0.26	3.62	1013.06
9	45	0.75	1.8	0.488	0.23	0.44	0.26	3.62	1013.06
10	50	0.83	1.5	0.407	0.23	0.37	0.18	2.48	670.61
11	55	0.92	1.6	0.434	0.23	0.39	0.20	2.86	784.76
12	60	1.00	1.8	0.488	0.23	0.44	0.26	3.62	1013.06
13	65	1.08	2.2	0.597	0.23	0.54	0.37	5.14	1469.65
14	70	1.17	2.2	0.597	0.23	0.54	0.37	5.14	1469.65
15	75	1.25	2.2	0.597	0.23	0.54	0.37	5.14	1469.65
16	80	1.33	2.0	0.542	0.23	0.49	0.31	4.38	1241.35
17	85	1.42	2.6	0.705	0.23	0.63	0.47	6.66	1926.24
18	90	1.50	2.7	0.732	0.23	0.66	0.50	7.04	2040.39
19	95	1.58	2.4	0.651	0.23	0.59	0.42	5.90	1697.95
20	100	1.67	2.7	0.732	0.23	0.66	0.50	7.04	2040.39
21	105	1.75	3.3	0.895	0.23	0.81	0.66	9.32	2725.28
22	110	1.83	3.1	0.841	0.23	0.76	0.61	8.56	2496.98
23	115	1.92	2.9	0.786	0.23	0.71	0.56	7.80	2268.69
24	120	2.00	3.0	0.814	0.23	0.73	0.58	8.18	2382.84
25	125	2.08	3.1	0.841	0.23	0.76	0.61	8.56	2496.98
26	130	2.17	4.2	1.139	0.23	1.03	0.91	12.75	3752.61
27	135	2.25	5.0	1.356	0.23	1.22	1.13	15.79	4665.80
28	140	2.33	3.5	0.949	0.23	0.85	0.72	10.09	2953.58
29	145	2.42	6.8	1.844	0.23	1.66	1.61	22.64	6720.46
30	150	2.50	7.3	1.980	0.23	1.78	1.75	24.54	7291.20
31	155	2.58	8.2	2.224	0.23	2.00	1.99	27.97	8318.54
32	160	2.67	5.9	1.600	0.23	1.44	1.37	19.22	5693.13
33	165	2.75	2.0	0.542	0.23	0.49	0.31	4.38	1241.35
34	170	2.83	1.8	0.488	0.23	0.44	0.26	3.62	1013.06
35	175	2.92	1.8	0.488	0.23	0.44	0.26	3.62	1013.06
36	180	3.00	0.6	0.163	0.23	0.15	0.02	0.23	0.00

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

EFFECTIVE RAIN (in)	1.58
FLOOD VOLUME (acft)	1.84
FLOOD VOLUME (cuft)	80259.04
REQUIRED STORAGE (acft)	1.77
REQUIRED STORAGE (cuft)	77006.94
PEAK FLOW RATE (cfs)	27.97

RCFCD SYNTHETIC UNIT HYDROGRAPH METHOD 100 YEAR - 6 HOUR STORM EVENT	PROJECT: LA QUINTA APARTMENTS CONCENTRATION POINT: SITE RETENTION BASIN BY: SPE DATE: 10/25/2022

EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	14.03		
UNIT TIME-MINUTES	5		
LAG TIME - MINUTES	2.50		
UNIT TIME-PERCENT OF LAG	199.9		
TOTAL ADJUSTED STORM RAIN-INCHES	2.84		
CONSTANT LOSS RATE-in/hr	0.230		
LOW LOSS RATE - PERCENT	90%	TOTAL PERCOLATION RATE (cfs)	0.24 cfs

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow	Required Storage
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs	cf
1	5	0.08	0.5	0.170	0.23	0.15	0.02	0.24	0.00
2	10	0.17	0.6	0.204	0.23	0.18	0.02	0.29	14.07
3	15	0.25	0.6	0.204	0.23	0.18	0.02	0.29	14.07
4	20	0.33	0.6	0.204	0.23	0.18	0.02	0.29	14.07
5	25	0.42	0.6	0.204	0.23	0.18	0.02	0.29	14.07
6	30	0.50	0.7	0.239	0.23	0.21	0.01	0.11	0.00
7	35	0.58	0.7	0.239	0.23	0.21	0.01	0.11	0.00
8	40	0.67	0.7	0.239	0.23	0.21	0.01	0.11	0.00
9	45	0.75	0.7	0.239	0.23	0.21	0.01	0.11	0.00
10	50	0.83	0.7	0.239	0.23	0.21	0.01	0.11	0.00
11	55	0.92	0.7	0.239	0.23	0.21	0.01	0.11	0.00
12	60	1.00	0.8	0.273	0.23	0.25	0.04	0.59	105.93
13	65	1.08	0.8	0.273	0.23	0.25	0.04	0.59	105.93
14	70	1.17	0.8	0.273	0.23	0.25	0.04	0.59	105.93
15	75	1.25	0.8	0.273	0.23	0.25	0.04	0.59	105.93
16	80	1.33	0.8	0.273	0.23	0.25	0.04	0.59	105.93
17	85	1.42	0.8	0.273	0.23	0.25	0.04	0.59	105.93
18	90	1.50	0.8	0.273	0.23	0.25	0.04	0.59	105.93
19	95	1.58	0.8	0.273	0.23	0.25	0.04	0.59	105.93
20	100	1.67	0.8	0.273	0.23	0.25	0.04	0.59	105.93
21	105	1.75	0.8	0.273	0.23	0.25	0.04	0.59	105.93
22	110	1.83	0.8	0.273	0.23	0.25	0.04	0.59	105.93
23	115	1.92	0.8	0.273	0.23	0.25	0.04	0.59	105.93
24	120	2.00	0.9	0.307	0.23	0.28	0.08	1.07	249.38
25	125	2.08	0.8	0.273	0.23	0.25	0.04	0.59	105.93
26	130	2.17	0.9	0.307	0.23	0.28	0.08	1.07	249.38
27	135	2.25	0.9	0.307	0.23	0.28	0.08	1.07	249.38
28	140	2.33	0.9	0.307	0.23	0.28	0.08	1.07	249.38
29	145	2.42	0.9	0.307	0.23	0.28	0.08	1.07	249.38
30	150	2.50	0.9	0.307	0.23	0.28	0.08	1.07	249.38
31	155	2.58	0.9	0.307	0.23	0.28	0.08	1.07	249.38
32	160	2.67	0.9	0.307	0.23	0.28	0.08	1.07	249.38
33	165	2.75	1.0	0.341	0.23	0.31	0.11	1.55	392.82
34	170	2.83	1.0	0.341	0.23	0.31	0.11	1.55	392.82
35	175	2.92	1.0	0.341	0.23	0.31	0.11	1.55	392.82
36	180	3.00	1.0	0.341	0.23	0.31	0.11	1.55	392.82
37	185	3.08	1.0	0.341	0.23	0.31	0.11	1.55	392.82
38	190	3.17	1.1	0.375	0.23	0.34	0.14	2.03	536.26
39	195	3.25	1.1	0.375	0.23	0.34	0.14	2.03	536.26
40	200	3.33	1.1	0.375	0.23	0.34	0.14	2.03	536.26
41	205	3.42	1.2	0.409	0.23	0.37	0.18	2.51	679.71
42	210	3.50	1.3	0.443	0.23	0.40	0.21	2.98	823.15
43	215	3.58	1.4	0.477	0.23	0.43	0.25	3.46	966.59
44	220	3.67	1.4	0.477	0.23	0.43	0.25	3.46	966.59
45	225	3.75	1.5	0.511	0.23	0.46	0.28	3.94	1110.03
46	230	3.83	1.5	0.511	0.23	0.46	0.28	3.94	1110.03
47	235	3.92	1.6	0.545	0.23	0.49	0.31	4.42	1253.48
48	240	4.00	1.6	0.545	0.23	0.49	0.31	4.42	1253.48
49	245	4.08	1.7	0.579	0.23	0.52	0.35	4.90	1396.92
50	250	4.17	1.8	0.613	0.23	0.55	0.38	5.37	1540.36
51	255	4.25	1.9	0.648	0.23	0.58	0.42	5.85	1683.80
52	260	4.33	2.0	0.682	0.23	0.61	0.45	6.33	1827.25
53	265	4.42	2.1	0.716	0.23	0.64	0.49	6.81	1970.69
54	270	4.50	2.1	0.716	0.23	0.64	0.49	6.81	1970.69
55	275	4.58	2.2	0.750	0.23	0.67	0.52	7.29	2114.13
56	280	4.67	2.3	0.784	0.23	0.71	0.55	7.77	2257.58

RCFCD SYNTHETIC UNIT HYDROGRAPH METHOD 100 YEAR - 6 HOUR STORM EVENT	PROJECT: LA QUINTA APARTMENTS CONCENTRATION POINT: SITE RETENTION BASIN BY: SPE DATE: 10/25/2022

EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	14.03		
UNIT TIME-MINUTES	5		
LAG TIME - MINUTES	2.50		
UNIT TIME-PERCENT OF LAG	199.9		
TOTAL ADJUSTED STORM RAIN-INCHES	2.84		
CONSTANT LOSS RATE-in/hr	0.230		
LOW LOSS RATE - PERCENT	90%	TOTAL PERCOLATION RATE (cfs)	0.24 cfs

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow	Required Storage
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs	cf
57	285	4.75	2.4	0.818	0.23	0.74	0.59	8.24	2401.02
58	290	4.83	2.4	0.818	0.23	0.74	0.59	8.24	2401.02
59	295	4.92	2.5	0.852	0.23	0.77	0.62	8.72	2544.46
60	300	5.00	2.6	0.886	0.23	0.80	0.66	9.20	2687.90
61	305	5.08	3.1	1.056	0.23	0.95	0.83	11.59	3405.12
62	310	5.17	3.6	1.227	0.23	1.10	1.00	13.98	4122.33
63	315	5.25	3.9	1.329	0.23	1.20	1.10	15.42	4552.66
64	320	5.33	4.2	1.431	0.23	1.29	1.20	16.85	4982.99
65	325	5.42	4.7	1.602	0.23	1.44	1.37	19.24	5700.20
66	330	5.50	5.6	1.908	0.23	1.72	1.68	23.54	6991.19
67	335	5.58	1.9	0.648	0.23	0.58	0.42	5.85	1683.80
68	340	5.67	0.9	0.307	0.23	0.28	0.08	1.07	249.38
69	345	5.75	0.6	0.204	0.23	0.18	0.02	0.29	14.07
70	350	5.83	0.5	0.170	0.23	0.15	0.02	0.24	0.00
71	355	5.92	0.3	0.102	0.23	0.09	0.01	0.14	0.00
72	360	6.00	0.2	0.068	0.23	0.06	0.01	0.10	0.00

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

EFFECTIVE RAIN (in)	1.52
FLOOD VOLUME (acft)	1.77
FLOOD VOLUME (cuft)	77186.24
REQUIRED STORAGE (acft)	1.65
REQUIRED STORAGE (cuft)	71661.92
PEAK FLOW RATE (cfs)	23.54

RCFCD SYNTHETIC UNIT HYDROGRAPH METHOD 100 YEAR - 24 HOUR STORM EVENT		PROJECT: LA QUINTA APARTMENTS CONCENTRATION POINT: SITE RETENTION BASIN BY: SPE DATE: 10/25/2022	

EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	14.030	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.2304
LAG TIME - MINUTES	2.50	MINIMUM LOSS RATE (for var. loss) - in/hr	0.115
UNIT TIME-PERCENT OF LAG	599.6	LOW LOSS RATE - DECIMAL	0.90
TOTAL ADJUSTED STORM RAIN-INCHES	4.54	C	0.00213
		PERCOLATION RATE (cfs)	0.24

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow	Required Storage
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs	cf
1	15	0.25	0.2	0.036	0.407	0.033	0.004	0.05	0.00
2	30	0.50	0.3	0.054	0.402	0.049	0.005	0.08	0.00
3	45	0.75	0.3	0.054	0.397	0.049	0.005	0.08	0.00
4	60	1.00	0.4	0.073	0.393	0.065	0.007	0.10	0.00
5	75	1.25	0.3	0.054	0.388	0.049	0.005	0.08	0.00
6	90	1.50	0.3	0.054	0.383	0.049	0.005	0.08	0.00
7	105	1.75	0.3	0.054	0.379	0.049	0.005	0.08	0.00
8	120	2.00	0.4	0.073	0.374	0.065	0.007	0.10	0.00
9	135	2.25	0.4	0.073	0.370	0.065	0.007	0.10	0.00
10	150	2.50	0.4	0.073	0.365	0.065	0.007	0.10	0.00
11	165	2.75	0.5	0.091	0.361	0.082	0.009	0.13	0.00
12	180	3.00	0.5	0.091	0.356	0.082	0.009	0.13	0.00
13	195	3.25	0.5	0.091	0.352	0.082	0.009	0.13	0.00
14	210	3.50	0.5	0.091	0.348	0.082	0.009	0.13	0.00
15	225	3.75	0.5	0.091	0.343	0.082	0.009	0.13	0.00
16	240	4.00	0.6	0.109	0.339	0.098	0.011	0.15	0.00
17	255	4.25	0.6	0.109	0.335	0.098	0.011	0.15	0.00
18	270	4.50	0.7	0.127	0.330	0.114	0.013	0.18	0.00
19	285	4.75	0.7	0.127	0.326	0.114	0.013	0.18	0.00
20	300	5.00	0.8	0.145	0.322	0.131	0.015	0.20	0.00
21	315	5.25	0.6	0.109	0.318	0.098	0.011	0.15	0.00
22	330	5.50	0.7	0.127	0.314	0.114	0.013	0.18	0.00
23	345	5.75	0.8	0.145	0.310	0.131	0.015	0.20	0.00
24	360	6.00	0.8	0.145	0.305	0.131	0.015	0.20	0.00
25	375	6.25	0.9	0.163	0.301	0.147	0.016	0.23	0.00
26	390	6.50	0.9	0.163	0.297	0.147	0.016	0.23	0.00
27	405	6.75	1.0	0.182	0.293	0.163	0.018	0.25	13.31
28	420	7.00	1.0	0.182	0.289	0.163	0.018	0.25	13.31
29	435	7.25	1.0	0.182	0.285	0.163	0.018	0.25	13.31
30	450	7.50	1.1	0.200	0.282	0.180	0.020	0.28	36.24
31	465	7.75	1.2	0.218	0.278	0.196	0.022	0.31	59.17
32	480	8.00	1.3	0.236	0.274	0.212	0.024	0.33	82.10
33	495	8.25	1.5	0.272	0.270	0.245	0.002	0.03	0.00
34	510	8.50	1.5	0.272	0.266	0.245	0.006	0.09	0.00
35	525	8.75	1.6	0.291	0.263	0.262	0.028	0.39	137.02
36	540	9.00	1.7	0.309	0.259	0.278	0.050	0.70	413.03
37	555	9.25	1.9	0.345	0.255	0.311	0.090	1.26	917.92
38	570	9.50	2.0	0.363	0.252	0.327	0.112	1.57	1193.09
39	585	9.75	2.1	0.381	0.248	0.343	0.133	1.87	1467.82
40	600	10.00	2.2	0.400	0.244	0.360	0.155	2.18	1742.12
41	615	10.25	1.5	0.272	0.241	0.245	0.031	0.44	181.54
42	630	10.50	1.5	0.272	0.237	0.245	0.035	0.49	225.65
43	645	10.75	2.0	0.363	0.234	0.327	0.129	1.81	1415.86
44	660	11.00	2.0	0.363	0.231	0.327	0.133	1.86	1459.09
45	675	11.25	1.9	0.345	0.227	0.311	0.118	1.65	1272.57
46	690	11.50	1.9	0.345	0.224	0.311	0.121	1.70	1314.89
47	705	11.75	1.7	0.309	0.220	0.278	0.088	1.24	898.14
48	720	12.00	1.8	0.327	0.217	0.294	0.110	1.54	1168.85
49	735	12.25	2.5	0.454	0.214	0.409	0.240	3.37	2814.93
50	750	12.50	2.6	0.472	0.211	0.425	0.261	3.67	3084.71
51	765	12.75	2.8	0.508	0.208	0.458	0.301	4.22	3583.31
52	780	13.00	2.9	0.527	0.204	0.474	0.322	4.52	3852.12
53	795	13.25	3.4	0.617	0.201	0.556	0.416	5.84	5037.68
54	810	13.50	3.4	0.617	0.198	0.556	0.419	5.88	5076.21
55	825	13.75	2.3	0.418	0.195	0.376	0.222	3.12	2591.88
56	840	14.00	2.3	0.418	0.192	0.376	0.225	3.16	2629.42
57	855	14.25	2.7	0.490	0.189	0.441	0.301	4.22	3583.67
58	870	14.50	2.6	0.472	0.187	0.425	0.286	4.01	3390.89
59	885	14.75	2.6	0.472	0.184	0.425	0.288	4.05	3426.89
60	900	15.00	2.5	0.454	0.181	0.409	0.273	3.83	3233.06
61	915	15.25	2.4	0.436	0.178	0.392	0.258	3.62	3038.70

RCFCD SYNTHETIC UNIT HYDROGRAPH METHOD 100 YEAR - 24 HOUR STORM EVENT	PROJECT: LA QUINTA APARTMENTS CONCENTRATION POINT: SITE RETENTION BASIN BY: SPE DATE: 10/25/2022

EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	14.030	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.2304
LAG TIME - MINUTES	2.50	MINIMUM LOSS RATE (for var. loss) - in/hr	0.115
UNIT TIME-PERCENT OF LAG	599.6	LOW LOSS RATE - DECIMAL	0.90
TOTAL ADJUSTED STORM RAIN-INCHES	4.54	C	0.00213
		PERCOLATION RATE (cfs)	0.24

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow	Required Storage
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs	cf
62	930	15.50	2.3	0.418	0.175	0.376	0.242	3.40	2843.80
63	945	15.75	1.9	0.345	0.173	0.311	0.172	2.42	1960.44
64	960	16.00	1.9	0.345	0.170	0.311	0.175	2.46	1993.75
65	975	16.25	0.4	0.073	0.167	0.065	0.007	0.10	0.00
66	990	16.50	0.4	0.073	0.165	0.065	0.007	0.10	0.00
67	1005	16.75	0.3	0.054	0.162	0.049	0.005	0.08	0.00
68	1020	17.00	0.3	0.054	0.160	0.049	0.005	0.08	0.00
69	1035	17.25	0.5	0.091	0.158	0.082	0.009	0.13	0.00
70	1050	17.50	0.5	0.091	0.155	0.082	0.009	0.13	0.00
71	1065	17.75	0.5	0.091	0.153	0.082	0.009	0.13	0.00
72	1080	18.00	0.4	0.073	0.151	0.065	0.007	0.10	0.00
73	1095	18.25	0.4	0.073	0.148	0.065	0.007	0.10	0.00
74	1110	18.50	0.4	0.073	0.146	0.065	0.007	0.10	0.00
75	1125	18.75	0.3	0.054	0.144	0.049	0.005	0.08	0.00
76	1140	19.00	0.2	0.036	0.142	0.033	0.004	0.05	0.00
77	1155	19.25	0.3	0.054	0.140	0.049	0.005	0.08	0.00
78	1170	19.50	0.4	0.073	0.138	0.065	0.007	0.10	0.00
79	1185	19.75	0.3	0.054	0.136	0.049	0.005	0.08	0.00
80	1200	20.00	0.2	0.036	0.134	0.033	0.004	0.05	0.00
81	1215	20.25	0.3	0.054	0.133	0.049	0.005	0.08	0.00
82	1230	20.50	0.3	0.054	0.131	0.049	0.005	0.08	0.00
83	1245	20.75	0.3	0.054	0.129	0.049	0.005	0.08	0.00
84	1260	21.00	0.2	0.036	0.128	0.033	0.004	0.05	0.00
85	1275	21.25	0.3	0.054	0.126	0.049	0.005	0.08	0.00
86	1290	21.50	0.2	0.036	0.125	0.033	0.004	0.05	0.00
87	1305	21.75	0.3	0.054	0.123	0.049	0.005	0.08	0.00
88	1320	22.00	0.2	0.036	0.122	0.033	0.004	0.05	0.00
89	1335	22.25	0.3	0.054	0.121	0.049	0.005	0.08	0.00
90	1350	22.50	0.2	0.036	0.120	0.033	0.004	0.05	0.00
91	1365	22.75	0.2	0.036	0.119	0.033	0.004	0.05	0.00
92	1380	23.00	0.2	0.036	0.118	0.033	0.004	0.05	0.00
93	1395	23.25	0.2	0.036	0.117	0.033	0.004	0.05	0.00
94	1410	23.50	0.2	0.036	0.116	0.033	0.004	0.05	0.00
95	1425	23.75	0.2	0.036	0.116	0.033	0.004	0.05	0.00
96	1440	24.00	0.2	0.036	0.115	0.033	0.004	0.05	0.00

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY	
EFFECTIVE RAIN (in)	1.57
FLOOD VOLUME (acft)	1.84
FLOOD VOLUME (cuft)	80099.08
REQUIRED STORAGE (acft)	1.52
REQUIRED STORAGE (cuft)	66166.46
PEAK FLOW (cfs)	5.88

PROJECT: LA QUINTA APARTMENTS
ECI JOB# 20210635
SITE RETENTION BASIN

BASIN CHARACTERISTICS

CONTOUR	DEPTH		AREA		VOLUME		
	INCR (ft)	TOTAL (ft)	INCR (sf)	TOTAL (sf)	INCR (cuft)	TOTAL (cuft)	(acre-ft)
42	0	0		8867	0	0	0.00
43	1	1	2816	11683	10275	10275	0.24
44	1	2	2929	14612	13148	23423	0.54
45	1	3	3042	17654	16133	39556	0.91
46	1	4	3155	20809	19232	58787	1.35
47	1	5	3268	24077	22443	81230	1.86
48	1	6	3381	27458	25768	106998	2.46

PERCOLATION CALCULATIONS
PERCOLATION RATE 0 in/hr 0.00000 cfs per square foot of perc area

DRYWELLS
NUMBER USED 2
RATE/DRYWELL 0.12 cfs
TOTAL DISSIPATED 0.24 cfs

TOTAL DRYWELL PERCOLATION RATE 0.24 cfs

INTERPOLATION TABLE FOR RETENTION BASIN DEPTH/AREA/VOLUME LOOKUP

CONTOUR	DEPTH		AREA		VOLUME		
	INCR (ft)	TOTAL (ft)	INCR (sf)	TOTAL (sf)	INCR (cuft)	TOTAL (cuft)	(acre-ft)
42.00	0	0	0	8867	0	0	0.00
42.03	0.025	0.02	70	8937	223	223	0.01
42.05	0.025	0.05	70	9008	225	449	0.01
42.08	0.025	0.07	70	9078	227	675	0.02
42.10	0.025	0.10	70	9149	229	904	0.02
42.13	0.025	0.12	70	9219	230	1134	0.03
42.15	0.025	0.15	70	9289	232	1366	0.03
42.18	0.025	0.17	70	9360	234	1600	0.04
42.20	0.025	0.20	70	9430	235	1835	0.04
42.23	0.025	0.22	70	9501	237	2072	0.05
42.25	0.025	0.25	70	9571	239	2311	0.05
42.28	0.025	0.27	70	9641	241	2552	0.06
42.30	0.025	0.30	70	9712	242	2794	0.06
42.33	0.025	0.32	70	9782	244	3038	0.07
42.35	0.025	0.35	70	9853	246	3284	0.08
42.38	0.025	0.37	70	9923	247	3531	0.08
42.40	0.025	0.40	70	9993	249	3780	0.09
42.43	0.025	0.42	70	10064	251	4031	0.09
42.45	0.025	0.45	70	10134	253	4284	0.10
42.48	0.025	0.47	70	10205	254	4538	0.10
42.50	0.025	0.50	70	10275	256	4794	0.11
42.53	0.025	0.52	70	10345	258	5052	0.12
42.55	0.025	0.55	70	10416	259	5311	0.12
42.58	0.025	0.57	70	10486	261	5572	0.13

42.60	0.025	0.60	70	10557	263	5835	0.13
42.63	0.025	0.62	70	10627	265	6100	0.14
42.65	0.025	0.65	70	10697	266	6366	0.15
42.68	0.025	0.67	70	10768	268	6634	0.15
42.70	0.025	0.70	70	10838	270	6904	0.16
42.73	0.025	0.72	70	10909	271	7176	0.16
42.75	0.025	0.75	70	10979	273	7449	0.17
42.78	0.025	0.77	70	11049	275	7724	0.18
42.80	0.025	0.80	70	11120	277	8000	0.18
42.83	0.025	0.82	70	11190	278	8279	0.19
42.85	0.025	0.85	70	11261	280	8559	0.20
42.88	0.025	0.87	70	11331	282	8840	0.20
42.90	0.025	0.90	70	11401	283	9124	0.21
42.92	0.025	0.92	70	11472	285	9409	0.22
42.95	0.025	0.95	70	11542	287	9696	0.22
42.97	0.025	0.97	70	11613	289	9985	0.23
43.00	0.025	1.00	70	11683	290	10275	0.24
43.03	0.025	1.03	73	11756	294	10569	0.24
43.05	0.025	1.05	73	11829	296	10865	0.25
43.08	0.025	1.08	73	11903	297	11162	0.26
43.10	0.025	1.10	73	11976	299	11461	0.26
43.13	0.025	1.12	73	12049	301	11762	0.27
43.15	0.025	1.15	73	12122	303	12065	0.28
43.18	0.025	1.17	73	12196	305	12370	0.28
43.20	0.025	1.20	73	12269	306	12676	0.29
43.23	0.025	1.22	73	12342	308	12984	0.30
43.25	0.025	1.25	73	12415	310	13294	0.31
43.28	0.025	1.27	73	12488	312	13606	0.31
43.30	0.025	1.30	73	12562	314	13919	0.32
43.33	0.025	1.32	73	12635	315	14234	0.33
43.35	0.025	1.35	73	12708	317	14552	0.33
43.38	0.025	1.37	73	12781	319	14870	0.34
43.40	0.025	1.40	73	12855	321	15191	0.35
43.43	0.025	1.42	73	12928	322	15514	0.36
43.45	0.025	1.45	73	13001	324	15838	0.36
43.48	0.025	1.47	73	13074	326	16164	0.37
43.50	0.025	1.50	73	13148	328	16492	0.38
43.53	0.025	1.52	73	13221	330	16821	0.39
43.55	0.025	1.55	73	13294	331	17153	0.39
43.58	0.025	1.57	73	13367	333	17486	0.40
43.60	0.025	1.60	73	13440	335	17821	0.41
43.63	0.025	1.62	73	13514	337	18157	0.42
43.65	0.025	1.65	73	13587	339	18496	0.42
43.68	0.025	1.67	73	13660	340	18836	0.43
43.70	0.025	1.70	73	13733	342	19178	0.44
43.73	0.025	1.72	73	13807	344	19522	0.45
43.75	0.025	1.75	73	13880	346	19868	0.46
43.78	0.025	1.77	73	13953	347	20215	0.46
43.80	0.025	1.80	73	14026	349	20564	0.47
43.83	0.025	1.82	73	14099	351	20915	0.48
43.85	0.025	1.85	73	14173	353	21268	0.49
43.88	0.025	1.87	73	14246	355	21623	0.50
43.90	0.025	1.90	73	14319	356	21979	0.50
43.92	0.025	1.92	73	14392	358	22337	0.51
43.95	0.025	1.95	73	14466	360	22697	0.52
43.97	0.025	1.97	73	14539	362	23059	0.53
44.00	0.025	2.00	73	14612	364	23423	0.54
44.03	0.025	2.03	76	14688	367	23790	0.55

44.05	0.025	2.05	76	14764	369	24159	0.55
44.08	0.025	2.08	76	14840	371	24530	0.56
44.10	0.025	2.10	76	14916	373	24902	0.57
44.13	0.025	2.12	76	14992	375	25277	0.58
44.15	0.025	2.15	76	15068	376	25653	0.59
44.18	0.025	2.17	76	15144	378	26032	0.60
44.20	0.025	2.20	76	15220	380	26412	0.61
44.23	0.025	2.22	76	15296	382	26794	0.62
44.25	0.025	2.25	76	15373	384	27178	0.62
44.28	0.025	2.27	76	15449	386	27563	0.63
44.30	0.025	2.30	76	15525	388	27951	0.64
44.33	0.025	2.32	76	15601	389	28340	0.65
44.35	0.025	2.35	76	15677	391	28731	0.66
44.38	0.025	2.37	76	15753	393	29125	0.67
44.40	0.025	2.40	76	15829	395	29520	0.68
44.43	0.025	2.42	76	15905	397	29916	0.69
44.45	0.025	2.45	76	15981	399	30315	0.70
44.48	0.025	2.47	76	16057	401	30716	0.71
44.50	0.025	2.50	76	16133	402	31118	0.71
44.53	0.025	2.52	76	16209	404	31522	0.72
44.55	0.025	2.55	76	16285	406	31928	0.73
44.58	0.025	2.57	76	16361	408	32336	0.74
44.60	0.025	2.60	76	16437	410	32746	0.75
44.63	0.025	2.62	76	16513	412	33158	0.76
44.65	0.025	2.65	76	16589	414	33571	0.77
44.68	0.025	2.67	76	16665	415	33987	0.78
44.70	0.025	2.70	76	16741	417	34404	0.79
44.73	0.025	2.72	76	16817	419	34823	0.80
44.75	0.025	2.75	76	16894	421	35244	0.81
44.78	0.025	2.77	76	16970	423	35667	0.82
44.80	0.025	2.80	76	17046	425	36091	0.83
44.83	0.025	2.82	76	17122	427	36518	0.84
44.85	0.025	2.85	76	17198	428	36946	0.85
44.88	0.025	2.87	76	17274	430	37377	0.86
44.90	0.025	2.90	76	17350	432	37809	0.87
44.92	0.025	2.92	76	17426	434	38243	0.88
44.95	0.025	2.95	76	17502	436	38678	0.89
44.97	0.025	2.97	76	17578	438	39116	0.90
45.00	0.025	3.00	76	17654	439	39556	0.91
45.03	0.025	3.03	79	17733	443	39999	0.92
45.05	0.025	3.05	79	17812	445	40444	0.93
45.08	0.025	3.08	79	17891	447	40891	0.94
45.10	0.025	3.10	79	17970	449	41340	0.95
45.13	0.025	3.12	79	18048	451	41791	0.96
45.15	0.025	3.15	79	18127	453	42244	0.97
45.18	0.025	3.17	79	18206	455	42699	0.98
45.20	0.025	3.20	79	18285	457	43156	0.99
45.23	0.025	3.22	79	18364	459	43614	1.00
45.25	0.025	3.25	79	18443	461	44075	1.01
45.28	0.025	3.27	79	18522	463	44537	1.02
45.30	0.025	3.30	79	18601	464	45002	1.03
45.33	0.025	3.32	79	18679	466	45468	1.04
45.35	0.025	3.35	79	18758	468	45936	1.05
45.38	0.025	3.37	79	18837	470	46407	1.07
45.40	0.025	3.40	79	18916	472	46879	1.08
45.43	0.025	3.42	79	18995	474	47353	1.09
45.45	0.025	3.45	79	19074	476	47829	1.10
45.48	0.025	3.47	79	19153	478	48307	1.11

45.50	0.025	3.50	79	19232	480	48786	1.12
45.53	0.025	3.52	79	19310	482	49268	1.13
45.55	0.025	3.55	79	19389	484	49752	1.14
45.58	0.025	3.57	79	19468	486	50238	1.15
45.60	0.025	3.60	79	19547	488	50725	1.16
45.63	0.025	3.62	79	19626	489	51214	1.18
45.65	0.025	3.65	79	19705	491	51706	1.19
45.68	0.025	3.67	79	19784	493	52199	1.20
45.70	0.025	3.70	79	19863	495	52694	1.21
45.73	0.025	3.72	79	19941	497	53191	1.22
45.75	0.025	3.75	79	20020	499	53691	1.23
45.78	0.025	3.77	79	20099	501	54192	1.24
45.80	0.025	3.80	79	20178	503	54694	1.26
45.83	0.025	3.82	79	20257	505	55199	1.27
45.85	0.025	3.85	79	20336	507	55706	1.28
45.88	0.025	3.87	79	20415	509	56215	1.29
45.90	0.025	3.90	79	20494	511	56725	1.30
45.92	0.025	3.92	79	20572	513	57238	1.31
45.95	0.025	3.95	79	20651	514	57752	1.33
45.97	0.025	3.97	79	20730	516	58269	1.34
46.00	0.025	4.00	79	20809	518	58787	1.35
46.03	0.025	4.03	82	20891	522	59309	1.36
46.05	0.025	4.05	82	20972	524	59833	1.37
46.08	0.025	4.08	82	21054	526	60360	1.39
46.10	0.025	4.10	82	21136	528	60888	1.40
46.13	0.025	4.12	82	21218	530	61418	1.41
46.15	0.025	4.15	82	21299	532	61950	1.42
46.18	0.025	4.17	82	21381	534	62484	1.43
46.20	0.025	4.20	82	21463	536	63021	1.45
46.23	0.025	4.22	82	21544	538	63559	1.46
46.25	0.025	4.25	82	21626	540	64099	1.47
46.28	0.025	4.27	82	21708	542	64641	1.48
46.30	0.025	4.30	82	21789	544	65185	1.50
46.33	0.025	4.32	82	21871	546	65731	1.51
46.35	0.025	4.35	82	21953	548	66279	1.52
46.38	0.025	4.37	82	22035	550	66829	1.53
46.40	0.025	4.40	82	22116	552	67382	1.55
46.43	0.025	4.42	82	22198	554	67936	1.56
46.45	0.025	4.45	82	22280	556	68492	1.57
46.48	0.025	4.47	82	22361	558	69050	1.59
46.50	0.025	4.50	82	22443	560	69610	1.60
46.53	0.025	4.52	82	22525	562	70172	1.61
46.55	0.025	4.55	82	22606	564	70736	1.62
46.58	0.025	4.57	82	22688	566	71302	1.64
46.60	0.025	4.60	82	22770	568	71870	1.65
46.63	0.025	4.62	82	22852	570	72440	1.66
46.65	0.025	4.65	82	22933	572	73012	1.68
46.68	0.025	4.67	82	23015	574	73586	1.69
46.70	0.025	4.70	82	23097	576	74162	1.70
46.73	0.025	4.72	82	23178	578	74740	1.72
46.75	0.025	4.75	82	23260	580	75320	1.73
46.78	0.025	4.77	82	23342	582	75902	1.74
46.80	0.025	4.80	82	23423	584	76486	1.76
46.83	0.025	4.82	82	23505	586	77072	1.77
46.85	0.025	4.85	82	23587	588	77660	1.78
46.88	0.025	4.87	82	23669	590	78250	1.80
46.90	0.025	4.90	82	23750	592	78842	1.81
46.92	0.025	4.92	82	23832	594	79436	1.82

46.95	0.025	4.95	82	23914	596	80032	1.84
46.97	0.025	4.97	82	23995	598	80630	1.85
47.00	0.025	5.00	82	24077	600	81230	1.86
47.03	0.025	5.03	85	24162	604	81834	1.88
47.05	0.025	5.05	85	24246	606	82440	1.89
47.08	0.025	5.08	85	24331	608	83048	1.91
47.10	0.025	5.10	85	24415	610	83658	1.92
47.13	0.025	5.12	85	24500	612	84271	1.93
47.15	0.025	5.15	85	24584	614	84885	1.95
47.18	0.025	5.17	85	24669	616	85501	1.96
47.20	0.025	5.20	85	24753	618	86120	1.98
47.23	0.025	5.22	85	24838	620	86740	1.99
47.25	0.025	5.25	85	24922	623	87363	2.01
47.28	0.025	5.27	85	25007	625	87987	2.02
47.30	0.025	5.30	85	25091	627	88614	2.03
47.33	0.025	5.32	85	25176	629	89243	2.05
47.35	0.025	5.35	85	25260	631	89873	2.06
47.38	0.025	5.37	85	25345	633	90506	2.08
47.40	0.025	5.40	85	25429	635	91141	2.09
47.43	0.025	5.42	85	25514	637	91778	2.11
47.45	0.025	5.45	85	25598	639	92417	2.12
47.48	0.025	5.47	85	25683	641	93058	2.14
47.50	0.025	5.50	85	25768	643	93701	2.15
47.53	0.025	5.52	85	25852	645	94347	2.17
47.55	0.025	5.55	85	25937	647	94994	2.18
47.58	0.025	5.57	85	26021	649	95643	2.20
47.60	0.025	5.60	85	26106	651	96295	2.21
47.63	0.025	5.62	85	26190	653	96948	2.23
47.65	0.025	5.65	85	26275	656	97604	2.24
47.68	0.025	5.67	85	26359	658	98261	2.26
47.70	0.025	5.70	85	26444	660	98921	2.27
47.73	0.025	5.72	85	26528	662	99583	2.29
47.75	0.025	5.75	85	26613	664	100246	2.30
47.78	0.025	5.77	85	26697	666	100912	2.32
47.80	0.025	5.80	85	26782	668	101580	2.33
47.83	0.025	5.82	85	26866	670	102250	2.35
47.85	0.025	5.85	85	26951	672	102922	2.36
47.88	0.025	5.87	85	27035	674	103596	2.38
47.90	0.025	5.90	85	27120	676	104272	2.39
47.92	0.025	5.92	85	27204	678	104951	2.41
47.95	0.025	5.95	85	27289	680	105631	2.42
47.97	0.025	5.97	85	27373	682	106313	2.44
48.00	0.025	6.00	85	27458	684	106998	2.46

SITE RETENTION BASIN
ECI JOB # 20210635
100 YEAR - 1 HOUR STORM EVENT

TIME UNIT PERIOD	(min)	FLOW IN (cfs)	VOLUME IN (cuft)	PERC AREA DEPTH (ft)	BASIN VOL PRE-PERC (cuft)	PERC AREA (sf)	PERC OUT (cuft)	POST PERC BASIN DEPTH (ft)	BALANCE IN BASIN (cuft)	(acre-ft)
1	5	6.56	1,967	42.23	1,967	9501	0	42.23	1,967	0.05
2	10	9.54	2,862	42.50	4,829	10275	0	42.50	4,829	0.11
3	15	10.35	3,106	42.80	7,934	11120	0	42.80	7,934	0.18
4	20	9.81	2,943	43.05	10,877	11829	0	43.05	10,877	0.25
5	25	14.42	4,325	43.40	15,203	12855	0	43.40	15,203	0.35
6	30	16.32	4,895	43.78	20,097	13953	0	43.78	20,097	0.46
7	35	19.30	5,789	44.18	25,886	15144	0	44.18	25,886	0.59
8	40	20.92	6,277	44.58	32,163	16361	0	44.58	32,163	0.74
9	45	29.87	8,960	45.10	41,124	17970	0	45.10	41,124	0.94
10	50	**44.23**	13,270	45.78	54,394	20099	0	45.78	54,394	1.25
11	55	40.17	12,051	46.35	66,445	21953	0	46.35	66,445	1.53
12	60	7.91	2,374	46.48	68,819	22361	0	**46.48**	68,819	1.58

SITE RETENTION BASIN
ECI JOB # 20210635
100 YEAR - 3 HOUR STORM EVENT

TIME UNIT PERIOD	(min)	FLOW IN (cfs)	VOLUME IN (cuft)	PERC AREA DEPTH (ft)	BASIN VOL PRE-PERC (cuft)	BASIN PERC AREA	PERC OUT (cuft)	POST PERC BASIN DEPTH (ft)	BALANCE IN BASIN (cuft)	(acre-ft)
1	5	1.47	442	42.05	442	9008	0	42.05	442	0.01
2	10	1.47	442	42.10	885	9149	0	42.10	885	0.02
3	15	0.71	214	42.13	1,099	9219	0	42.13	1,099	0.03
4	20	2.24	671	42.20	1,769	9430	0	42.20	1,769	0.04
5	25	2.24	671	42.28	2,440	9641	0	42.28	2,440	0.06
6	30	3.38	1,013	42.38	3,453	9923	0	42.38	3,453	0.08
7	35	2.24	671	42.43	4,124	10064	0	42.43	4,124	0.09
8	40	3.38	1,013	42.53	5,137	10345	0	42.53	5,137	0.12
9	45	3.38	1,013	42.63	6,150	10627	0	42.63	6,150	0.14
10	50	2.24	671	42.70	6,820	10838	0	42.70	6,820	0.16
11	55	2.62	785	42.78	7,605	11049	0	42.78	7,605	0.17
12	60	3.38	1,013	42.85	8,618	11261	0	42.85	8,618	0.20
13	65	4.90	1,470	42.97	10,088	11613	0	42.97	10,088	0.23
14	70	4.90	1,470	43.10	11,557	11976	0	43.10	11,557	0.27
15	75	4.90	1,470	43.23	13,027	12342	0	43.23	13,027	0.30
16	80	4.14	1,241	43.33	14,268	12635	0	43.33	14,268	0.33
17	85	6.42	1,926	43.48	16,195	13074	0	43.48	16,195	0.37
18	90	6.80	2,040	43.63	18,235	13514	0	43.63	18,235	0.42
19	95	5.66	1,698	43.75	19,933	13880	0	43.75	19,933	0.46
20	100	6.80	2,040	43.90	21,973	14319	0	43.90	21,973	0.50
21	105	9.08	2,725	44.08	24,699	14840	0	44.08	24,699	0.57
22	110	8.32	2,497	44.25	27,196	15373	0	44.25	27,196	0.62
23	115	7.56	2,269	44.40	29,464	15829	0	44.40	29,464	0.68
24	120	7.94	2,383	44.55	31,847	16285	0	44.55	31,847	0.73
25	125	8.32	2,497	44.70	34,344	16741	0	44.70	34,344	0.79
26	130	12.51	3,753	44.92	38,097	17426	0	44.92	38,097	0.87
27	135	15.55	4,666	45.18	42,763	18206	0	45.18	42,763	0.98
28	140	9.85	2,954	45.35	45,716	18758	0	45.35	45,716	1.05
29	145	22.40	6,720	45.68	52,437	19784	0	45.68	52,437	1.20
30	150	24.30	7,291	46.05	59,728	20972	0	46.05	59,728	1.37
31	155	**27.73**	8,319	46.43	68,046	22198	0	46.43	68,046	1.56
32	160	18.98	5,693	46.68	73,739	23015	0	46.68	73,739	1.69
33	165	4.14	1,241	46.73	74,981	23178	0	46.73	74,981	1.72
34	170	3.38	1,013	46.78	75,994	23342	0	46.78	75,994	1.74
35	175	3.38	1,013	46.83	77,007	23505	0	**46.83**	77,007	1.77
36	180	-0.01	(4)	46.83	77,003	23505	0	**46.83**	77,003	1.77

SITE RETENTION BASIN
ECI JOB # 20210635
100 YEAR - 6 HOUR STORM EVENT

TIME UNIT PERIOD	(min)	FLOW IN (cfs)	VOLUME IN (cuft)	PERC AREA DEPTH (ft)	BASIN VOL PRE-PERC (cuft)	BASIN PERC AREA	PERC OUT (cuft)	POST PERC BASIN DEPTH (ft)	BALANCE IN BASIN (cuft)	(acre-ft)
1	5	0.00	(0)	42.00	(0)	8867	0	42.00	-	0.00
2	10	0.05	14	42.00	14	8867	0	42.00	14	0.00
3	15	0.05	14	42.00	28	8867	0	42.00	28	0.00
4	20	0.05	14	42.00	42	8867	0	42.00	42	0.00
5	25	0.05	14	42.00	56	8867	0	42.00	56	0.00
6	30	-0.13	(38)	42.00	19	8867	0	42.00	19	0.00
7	35	-0.13	(38)	42.00	(19)	8867	0	42.00	-	0.00
8	40	-0.13	(38)	42.00	(38)	8867	0	42.00	-	0.00
9	45	-0.13	(38)	42.00	(38)	8867	0	42.00	-	0.00
10	50	-0.13	(38)	42.00	(38)	8867	0	42.00	-	0.00
11	55	-0.13	(38)	42.00	(38)	8867	0	42.00	-	0.00
12	60	0.35	106	42.00	106	8867	0	42.00	106	0.00
13	65	0.35	106	42.03	212	8937	0	42.03	212	0.00
14	70	0.35	106	42.03	318	8937	0	42.03	318	0.01
15	75	0.35	106	42.05	424	9008	0	42.05	424	0.01
16	80	0.35	106	42.05	530	9008	0	42.05	530	0.01
17	85	0.35	106	42.08	636	9078	0	42.08	636	0.01
18	90	0.35	106	42.08	742	9078	0	42.08	742	0.02
19	95	0.35	106	42.10	847	9149	0	42.10	847	0.02
20	100	0.35	106	42.10	953	9149	0	42.10	953	0.02
21	105	0.35	106	42.13	1,059	9219	0	42.13	1,059	0.02
22	110	0.35	106	42.13	1,165	9219	0	42.13	1,165	0.03
23	115	0.35	106	42.15	1,271	9289	0	42.15	1,271	0.03
24	120	0.83	249	42.18	1,521	9360	0	42.18	1,521	0.03
25	125	0.35	106	42.18	1,627	9360	0	42.18	1,627	0.04
26	130	0.83	249	42.20	1,876	9430	0	42.20	1,876	0.04
27	135	0.83	249	42.23	2,125	9501	0	42.23	2,125	0.05
28	140	0.83	249	42.25	2,375	9571	0	42.25	2,375	0.05
29	145	0.83	249	42.28	2,624	9641	0	42.28	2,624	0.06
30	150	0.83	249	42.30	2,873	9712	0	42.30	2,873	0.07
31	155	0.83	249	42.33	3,123	9782	0	42.33	3,123	0.07
32	160	0.83	249	42.35	3,372	9853	0	42.35	3,372	0.08
33	165	1.31	393	42.40	3,765	9993	0	42.40	3,765	0.09
34	170	1.31	393	42.45	4,158	10134	0	42.45	4,158	0.10
35	175	1.31	393	42.48	4,551	10205	0	42.48	4,551	0.10
36	180	1.31	393	42.53	4,943	10345	0	42.53	4,943	0.11
37	185	1.31	393	42.55	5,336	10416	0	42.55	5,336	0.12
38	190	1.79	536	42.60	5,873	10557	0	42.60	5,873	0.13
39	195	1.79	536	42.65	6,409	10697	0	42.65	6,409	0.15
40	200	1.79	536	42.70	6,945	10838	0	42.70	6,945	0.16
41	205	2.27	680	42.78	7,625	11049	0	42.78	7,625	0.18
42	210	2.74	823	42.85	8,448	11261	0	42.85	8,448	0.19
43	215	3.22	967	42.92	9,415	11472	0	42.92	9,415	0.22
44	220	3.22	967	43.00	10,381	11683	0	43.00	10,381	0.24
45	225	3.70	1,110	43.10	11,491	11976	0	43.10	11,491	0.26
46	230	3.70	1,110	43.20	12,601	12269	0	43.20	12,601	0.29
47	235	4.18	1,253	43.30	13,855	12562	0	43.30	13,855	0.32
48	240	4.18	1,253	43.40	15,108	12855	0	43.40	15,108	0.35
49	245	4.66	1,397	43.50	16,505	13148	0	43.50	16,505	0.38
50	250	5.13	1,540	43.63	18,045	13514	0	43.63	18,045	0.41
51	255	5.61	1,684	43.75	19,729	13880	0	43.75	19,729	0.45
52	260	6.09	1,827	43.88	21,556	14246	0	43.88	21,556	0.49

SITE RETENTION BASIN
ECI JOB # 20210635
100 YEAR - 6 HOUR STORM EVENT

TIME UNIT PERIOD	(min)	FLOW IN (cfs)	VOLUME IN (cuft)	PERC AREA DEPTH (ft)	BASIN VOL PRE-PERC (cuft)	BASIN PERC AREA	PERC OUT (cuft)	POST PERC BASIN DEPTH (ft)	BALANCE IN BASIN (cuft)	(acre-ft)
53	265	6.57	1,971	44.00	23,527	14612	0	44.00	23,527	0.54
54	270	6.57	1,971	44.15	25,498	15068	0	44.15	25,498	0.59
55	275	7.05	2,114	44.28	27,612	15449	0	44.28	27,612	0.63
56	280	7.53	2,258	44.43	29,870	15905	0	44.43	29,870	0.69
57	285	8.00	2,401	44.58	32,271	16361	0	44.58	32,271	0.74
58	290	8.00	2,401	44.73	34,672	16817	0	44.73	34,672	0.80
59	295	8.48	2,544	44.88	37,216	17274	0	44.88	37,216	0.85
60	300	8.96	2,688	45.03	39,904	17733	0	45.03	39,904	0.92
61	305	11.35	3,405	45.20	43,309	18285	0	45.20	43,309	0.99
62	310	13.74	4,122	45.43	47,431	18995	0	45.43	47,431	1.09
63	315	15.18	4,553	45.68	51,984	19784	0	45.68	51,984	1.19
64	320	16.61	4,983	45.90	56,967	20494	0	45.90	56,967	1.31
65	325	19.00	5,700	46.18	62,667	21381	0	46.18	62,667	1.44
66	330	**23.30**	6,991	46.50	69,658	22443	0	46.50	69,658	1.60
67	335	5.61	1,684	46.58	71,342	22688	0	46.58	71,342	1.64
68	340	0.83	249	46.60	71,592	22770	0	**46.60**	71,592	1.64
69	345	0.05	14	46.60	71,606	22770	0	**46.60**	71,606	1.64
70	350	0.00	(0)	46.60	71,605	22770	0	**46.60**	71,605	1.64
71	355	-0.10	(29)	46.58	71,576	22688	0	46.58	71,576	1.64
72	360	-0.14	(43)	46.58	71,533	22688	0	46.58	71,533	1.64

SITE RETENTION BASIN
ECI JOB # 20210635
100 YEAR - 24 HOUR STORM EVENT

TIME UNIT PERIOD	(min)	FLOW IN (cfs)	VOLUME IN (cuft)	PERC AREA DEPTH (ft)	BASIN VOL PRE-PERC (cuft)	BASIN PERC AREA	PERC OUT (cuft)	POST PERC BASIN DEPTH (ft)	BALANCE IN BASIN (cuft)	(acre-ft)
1	15	-0.19	(170)	42.00	(170)	8867	0	42.00	-	0.00
2	30	-0.16	(147)	42.00	(147)	8867	0	42.00	-	0.00
3	45	-0.16	(147)	42.00	(147)	8867	0	42.00	-	0.00
4	60	-0.14	(124)	42.00	(124)	8867	0	42.00	-	0.00
5	75	-0.16	(147)	42.00	(147)	8867	0	42.00	-	0.00
6	90	-0.16	(147)	42.00	(147)	8867	0	42.00	-	0.00
7	105	-0.16	(147)	42.00	(147)	8867	0	42.00	-	0.00
8	120	-0.14	(124)	42.00	(124)	8867	0	42.00	-	0.00
9	135	-0.14	(124)	42.00	(124)	8867	0	42.00	-	0.00
10	150	-0.14	(124)	42.00	(124)	8867	0	42.00	-	0.00
11	165	-0.11	(101)	42.00	(101)	8867	0	42.00	-	0.00
12	180	-0.11	(101)	42.00	(101)	8867	0	42.00	-	0.00
13	195	-0.11	(101)	42.00	(101)	8867	0	42.00	-	0.00
14	210	-0.11	(101)	42.00	(101)	8867	0	42.00	-	0.00
15	225	-0.11	(101)	42.00	(101)	8867	0	42.00	-	0.00
16	240	-0.09	(78)	42.00	(78)	8867	0	42.00	-	0.00
17	255	-0.09	(78)	42.00	(78)	8867	0	42.00	-	0.00
18	270	-0.06	(55)	42.00	(55)	8867	0	42.00	-	0.00
19	285	-0.06	(55)	42.00	(55)	8867	0	42.00	-	0.00
20	300	-0.04	(33)	42.00	(33)	8867	0	42.00	-	0.00
21	315	-0.09	(78)	42.00	(78)	8867	0	42.00	-	0.00
22	330	-0.06	(55)	42.00	(55)	8867	0	42.00	-	0.00
23	345	-0.04	(33)	42.00	(33)	8867	0	42.00	-	0.00
24	360	-0.04	(33)	42.00	(33)	8867	0	42.00	-	0.00
25	375	-0.01	(10)	42.00	(10)	8867	0	42.00	-	0.00
26	390	-0.01	(10)	42.00	(10)	8867	0	42.00	-	0.00
27	405	0.01	13	42.00	13	8867	0	42.00	13	0.00
28	420	0.01	13	42.00	27	8867	0	42.00	27	0.00
29	435	0.01	13	42.00	40	8867	0	42.00	40	0.00
30	450	0.04	36	42.00	76	8867	0	42.00	76	0.00
31	465	0.07	59	42.03	135	8937	0	42.03	135	0.00
32	480	0.09	82	42.03	217	8937	0	42.03	217	0.00
33	495	-0.21	(187)	42.00	30	8867	0	42.00	30	0.00
34	510	-0.15	(139)	42.00	(109)	8867	0	42.00	-	0.00
35	525	0.15	137	42.03	137	8937	0	42.03	137	0.00
36	540	0.46	413	42.05	550	9008	0	42.05	550	0.01
37	555	1.02	918	42.15	1,468	9289	0	42.15	1,468	0.03
38	570	1.33	1,193	42.28	2,661	9641	0	42.28	2,661	0.06
39	585	1.63	1,468	42.43	4,129	10064	0	42.43	4,129	0.09
40	600	1.94	1,742	42.60	5,871	10557	0	42.60	5,871	0.13
41	615	0.20	182	42.63	6,053	10627	0	42.63	6,053	0.14
42	630	0.25	226	42.65	6,278	10697	0	42.65	6,278	0.14
43	645	1.57	1,416	42.78	7,694	11049	0	42.78	7,694	0.18
44	660	1.62	1,459	42.90	9,153	11401	0	42.90	9,153	0.21
45	675	1.41	1,273	43.03	10,426	11756	0	43.03	10,426	0.24
46	690	1.46	1,315	43.13	11,741	12049	0	43.13	11,741	0.27
47	705	1.00	898	43.20	12,639	12269	0	43.20	12,639	0.29
48	720	1.30	1,169	43.30	13,808	12562	0	43.30	13,808	0.32
49	735	3.13	2,815	43.50	16,623	13148	0	43.50	16,623	0.38
50	750	3.43	3,085	43.75	19,707	13880	0	43.75	19,707	0.45
51	765	3.98	3,583	44.00	23,291	14612	0	44.00	23,291	0.53
52	780	4.28	3,852	44.25	27,143	15373	0	44.25	27,143	0.62
53	795	5.60	5,038	44.58	32,180	16361	0	44.58	32,180	0.74

SITE RETENTION BASIN
ECI JOB # 20210635
100 YEAR - 24 HOUR STORM EVENT

TIME UNIT PERIOD	(min)	FLOW IN (cfs)	VOLUME IN (cuft)	PERC AREA DEPTH (ft)	BASIN VOL PRE-PERC (cuft)	BASIN PERC AREA	PERC OUT (cuft)	POST PERC BASIN DEPTH (ft)	BALANCE IN BASIN (cuft)	(acre-ft)
54	810	**5.64**	5,076	44.88	37,257	17274	0	44.88	37,257	0.86
55	825	2.88	2,592	45.03	39,848	17733	0	45.03	39,848	0.91
56	840	2.92	2,629	45.18	42,478	18206	0	45.18	42,478	0.98
57	855	3.98	3,584	45.35	46,062	18758	0	45.35	46,062	1.06
58	870	3.77	3,391	45.53	49,452	19310	0	45.53	49,452	1.14
59	885	3.81	3,427	45.70	52,879	19863	0	45.70	52,879	1.21
60	900	3.59	3,233	45.88	56,112	20415	0	45.88	56,112	1.29
61	915	3.38	3,039	46.03	59,151	20891	0	46.03	59,151	1.36
62	930	3.16	2,844	46.15	61,995	21299	0	46.15	61,995	1.42
63	945	2.18	1,960	46.25	63,955	21626	0	46.25	63,955	1.47
64	960	2.22	1,994	46.33	65,949	21871	0	**46.33**	65,949	1.51
65	975	-0.14	(124)	46.33	65,825	21871	0	**46.33**	65,825	1.51
66	990	-0.14	(124)	46.33	65,700	21871	0	**46.33**	65,700	1.51
67	1005	-0.16	(147)	46.33	65,553	21871	0	**46.33**	65,553	1.50
68	1020	-0.16	(147)	46.30	65,406	21789	0	46.30	65,406	1.50
69	1035	-0.11	(101)	46.30	65,305	21789	0	46.30	65,305	1.50
70	1050	-0.11	(101)	46.30	65,203	21789	0	46.30	65,203	1.50
71	1065	-0.11	(101)	46.30	65,102	21789	0	46.30	65,102	1.49
72	1080	-0.14	(124)	46.30	64,978	21789	0	46.30	64,978	1.49
73	1095	-0.14	(124)	46.28	64,853	21708	0	46.28	64,853	1.49
74	1110	-0.14	(124)	46.28	64,729	21708	0	46.28	64,729	1.49
75	1125	-0.16	(147)	46.28	64,582	21708	0	46.28	64,582	1.48
76	1140	-0.19	(170)	46.28	64,412	21708	0	46.28	64,412	1.48
77	1155	-0.16	(147)	46.25	64,265	21626	0	46.25	64,265	1.48
78	1170	-0.14	(124)	46.25	64,140	21626	0	46.25	64,140	1.47
79	1185	-0.16	(147)	46.25	63,993	21626	0	46.25	63,993	1.47
80	1200	-0.19	(170)	46.23	63,823	21544	0	46.23	63,823	1.47
81	1215	-0.16	(147)	46.23	63,676	21544	0	46.23	63,676	1.46
82	1230	-0.16	(147)	46.23	63,529	21544	0	46.23	63,529	1.46
83	1245	-0.16	(147)	46.23	63,381	21544	0	46.23	63,381	1.46
84	1260	-0.19	(170)	46.20	63,211	21463	0	46.20	63,211	1.45
85	1275	-0.16	(147)	46.20	63,064	21463	0	46.20	63,064	1.45
86	1290	-0.19	(170)	46.20	62,894	21463	0	46.20	62,894	1.44
87	1305	-0.16	(147)	46.18	62,747	21381	0	46.18	62,747	1.44
88	1320	-0.19	(170)	46.18	62,577	21381	0	46.18	62,577	1.44
89	1335	-0.16	(147)	46.18	62,429	21381	0	46.18	62,429	1.43
90	1350	-0.19	(170)	46.18	62,259	21381	0	46.18	62,259	1.43
91	1365	-0.19	(170)	46.15	62,089	21299	0	46.15	62,089	1.43
92	1380	-0.19	(170)	46.15	61,919	21299	0	46.15	61,919	1.42
93	1395	-0.19	(170)	46.15	61,749	21299	0	46.15	61,749	1.42
94	1410	-0.19	(170)	46.13	61,579	21218	0	46.13	61,579	1.41
95	1425	-0.19	(170)	46.13	61,409	21218	0	46.13	61,409	1.41
96	1440	-0.19	(170)	46.13	61,238	21218	0	46.13	61,238	1.41

Appendix C – Rational Method and Hydraulic Calculations for Street Sections

RATIONAL METHOD

General - The Rational method is commonly used for determining peak discharge from relatively small drainage areas. For areas in excess of 300 to 500-acres the Synthetic Unit Hydrograph method should normally be used. Before attempting to apply the information in this section, the engineer should become thoroughly familiar with sections A, B and C of this manual.

Rational Equation - The Rational method is based on the following equation:

$$Q = CIA$$

where:

Q = Peak discharge - cfs

C = Coefficient of runoff

I = Rainfall intensity (inches/hour) corresponding to the time of concentration

A = Area – acres

Time of Concentration - If rain were to fall continuously at a constant rate and be uniformly distributed over an impervious surface, the rate of runoff from that surface would reach a maximum rate equivalent to the rate of rainfall. This maximum would occur when all parts of the surface were contributing runoff to the concentration point. The time required to reach the maximum or equilibrium runoff rate is defined as the time of concentration. The time of concentration is a function of many variables including the length of the flow path from the most remote point of an area to the concentration point, the slope and other characteristics of natural and improved channels in the area, the infiltration characteristics of the soil, and the degree and type of development. In District Rational tabling, the time of concentration for an initial sub-area can be estimated from the nomograph on Plate D-3. The time of concentration for the next downstream subarea is computed by adding to the initial time, the time required for

the computed peak flow to travel to the next concentration point. Time of concentration is computed for each subsequent subarea by computing travel time between subareas and adding the cumulative sum. Travel time may be estimated using the tabling aids on Plates D-6 through D-9.

To avoid distortion of travel time large subareas should be avoided. Where extremely large subareas are used, peak flow entering a travel reach may be much lower than the flow leaving that reach. Velocity normally increases with discharge, therefore travel time computed using the average flow over a reach may be significantly lower than travel time computed using inflow to the reach. Since rainfall intensity is inversely proportional to time, flow rates would be consistently underestimated by use of large subareas.

Intensity-Duration Curves - Rainfall intensity, "I", is determined using District intensity-duration curves for the area under study. Standard intensity-duration curves have been prepared for many population centers in the District. Intensity-duration data for these standard curves is given in tabular form on Plate D-4.l. The standard curves for these areas may be reproduced by plotting the 10 and 60-minute values on Plate D-4.2, and drawing a straight line through them. For areas where curves have not been published, Plates D-4.3 through D-4.7 should be used to develop design intensity-duration curves.

Plates D-4.3 and D-4.4 are isohyetal maps of the maximum 2-year 1-hour and 100-year 1-hour precipitation respectively. One-hour point rain for intermediate return periods can be determined from Plate D-4.5. The slope of the intensity duration curve can be obtained from Plate D-4.6. Intensity duration curves for a particular area can be easily developed using Plate D-4.7, plotting the 1-hour point rain value for the desired return period, and drawing a straight line through the 1-hour value parallel to the required slope.

The isohyetal maps and return period diagram are based on NOAA Atlas 2 discussed in more detail in Section B of this report. The map of intensity-duration curve slope is based on

District analysis of all available recording rain gauge records in and near the District. This material is also discussed in Section B of this manual.

Coefficient of Runoff Curves - The coefficient of runoff is intended to account for the many factors which influence peak flow rate. The co-efficient depends on the rainfall intensity, soil type and cover, percentage of impervious area, antecedent moisture condition, etc. To account for the difference between actual and effective impervious area it is assumed the maximum runoff rate which can occur from impervious surfaces is 90-percent of the rainfall rate. The runoff from pervious surfaces is further reduced by infiltration. Runoff coefficient curves can be developed using the relationship:

$$C = 0.9 \left[A_i + \frac{I - F_p}{I} A_p \right]$$

where:

C = Runoff coefficient

I = Rainfall intensity - inches/hour

F_p = Infiltration rate for pervious areas - inches/hour

A_i = Impervious area (actual) - decimal percent

A_p = Pervious area (actual) - decimal percent

and $A_p = 1.00 - A_i$

The infiltration rate for pervious areas, "F_p", can be estimated using the methods discussed in Section C of this manual for various combinations of soil type, cover type and antecedent moisture condition (AMC). In practice it is not necessary for the engineer to make these computations, as runoff coefficient curve data has been tabulated by the District on Plate D-5.7 for the working range of runoff index (RI) numbers. Runoff coefficient curves can be developed for any combination of conditions by simply plotting the data from Plate D-5.7 on Plate D-5.8.

In addition, for the common case of urban landscaping type cover, runoff coefficient curves have been plotted on Plates D-5.l through D-5.4.

COVER TYPE DESCRIPTIONS

NATURAL COVERS -

Barren - Areas with 15 percent or less of the ground surface covered by plants or litter. It includes rockland, eroded land, and shaped or graded land. Barren land does not include fallow land.

Chaparral, Broadleaf - Areas on which the principal vegetation consists of evergreen shrubs with broad, hard, stiff leaves such as manzonita, ceanothus and scrub oak. The brush cover is usually dense or moderately dense.

Chaparral, Narrowleaf - Land on which the principal vegetation consists of diffusely branched evergreen shrubs with fine needle-like leaves such as chamise and redshank. The shrubs are usually widely spaced and low in growth. If the narrowleaf chaparral shrubs are dense and high; the land should be included with broadleaf chaparral cover.

Grass, Annual - Land on which the principal vegetation consists of annual grasses and weeds such as annual bromes, wild barley, soft chess, ryegrass and filaree.

Grass, Perennial - Areas on which the principal vegetation consists of perennial grass, either native or introduced, and which grows under normal dryland conditions. Examples are Stipa or needle grass, Harding grass and wheat grass. It does not include irrigated and meadow grasses.

Meadow - Land areas with seasonally high water table, often called cienegas. Principal vegetation consists of sod-forming grasses interspersed with other plants.

Open Brush - Principal vegetation consists of soft wood shrubs, usually grayish in color. Examples include California buckwheat, California sagebrush, black sage, white sage and purple sage. It also includes vegetation on desert facing slopes where broadleaf chaparral predominate in an open shrub cover.

Woodland - Areas on which coniferous or broadleaf trees predominate. The crown or canopy density, the amount of ground surface shaded at high noon, is at least 50 percent. Open areas may have a cover of annual or perennial grasses or of brush. Plant cover under the trees is usually sparse because of leaf or needle litter accumulation.

Woodland, Grass - Areas with an open cover of broadleaf or coniferous trees usually live oak and pines, with the intervening ground space occupied by annual grasses or weeds. The trees may occur singly or in small clumps. Canopy density, the amount of ground surface shaded at high noon, is from 20 to 50 percent.

URBAN COVERS -

Residential or Commercial Landscaping - The pervious portions of commercial establishments, single and multiple family dwellings, trailer parks and schools where the predominant land cover is lawn, shrubbery and trees.

COVER TYPE DESCRIPTIONS

URBAN COVERS (cont.) -

Turf - Golf courses, parks, cemeteries, and similar lands where the predominant cover is irrigated mowed close-grown turf grass. Parks in which trees are dense may be classified as woodland.

AGRICULTURAL COVER -

Fallow - Fallow land is land plowed but not yet seeded or tilled. It is more effective than barren land in reducing storm runoff.

Legumes, Close Seeded - Alfalfa, sweetclover, timothy, etc. and combinations, either planted in close rows or broadcast.

Orchards, Deciduous - Land planted to such deciduous trees as apples, apricots, pears, walnuts and almonds. The ground cover during the rainy reason alters the hydrologic response to storm rainfall. Ground cover may be annual grass or perennial grass with or without legumes. Occasionally legumes are used alone. Use runoff index numbers which apply to the land use or the kind and condition of cover during storm periods. If orchards are kept bare by disking, or through the use of herbicides, fallow applies.

Orchards, Evergreen - Land planted to evergreen trees which include citrus and avocado orchards and coniferous plantings. The effectiveness of this kind of land use is in part determined by the tree, the litter and the ground cover. In these groves the ground cover may be legumes alone or annual or perennial grasses with or without legumes. The ground cover may be entirely litter if the tree canopy is sufficiently dense to produce a substantial quantity of fallen leaves or needles. As with deciduous orchards, management practices affect the runoff potential of evergreen orchards.

Pasture, Dryland - Equivalent to annual grass. Land on which the principal vegetation consists of annual grasses and weeds such as annual bromes, wild barley, soft chess, ryegrass and filaree.

Pasture, Irrigated - Irrigated land planted to perennial grasses and legumes for production of forage and which is cultivated only to establish or renew the stand of plants.

Row Crops - Lettuce, tomatoes, sugar beets, tulips or any field crop planted in rows far enough apart that most of the soil surface is exposed to rainfall impact throughout the growing season. At plowing, planting and harvest times it is equivalent to fallow.

Small Grain - Wheat, oats, barley, flax, etc. planted in rows close enough that the soil surface is not exposed except during planting and shortly thereafter.

Vineyards - As with orchards, ground cover and land condition must be considered in estimating runoff potential. Use runoff index numbers which apply to the kind and condition of cover. For example either annual grass or fallow may apply.

Reference: Bibliography item No. 17.

RCFC & WCD

HYDROLOGY MANUAL

COVER TYPE DESCRIPTIONS

RCFC & WCD HYDROLOGY MANUAL
RATIONAL METHOD CALCULATION FORM

Sheet No. 1 of 1 Sheets

PROJECT TROUTDALE VILLAGE - 20210635

Calculated by SPE 01/05/2022 DATE

FREQUENCY _____

Checked by BDE 01/05/2022 DATE

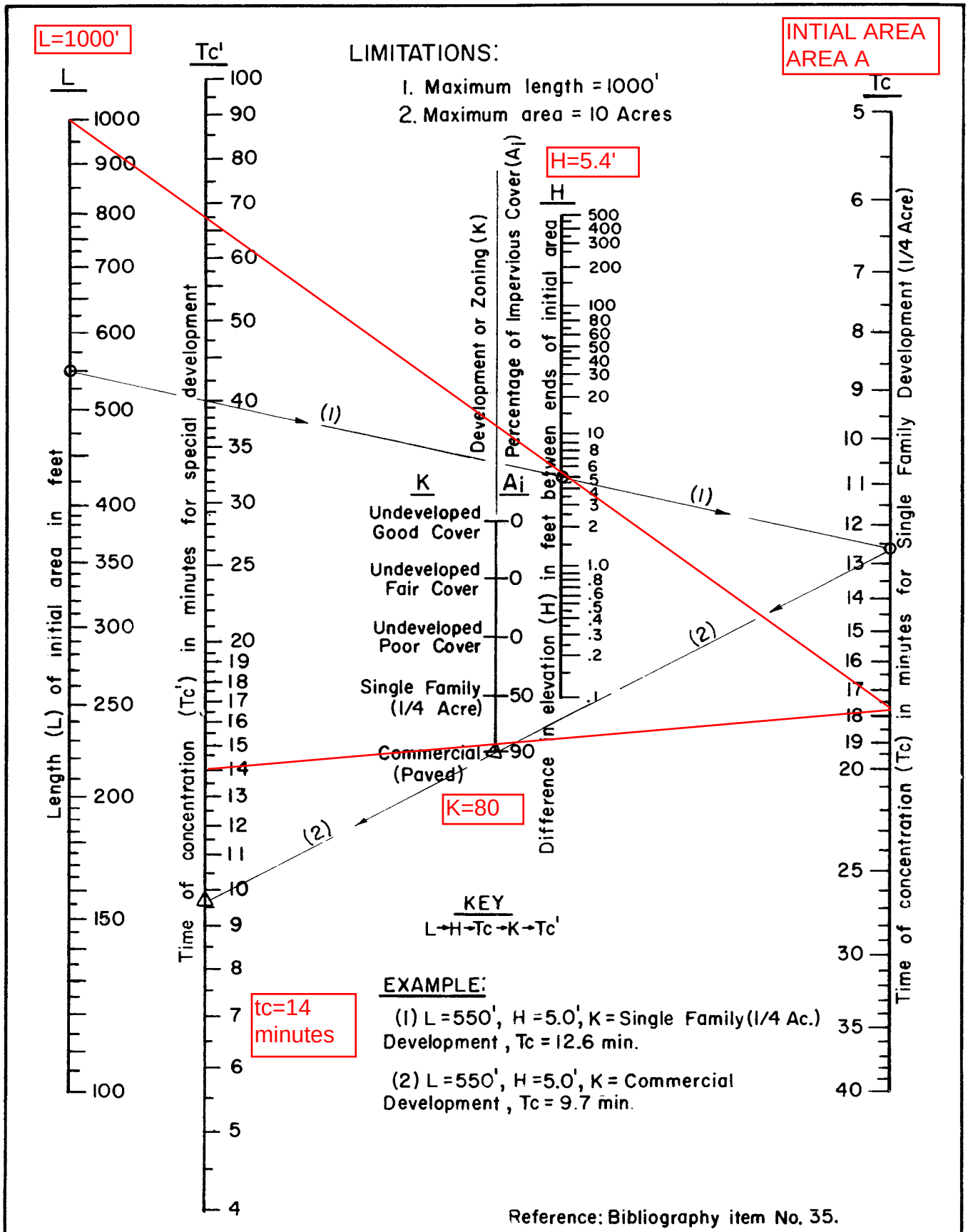
DRAINAGE AREA	Soil & Development	A Acres	I in/hr.	C	ΔQ CFS	Σ Q CFS	SLOPE	SECTION	v FPS	L FT.	T MIN.	Σ T	REMARKS
A	A - 80	6.34	3.72	0.82	19.34								AREA A - NORTH
B	A - 80	7.69	3.72	0.82	23.46								AREA B - SOUTH

PLATE D-2

RAINFALL INTENSITY–INCHES PER HOUR

CATHEDRAL CITY			CHERRY VALLEY			CORONA			DESERT HOT SPRINGS			ELSINORE - WILDOMAR		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	4.14	6.76	5	3.65	5.49	5	3.10	4.78	5	4.39	6.76	5	3.23	4.94
6	3.73	6.08	6	3.30	4.97	6	2.84	4.38	6	3.95	6.08	6	2.96	4.53
7	3.41	5.56	7	3.03	4.56	7	2.64	4.07	7	3.62	5.56	7	2.75	4.21
8	3.15	5.15	8	2.82	4.24	8	2.47	3.81	8	3.35	5.15	8	2.58	3.95
9	2.95	4.81	9	2.64	3.97	9	2.34	3.60	9	3.13	4.81	9	2.44	3.73
10	2.77	4.52	10	2.49	3.75	10	2.22	3.43	10	2.94	4.52	10	2.32	3.54
11	2.62	4.28	11	2.36	3.56	11	2.12	3.27	11	2.78	4.28	11	2.21	3.39
12	2.49	4.07	12	2.25	3.39	12	2.04	3.14	12	2.65	4.07	12	2.12	3.25
13	2.38	3.88	13	2.16	3.25	13	1.96	3.02	13	2.53	3.88	13	2.04	3.13
14	2.28	3.72	14	2.07	3.12	14	1.89	2.92	14	2.42	3.72	14	1.97	3.02
15	2.19	3.58	15	1.99	3.00	15	1.83	2.82	15	2.32	3.58	15	1.91	2.92
16	2.11	3.44	16	1.92	2.90	16	1.77	2.73	16	2.24	3.44	16	1.85	2.83
17	2.04	3.32	17	1.86	2.80	17	1.72	2.66	17	2.16	3.32	17	1.80	2.75
18	1.97	3.22	18	1.80	2.71	18	1.68	2.58	18	2.09	3.22	18	1.75	2.67
19	1.91	3.12	19	1.75	2.64	19	1.63	2.52	19	2.03	3.12	19	1.70	2.60
20	1.85	3.03	20	1.70	2.56	20	1.59	2.46	20	1.97	3.03	20	1.66	2.54
22	1.75	2.86	22	1.61	2.43	22	1.52	2.35	22	1.86	2.86	22	1.59	2.43
24	1.67	2.72	24	1.54	2.32	24	1.46	2.25	24	1.77	2.72	24	1.52	2.33
26	1.59	2.60	26	1.47	2.22	26	1.40	2.17	26	1.69	2.60	26	1.46	2.24
28	1.52	2.49	28	1.41	2.13	28	1.36	2.09	28	1.62	2.49	28	1.41	2.16
30	1.46	2.39	30	1.36	2.05	30	1.31	2.02	30	1.55	2.39	30	1.37	2.09
32	1.41	2.30	32	1.31	1.98	32	1.27	1.96	32	1.50	2.30	32	1.33	2.03
34	1.36	2.22	34	1.27	1.91	34	1.23	1.90	34	1.45	2.22	34	1.29	1.97
36	1.32	2.15	36	1.23	1.85	36	1.20	1.85	36	1.40	2.15	36	1.25	1.92
38	1.28	2.09	38	1.20	1.80	38	1.17	1.81	38	1.36	2.09	38	1.22	1.87
40	1.24	2.02	40	1.16	1.75	40	1.14	1.76	40	1.32	2.02	40	1.19	1.82
45	1.16	1.89	45	1.09	1.64	45	1.08	1.66	45	1.23	1.89	45	1.13	1.72
50	1.09	1.78	50	1.03	1.55	50	1.03	1.58	50	1.16	1.78	50	1.07	1.64
55	1.03	1.68	55	.98	1.47	55	.98	1.51	55	1.09	1.68	55	1.02	1.56
60	.98	1.60	60	.93	1.40	60	.94	1.45	60	1.04	1.60	60	.98	1.50
65	.94	1.53	65	.89	1.34	65	.90	1.40	65	.99	1.53	65	.94	1.44
70	.90	1.46	70	.85	1.29	70	.87	1.35	70	.95	1.46	70	.91	1.39
75	.86	1.41	75	.82	1.24	75	.84	1.30	75	.91	1.41	75	.88	1.35
80	.83	1.35	80	.79	1.20	80	.82	1.26	80	.88	1.35	80	.85	1.31
85	.80	1.31	85	.77	1.16	85	.80	1.23	85	.85	1.31	85	.83	1.27
SLOPE = .580			SLOPE = .550			SLOPE = .480			SLOPE = .580			SLOPE = .480		

STANDARD INTENSITY–DURATION CURVES DATA

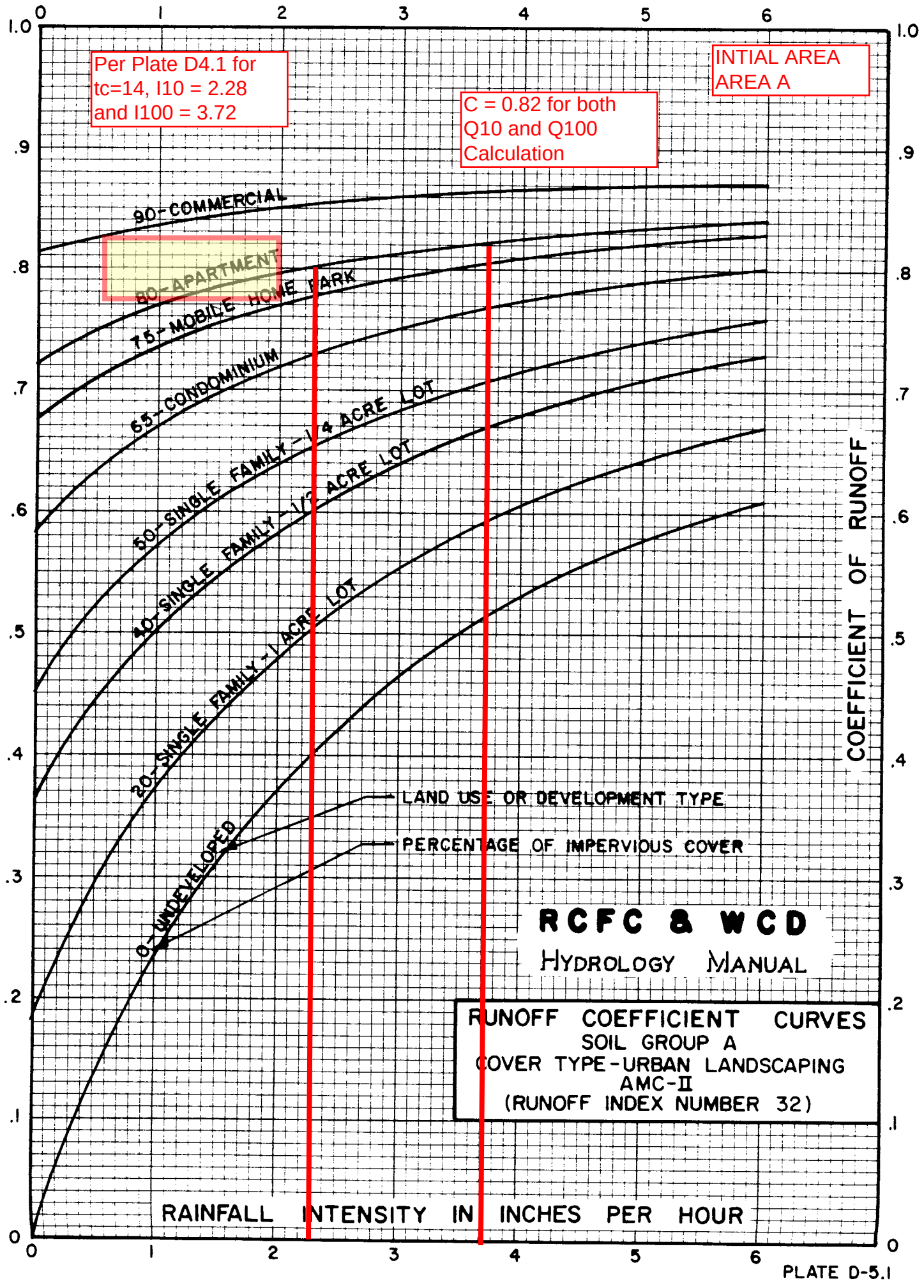


Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION
FOR INITIAL SUBAREA

PLATE D-3


Per Plate D4.1 for
tc=14, I10 = 2.28
and I100 = 3.72
INTIAL AREA
AREA A
C = 0.82 for both
Q10 and Q100
Calculation
90-COMMERCIAL
80-APARTMENT
75-MOBILE HOME PARK
65-CONDOMINIUM
50-SINGLE FAMILY-1/4 ACRE LOT
40-SINGLE FAMILY-1/3 ACRE LOT
20-SINGLE FAMILY-1 ACRE LOT
0-UNDEVELOPED
LAND USE OR DEVELOPMENT TYPE
PERCENTAGE OF IMPERVIOUS COVER
COEFFICIENT OF RUNOFF
RAINFALL INTENSITY IN INCHES PER HOUR
RCFC & WCD
HYDROLOGY MANUAL
RUNOFF COEFFICIENT CURVES
SOIL GROUP A
COVER TYPE-URBAN LANDSCAPING
AMC-II
(RUNOFF INDEX NUMBER 32)
PLATE D-5.1

Channel Report

Hydraflow Express by Intelisolve | Monday, Jan 17 2022

20210635 - Troutdale Village - 32' Driveway - Area 'A'

User-defined

Invert Elev (ft)	= 0.55
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

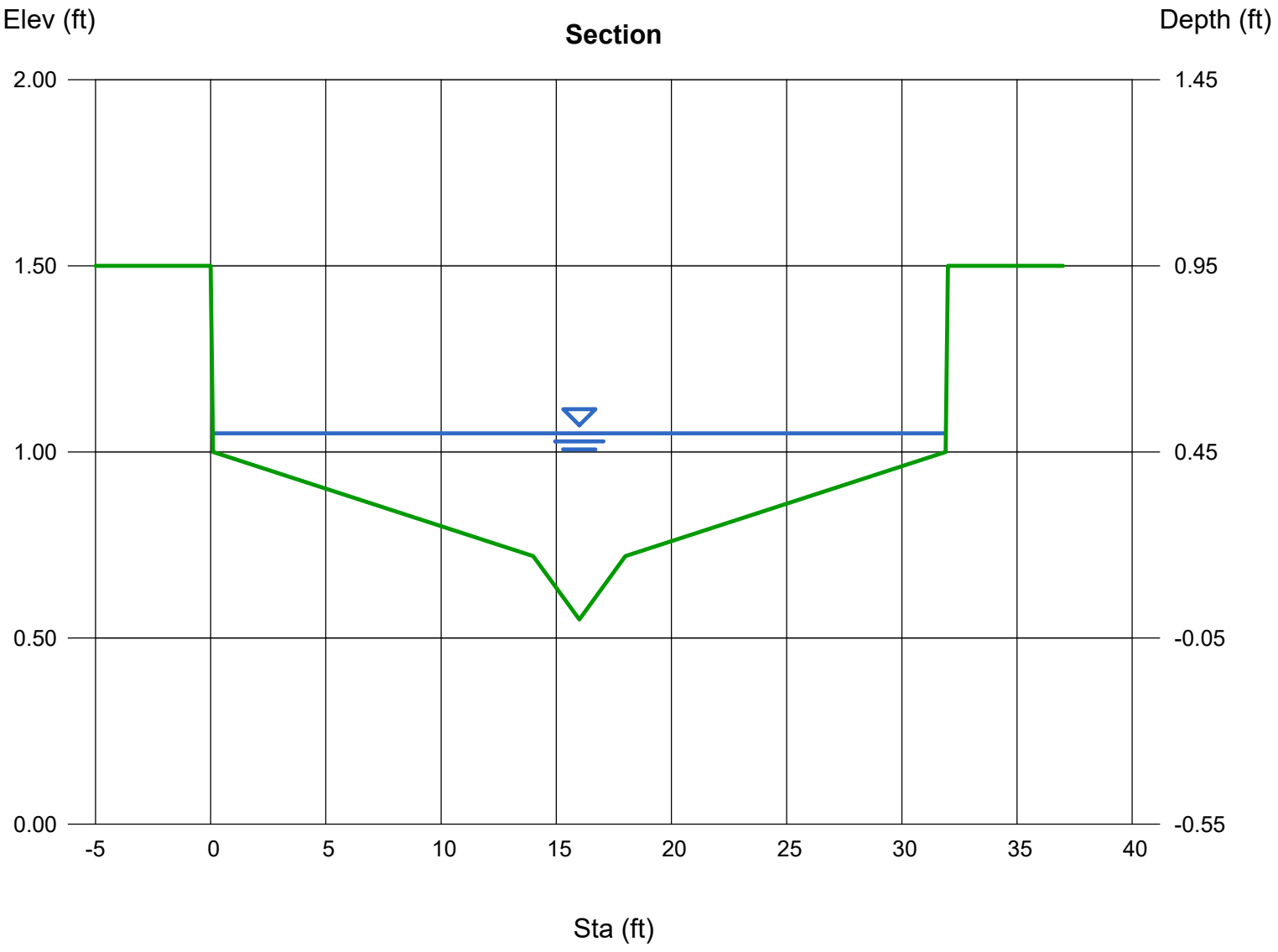
Compute by:	Known Q
Known Q (cfs)	= 19.34

Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 19.34
Area (sqft)	= 6.94
Velocity (ft/s)	= 2.79
Wetted Perim (ft)	= 31.92
Crit Depth, Yc (ft)	= 0.51
Top Width (ft)	= 31.82
EGL (ft)	= 0.62

(Sta, El, n)-(Sta, El, n)...

(0.00, 1.50)-(0.10, 1.00, 0.013)-(14.00, 0.72, 0.013)-(16.00, 0.55, 0.013)-(18.00, 0.72, 0.013)-(31.90, 1.00, 0.013)-(32.00, 1.50, 0.013)



Inlet Report

Drop Inlet at Draiange Area A

Drop Grate Inlet

Location	=	Sag
Curb Length (ft)	=	-0-
Throat Height (in)	=	-0-
Grate Area (sqft)	=	9.00
Grate Width (ft)	=	3.00
Grate Length (ft)	=	3.00

Gutter

Slope, Sw (ft/ft)	=	0.020
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	-0-
Gutter Width (ft)	=	4.00
Gutter Slope (%)	=	-0-
Gutter n-value	=	-0-

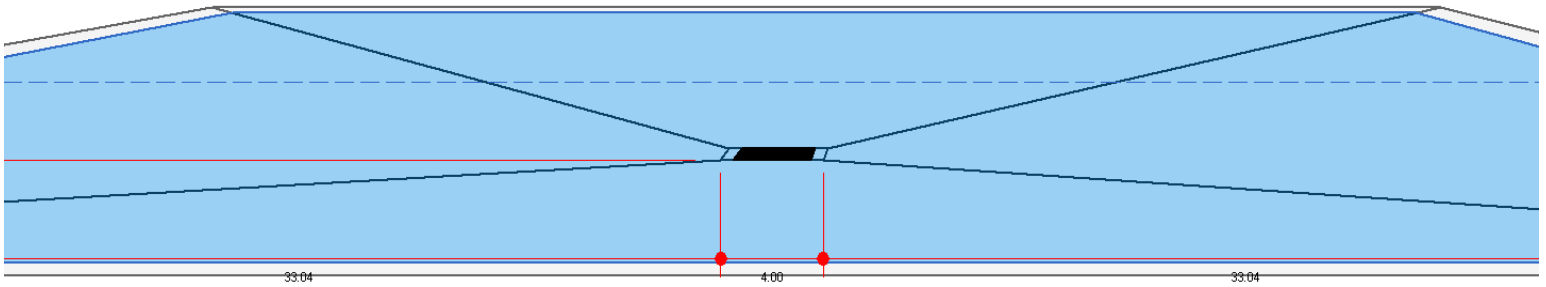
Calculations

Compute by:		Known Q
Q (cfs)	=	19.34

Highlighted

Q Total (cfs)	=	19.34
Q Capt (cfs)	=	19.34
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.93
Efficiency (%)	=	100
Gutter Spread (ft)	=	70.07
Gutter Vel (ft/s)	=	-0-
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

All dimensions in feet



Channel Report

Hydraflow Express by Intelisolve | Monday, Jan 17 2022

20210635 - Troutdale Village - 30" Drainage Pipe - AREA A

Circular

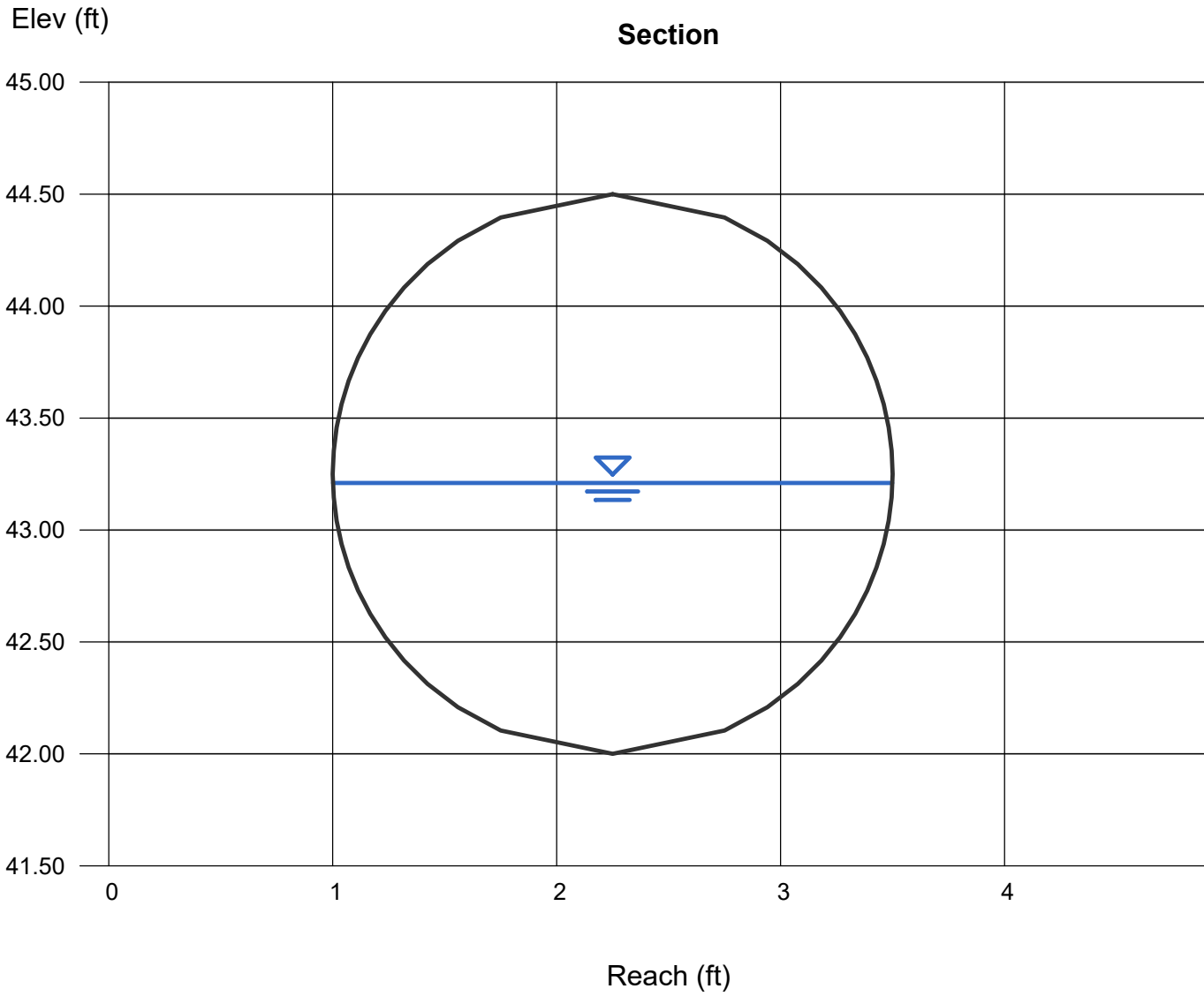
Diameter (ft)	= 2.50
Invert Elev (ft)	= 42.00
Slope (%)	= 1.00
N-Value	= 0.013

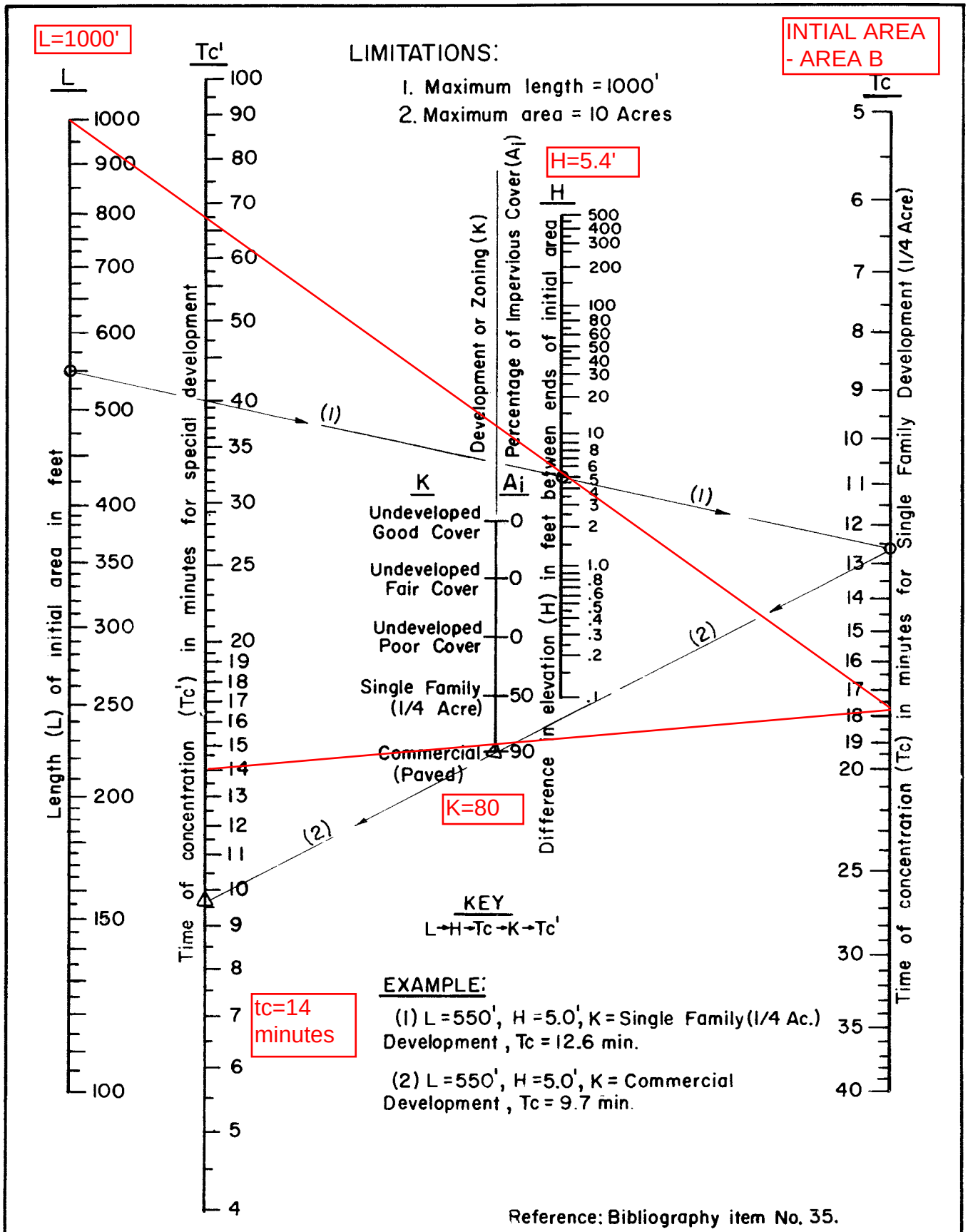
Calculations

Compute by:	Known Q
Known Q (cfs)	= 19.34

Highlighted

Depth (ft)	= 1.21
Q (cfs)	= 19.34
Area (sqft)	= 2.36
Velocity (ft/s)	= 8.20
Wetted Perim (ft)	= 3.85
Crit Depth, Yc (ft)	= 1.50
Top Width (ft)	= 2.50
EGL (ft)	= 2.26



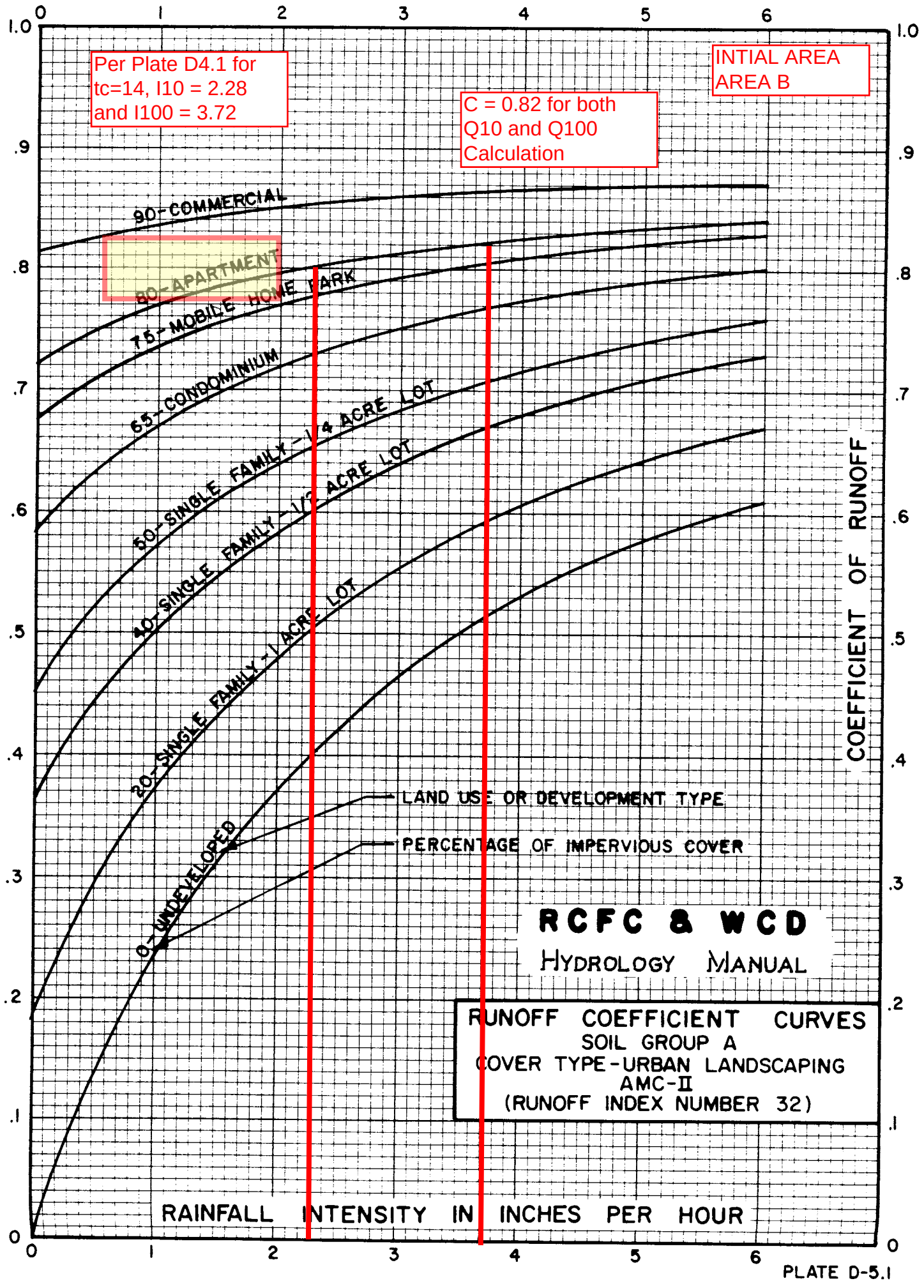


Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION
FOR INITIAL SUBAREA

PLATE D-3


Per Plate D4.1 for
tc=14, I10 = 2.28
and I100 = 3.72
INTIAL AREA
AREA B
C = 0.82 for both
Q10 and Q100
Calculation
90-COMMERCIAL
80-APARTMENT
75-MOBILE HOME PARK
65-CONDOMINIUM
50-SINGLE FAMILY-1/4 ACRE LOT
40-SINGLE FAMILY-1/3 ACRE LOT
20-SINGLE FAMILY-1 ACRE LOT
0-UNDEVELOPED
LAND USE OR DEVELOPMENT TYPE
PERCENTAGE OF IMPERVIOUS COVER
COEFFICIENT OF RUNOFF
RAINFALL INTENSITY IN INCHES PER HOUR
RCFC & WCD
HYDROLOGY MANUAL
RUNOFF COEFFICIENT CURVES
SOIL GROUP A
COVER TYPE-URBAN LANDSCAPING
AMC-II
(RUNOFF INDEX NUMBER 32)
PLATE D-5.1

Channel Report

Hydraflow Express by Intelisolve | Monday, Jan 17 2022

20210635 - Troutdale Village - 32' Driveway - Area 'B'

User-defined

Invert Elev (ft)	= 0.55
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

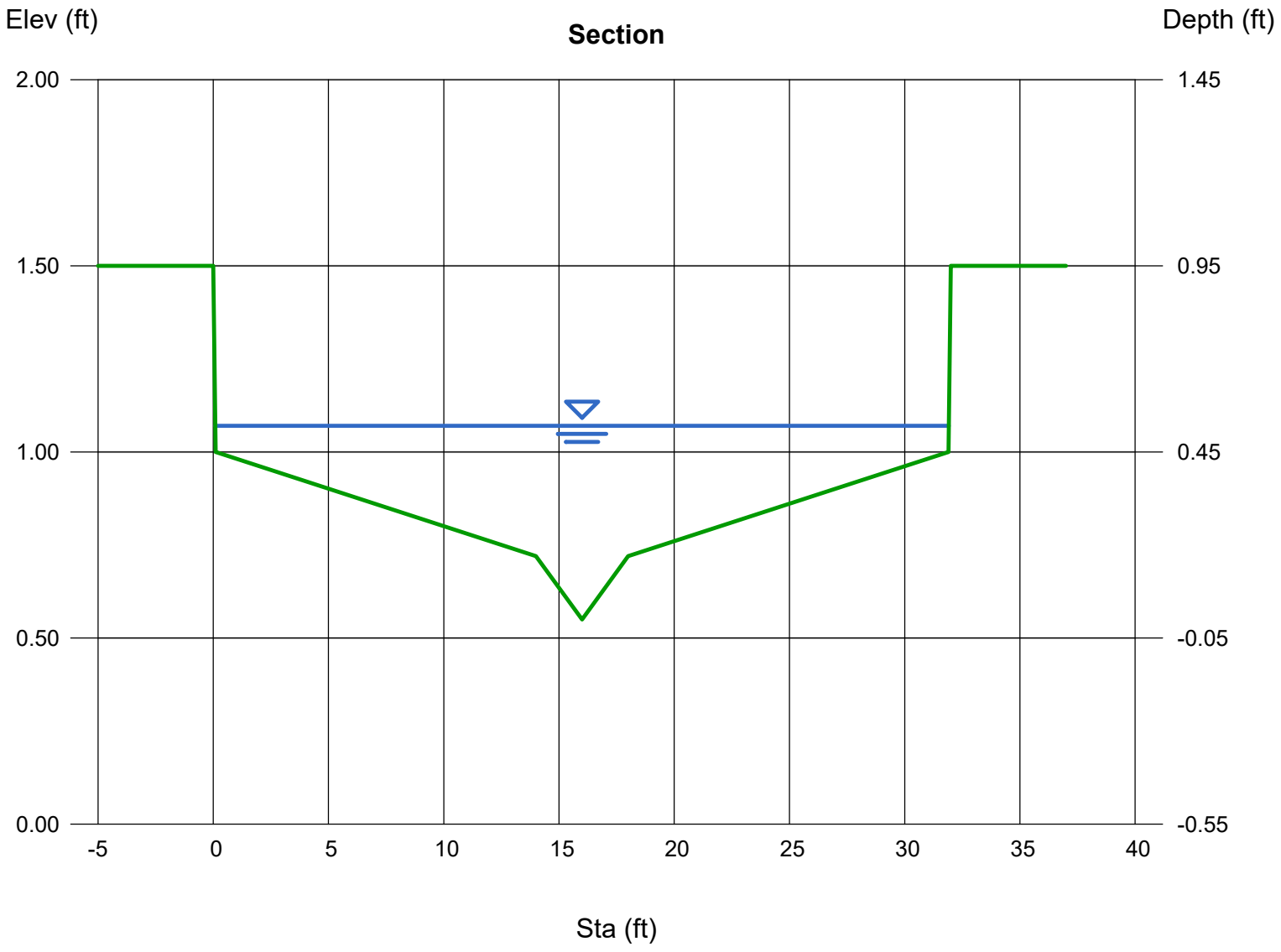
Compute by:	Known Q
Known Q (cfs)	= 23.46

Highlighted

Depth (ft)	= 0.52
Q (cfs)	= 23.46
Area (sqft)	= 7.58
Velocity (ft/s)	= 3.10
Wetted Perim (ft)	= 31.96
Crit Depth, Yc (ft)	= 0.54
Top Width (ft)	= 31.83
EGL (ft)	= 0.67

(Sta, El, n)-(Sta, El, n)...

(0.00, 1.50)-(0.10, 1.00, 0.013)-(14.00, 0.72, 0.013)-(16.00, 0.55, 0.013)-(18.00, 0.72, 0.013)-(31.90, 1.00, 0.013)-(32.00, 1.50, 0.013)



Inlet Report

Drop Inlet at Draiange Area B

Drop Grate Inlet

Location	=	Sag
Curb Length (ft)	=	-0-
Throat Height (in)	=	-0-
Grate Area (sqft)	=	9.00
Grate Width (ft)	=	3.00
Grate Length (ft)	=	3.00

Gutter

Slope, Sw (ft/ft)	=	0.020
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	-0-
Gutter Width (ft)	=	4.00
Gutter Slope (%)	=	-0-
Gutter n-value	=	-0-

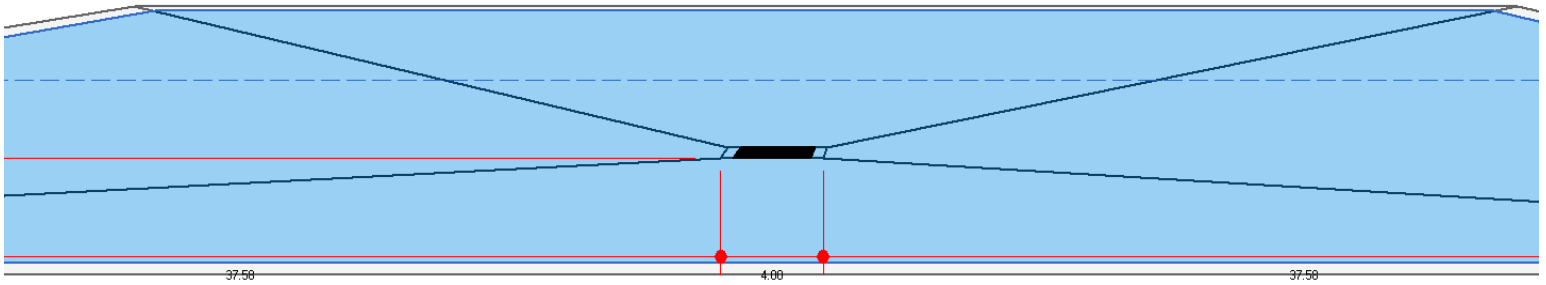
Calculations

Compute by:		Known Q
Q (cfs)	=	23.46

Highlighted

Q Total (cfs)	=	23.46
Q Capt (cfs)	=	23.46
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	9.02
Efficiency (%)	=	100
Gutter Spread (ft)	=	79.15
Gutter Vel (ft/s)	=	-0-
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

All dimensions in feet



Channel Report

Hydraflow Express by Intelisolve | Monday, Jan 17 2022

20210635 - Troutdale Village - 30" Drainage Pipe - AREA B

Circular

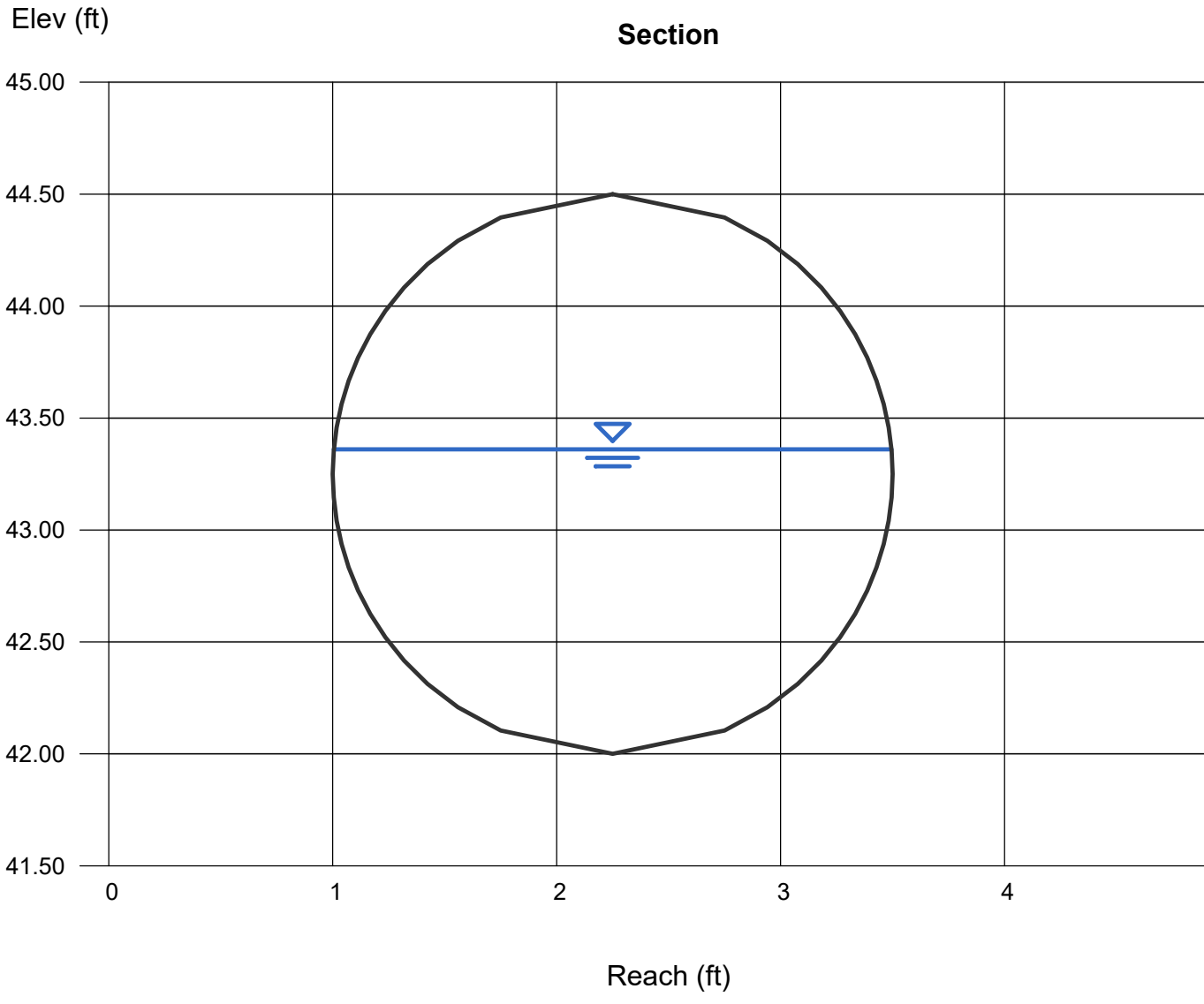
Diameter (ft)	= 2.50
Invert Elev (ft)	= 42.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 23.46

Highlighted

Depth (ft)	= 1.36
Q (cfs)	= 23.46
Area (sqft)	= 2.73
Velocity (ft/s)	= 8.59
Wetted Perim (ft)	= 4.15
Crit Depth, Yc (ft)	= 1.65
Top Width (ft)	= 2.49
EGL (ft)	= 2.51

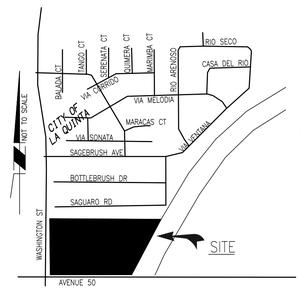


Appendix D – Hydrology Map

IN THE CITY OF LA QUINTA, RIVERSIDE COUNTY

HYDROLOGY MAP AND WQMP SITE PLAN

TROUTDALE VILLAGE



VICINITY MAP

LEGEND

- RETENTION BASIN – (27,450 SQ.FT.)
- LANDSCAPE AREA – (185,700 SQ.FT.)
- CONCRETE PAVING – (61,500 SQ.FT.)
- ASPHALT PAVING – (204,490 SQ.FT.)
- BUILDING AREA – (132,000 SQ.FT.)
- FLOW PATH
- DRAINAGE AREA

PROJECT STATISTICS

SITE AREA:	14.03 AC (611,085 SF)
RETENTION AREA:	0.61 AC (27,450 SF)
ON SITE DRAINAGE AREA:	13.42 AC (584,485 SF)
OFF SITE DRAINAGE AREA:	1.28 AC (56,004 SF)
PERMEABLE:	35%
IMPERMEABLE:	65%
OPEN SPACE:	78%
BUILDING FOOTPRINT:	22%

DRAINAGE AREA "A"

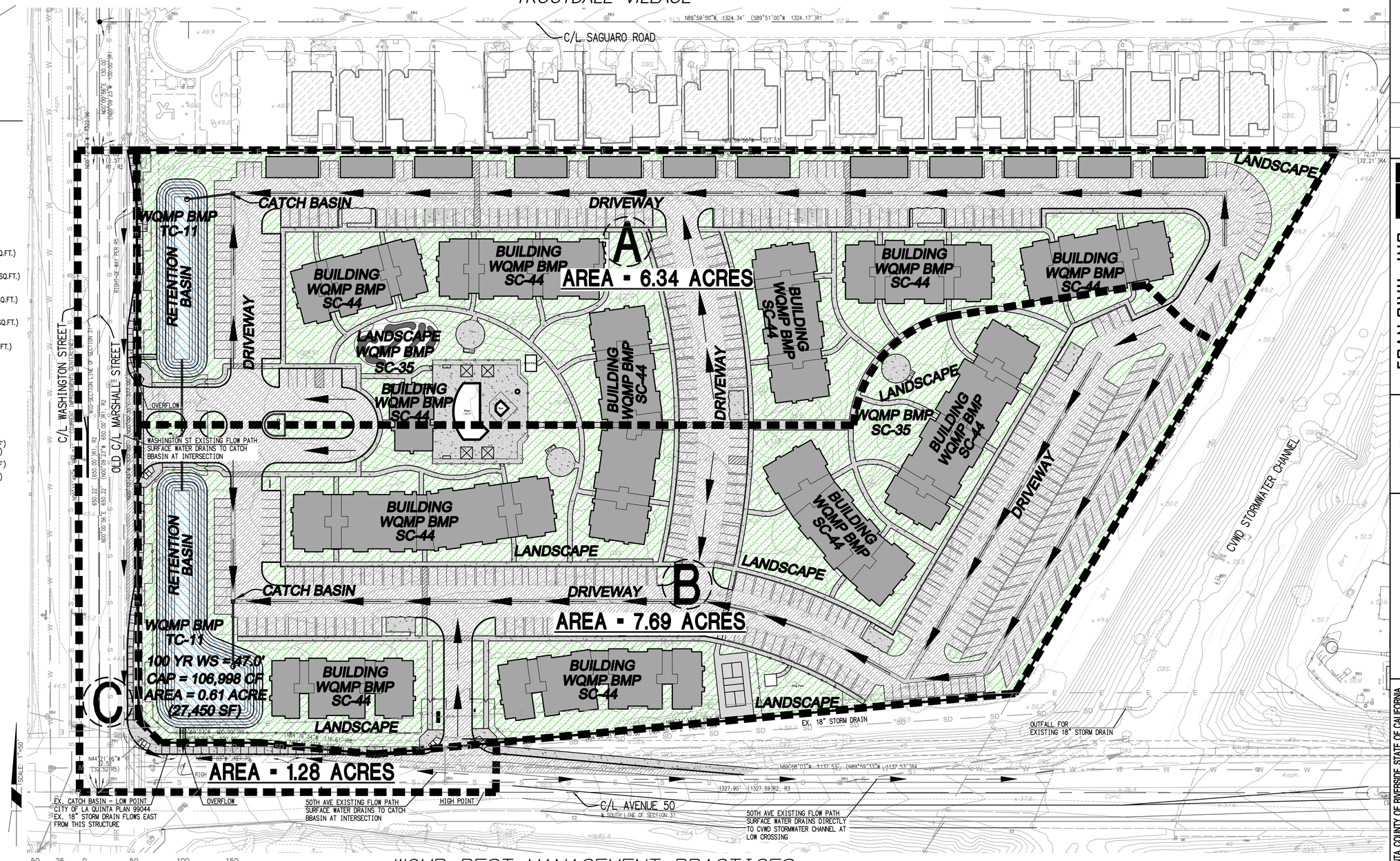
tc = 16 min
I10 = 2.11
I100 = 3.44
L = 1,000
Lca = 240
H = 5.4'

DRAINAGE AREA "B"

tc = 16 min
I10 = 2.11
I100 = 3.44
L = 1,000
Lca = 180
H = 5.4'

DRAINAGE AREA "C"

tc = 11 min
I10 = 2.62
I100 = 4.28
L = 640
Lca = 325
H = 3.5'



WQMP BEST MANAGEMENT PRACTICES:

TC-11 - INFILTRATION BASINS
SC-44 - BUILDINGS AND GROUNDS MAINTENANCE
SC-35 - SAFER ALTERNATIVE PRODUCTS

BENCHMARK:

BENCHMARK: TOP OF CURB #2006 ELEVATION: 252.27 TC DATUM: NGVD29

DESCRIPTION: TOP OF CURB AT THE BCR AS SHOWN ON THE CITY OF RANCHO MIRAGE STREET PLANS FOR THE KESSLER OFFICE BUILDING, SHEET 9 OF 9 ON FILE IN THE OFFICE OF CITY ENGINEER OF THE CITY OF RANCHO MIRAGE AS PLAN NUMBER E0600371.

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY ARE BASED ON THE CALIFORNIA COORDINATE SYSTEM (CCS83), ZONE VI, (2017.50 EPOCH) AS PER GRID INVERSE CALCULATIONS BETWEEN CONTINUOSLY OPERATING REFERENCE (C.O.R.S.) STATIONS P491 AND PIN1 PER PUBLISHED VALUES PROVIDED BY THE SCRIPPS ORBIT AND PERMANENT ARRAY CENTER (S.O.P.A.C.), BEING:
NORTH 78° 59' 35.49" WEST.

DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

EGAN CIVIL, INC.
PO BOX 5282, LA QUINTA, CA 92248-5282
(760) 404-7663 WWW.EGANCIVIL.COM
BENJAMIN DANIEL EGAN, PE, PLS

DATE: 01/12/2023
PE: 73070

PROFESSIONAL ENGINEER * REGISTERED * BENJAMIN DANIEL EGAN * NO. 73070 * CIVIL * STATE OF CALIFORNIA

DEVELOPER:
PARKER DEVELOPMENT NW
1800 BLANKENSHIO RD.
WEST LINN, OR 97068
(503)742-1942

CITY OF LA QUINTA, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA
WASHINGTON STREET AND AVENUE 50
TROUTDALE VILLAGE
HYDROLOGY MAP & WQMP PLAN
VACANT LAND
FOR: PARKER DEVELOPMENT NW

DRAWN BY	SPE/BDE
CHECKED BY	BDE
SCALE	AS NOTED
JOB NUMBER	20210635
DATE	JANUARY 12, 2023

SHEET 1 OF 1

FILE NO. 20210635