

# PRELIMINARY HYDROLOGY STUDY

For:

**ARCO AM/PM  
Bloomington**

**11279 Cedar Avenue  
Bloomington, CA 92316**

*Prepared for*

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Project No. 19-081



**Table of Content**

Section I	Introduction
Section II	Hydrology Methodology
Section III	Project Description <ul style="list-style-type: none"><li>• Pre-developed condition</li><li>• Post-developed condition</li></ul>
Section IV	Post-development Runoff Mitigation, Retention & Conclusion
Appendix A	Vicinity Map
Appendix B	Hydrological Rainfall Data Reference <ul style="list-style-type: none"><li>• NOAA Precipitation Data</li></ul>
Appendix C	Hydrology Study – Rational Method for 10-year and 100-year Storm event using CivilD software
Appendix D	Hydrology Study – Synthetic Unit Hydrograph Method for Post-developed 10-year & 100-year Storm event using CivilD software
Appendix E	Hydraflow Hydrographs Report
Appendix F	Pre-developed Hydrology Map – Rational Method Post-developed Hydrology Map – Rational Method Post-developed Hydrology Map – Synthetic Unit Hydrograph Method

## ***Section I Introduction***

The following hydrology and hydraulic study has been prepared for the development of the commercial property situated north east of Cedar Avenue and Jurupa Avenue in the City of Bloomington in San Bernardino County, California. The subject site is approximately 2.25 acres and the general location of the site is illustrated in "Vicinity map" in "Appendix A" of this report.

## ***Section II Methodology***

For both, the pre-developed and post-developed conditions, the peak flow rates were determined for 10-year and 100-year storm events using Rational Method per San Bernardino County Hydrology Manual. The Inlets were sized for peak flow rates of 100-year storm event generated using Rational method in conformance with San Bernardino county standards. The drainage area was studied for Synthetic Unit Hydrograph Method to determine hydrograph volume of 100-year storm event with 24-hour storm duration. All hydrological calculation was developed using CivilD Design software Version 9.0. The retention volume calculation for MC-4500 Stormtech underground chambers was analyzed using Hydraflow Hydrograph software.

## ***Section III Project Description***

### **Pre-developed Site Conditions**

Currently, the existing site consists of approximately a total of 2.25 acre of barren land with poor vegetation. The runoff from the site sheet flows in the south-east direction on to Jurupa Avenue. Based on the Figure C-16 in the San Bernardino County Hydrology Manual, the project site is classified as hydrologic soil type A. Refer to the "Pre-developed Hydrology Map" in "Appendix F" for an illustration of drainage pattern.

The entire site is considered as a single drainage basin in the pre-developed condition. The peak flow rates for 10-year and 100-year storm events are determined for the drainage basin using Rational method in the pre-developed condition. All calculations can be found in Appendix C of this report.

Table-1, Peak flow rates using rational method pre-developed condition:

Drainage Area	Area (acres)	Flow Length (ft)	Soil Type	Q <sub>10</sub> (cfs)	Q <sub>100</sub> (cfs)
DA1	2.246	408	A	3.01	6.09

Thus, the site is discharging 3.01 cfs and 6.09 cfs for 10-year and 100-year storm events respectively on to Jurupa Avenue at the southeast corner of the site.

### **Post-developed Site Conditions**

The proposed development will consist of construction of one hotel building, storage building, gas pumps, convenience store, car wash area, paved parking area, drive aisles, landscape planters, occupying approximately an area of 2.25 acres. In the post-developed condition, the entire site is divided into 9 distinct sub-basins. The peak flow rates for 10-year and 100-year storm events are determined for each sub-basin using Rational Method in the post-developed condition. Refer to the "Post-developed Hydrology Map – Rational method" in "Appendix F" for an illustration of the proposed drainage pattern. The runoff from the site will sheet flow over the parking areas into the ribbon gutter and curb and gutter system. The runoff will be intercepted by catch basins and conveyed further by storm drain system into the underground MC-3500 stormtech infiltration system located near to the center of the site.

The following table summarizes the peak flow rates for 10-year and 100-year storm events using rational method in the post-developed condition:

Table-2, Peak flow rates using rational method post-developed condition:

Drainage Area Sub-Basins	Area (acres)	Flow Length (ft)	Soil Type	Q <sub>10</sub> (cfs)	Q <sub>100</sub> (cfs)
SB1	0.117	199	A	0.35	0.57
SB2	0.188	100	A	0.60	0.97
SB3	0.59	256	A	1.51	2.46
SB4	0.342	219	A	0.86	1.40
SB5	0.245	136	A	0.75	1.21
SB6	0.28	157	A	0.81	1.31
SB7	0.092	136	A	0.26	0.42
SB8	0.184	95	A	0.69	1.11
SB9	0.208	147	A	0.67	1.09
Discharging into the underground MC-3500 stormtech system located at the center of the site			A	5.77	9.34

## ***Section IV Post-development Runoff Mitigation, Retention & Conclusion***

### **Post-developed Peak Flow Rates Mitigation and Retention Volume**

The underground MC-3500 stormtech system will provide adequate infiltration into the surrounding soil and attenuate the peak flow rates lower than the pre-developed flow



rates. The synthetic unit hydrograph method is used to determine the hydrograph volume for 10-year & 100-year storm events with 24-hour storm duration. Refer to the “Post-developed Hydrology Map – Synthetic Unit Hydrograph method” in “Appendix F” for an illustration of runoff outflow from the site. A hydrograph analysis was performed to determine the required retention volume using MC-3500 stormtech system. Refer to the “Hydraflow Hydrographs Report in Appendix E” which illustrates that a retention volume of 12,183 CF is provided to reduce the peak flow rates of 10-year & 100-year storm events to less than the corresponding pre-developed condition flow rates. In the event of a larger storm the excess flow will be discharged onto the curb & gutter system at Jurupa Avenue at the southeast side.

### **Summary**

The difference in peak flow rates of pre-developed and post-developed conditions for 10-yr and 100-yr storm events are primarily due to increase in impervious area which is approximately 73% in the post-developed condition. Below is the hydrology summary table of entire site for pre-developed and post-developed condition after retention:

Table-3, Peak flow rates comparison pre-developed & post-developed condition after retention:

Drainage Area	Area (acres)	Pre-developed discharge		Post-developed mitigated discharge	
		Q <sub>10</sub> (cfs)	Q <sub>100</sub> (cfs)	Q <sub>10</sub> (cfs)	Q <sub>100</sub> (cfs)
Basin 1	2.246	3.01	6.09	0	5.11
<b>Total</b>	<b>2.246</b>	<b>3.01</b>	<b>6.09</b>	<b>0</b>	<b>5.11</b>

We conclude that adequate storage volume has been provided in the post-developed condition. This indicates that there will be no adverse impact on the downstream end due to the development of this site. The underground MC-3500 stormtech system will attenuate the post-developed flow rate and will hold the post-developed 100-year peak discharge below 90% of the pre-developed flow rate.

***APPENDIX A***

VICINITY MAP



North Arrow

***APPENDIX B***

Hydrological Rainfall data Reference

NOAA Precipitation data



NOAA Atlas 14, Volume 6, Version 2  
 Location name: **Bloomington, California, USA\***  
 Latitude: **34.0491°**, Longitude: **-117.3963°**  
 Elevation: **1002.69 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

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**PF tabular**

<b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.106 (0.088-0.129)	0.137 (0.114-0.167)	0.179 (0.149-0.218)	0.214 (0.176-0.263)	0.262 (0.209-0.333)	0.301 (0.234-0.390)	0.340 (0.258-0.453)	0.383 (0.282-0.525)	0.442 (0.312-0.633)	0.490 (0.334-0.727)
10-min	0.152 (0.127-0.184)	0.197 (0.164-0.239)	0.257 (0.213-0.312)	0.307 (0.252-0.376)	0.376 (0.299-0.478)	0.431 (0.335-0.560)	0.488 (0.370-0.650)	0.549 (0.404-0.752)	0.634 (0.447-0.907)	0.703 (0.479-1.04)
15-min	0.184 (0.153-0.223)	0.238 (0.198-0.289)	0.310 (0.258-0.378)	0.371 (0.305-0.455)	0.455 (0.362-0.578)	0.521 (0.405-0.677)	0.590 (0.448-0.786)	0.664 (0.489-0.910)	0.767 (0.541-1.10)	0.850 (0.579-1.26)
30-min	0.275 (0.229-0.333)	0.356 (0.296-0.432)	0.464 (0.385-0.564)	0.554 (0.456-0.680)	0.680 (0.540-0.863)	0.779 (0.606-1.01)	0.882 (0.669-1.17)	0.991 (0.731-1.36)	1.15 (0.808-1.64)	1.27 (0.865-1.88)
60-min	0.401 (0.334-0.486)	0.519 (0.432-0.630)	0.677 (0.562-0.823)	0.808 (0.665-0.992)	0.991 (0.788-1.26)	1.14 (0.884-1.48)	1.29 (0.976-1.71)	1.45 (1.07-1.98)	1.67 (1.18-2.39)	1.85 (1.26-2.75)
2-hr	0.586 (0.489-0.710)	0.752 (0.626-0.912)	0.970 (0.805-1.18)	1.15 (0.946-1.41)	1.40 (1.11-1.78)	1.59 (1.24-2.06)	1.79 (1.36-2.38)	1.99 (1.47-2.73)	2.28 (1.61-3.27)	2.51 (1.71-3.72)
3-hr	0.730 (0.608-0.884)	0.933 (0.777-1.13)	1.20 (0.996-1.46)	1.42 (1.17-1.74)	1.72 (1.37-2.18)	1.95 (1.52-2.53)	2.18 (1.66-2.91)	2.43 (1.79-3.33)	2.77 (1.95-3.96)	3.04 (2.07-4.50)
6-hr	1.03 (0.856-1.25)	1.32 (1.10-1.60)	1.69 (1.40-2.06)	1.99 (1.64-2.45)	2.40 (1.91-3.05)	2.72 (2.11-3.53)	3.04 (2.30-4.04)	3.37 (2.48-4.62)	3.82 (2.69-5.46)	4.17 (2.84-6.18)
12-hr	1.37 (1.14-1.65)	1.76 (1.46-2.13)	2.26 (1.88-2.75)	2.67 (2.20-3.28)	3.22 (2.56-4.09)	3.64 (2.83-4.72)	4.06 (3.08-5.40)	4.49 (3.31-6.15)	5.07 (3.58-7.26)	5.52 (3.76-8.19)
24-hr	1.82 (1.61-2.10)	2.37 (2.10-2.74)	3.08 (2.72-3.56)	3.65 (3.19-4.26)	4.41 (3.74-5.32)	4.99 (4.14-6.14)	5.57 (4.51-7.02)	6.17 (4.86-7.99)	6.97 (5.27-9.40)	7.59 (5.55-10.6)
2-day	2.21 (1.96-2.55)	2.93 (2.59-3.39)	3.87 (3.41-4.48)	4.63 (4.05-5.40)	5.65 (4.78-6.81)	6.43 (5.34-7.91)	7.23 (5.85-9.10)	8.04 (6.34-10.4)	9.14 (6.92-12.3)	10.0 (7.32-14.0)
3-day	2.37 (2.10-2.74)	3.20 (2.83-3.69)	4.27 (3.77-4.94)	5.15 (4.50-6.00)	6.35 (5.37-7.65)	7.27 (6.03-8.94)	8.22 (6.66-10.3)	9.19 (7.25-11.9)	10.5 (7.97-14.2)	11.6 (8.46-16.1)
4-day	2.55 (2.26-2.94)	3.47 (3.07-4.01)	4.68 (4.12-5.41)	5.67 (4.96-6.61)	7.02 (5.95-8.46)	8.08 (6.70-9.93)	9.15 (7.42-11.5)	10.3 (8.10-13.3)	11.8 (8.94-15.9)	13.0 (9.53-18.2)
7-day	2.92 (2.59-3.37)	4.02 (3.56-4.64)	5.47 (4.82-6.33)	6.66 (5.83-7.77)	8.30 (7.03-10.00)	9.58 (7.95-11.8)	10.9 (8.83-13.7)	12.3 (9.67-15.9)	14.2 (10.7-19.1)	15.7 (11.5-21.9)
10-day	3.17 (2.81-3.66)	4.39 (3.88-5.07)	6.00 (5.30-6.95)	7.34 (6.42-8.56)	9.18 (7.77-11.1)	10.6 (8.81-13.1)	12.1 (9.81-15.3)	13.7 (10.8-17.7)	15.8 (12.0-21.3)	17.6 (12.8-24.5)
20-day	3.84 (3.40-4.43)	5.36 (4.74-6.19)	7.39 (6.51-8.55)	9.08 (7.94-10.6)	11.4 (9.68-13.8)	13.3 (11.0-16.3)	15.2 (12.3-19.2)	17.3 (13.6-22.4)	20.1 (15.2-27.2)	22.5 (16.4-31.3)
30-day	4.55 (4.03-5.25)	6.35 (5.62-7.33)	8.77 (7.73-10.1)	10.8 (9.44-12.6)	13.6 (11.5-16.4)	15.9 (13.2-19.5)	18.3 (14.8-23.0)	20.8 (16.4-26.9)	24.4 (18.4-32.8)	27.3 (19.9-38.0)
45-day	5.44 (4.81-6.27)	7.53 (6.66-8.69)	10.4 (9.13-12.0)	12.7 (11.1-14.9)	16.1 (13.6-19.4)	18.8 (15.6-23.1)	21.6 (17.5-27.3)	24.7 (19.5-32.0)	29.1 (22.0-39.2)	32.7 (23.9-45.6)
60-day	6.36 (5.63-7.33)	8.71 (7.70-10.1)	11.9 (10.5-13.8)	14.6 (12.8-17.0)	18.4 (15.6-22.2)	21.5 (17.9-26.5)	24.8 (20.1-31.3)	28.4 (22.4-36.7)	33.5 (25.3-45.1)	37.7 (27.6-52.6)

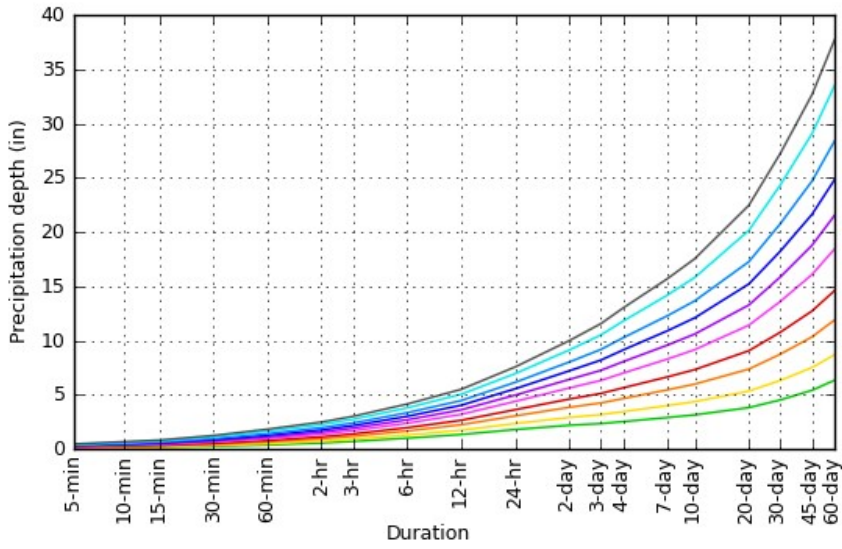
<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration 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.

[Back to Top](#)

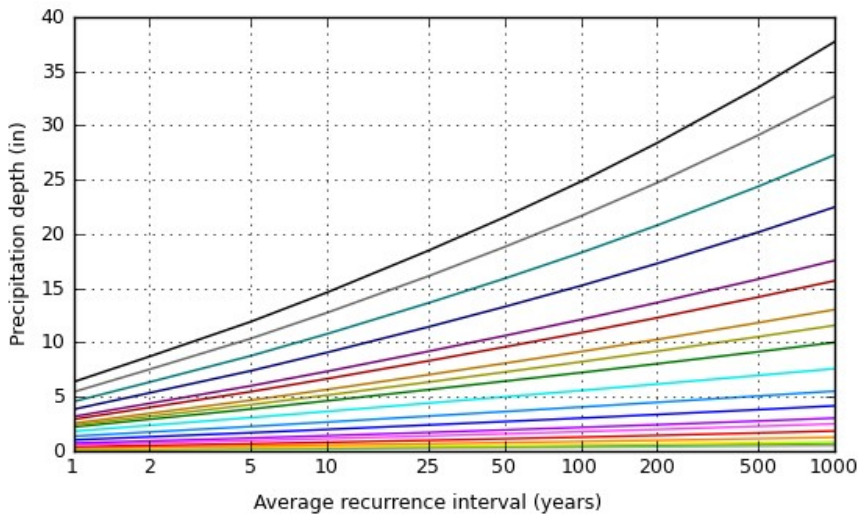


## PF graphical

PDS-based depth-duration-frequency (DDF) curves  
Latitude: 34.0491°, Longitude: -117.3963°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000

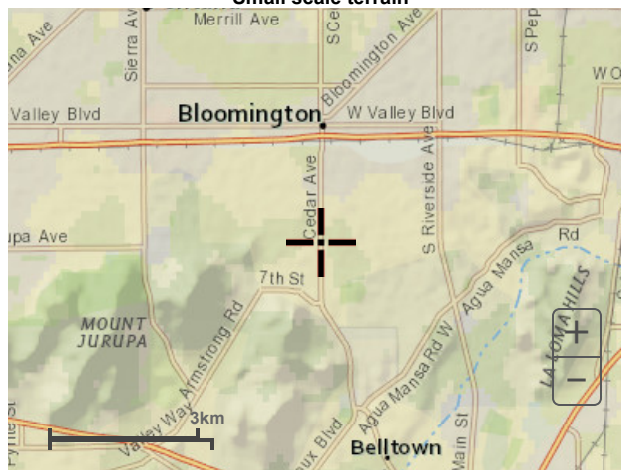


Duration
5-min
10-min
15-min
30-min
60-min
2-hr
3-hr
6-hr
12-hr
24-hr
2-day
3-day
4-day
7-day
10-da
20-da
30-da
45-da
60-da

[Back to Top](#)

## Maps & aerials

Small scale terrain



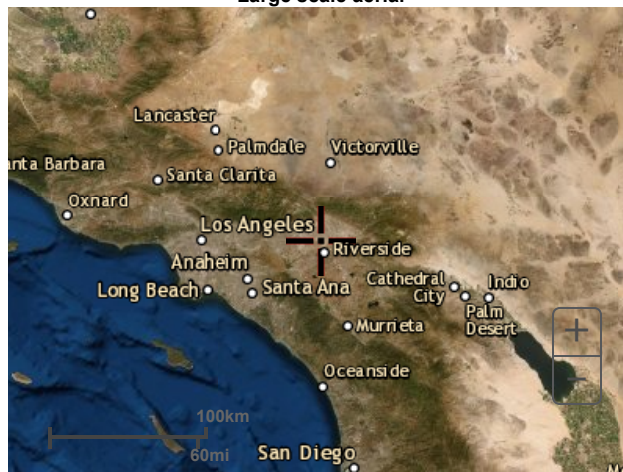
Large scale terrain



Large scale map



Large scale aerial



[Back to Top](#)

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NOAA Atlas 14, Volume 6, Version 2  
 Location name: **Bloomington, California, USA\***  
 Latitude: **34.0491°**, Longitude: **-117.3963°**  
 Elevation: **1002.69 ft\*\***  
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NOAA, National Weather Service, Silver Spring, Maryland

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Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.27 (0.612-0.892)	1.64 (1.37-2.00)	2.15 (1.79-2.62)	2.57 (2.11-3.16)	3.14 (2.51-4.00)	3.61 (2.81-4.68)	4.08 (3.10-5.44)	4.60 (3.38-6.30)	5.30 (3.74-7.60)	5.88 (4.01-8.72)
10-min	0.912 (0.762-1.10)	1.18 (0.984-1.43)	1.54 (1.28-1.87)	1.84 (1.51-2.26)	2.26 (1.79-2.87)	2.59 (2.01-3.36)	2.93 (2.22-3.90)	3.29 (2.42-4.51)	3.80 (2.68-5.44)	4.22 (2.87-6.25)
15-min	0.736 (0.612-0.892)	0.952 (0.792-1.16)	1.24 (1.03-1.51)	1.48 (1.22-1.82)	1.82 (1.45-2.31)	2.08 (1.62-2.71)	2.36 (1.79-3.14)	2.66 (1.96-3.64)	3.07 (2.16-4.39)	3.40 (2.32-5.04)
30-min	0.550 (0.458-0.666)	0.712 (0.592-0.864)	0.928 (0.770-1.13)	1.11 (0.912-1.36)	1.36 (1.08-1.73)	1.56 (1.21-2.02)	1.76 (1.34-2.35)	1.98 (1.46-2.72)	2.29 (1.62-3.28)	2.54 (1.73-3.77)
60-min	0.401 (0.334-0.486)	0.519 (0.432-0.630)	0.677 (0.562-0.823)	0.808 (0.665-0.992)	0.991 (0.788-1.26)	1.14 (0.884-1.48)	1.29 (0.976-1.71)	1.45 (1.07-1.98)	1.67 (1.18-2.39)	1.85 (1.26-2.75)
2-hr	0.293 (0.244-0.355)	0.376 (0.313-0.456)	0.485 (0.402-0.590)	0.575 (0.473-0.706)	0.698 (0.556-0.888)	0.794 (0.618-1.03)	0.894 (0.678-1.19)	0.997 (0.735-1.37)	1.14 (0.806-1.63)	1.26 (0.855-1.86)
3-hr	0.243 (0.202-0.294)	0.311 (0.259-0.377)	0.400 (0.332-0.487)	0.473 (0.389-0.580)	0.572 (0.455-0.726)	0.648 (0.504-0.842)	0.727 (0.551-0.968)	0.809 (0.596-1.11)	0.922 (0.651-1.32)	1.01 (0.689-1.50)
6-hr	0.172 (0.143-0.208)	0.220 (0.183-0.267)	0.282 (0.234-0.343)	0.333 (0.274-0.408)	0.401 (0.319-0.510)	0.454 (0.353-0.589)	0.507 (0.385-0.675)	0.562 (0.414-0.771)	0.637 (0.450-0.912)	0.696 (0.474-1.03)
12-hr	0.113 (0.094-0.137)	0.146 (0.121-0.177)	0.188 (0.156-0.229)	0.222 (0.183-0.272)	0.267 (0.212-0.339)	0.302 (0.235-0.392)	0.337 (0.255-0.448)	0.372 (0.274-0.511)	0.421 (0.297-0.602)	0.458 (0.312-0.680)
24-hr	0.076 (0.067-0.088)	0.099 (0.087-0.114)	0.128 (0.113-0.149)	0.152 (0.133-0.177)	0.184 (0.156-0.222)	0.208 (0.173-0.256)	0.232 (0.188-0.293)	0.257 (0.203-0.333)	0.290 (0.220-0.392)	0.316 (0.231-0.441)
2-day	0.046 (0.041-0.053)	0.061 (0.054-0.071)	0.081 (0.071-0.093)	0.096 (0.084-0.112)	0.118 (0.100-0.142)	0.134 (0.111-0.165)	0.150 (0.122-0.190)	0.167 (0.132-0.217)	0.190 (0.144-0.257)	0.208 (0.152-0.291)
3-day	0.033 (0.029-0.038)	0.044 (0.039-0.051)	0.059 (0.052-0.069)	0.071 (0.063-0.083)	0.088 (0.075-0.106)	0.101 (0.084-0.124)	0.114 (0.092-0.144)	0.128 (0.101-0.165)	0.146 (0.111-0.197)	0.161 (0.118-0.224)
4-day	0.027 (0.024-0.031)	0.036 (0.032-0.042)	0.049 (0.043-0.056)	0.059 (0.052-0.069)	0.073 (0.062-0.088)	0.084 (0.070-0.103)	0.095 (0.077-0.120)	0.107 (0.084-0.139)	0.123 (0.093-0.166)	0.136 (0.099-0.189)
7-day	0.017 (0.015-0.020)	0.024 (0.021-0.028)	0.033 (0.029-0.038)	0.040 (0.035-0.046)	0.049 (0.042-0.060)	0.057 (0.047-0.070)	0.065 (0.053-0.082)	0.073 (0.058-0.095)	0.084 (0.064-0.114)	0.093 (0.068-0.130)
10-day	0.013 (0.012-0.015)	0.018 (0.016-0.021)	0.025 (0.022-0.029)	0.031 (0.027-0.036)	0.038 (0.032-0.046)	0.044 (0.037-0.054)	0.050 (0.041-0.064)	0.057 (0.045-0.074)	0.066 (0.050-0.089)	0.073 (0.053-0.102)
20-day	0.008 (0.007-0.009)	0.011 (0.010-0.013)	0.015 (0.014-0.018)	0.019 (0.017-0.022)	0.024 (0.020-0.029)	0.028 (0.023-0.034)	0.032 (0.026-0.040)	0.036 (0.028-0.047)	0.042 (0.032-0.057)	0.047 (0.034-0.065)
30-day	0.006 (0.006-0.007)	0.009 (0.008-0.010)	0.012 (0.011-0.014)	0.015 (0.013-0.017)	0.019 (0.016-0.023)	0.022 (0.018-0.027)	0.025 (0.021-0.032)	0.029 (0.023-0.037)	0.034 (0.026-0.046)	0.038 (0.028-0.053)
45-day	0.005 (0.004-0.006)	0.007 (0.006-0.008)	0.010 (0.008-0.011)	0.012 (0.010-0.014)	0.015 (0.013-0.018)	0.017 (0.014-0.021)	0.020 (0.016-0.025)	0.023 (0.018-0.030)	0.027 (0.020-0.036)	0.030 (0.022-0.042)
60-day	0.004 (0.004-0.005)	0.006 (0.005-0.007)	0.008 (0.007-0.010)	0.010 (0.009-0.012)	0.013 (0.011-0.015)	0.015 (0.012-0.018)	0.017 (0.014-0.022)	0.020 (0.016-0.026)	0.023 (0.018-0.031)	0.026 (0.019-0.037)

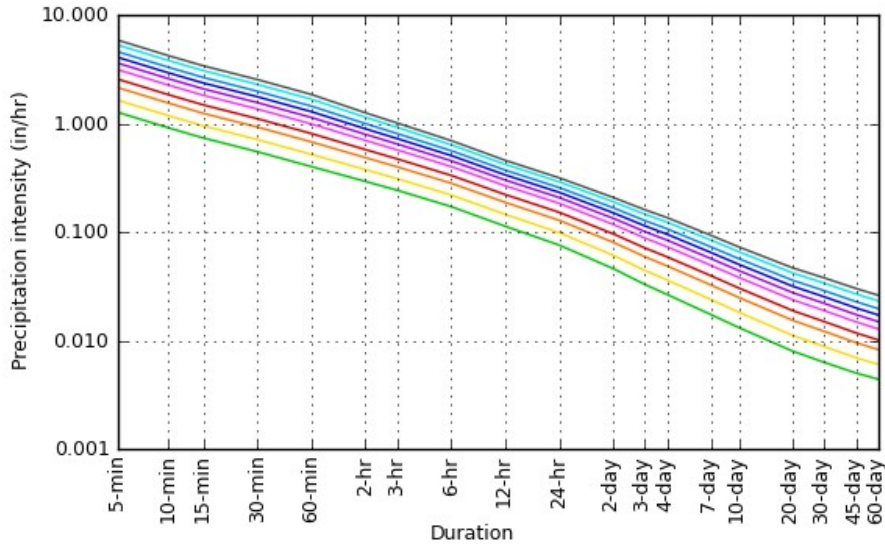
<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration 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.

[Back to Top](#)

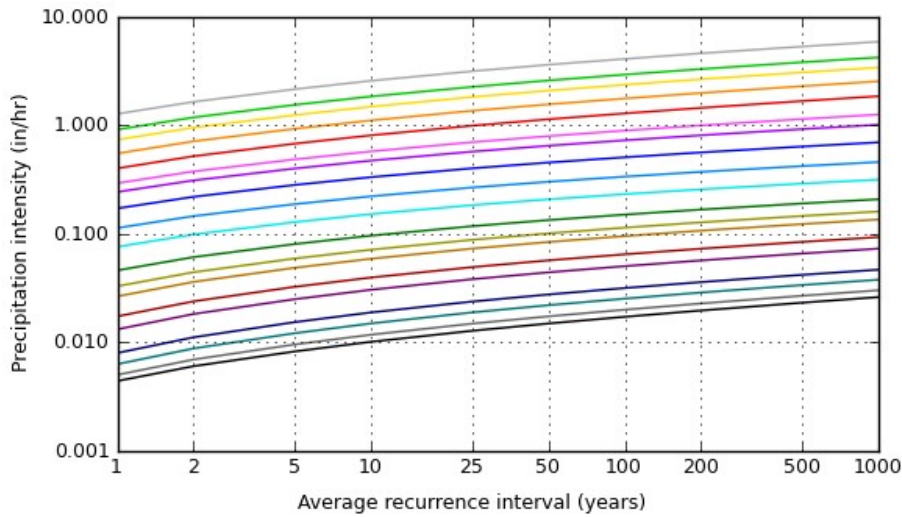


# PF graphical

PDS-based intensity-duration-frequency (IDF) curves  
 Latitude: 34.0491°, Longitude: -117.3963°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000

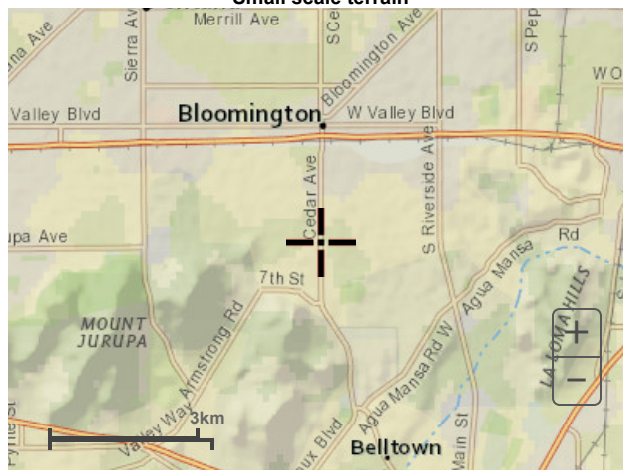


Duration
5-min
10-min
15-min
30-min
60-min
2-hr
3-hr
6-hr
12-hr
24-hr
2-day
3-day
4-day
7-day
10-da
20-da
30-da
45-da
60-da

[Back to Top](#)

## Maps & aerials

Small scale terrain



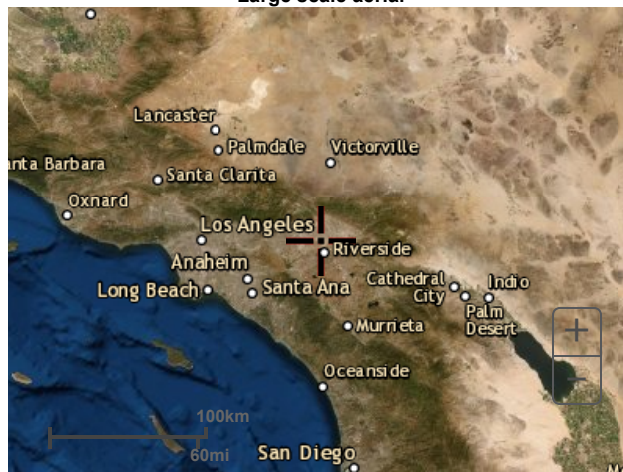
Large scale terrain



Large scale map



Large scale aerial



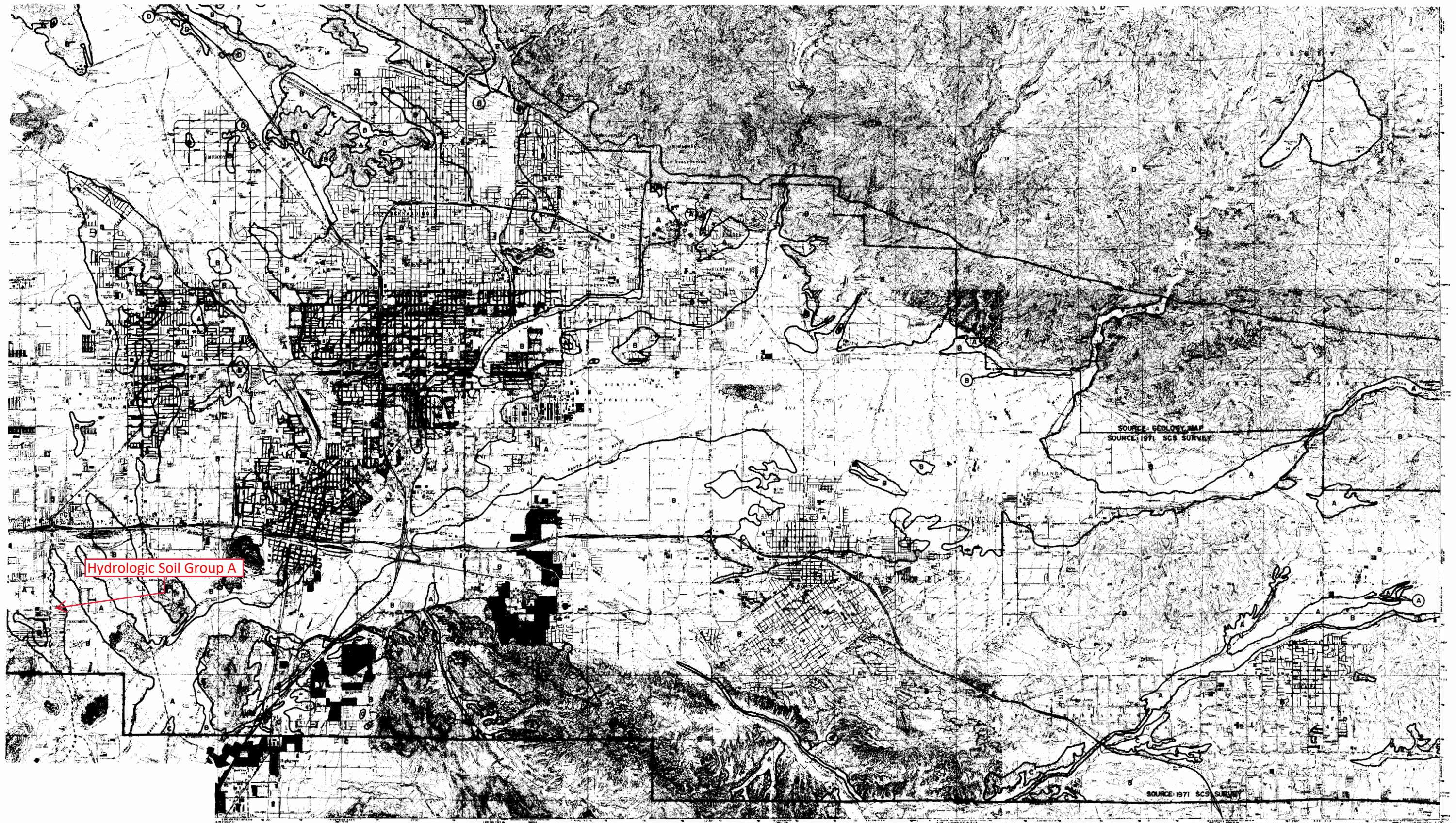
[Back to Top](#)

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[US Department of Commerce](#)  
[National Oceanic and Atmospheric Administration](#)  
[National Weather Service](#)  
[National Water Center](#)  
1325 East West Highway  
Silver Spring, MD 20910  
Questions?: [HDSC.Questions@noaa.gov](mailto:HDSC.Questions@noaa.gov)

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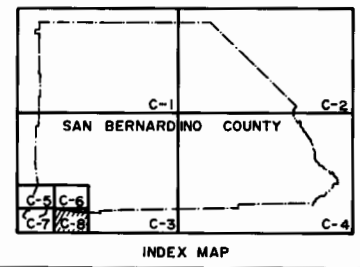


Hydrologic Soil Group A

SOURCE: GEOLOGY MAP  
SOURCE: 1971 SCS SURVEY

SOURCE: 1971 SCS SURVEY

**SAN BERNARDINO COUNTY**  
HYDROLOGY MANUAL



- LEGEND
- SOIL GROUP BOUNDARY
  - A SOIL GROUP DESIGNATION
  - - - - BOUNDARY OF INDICATED SOURCE

SCALE REDUCED BY 1/2

**HYDROLOGIC SOILS GROUP MAP**  
FOR  
SOUTHWEST-D AREA



## ***APPENDIX C***

Hydrology Study – Rational Method for 10-year and 100-year storm event  
using CivilID software

- Pre-developed Conditions
- Post-developed conditions

Pre10yr

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2019 Version 9.1  
Rational Hydrology Study Date: 09/11/20

-----  
ACRO AM/PM  
PRE-DEVELOPEMENT 10-YR (DA1)  
11279 CEDAR AVENUE  
BLOOMINGTON CA 92316  
-----

Program License Serial Number 6474

-----  
\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*  
-----

Rational hydrology study storm event year is 10.0  
Computed rainfall intensity:  
Storm year = 10.00 1 hour rainfall = 0.808 (In.)  
Slope used for rainfall intensity curve b = 0.6000  
Soil antecedent moisture condition (AMC) = 2

+++++  
Process from Point/Station 110.000 to Point/Station 120.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

-----  
UNDEVELOPED (poor cover) subarea  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 67.00  
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.578(In/Hr)  
Initial subarea data:  
Initial area flow distance = 408.000(Ft.)  
Top (of initial area) elevation = 1007.000(Ft.)  
Bottom (of initial area) elevation = 998.250(Ft.)  
Difference in elevation = 8.750(Ft.)  
Slope = 0.02145 s(%)= 2.14  
TC = k(0.525)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 12.536 min.  
Rainfall intensity = 2.067(In/Hr) for a 10.0 year storm

Pre10yr

Effective runoff coefficient used for area (Q=KCIA) is  $C = 0.648$

Subarea runoff = 3.010(CFS)

Total initial stream area = 2.246(Ac.)

Pervious area fraction = 1.000

Initial area Fm value = 0.578(In/Hr)

End of computations, Total Study Area = 2.25 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction( $A_p$ ) = 1.000

Area averaged SCS curve number = 67.0

Pre100yr

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2019 Version 9.1  
Rational Hydrology Study Date: 09/11/20

-----  
ACRO AM/PM  
PRE-DEVELOPEMENT 100-YR (DA1)  
11279 CEDAR AVENUE  
BLOOMINGTON CA 92316  
-----

Program License Serial Number 6474

-----  
\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*  
-----

Rational hydrology study storm event year is 100.0  
10 Year storm 1 hour rainfall = 0.808(In.)  
100 Year storm 1 hour rainfall = 1.290(In.)  
Computed rainfall intensity:  
Storm year = 100.00 1 hour rainfall = 1.290 (In.)  
Slope used for rainfall intensity curve b = 0.6000  
Soil antecedent moisture condition (AMC) = 3

++++  
Process from Point/Station 110.000 to Point/Station 120.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

-----  
UNDEVELOPED (poor cover) subarea  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 67.00  
Adjusted SCS curve number for AMC 3 = 84.60  
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.290(In/Hr)  
Initial subarea data:  
Initial area flow distance = 408.000(Ft.)  
Top (of initial area) elevation = 1007.000(Ft.)  
Bottom (of initial area) elevation = 998.250(Ft.)  
Difference in elevation = 8.750(Ft.)  
Slope = 0.02145 s(%)= 2.14

Pre100yr

TC =  $k(0.525)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$

Initial area time of concentration = 12.536 min.

Rainfall intensity = 3.301(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.821

Subarea runoff = 6.086(CFS)

Total initial stream area = 2.246(Ac.)

Pervious area fraction = 1.000

Initial area Fm value = 0.290(In/Hr)

End of computations, Total Study Area = 2.25 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000

Area averaged SCS curve number = 67.0



post10yr1

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2019 Version 9.1  
Rational Hydrology Study Date: 09/11/20

-----  
ACRO AM/PM  
POST-DEVELOPEMENT 10-YR (SUB-BASINS SB1 & SB2)  
11279 CEDAR AVENUE  
BLOOMINGTON CA 92316  
-----

Program License Serial Number 6474

-----  
\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*  
-----

Rational hydrology study storm event year is 10.0  
Computed rainfall intensity:  
Storm year = 10.00 1 hour rainfall = 0.808 (In.)  
Slope used for rainfall intensity curve b = 0.6000  
Soil antecedent moisture condition (AMC) = 2

++++  
Process from Point/Station 100.000 to Point/Station 101.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

-----  
COMMERCIAL subarea type  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 32.00  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)  
Initial subarea data:  
Initial area flow distance = 109.000(Ft.)  
Top (of initial area) elevation = 1003.910(Ft.)  
Bottom (of initial area) elevation = 1003.130(Ft.)  
Difference in elevation = 0.780(Ft.)  
Slope = 0.00716 s(%)= 0.72  
TC = k(0.304)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 5.332 min.  
Rainfall intensity = 3.453(In/Hr) for a 10.0 year storm

post10yr1

Effective runoff coefficient used for area (Q=KCIA) is C = 0.875  
Subarea runoff = 0.353(CFS)  
Total initial stream area = 0.117(Ac.)  
Pervious area fraction = 0.100  
Initial area Fm value = 0.098(In/Hr)

++++  
Process from Point/Station 101.000 to Point/Station 202.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 1000.130(Ft.)  
Downstream point/station elevation = 995.480(Ft.)  
Pipe length = 103.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 0.353(CFS)  
Given pipe size = 12.00(In.)  
Calculated individual pipe flow = 0.353(CFS)  
Normal flow depth in pipe = 1.76(In.)  
Flow top width inside pipe = 8.50(In.)  
Critical Depth = 2.93(In.)  
Pipe flow velocity = 4.92(Ft/s)  
Travel time through pipe = 0.35 min.  
Time of concentration (TC) = 5.68 min.

++++  
Process from Point/Station 202.000 to Point/Station 202.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 0.117(Ac.)  
Runoff from this stream = 0.353(CFS)  
Time of concentration = 5.68 min.  
Rainfall intensity = 3.324(In/Hr)  
Area averaged loss rate (Fm) = 0.0978(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 200.000 to Point/Station 201.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

COMMERCIAL subarea type  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000

post10yr1

Decimal fraction soil group D = 0.000  
 SCS curve number for soil(AMC 2) = 32.00  
 Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)  
 Initial subarea data:  
 Initial area flow distance = 100.000(Ft.)  
 Top (of initial area) elevation = 1004.020(Ft.)  
 Bottom (of initial area) elevation = 1003.120(Ft.)  
 Difference in elevation = 0.900(Ft.)  
 Slope = 0.00900 s(%)= 0.90  
 $TC = k(0.304)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 4.921 min.  
 Rainfall intensity = 3.623(In/Hr) for a 10.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.876  
 Subarea runoff = 0.596(CFS)  
 Total initial stream area = 0.188(Ac.)  
 Pervious area fraction = 0.100  
 Initial area Fm value = 0.098(In/Hr)

++++  
 Process from Point/Station 201.000 to Point/Station 202.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.188(Ac.)  
 Runoff from this stream = 0.596(CFS)  
 Time of concentration = 4.92 min.  
 Rainfall intensity = 3.623(In/Hr)  
 Area averaged loss rate (Fm) = 0.0978(In/Hr)  
 Area averaged Pervious ratio (Ap) = 0.1000  
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	0.35	0.117	5.68	0.098	3.324
2	0.60	0.188	4.92	0.098	3.623
Qmax(1) =					
	1.000 *	1.000 *		0.353) +	
	0.915 *	1.000 *		0.596) + =	0.899
Qmax(2) =					
	1.093 *	0.866 *		0.353) +	
	1.000 *	1.000 *		0.596) + =	0.931

Total of 2 main streams to confluence:  
 Flow rates before confluence point:

post10yr1

1.353          1.596  
Maximum flow rates at confluence using above data:  
0.899          0.931  
Area of streams before confluence:  
0.117          0.188  
Effective area values after confluence:  
0.305          0.289

Results of confluence:

Total flow rate =          0.931(CFS)  
Time of concentration =      4.921 min.  
Effective stream area after confluence =          0.289(Ac.)  
Study area average Pervious fraction(Ap) = 0.100  
Study area average soil loss rate(Fm) =      0.098(In/Hr)  
Study area total =          0.30(Ac.)

+++++  
Process from Point/Station      202.000 to Point/Station      403.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 995.480(Ft.)  
Downstream point/station elevation = 994.350(Ft.)  
Pipe length = 25.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 0.931(CFS)  
Given pipe size = 12.00(In.)  
Calculated individual pipe flow = 0.931(CFS)  
Normal flow depth in pipe = 2.84(In.)  
Flow top width inside pipe = 10.20(In.)  
Critical Depth = 4.85(In.)  
Pipe flow velocity = 6.55(Ft/s)  
Travel time through pipe = 0.06 min.  
Time of concentration (TC) = 4.98 min.  
End of computations, Total Study Area = 0.30 (Ac.)

The following figures may  
be used for a unit hydrograph study of the same area.  
Note: These figures do not consider reduced effective area  
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.100  
Area averaged SCS curve number = 32.0

Post10yr2

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2019 Version 9.1  
Rational Hydrology Study Date: 09/11/20

-----  
ACRO AM/PM  
POST-DEVELOPEMENT 100-YR (SUB-BASINS SB3, SB4 & CONFLUENCE w SB1& SB2)  
11279 CEDAR AVENUE  
BLOOMINGTON CA 92316  
-----

Program License Serial Number 6474

-----  
\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*  
-----

Rational hydrology study storm event year is 10.0  
Computed rainfall intensity:  
Storm year = 10.00 1 hour rainfall = 0.808 (In.)  
Slope used for rainfall intensity curve b = 0.6000  
Soil antecedent moisture condition (AMC) = 2

++++  
Process from Point/Station 300.000 to Point/Station 301.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

-----  
COMMERCIAL subarea type  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 32.00  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)  
Initial subarea data:  
Initial area flow distance = 256.000(Ft.)  
Top (of initial area) elevation = 1003.780(Ft.)  
Bottom (of initial area) elevation = 1001.060(Ft.)  
Difference in elevation = 2.720(Ft.)  
Slope = 0.01063 s(%)= 1.06  
TC = k(0.304)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 6.933 min.  
Rainfall intensity = 2.950(In/Hr) for a 10.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870

Post10yr2

Subarea runoff = 1.514(CFS)  
Total initial stream area = 0.590(Ac.)  
Pervious area fraction = 0.100  
Initial area Fm value = 0.098(In/Hr)

++++  
Process from Point/Station 301.000 to Point/Station 402.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 998.060(Ft.)  
Downstream point/station elevation = 996.770(Ft.)  
Pipe length = 80.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 1.514(CFS)  
Given pipe size = 12.00(In.)  
Calculated individual pipe flow = 1.514(CFS)  
Normal flow depth in pipe = 4.78(In.)  
Flow top width inside pipe = 11.75(In.)  
Critical Depth = 6.25(In.)  
Pipe flow velocity = 5.19(Ft/s)  
Travel time through pipe = 0.26 min.  
Time of concentration (TC) = 7.19 min.

++++  
Process from Point/Station 402.000 to Point/Station 402.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 0.590(Ac.)  
Runoff from this stream = 1.514(CFS)  
Time of concentration = 7.19 min.  
Rainfall intensity = 2.886(In/Hr)  
Area averaged loss rate (Fm) = 0.0978(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 400.000 to Point/Station 401.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

COMMERCIAL subarea type  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000

Post10yr2

SCS curve number for soil(AMC 2) = 32.00  
 Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)  
 Initial subarea data:  
 Initial area flow distance = 219.000(Ft.)  
 Top (of initial area) elevation = 1003.450(Ft.)  
 Bottom (of initial area) elevation = 1001.950(Ft.)  
 Difference in elevation = 1.500(Ft.)  
 Slope = 0.00685 s(%)= 0.68  
 $TC = k(0.304)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 7.111 min.  
 Rainfall intensity = 2.905(In/Hr) for a 10.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.870  
 Subarea runoff = 0.864(CFS)  
 Total initial stream area = 0.342(Ac.)  
 Pervious area fraction = 0.100  
 Initial area Fm value = 0.098(In/Hr)

++++  
 Process from Point/Station 401.000 to Point/Station 402.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.342(Ac.)  
 Runoff from this stream = 0.864(CFS)  
 Time of concentration = 7.11 min.  
 Rainfall intensity = 2.905(In/Hr)  
 Area averaged loss rate (Fm) = 0.0978(In/Hr)  
 Area averaged Pervious ratio (Ap) = 0.1000  
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	1.51	0.590	7.19	0.098	2.886
2	0.86	0.342	7.11	0.098	2.905
Qmax(1) =					
	1.000 *	1.000 *	1.514)	+	
	0.993 *	1.000 *	0.864)	+ =	2.372
Qmax(2) =					
	1.007 *	0.989 *	1.514)	+	
	1.000 *	1.000 *	0.864)	+ =	2.372

Total of 2 main streams to confluence:  
 Flow rates before confluence point:  
 2.514            1.864

Post10yr2

Maximum flow rates at confluence using above data:

2.372            2.372

Area of streams before confluence:

0.590            0.342

Effective area values after confluence:

0.932            0.926

Results of confluence:

Total flow rate =        2.372(CFS)

Time of concentration =    7.190 min.

Effective stream area after confluence =        0.932(Ac.)

Study area average Pervious fraction(Ap) = 0.100

Study area average soil loss rate(Fm) =    0.098(In/Hr)

Study area total =        0.93(Ac.)

++++  
Process from Point/Station        402.000 to Point/Station        403.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 996.770(Ft.)  
Downstream point/station elevation = 994.350(Ft.)  
Pipe length = 151.00(Ft.)    Manning's N = 0.013  
No. of pipes = 1    Required pipe flow =        2.372(CFS)  
Given pipe size =        12.00(In.)  
Calculated individual pipe flow =        2.372(CFS)  
Normal flow depth in pipe =    6.18(In.)  
Flow top width inside pipe =    11.99(In.)  
Critical Depth =        7.91(In.)  
Pipe flow velocity =        5.81(Ft/s)  
Travel time through pipe =    0.43 min.  
Time of concentration (TC) =    7.62 min.

++++  
Process from Point/Station        403.000 to Point/Station        403.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area =        0.932(Ac.)  
Runoff from this stream =        2.372(CFS)  
Time of concentration =    7.62 min.  
Rainfall intensity =        2.786(In/Hr)  
Area averaged loss rate (Fm) =    0.0978(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Program is now starting with Main Stream No. 2



Post10yr2

+++++  
 Process from Point/Station 202.000 to Point/Station 403.000  
 \*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

---

COMMERCIAL subarea type  
 Decimal fraction soil group A = 1.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 0.000  
 SCS curve number for soil(AMC 2) = 32.00  
 Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)  
 Rainfall intensity = 3.597(In/Hr) for a 10.0 year storm  
 User specified values are as follows:  
 TC = 4.98 min. Rain intensity = 3.60(In/Hr)  
 Total area this stream = 0.30(Ac.)  
 Total Study Area (Main Stream No. 2) = 1.23(Ac.)  
 Total runoff = 0.93(CFS)

+++++  
 Process from Point/Station 403.000 to Point/Station 403.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.300(Ac.)  
 Runoff from this stream = 0.931(CFS)  
 Time of concentration = 4.98 min.  
 Rainfall intensity = 3.597(In/Hr)  
 Area averaged loss rate (Fm) = 0.0978(In/Hr)  
 Area averaged Pervious ratio (Ap) = 0.1000  
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	2.37	0.932	7.62	0.098	2.786
2	0.93	0.300	4.98	0.098	3.597
Qmax(1) =					
	1.000 *	1.000 *	2.372)	+	
	0.768 *	1.000 *	0.931)	+	3.088
Qmax(2) =					
	1.302 *	0.653 *	2.372)	+	
	1.000 *	1.000 *	0.931)	+	2.948

Post10yr2

Total of 2 main streams to confluence:

Flow rates before confluence point:

3.372          1.931

Maximum flow rates at confluence using above data:

3.088          2.948

Area of streams before confluence:

0.932          0.300

Effective area values after confluence:

1.232          0.909

Results of confluence:

Total flow rate =          3.088(CFS)

Time of concentration =          7.623 min.

Effective stream area after confluence =          1.232(Ac.)

Study area average Pervious fraction(Ap) =          0.100

Study area average soil loss rate(Fm) =          0.098(In/Hr)

Study area total =          1.23(Ac.)

End of computations, Total Study Area =          1.23 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.100

Area averaged SCS curve number = 32.0

Post10yr3

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2019 Version 9.1  
Rational Hydrology Study Date: 09/11/20

-----  
ACRO AM/PM  
POST-DEVELOPEMENT 100-YR (SUB-BASINS SB5, SB6, SB7, SB8, SB9 &  
CONFLUENCE w SB1, SB2, SB3 & SB4)  
11279 CEDAR AVENUE  
BLOOMINGTON CA 92316  
-----

Program License Serial Number 6474

-----  
\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*  
-----

Rational hydrology study storm event year is 10.0  
Computed rainfall intensity:  
Storm year = 10.00 1 hour rainfall = 0.808 (In.)  
Slope used for rainfall intensity curve b = 0.6000  
Soil antecedent moisture condition (AMC) = 2

+++++  
Process from Point/Station 500.000 to Point/Station 501.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

-----  
COMMERCIAL subarea type  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 32.00  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)  
Initial subarea data:  
Initial area flow distance = 136.000(Ft.)  
Top (of initial area) elevation = 1001.490(Ft.)  
Bottom (of initial area) elevation = 999.800(Ft.)  
Difference in elevation = 1.690(Ft.)  
Slope = 0.01243 s(%)= 1.24  
TC = k(0.304)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 5.217 min.  
Rainfall intensity = 3.498(In/Hr) for a 10.0 year storm

Post10yr3

Effective runoff coefficient used for area (Q=KCIA) is C = 0.875  
Subarea runoff = 0.750(CFS)  
Total initial stream area = 0.245(Ac.)  
Pervious area fraction = 0.100  
Initial area Fm value = 0.098(In/Hr)

++++  
Process from Point/Station 501.000 to Point/Station 602.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 996.400(Ft.)  
Downstream point/station elevation = 995.350(Ft.)  
Pipe length = 43.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 0.750(CFS)  
Given pipe size = 12.00(In.)  
Calculated individual pipe flow = 0.750(CFS)  
Normal flow depth in pipe = 2.98(In.)  
Flow top width inside pipe = 10.36(In.)  
Critical Depth = 4.33(In.)  
Pipe flow velocity = 4.94(Ft/s)  
Travel time through pipe = 0.14 min.  
Time of concentration (TC) = 5.36 min.

++++  
Process from Point/Station 602.000 to Point/Station 602.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 0.245(Ac.)  
Runoff from this stream = 0.750(CFS)  
Time of concentration = 5.36 min.  
Rainfall intensity = 3.441(In/Hr)  
Area averaged loss rate (Fm) = 0.0978(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 600.000 to Point/Station 601.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

COMMERCIAL subarea type  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000

Post10yr3

Decimal fraction soil group D = 0.000  
 SCS curve number for soil(AMC 2) = 32.00  
 Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)  
 Initial subarea data:  
 Initial area flow distance = 157.000(Ft.)  
 Top (of initial area) elevation = 1001.530(Ft.)  
 Bottom (of initial area) elevation = 999.950(Ft.)  
 Difference in elevation = 1.580(Ft.)  
 Slope = 0.01006 s(%)= 1.01  
 $TC = k(0.304)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 5.763 min.  
 Rainfall intensity = 3.295(In/Hr) for a 10.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.873  
 Subarea runoff = 0.806(CFS)  
 Total initial stream area = 0.280(Ac.)  
 Pervious area fraction = 0.100  
 Initial area Fm value = 0.098(In/Hr)

++++  
 Process from Point/Station 601.000 to Point/Station 602.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.280(Ac.)  
 Runoff from this stream = 0.806(CFS)  
 Time of concentration = 5.76 min.  
 Rainfall intensity = 3.295(In/Hr)  
 Area averaged loss rate (Fm) = 0.0978(In/Hr)  
 Area averaged Pervious ratio (Ap) = 0.1000  
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	0.75	0.245	5.36	0.098	3.441
2	0.81	0.280	5.76	0.098	3.295
Qmax(1) =					
	1.000 *	1.000 *		0.750) +	
	1.046 *	0.930 *		0.806) + =	1.534
Qmax(2) =					
	0.956 *	1.000 *		0.750) +	
	1.000 *	1.000 *		0.806) + =	1.523

Total of 2 main streams to confluence:  
 Flow rates before confluence point:

Post10yr3

1.750      1.806  
Maximum flow rates at confluence using above data:  
1.534      1.523  
Area of streams before confluence:  
0.245      0.280  
Effective area values after confluence:  
0.505      0.525

Results of confluence:

Total flow rate = 1.534(CFS)  
Time of concentration = 5.362 min.  
Effective stream area after confluence = 0.505(Ac.)  
Study area average Pervious fraction(Ap) = 0.100  
Study area average soil loss rate(Fm) = 0.098(In/Hr)  
Study area total = 0.53(Ac.)

++++  
Process from Point/Station 602.000 to Point/Station 902.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 995.350(Ft.)  
Downstream point/station elevation = 994.540(Ft.)  
Pipe length = 149.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 1.534(CFS)  
Given pipe size = 12.00(In.)  
Calculated individual pipe flow = 1.534(CFS)  
Normal flow depth in pipe = 6.59(In.)  
Flow top width inside pipe = 11.94(In.)  
Critical Depth = 6.30(In.)  
Pipe flow velocity = 3.47(Ft/s)  
Travel time through pipe = 0.71 min.  
Time of concentration (TC) = 6.08 min.

++++  
Process from Point/Station 902.000 to Point/Station 902.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 0.505(Ac.)  
Runoff from this stream = 1.534(CFS)  
Time of concentration = 6.08 min.  
Rainfall intensity = 3.192(In/Hr)  
Area averaged loss rate (Fm) = 0.0978(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000

Post10yr3

Program is now starting with Main Stream No. 2

+++++  
Process from Point/Station 700.000 to Point/Station 701.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

COMMERCIAL subarea type  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 32.00  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)  
Initial subarea data:  
Initial area flow distance = 136.000(Ft.)  
Top (of initial area) elevation = 1001.370(Ft.)  
Bottom (of initial area) elevation = 1000.470(Ft.)  
Difference in elevation = 0.900(Ft.)  
Slope = 0.00662 s(%)= 0.66  
TC =  $k(0.304)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 5.918 min.  
Rainfall intensity = 3.243(In/Hr) for a 10.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.873  
Subarea runoff = 0.260(CFS)  
Total initial stream area = 0.092(Ac.)  
Pervious area fraction = 0.100  
Initial area Fm value = 0.098(In/Hr)

+++++  
Process from Point/Station 701.000 to Point/Station 901.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 998.970(Ft.)  
Downstream point/station elevation = 997.780(Ft.)  
Pipe length = 51.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 0.260(CFS)  
Given pipe size = 12.00(In.)  
Calculated individual pipe flow = 0.260(CFS)  
Normal flow depth in pipe = 1.79(In.)  
Flow top width inside pipe = 8.54(In.)  
Critical Depth = 2.51(In.)  
Pipe flow velocity = 3.56(Ft/s)  
Travel time through pipe = 0.24 min.  
Time of concentration (TC) = 6.16 min.

Post10yr3

+++++  
 Process from Point/Station 901.000 to Point/Station 902.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.092(Ac.)  
 Runoff from this stream = 0.260(CFS)  
 Time of concentration = 6.16 min.  
 Rainfall intensity = 3.167(In/Hr)  
 Area averaged loss rate (Fm) = 0.0978(In/Hr)  
 Area averaged Pervious ratio (Ap) = 0.1000  
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	1.53	0.505	6.08	0.098	3.192
2	0.26	0.092	6.16	0.098	3.167

Qmax(1) =  
 1.000 \* 1.000 \* 1.534) +  
 1.008 \* 0.987 \* 0.260) + = 1.793

Qmax(2) =  
 0.992 \* 1.000 \* 1.534) +  
 1.000 \* 1.000 \* 0.260) + = 1.782

Total of 2 main streams to confluence:  
 Flow rates before confluence point:  
 2.534 1.260  
 Maximum flow rates at confluence using above data:  
 1.793 1.782  
 Area of streams before confluence:  
 0.505 0.092  
 Effective area values after confluence:  
 0.596 0.597

Results of confluence:  
 Total flow rate = 1.793(CFS)  
 Time of concentration = 6.077 min.  
 Effective stream area after confluence = 0.596(Ac.)  
 Study area average Pervious fraction(Ap) = 0.100  
 Study area average soil loss rate(Fm) = 0.098(In/Hr)  
 Study area total = 0.60(Ac.)



Post10yr3

Process from Point/Station 902.000 to Point/Station 902.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 0.596(Ac.)  
Runoff from this stream = 1.793(CFS)  
Time of concentration = 6.08 min.  
Rainfall intensity = 3.192(In/Hr)  
Area averaged loss rate (Fm) = 0.0978(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Program is now starting with Main Stream No. 2

---

++++  
Process from Point/Station 800.000 to Point/Station 801.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

COMMERCIAL subarea type  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 32.00  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)  
Initial subarea data:  
Initial area flow distance = 95.000(Ft.)  
Top (of initial area) elevation = 1003.910(Ft.)  
Bottom (of initial area) elevation = 1001.070(Ft.)  
Difference in elevation = 2.840(Ft.)  
Slope = 0.02989 s(%)= 2.99  
TC =  $k(0.304)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 3.792 min.  
Rainfall intensity = 4.236(In/Hr) for a 10.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.879  
Subarea runoff = 0.685(CFS)  
Total initial stream area = 0.184(Ac.)  
Pervious area fraction = 0.100  
Initial area Fm value = 0.098(In/Hr)

---

++++  
Process from Point/Station 801.000 to Point/Station 902.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 998.070(Ft.)  
Downstream point/station elevation = 994.540(Ft.)  
Pipe length = 92.00(Ft.) Manning's N = 0.013

Post10yr3

No. of pipes = 1 Required pipe flow = 0.685(CFS)  
 Given pipe size = 12.00(In.)  
 Calculated individual pipe flow = 0.685(CFS)  
 Normal flow depth in pipe = 2.54(In.)  
 Flow top width inside pipe = 9.81(In.)  
 Critical Depth = 4.13(In.)  
 Pipe flow velocity = 5.65(Ft/s)  
 Travel time through pipe = 0.27 min.  
 Time of concentration (TC) = 4.06 min.

++++  
 Process from Point/Station 902.000 to Point/Station 902.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.184(Ac.)  
 Runoff from this stream = 0.685(CFS)  
 Time of concentration = 4.06 min.  
 Rainfall intensity = 4.064(In/Hr)  
 Area averaged loss rate (Fm) = 0.0978(In/Hr)  
 Area averaged Pervious ratio (Ap) = 0.1000  
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	1.79	0.596	6.08	0.098	3.192
2	0.69	0.184	4.06	0.098	4.064
Qmax(1) =					
	1.000 *	1.000 *	1.793)	+	
	0.780 *	1.000 *	0.685)	+	2.327
Qmax(2) =					
	1.282 *	0.669 *	1.793)	+	
	1.000 *	1.000 *	0.685)	+	2.222

Total of 2 main streams to confluence:

Flow rates before confluence point:

2.793      1.685

Maximum flow rates at confluence using above data:

2.327      2.222

Area of streams before confluence:

0.596      0.184

Effective area values after confluence:

0.780      0.583

Post10yr3

Results of confluence:

Total flow rate = 2.327(CFS)  
Time of concentration = 6.077 min.  
Effective stream area after confluence = 0.780(Ac.)  
Study area average Pervious fraction(Ap) = 0.100  
Study area average soil loss rate(Fm) = 0.098(In/Hr)  
Study area total = 0.78(Ac.)

++++  
Process from Point/Station 902.000 to Point/Station 902.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 0.780(Ac.)  
Runoff from this stream = 2.327(CFS)  
Time of concentration = 6.08 min.  
Rainfall intensity = 3.192(In/Hr)  
Area averaged loss rate (Fm) = 0.0978(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 900.000 to Point/Station 901.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

COMMERCIAL subarea type

Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 32.00  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)  
Initial subarea data:  
Initial area flow distance = 147.000(Ft.)  
Top (of initial area) elevation = 1004.180(Ft.)  
Bottom (of initial area) elevation = 1000.780(Ft.)  
Difference in elevation = 3.400(Ft.)  
Slope = 0.02313 s(%)= 2.31  
TC =  $k(0.304)*[(length^3)/(elevation\ change)]^{0.2}$   
Initial area time of concentration = 4.753 min.  
Rainfall intensity = 3.699(In/Hr) for a 10.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.876  
Subarea runoff = 0.674(CFS)  
Total initial stream area = 0.208(Ac.)

Post10yr3

Pervious area fraction = 0.100  
Initial area Fm value = 0.098(In/Hr)

++++  
Process from Point/Station 901.000 to Point/Station 902.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
Stream flow area = 0.208(Ac.)  
Runoff from this stream = 0.674(CFS)  
Time of concentration = 4.75 min.  
Rainfall intensity = 3.699(In/Hr)  
Area averaged loss rate (Fm) = 0.0978(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
------------	-----------------	------------	----------	------------	----------------------------

1	2.33	0.780	6.08	0.098	3.192
2	0.67	0.208	4.75	0.098	3.699

Qmax(1) =  
 1.000 \* 1.000 \* 2.327) +  
 0.859 \* 1.000 \* 0.674) + = 2.907

Qmax(2) =  
 1.164 \* 0.782 \* 2.327) +  
 1.000 \* 1.000 \* 0.674) + = 2.793

Total of 2 main streams to confluence:

Flow rates before confluence point:  
3.327 1.674

Maximum flow rates at confluence using above data:  
2.907 2.793

Area of streams before confluence:  
0.780 0.208

Effective area values after confluence:  
0.988 0.818

Results of confluence:

Total flow rate = 2.907(CFS)  
Time of concentration = 6.077 min.  
Effective stream area after confluence = 0.988(Ac.)  
Study area average Pervious fraction(Ap) = 0.100  
Study area average soil loss rate(Fm) = 0.098(In/Hr)

Post10yr3

Study area total = 0.99(Ac.)

+++++  
Process from Point/Station 902.000 to Point/Station 903.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 994.540(Ft.)  
Downstream point/station elevation = 994.350(Ft.)  
Pipe length = 34.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 2.907(CFS)  
Given pipe size = 12.00(In.)  
NOTE: Normal flow is pressure flow in user selected pipe size.  
The approximate hydraulic grade line above the pipe invert is  
0.355(Ft.) at the headworks or inlet of the pipe(s)  
Pipe friction loss = 0.226(Ft.)  
Minor friction loss = 0.319(Ft.) K-factor = 1.50  
Pipe flow velocity = 3.70(Ft/s)  
Travel time through pipe = 0.15 min.  
Time of concentration (TC) = 6.23 min.

+++++  
Process from Point/Station 903.000 to Point/Station 903.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 0.988(Ac.)  
Runoff from this stream = 2.907(CFS)  
Time of concentration = 6.23 min.  
Rainfall intensity = 3.145(In/Hr)  
Area averaged loss rate (Fm) = 0.0978(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Program is now starting with Main Stream No. 2

+++++  
Process from Point/Station 403.000 to Point/Station 403.000  
\*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

---

COMMERCIAL subarea type  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 32.00  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)

Post10yr3

Rainfall intensity = 2.786(In/Hr) for a 10.0 year storm  
User specified values are as follows:  
TC = 7.62 min. Rain intensity = 2.79(In/Hr)  
Total area this stream = 1.23(Ac.)  
Total Study Area (Main Stream No. 2) = 2.24(Ac.)  
Total runoff = 3.09(CFS)

++++  
Process from Point/Station 903.000 to Point/Station 904.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
Stream flow area = 1.230(Ac.)  
Runoff from this stream = 3.088(CFS)  
Time of concentration = 7.62 min.  
Rainfall intensity = 2.786(In/Hr)  
Area averaged loss rate (Fm) = 0.0978(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	2.91	0.988	6.23	0.098	3.145
2	3.09	1.230	7.62	0.098	2.786
Qmax(1) =					
	1.000 *	1.000 *		2.907)	+
	1.133 *	0.817 *		3.088)	+ = 5.767
Qmax(2) =					
	0.882 *	1.000 *		2.907)	+
	1.000 *	1.000 *		3.088)	+ = 5.653

Total of 2 main streams to confluence:  
Flow rates before confluence point:  
3.907      4.088  
Maximum flow rates at confluence using above data:  
5.767      5.653  
Area of streams before confluence:  
0.988      1.230  
Effective area values after confluence:  
1.994      2.218

Results of confluence:  
Total flow rate = 5.767(CFS)

Post10yr3

Time of concentration = 6.230 min.  
Effective stream area after confluence = 1.994(Ac.)  
Study area average Pervious fraction( $A_p$ ) = 0.100  
Study area average soil loss rate( $F_m$ ) = 0.098(In/Hr)  
Study area total = 2.22(Ac.)  
End of computations, Total Study Area = 2.24 (Ac.)

The following figures may  
be used for a unit hydrograph study of the same area.  
Note: These figures do not consider reduced effective area  
effects caused by confluences in the rational equation.

Area averaged pervious area fraction( $A_p$ ) = 0.100  
Area averaged SCS curve number = 32.0

post100yr1

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2019 Version 9.1  
Rational Hydrology Study Date: 09/10/20

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ACRO AM/PM  
POST-DEVELOPEMENT 100-YR (SUB-BASINS SB1 & SB2)  
11279 CEDAR AVENUE  
BLOOMINGTON CA 92316  
-----

Program License Serial Number 6474

-----  
\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

-----  
Rational hydrology study storm event year is 100.0  
10 Year storm 1 hour rainfall = 0.808(In.)  
100 Year storm 1 hour rainfall = 1.290(In.)  
Computed rainfall intensity:  
Storm year = 100.00 1 hour rainfall = 1.290 (In.)  
Slope used for rainfall intensity curve b = 0.6000  
Soil antecedent moisture condition (AMC) = 3

++++  
Process from Point/Station 100.000 to Point/Station 101.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

-----  
COMMERCIAL subarea type  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 32.00  
Adjusted SCS curve number for AMC 3 = 52.00  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)  
Initial subarea data:  
Initial area flow distance = 109.000(Ft.)  
Top (of initial area) elevation = 1003.910(Ft.)  
Bottom (of initial area) elevation = 1003.130(Ft.)  
Difference in elevation = 0.780(Ft.)  
Slope = 0.00716 s(%)= 0.72



post100yr1  
TC =  $k(0.304)*[(length^3)/(elevation\ change)]^{0.2}$   
Initial area time of concentration = 5.332 min.  
Rainfall intensity = 5.512(In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.887  
Subarea runoff = 0.572(CFS)  
Total initial stream area = 0.117(Ac.)  
Pervious area fraction = 0.100  
Initial area Fm value = 0.079(In/Hr)

++++  
Process from Point/Station 101.000 to Point/Station 202.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 1000.130(Ft.)  
Downstream point/station elevation = 995.480(Ft.)  
Pipe length = 103.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 0.572(CFS)  
Given pipe size = 12.00(In.)  
Calculated individual pipe flow = 0.572(CFS)  
Normal flow depth in pipe = 2.23(In.)  
Flow top width inside pipe = 9.34(In.)  
Critical Depth = 3.77(In.)  
Pipe flow velocity = 5.68(Ft/s)  
Travel time through pipe = 0.30 min.  
Time of concentration (TC) = 5.63 min.

++++  
Process from Point/Station 202.000 to Point/Station 202.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 0.117(Ac.)  
Runoff from this stream = 0.572(CFS)  
Time of concentration = 5.63 min.  
Rainfall intensity = 5.333(In/Hr)  
Area averaged loss rate (Fm) = 0.0785(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 200.000 to Point/Station 201.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

COMMERCIAL subarea type

post100yr1

Decimal fraction soil group A = 1.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 0.000  
 SCS curve number for soil(AMC 2) = 32.00  
 Adjusted SCS curve number for AMC 3 = 52.00  
 Pervious ratio(Ap) = 0.1000      Max loss rate(Fm)=      0.079(In/Hr)  
 Initial subarea data:  
 Initial area flow distance = 100.000(Ft.)  
 Top (of initial area) elevation = 1004.020(Ft.)  
 Bottom (of initial area) elevation = 1003.120(Ft.)  
 Difference in elevation = 0.900(Ft.)  
 Slope = 0.00900 s(%)= 0.90  
 $TC = k(0.304)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 4.921 min.  
 Rainfall intensity = 5.784(In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.888  
 Subarea runoff = 0.965(CFS)  
 Total initial stream area = 0.188(Ac.)  
 Pervious area fraction = 0.100  
 Initial area Fm value = 0.079(In/Hr)

++++++  
 Process from Point/Station 201.000 to Point/Station 202.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.188(Ac.)  
 Runoff from this stream = 0.965(CFS)  
 Time of concentration = 4.92 min.  
 Rainfall intensity = 5.784(In/Hr)  
 Area averaged loss rate (Fm) = 0.0785(In/Hr)  
 Area averaged Pervious ratio (Ap) = 0.1000  
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	0.57	0.117	5.63	0.079	5.333
2	0.97	0.188	4.92	0.079	5.784
Qmax(1) =					
	1.000 *	1.000 *		0.572) +	
	0.921 *	1.000 *		0.965) + =	1.461
Qmax(2) =					
	1.086 *	0.873 *		0.572) +	

post100yr1  
 1.000 \*    1.000 \*    0.965) + =    1.508

Total of 2 main streams to confluence:

Flow rates before confluence point:

1.572            1.965

Maximum flow rates at confluence using above data:

1.461            1.508

Area of streams before confluence:

0.117            0.188

Effective area values after confluence:

0.305            0.290

Results of confluence:

Total flow rate =        1.508(CFS)

Time of concentration =    4.921 min.

Effective stream area after confluence =        0.290(Ac.)

Study area average Pervious fraction(Ap) = 0.100

Study area average soil loss rate(Fm) =    0.079(In/Hr)

Study area total =        0.30(Ac.)

+++++  
 Process from Point/Station        202.000 to Point/Station        403.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 995.480(Ft.)

Downstream point/station elevation = 994.350(Ft.)

Pipe length = 25.00(Ft.)    Manning's N = 0.013

No. of pipes = 1    Required pipe flow = 1.508(CFS)

Given pipe size = 12.00(In.)

Calculated individual pipe flow = 1.508(CFS)

Normal flow depth in pipe = 3.63(In.)

Flow top width inside pipe = 11.02(In.)

Critical Depth = 6.25(In.)

Pipe flow velocity = 7.52(Ft/s)

Travel time through pipe = 0.06 min.

Time of concentration (TC) = 4.98 min.

End of computations, Total Study Area = 0.30 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.100

Area averaged SCS curve number = 32.0

Post100yr2

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2019 Version 9.1  
Rational Hydrology Study Date: 09/10/20

-----  
ACRO AM/PM  
POST-DEVELOPEMENT 100-YR (SUB-BASINS SB3, SB4 & CONFLUENCE w SB1& SB2)  
11279 CEDAR AVENUE  
BLOOMINGTON CA 92316  
-----

Program License Serial Number 6474

-----  
\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*  
-----

Rational hydrology study storm event year is 100.0  
10 Year storm 1 hour rainfall = 0.808(In.)  
100 Year storm 1 hour rainfall = 1.290(In.)  
Computed rainfall intensity:  
Storm year = 100.00 1 hour rainfall = 1.290 (In.)  
Slope used for rainfall intensity curve b = 0.6000  
Soil antecedent moisture condition (AMC) = 3

++++  
Process from Point/Station 300.000 to Point/Station 301.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

-----  
COMMERCIAL subarea type  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 32.00  
Adjusted SCS curve number for AMC 3 = 52.00  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)  
Initial subarea data:  
Initial area flow distance = 256.000(Ft.)  
Top (of initial area) elevation = 1003.780(Ft.)  
Bottom (of initial area) elevation = 1001.060(Ft.)  
Difference in elevation = 2.720(Ft.)  
Slope = 0.01063 s(%)= 1.06  
TC = k(0.304)\*[(length^3)/(elevation change)]^0.2

Post100yr2

Initial area time of concentration = 6.933 min.  
Rainfall intensity = 4.709(In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.885  
Subarea runoff = 2.459(CFS)  
Total initial stream area = 0.590(Ac.)  
Pervious area fraction = 0.100  
Initial area Fm value = 0.079(In/Hr)

+++++

Process from Point/Station 301.000 to Point/Station 402.000

\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 998.060(Ft.)  
Downstream point/station elevation = 996.770(Ft.)  
Pipe length = 80.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 2.459(CFS)  
Given pipe size = 12.00(In.)  
Calculated individual pipe flow = 2.459(CFS)  
Normal flow depth in pipe = 6.30(In.)  
Flow top width inside pipe = 11.98(In.)  
Critical Depth = 8.05(In.)  
Pipe flow velocity = 5.88(Ft/s)  
Travel time through pipe = 0.23 min.  
Time of concentration (TC) = 7.16 min.

+++++

Process from Point/Station 402.000 to Point/Station 402.000

\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 0.590(Ac.)  
Runoff from this stream = 2.459(CFS)  
Time of concentration = 7.16 min.  
Rainfall intensity = 4.619(In/Hr)  
Area averaged loss rate (Fm) = 0.0785(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Program is now starting with Main Stream No. 2

+++++

Process from Point/Station 400.000 to Point/Station 401.000

\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

COMMERCIAL subarea type  
Decimal fraction soil group A = 1.000

Post100yr2

Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 0.000  
 SCS curve number for soil(AMC 2) = 32.00  
 Adjusted SCS curve number for AMC 3 = 52.00  
 Pervious ratio(Ap) = 0.1000      Max loss rate(Fm)=      0.079(In/Hr)  
 Initial subarea data:  
 Initial area flow distance = 219.000(Ft.)  
 Top (of initial area) elevation = 1003.450(Ft.)  
 Bottom (of initial area) elevation = 1001.950(Ft.)  
 Difference in elevation = 1.500(Ft.)  
 Slope = 0.00685 s(%)= 0.68  
 $TC = k(0.304)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 7.111 min.  
 Rainfall intensity = 4.638(In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.885  
 Subarea runoff = 1.403(CFS)  
 Total initial stream area = 0.342(Ac.)  
 Pervious area fraction = 0.100  
 Initial area Fm value = 0.079(In/Hr)

++++  
 Process from Point/Station 401.000 to Point/Station 402.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.342(Ac.)  
 Runoff from this stream = 1.403(CFS)  
 Time of concentration = 7.11 min.  
 Rainfall intensity = 4.638(In/Hr)  
 Area averaged loss rate (Fm) = 0.0785(In/Hr)  
 Area averaged Pervious ratio (Ap) = 0.1000  
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	2.46	0.590	7.16	0.079	4.619
2	1.40	0.342	7.11	0.079	4.638
Qmax(1) =					
	1.000 *	1.000 *	2.459)	+	
	0.996 *	1.000 *	1.403)	+	3.856
Qmax(2) =					
	1.004 *	0.993 *	2.459)	+	
	1.000 *	1.000 *	1.403)	+	3.856

Post100yr2

Total of 2 main streams to confluence:

Flow rates before confluence point:

3.459          2.403

Maximum flow rates at confluence using above data:

3.856          3.856

Area of streams before confluence:

0.590          0.342

Effective area values after confluence:

0.932          0.928

Results of confluence:

Total flow rate =          3.856(CFS)

Time of concentration =          7.159 min.

Effective stream area after confluence =          0.932(Ac.)

Study area average Pervious fraction(Ap) =          0.100

Study area average soil loss rate(Fm) =          0.079(In/Hr)

Study area total =          0.93(Ac.)

+++++  
Process from Point/Station          402.000 to Point/Station          403.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation =          996.770(Ft.)  
Downstream point/station elevation =          994.350(Ft.)  
Pipe length =          151.00(Ft.)          Manning's N =          0.013  
No. of pipes = 1          Required pipe flow =          3.856(CFS)  
Given pipe size =          12.00(In.)  
Calculated individual pipe flow =          3.856(CFS)  
Normal flow depth in pipe =          8.53(In.)  
Flow top width inside pipe =          10.88(In.)  
Critical Depth =          10.01(In.)  
Pipe flow velocity =          6.45(Ft/s)  
Travel time through pipe =          0.39 min.  
Time of concentration (TC) =          7.55 min.

+++++  
Process from Point/Station          403.000 to Point/Station          403.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:  
In Main Stream number: 1  
Stream flow area =          0.932(Ac.)  
Runoff from this stream =          3.856(CFS)  
Time of concentration =          7.55 min.

Post100yr2

Rainfall intensity = 4.474(In/Hr)  
Area averaged loss rate (Fm) = 0.0785(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 202.000 to Point/Station 403.000  
\*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

COMMERCIAL subarea type  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 32.00  
Adjusted SCS curve number for AMC 3 = 52.00  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)  
Rainfall intensity = 5.743(In/Hr) for a 100.0 year storm  
User specified values are as follows:  
TC = 4.98 min. Rain intensity = 5.74(In/Hr)  
Total area this stream = 0.30(Ac.)  
Total Study Area (Main Stream No. 2) = 1.23(Ac.)  
Total runoff = 1.51(CFS)

++++  
Process from Point/Station 403.000 to Point/Station 403.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
Stream flow area = 0.300(Ac.)  
Runoff from this stream = 1.508(CFS)  
Time of concentration = 4.98 min.  
Rainfall intensity = 5.743(In/Hr)  
Area averaged loss rate (Fm) = 0.0785(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	3.86	0.932	7.55	0.079	4.474
2	1.51	0.300	4.98	0.079	5.743
Qmax(1) = 1.000 * 1.000 * 3.856) +					



			Post100yr2	
Qmax(2) =	0.776 *	1.000 *	1.508) + =	5.027
	1.289 *	0.660 *	3.856) +	
	1.000 *	1.000 *	1.508) + =	4.786

Total of 2 main streams to confluence:

Flow rates before confluence point:

4.856          2.508

Maximum flow rates at confluence using above data:

5.027          4.786

Area of streams before confluence:

0.932          0.300

Effective area values after confluence:

1.232          0.915

Results of confluence:

Total flow rate =          5.027(CFS)

Time of concentration =          7.550 min.

Effective stream area after confluence =          1.232(Ac.)

Study area average Pervious fraction(Ap) =          0.100

Study area average soil loss rate(Fm) =          0.079(In/Hr)

Study area total =          1.23(Ac.)

Post100yr3

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2019 Version 9.1  
Rational Hydrology Study Date: 09/10/20

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ACRO AM/PM  
POST-DEVELOPEMENT 100-YR (SUB-BASINS SB5, SB6, SB7, SB8, SB9 &  
CONFLUENCE w SB1, SB2, SB3 & SB4)  
11279 CEDAR AVENUE  
BLOOMINGTON CA 92316  
-----

Program License Serial Number 6474

-----  
\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*  
-----

Rational hydrology study storm event year is 100.0  
10 Year storm 1 hour rainfall = 0.808(In.)  
100 Year storm 1 hour rainfall = 1.290(In.)  
Computed rainfall intensity:  
Storm year = 100.00 1 hour rainfall = 1.290 (In.)  
Slope used for rainfall intensity curve b = 0.6000  
Soil antecedent moisture condition (AMC) = 3

++++  
Process from Point/Station 500.000 to Point/Station 501.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

-----  
COMMERCIAL subarea type  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 32.00  
Adjusted SCS curve number for AMC 3 = 52.00  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)  
Initial subarea data:  
Initial area flow distance = 136.000(Ft.)  
Top (of initial area) elevation = 1001.490(Ft.)  
Bottom (of initial area) elevation = 999.800(Ft.)  
Difference in elevation = 1.690(Ft.)  
Slope = 0.01243 s(%)= 1.24

Post100yr3

TC = k(0.304)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 5.217 min.  
Rainfall intensity = 5.585(In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.887  
Subarea runoff = 1.214(CFS)  
Total initial stream area = 0.245(Ac.)  
Pervious area fraction = 0.100  
Initial area Fm value = 0.079(In/Hr)

++++  
Process from Point/Station 501.000 to Point/Station 602.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

-----  
Upstream point/station elevation = 996.400(Ft.)  
Downstream point/station elevation = 995.350(Ft.)  
Pipe length = 43.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 1.214(CFS)  
Given pipe size = 12.00(In.)  
Calculated individual pipe flow = 1.214(CFS)  
Normal flow depth in pipe = 3.81(In.)  
Flow top width inside pipe = 11.17(In.)  
Critical Depth = 5.58(In.)  
Pipe flow velocity = 5.67(Ft/s)  
Travel time through pipe = 0.13 min.  
Time of concentration (TC) = 5.34 min.

++++  
Process from Point/Station 602.000 to Point/Station 602.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

-----  
The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 0.245(Ac.)  
Runoff from this stream = 1.214(CFS)  
Time of concentration = 5.34 min.  
Rainfall intensity = 5.505(In/Hr)  
Area averaged loss rate (Fm) = 0.0785(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 600.000 to Point/Station 601.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

-----  
COMMERCIAL subarea type

Post100yr3

Decimal fraction soil group A = 1.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 0.000  
 SCS curve number for soil(AMC 2) = 32.00  
 Adjusted SCS curve number for AMC 3 = 52.00  
 Pervious ratio(Ap) = 0.1000      Max loss rate(Fm)=      0.079(In/Hr)  
 Initial subarea data:  
 Initial area flow distance = 157.000(Ft.)  
 Top (of initial area) elevation = 1001.530(Ft.)  
 Bottom (of initial area) elevation = 999.950(Ft.)  
 Difference in elevation = 1.580(Ft.)  
 Slope = 0.01006 s(%)= 1.01  
 TC = k(0.304)\*[(length^3)/(elevation change)]^0.2  
 Initial area time of concentration = 5.763 min.  
 Rainfall intensity = 5.261(In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.887  
 Subarea runoff = 1.306(CFS)  
 Total initial stream area = 0.280(Ac.)  
 Pervious area fraction = 0.100  
 Initial area Fm value = 0.079(In/Hr)

++++++  
 Process from Point/Station 601.000 to Point/Station 602.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.280(Ac.)  
 Runoff from this stream = 1.306(CFS)  
 Time of concentration = 5.76 min.  
 Rainfall intensity = 5.261(In/Hr)  
 Area averaged loss rate (Fm) = 0.0785(In/Hr)  
 Area averaged Pervious ratio (Ap) = 0.1000  
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	1.21	0.245	5.34	0.079	5.505
2	1.31	0.280	5.76	0.079	5.261
Qmax(1) =					
	1.000 *	1.000 *	1.214) +		
	1.047 *	0.927 *	1.306) + =		2.482
Qmax(2) =					
	0.955 *	1.000 *	1.214) +		

Post100yr3  
1.000 \* 1.000 \* 1.306) + = 2.466

Total of 2 main streams to confluence:

Flow rates before confluence point:

2.214 2.306

Maximum flow rates at confluence using above data:

2.482 2.466

Area of streams before confluence:

0.245 0.280

Effective area values after confluence:

0.505 0.525

Results of confluence:

Total flow rate = 2.482(CFS)

Time of concentration = 5.343 min.

Effective stream area after confluence = 0.505(Ac.)

Study area average Pervious fraction(Ap) = 0.100

Study area average soil loss rate(Fm) = 0.079(In/Hr)

Study area total = 0.53(Ac.)

++++  
Process from Point/Station 602.000 to Point/Station 902.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 995.350(Ft.)  
Downstream point/station elevation = 994.540(Ft.)  
Pipe length = 149.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 2.482(CFS)  
Given pipe size = 12.00(In.)  
Calculated individual pipe flow = 2.482(CFS)  
Normal flow depth in pipe = 9.28(In.)  
Flow top width inside pipe = 10.05(In.)  
Critical Depth = 8.09(In.)  
Pipe flow velocity = 3.80(Ft/s)  
Travel time through pipe = 0.65 min.  
Time of concentration (TC) = 6.00 min.

++++  
Process from Point/Station 902.000 to Point/Station 902.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1

Stream flow area = 0.505(Ac.)

Runoff from this stream = 2.482(CFS)

Post100yr3

Time of concentration = 6.00 min.  
Rainfall intensity = 5.138(In/Hr)  
Area averaged loss rate (Fm) = 0.0785(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 700.000 to Point/Station 701.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

COMMERCIAL subarea type  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 32.00  
Adjusted SCS curve number for AMC 3 = 52.00  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)  
Initial subarea data:  
Initial area flow distance = 136.000(Ft.)  
Top (of initial area) elevation = 1001.370(Ft.)  
Bottom (of initial area) elevation = 1000.470(Ft.)  
Difference in elevation = 0.900(Ft.)  
Slope = 0.00662 s(%)= 0.66  
TC =  $k(0.304)*[(length^3)/(elevation\ change)]^{0.2}$   
Initial area time of concentration = 5.918 min.  
Rainfall intensity = 5.178(In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.886  
Subarea runoff = 0.422(CFS)  
Total initial stream area = 0.092(Ac.)  
Pervious area fraction = 0.100  
Initial area Fm value = 0.079(In/Hr)

++++  
Process from Point/Station 701.000 to Point/Station 901.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 998.970(Ft.)  
Downstream point/station elevation = 997.780(Ft.)  
Pipe length = 51.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 0.422(CFS)  
Given pipe size = 12.00(In.)  
Calculated individual pipe flow = 0.422(CFS)  
Normal flow depth in pipe = 2.26(In.)  
Flow top width inside pipe = 9.38(In.)  
Critical Depth = 3.22(In.)

Post100yr3

Pipe flow velocity = 4.11(Ft/s)  
Travel time through pipe = 0.21 min.  
Time of concentration (TC) = 6.12 min.

++++  
Process from Point/Station 901.000 to Point/Station 902.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
Stream flow area = 0.092(Ac.)  
Runoff from this stream = 0.422(CFS)  
Time of concentration = 6.12 min.  
Rainfall intensity = 5.073(In/Hr)  
Area averaged loss rate (Fm) = 0.0785(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	2.48	0.505	6.00	0.079	5.138
2	0.42	0.092	6.12	0.079	5.073
Qmax(1) =					
	1.000 *	1.000 *		2.482) +	
	1.013 *	0.979 *		0.422) + =	2.901
Qmax(2) =					
	0.987 *	1.000 *		2.482) +	
	1.000 *	1.000 *		0.422) + =	2.873

Total of 2 main streams to confluence:

Flow rates before confluence point:

3.482      1.422

Maximum flow rates at confluence using above data:

2.901      2.873

Area of streams before confluence:

0.505      0.092

Effective area values after confluence:

0.595      0.597

Results of confluence:

Total flow rate = 2.901(CFS)

Time of concentration = 5.996 min.

Effective stream area after confluence = 0.595(Ac.)

Study area average Pervious fraction(Ap) = 0.100

Post100yr3

Study area average soil loss rate(Fm) = 0.079(In/Hr)  
Study area total = 0.60(Ac.)

++++  
Process from Point/Station 902.000 to Point/Station 902.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 0.595(Ac.)  
Runoff from this stream = 2.901(CFS)  
Time of concentration = 6.00 min.  
Rainfall intensity = 5.138(In/Hr)  
Area averaged loss rate (Fm) = 0.0785(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 800.000 to Point/Station 801.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

COMMERCIAL subarea type

Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 32.00  
Adjusted SCS curve number for AMC 3 = 52.00  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)  
Initial subarea data:  
Initial area flow distance = 95.000(Ft.)  
Top (of initial area) elevation = 1003.910(Ft.)  
Bottom (of initial area) elevation = 1001.070(Ft.)  
Difference in elevation = 2.840(Ft.)  
Slope = 0.02989 s(%)= 2.99  
TC = k(0.304)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 3.792 min.  
Rainfall intensity = 6.764(In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.890  
Subarea runoff = 1.107(CFS)  
Total initial stream area = 0.184(Ac.)  
Pervious area fraction = 0.100  
Initial area Fm value = 0.079(In/Hr)

++++



Post100yr3

Process from Point/Station 801.000 to Point/Station 902.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 998.070(Ft.)  
 Downstream point/station elevation = 994.540(Ft.)  
 Pipe length = 92.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 1.107(CFS)  
 Given pipe size = 12.00(In.)  
 Calculated individual pipe flow = 1.107(CFS)  
 Normal flow depth in pipe = 3.23(In.)  
 Flow top width inside pipe = 10.65(In.)  
 Critical Depth = 5.32(In.)  
 Pipe flow velocity = 6.49(Ft/s)  
 Travel time through pipe = 0.24 min.  
 Time of concentration (TC) = 4.03 min.

+++++  
 Process from Point/Station 902.000 to Point/Station 902.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.184(Ac.)  
 Runoff from this stream = 1.107(CFS)  
 Time of concentration = 4.03 min.  
 Rainfall intensity = 6.523(In/Hr)  
 Area averaged loss rate (Fm) = 0.0785(In/Hr)  
 Area averaged Pervious ratio (Ap) = 0.1000  
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	2.90	0.595	6.00	0.079	5.138
2	1.11	0.184	4.03	0.079	6.523

Qmax(1) =  
 1.000 \* 1.000 \* 2.901) +  
 0.785 \* 1.000 \* 1.107) + = 3.770  
 Qmax(2) =  
 1.274 \* 0.672 \* 2.901) +  
 1.000 \* 1.000 \* 1.107) + = 3.589

Total of 2 main streams to confluence:

Flow rates before confluence point:  
 3.901 2.107

Maximum flow rates at confluence using above data:

Post100yr3

3.770            3.589  
Area of streams before confluence:  
0.595            0.184  
Effective area values after confluence:  
0.779            0.583

Results of confluence:  
Total flow rate =        3.770(CFS)  
Time of concentration =    5.996 min.  
Effective stream area after confluence =        0.779(Ac.)  
Study area average Pervious fraction(Ap) = 0.100  
Study area average soil loss rate(Fm) =    0.079(In/Hr)  
Study area total =        0.78(Ac.)

++++  
Process from Point/Station        902.000 to Point/Station        902.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area =        0.779(Ac.)  
Runoff from this stream =    3.770(CFS)  
Time of concentration =    6.00 min.  
Rainfall intensity =       5.138(In/Hr)  
Area averaged loss rate (Fm) =    0.0785(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station        900.000 to Point/Station        901.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

COMMERCIAL subarea type  
Decimal fraction soil group A = 1.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 32.00  
Adjusted SCS curve number for AMC 3 = 52.00  
Pervious ratio(Ap) = 0.1000        Max loss rate(Fm)=        0.079(In/Hr)  
Initial subarea data:  
Initial area flow distance =    147.000(Ft.)  
Top (of initial area) elevation = 1004.180(Ft.)  
Bottom (of initial area) elevation = 1000.780(Ft.)  
Difference in elevation =       3.400(Ft.)

Post100yr3

Slope = 0.02313 s(%)= 2.31  
 TC = k(0.304)\*[(length^3)/(elevation change)]^0.2  
 Initial area time of concentration = 4.753 min.  
 Rainfall intensity = 5.906(In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.888  
 Subarea runoff = 1.091(CFS)  
 Total initial stream area = 0.208(Ac.)  
 Pervious area fraction = 0.100  
 Initial area Fm value = 0.079(In/Hr)

++++  
 Process from Point/Station 901.000 to Point/Station 902.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.208(Ac.)  
 Runoff from this stream = 1.091(CFS)  
 Time of concentration = 4.75 min.  
 Rainfall intensity = 5.906(In/Hr)  
 Area averaged loss rate (Fm) = 0.0785(In/Hr)  
 Area averaged Pervious ratio (Ap) = 0.1000  
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	3.77	0.779	6.00	0.079	5.138
2	1.09	0.208	4.75	0.079	5.906
Qmax(1) =					
	1.000 *	1.000 *		3.770) +	
	0.868 *	1.000 *		1.091) + =	4.717
Qmax(2) =					
	1.152 *	0.793 *		3.770) +	
	1.000 *	1.000 *		1.091) + =	4.533

Total of 2 main streams to confluence:

Flow rates before confluence point:

4.770      2.091

Maximum flow rates at confluence using above data:

4.717      4.533

Area of streams before confluence:

0.779      0.208

Effective area values after confluence:

0.987      0.825

Post100yr3

Results of confluence:

Total flow rate = 4.717(CFS)  
Time of concentration = 5.996 min.  
Effective stream area after confluence = 0.987(Ac.)  
Study area average Pervious fraction(Ap) = 0.100  
Study area average soil loss rate(Fm) = 0.079(In/Hr)  
Study area total = 0.99(Ac.)

++++  
Process from Point/Station 902.000 to Point/Station 903.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 994.540(Ft.)  
Downstream point/station elevation = 994.350(Ft.)  
Pipe length = 34.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 4.717(CFS)  
Given pipe size = 12.00(In.)  
NOTE: Normal flow is pressure flow in user selected pipe size.  
The approximate hydraulic grade line above the pipe invert is  
1.246(Ft.) at the headworks or inlet of the pipe(s)  
Pipe friction loss = 0.596(Ft.)  
Minor friction loss = 0.840(Ft.) K-factor = 1.50  
Pipe flow velocity = 6.01(Ft/s)  
Travel time through pipe = 0.09 min.  
Time of concentration (TC) = 6.09 min.

++++  
Process from Point/Station 903.000 to Point/Station 903.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 0.987(Ac.)  
Runoff from this stream = 4.717(CFS)  
Time of concentration = 6.09 min.  
Rainfall intensity = 5.090(In/Hr)  
Area averaged loss rate (Fm) = 0.0785(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 403.000 to Point/Station 403.000  
\*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

Post100yr3

COMMERCIAL subarea type

Decimal fraction soil group A = 1.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 0.000

SCS curve number for soil(AMC 2) = 32.00

Adjusted SCS curve number for AMC 3 = 52.00

Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)

Rainfall intensity = 4.474(In/Hr) for a 100.0 year storm

User specified values are as follows:

TC = 7.55 min. Rain intensity = 4.47(In/Hr)

Total area this stream = 1.23(Ac.)

Total Study Area (Main Stream No. 2) = 2.24(Ac.)

Total runoff = 5.03(CFS)

++++  
 Process from Point/Station 903.000 to Point/Station 904.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2

Stream flow area = 1.230(Ac.)

Runoff from this stream = 5.027(CFS)

Time of concentration = 7.55 min.

Rainfall intensity = 4.474(In/Hr)

Area averaged loss rate (Fm) = 0.0785(In/Hr)

Area averaged Pervious ratio (Ap) = 0.1000

Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
------------	-----------------	------------	----------	------------	----------------------------

1	4.72	0.987	6.09	0.079	5.090
2	5.03	1.230	7.55	0.079	4.474

Qmax(1) =

1.000 *	1.000 *	4.717) +	
1.140 *	0.807 *	5.027) + =	9.340

Qmax(2) =

0.877 *	1.000 *	4.717) +	
1.000 *	1.000 *	5.027) + =	9.165

Total of 2 main streams to confluence:

Flow rates before confluence point:

5.717          6.027

Maximum flow rates at confluence using above data:

9.340          9.165

Post100yr3

Area of streams before confluence:

0.987            1.230

Effective area values after confluence:

1.979            2.217

Results of confluence:

Total flow rate =        9.340(CFS)

Time of concentration =    6.090 min.

Effective stream area after confluence =        1.979(Ac.)

Study area average Pervious fraction( $A_p$ ) = 0.100

Study area average soil loss rate( $F_m$ ) =    0.079(In/Hr)

Study area total =        2.22(Ac.)

End of computations, Total Study Area =            2.24 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction( $A_p$ ) = 0.100

Area averaged SCS curve number = 32.0

***APPENDIX D***

Hydrology Study – Synthetic Unit Hydrograph Method for Post-developed  
10-year & 100-year Storm event using CivilD software

Post10yr

U n i t   H y d r o g r a p h   A n a l y s i s

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2018, Version 9.0

Study date 09/11/20

+++++  
-----

San Bernardino County Synthetic Unit Hydrology Method  
Manual date - August 1986

Program License Serial Number 6474

-----  
ACRO AM/PM  
POST-DEVELOPEMENT 10-YR (SUB-BASINS SB1,SB2,SB3,SB4,SB5,SB6,SB7,SB8  
& SB9)  
11279 CEDAR AVENUE  
BLOOMINGTON CA 92316  
-----  
-----

Storm Event Year = 10

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:  
Sub-Area            Duration            Isohyetal  
(Ac.)                (hours)            (In)  
Rainfall data for year 10  
                  2.24                1                    0.81

-----  
Rainfall data for year 10  
                  2.24                6                    1.99  
-----



Post10yr

Rainfall data for year 10

2.24                      24                      3.65

-----  
+++++

\*\*\*\*\* Area-averaged max loss rate, Fm \*\*\*\*\*

SCS curve No.(AMCII)	SCS curve NO.(AMC 2)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
78.0	78.0	2.24	1.000	0.404	0.100	0.040

Area-averaged adjusted loss rate Fm (In/Hr) = 0.040

\*\*\*\*\* Area-Averaged low loss rate fraction, Yb \*\*\*\*\*

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
0.22	0.100	78.0	78.0	2.82	0.442
2.02	0.900	98.0	98.0	0.20	0.936

Area-averaged catchment yield fraction, Y = 0.886

Area-averaged low loss fraction, Yb = 0.114

User entry of time of concentration = 0.102 (hours)

+++++

Watershed area = 2.24(Ac.)

Catchment Lag time = 0.081 hours

Unit interval = 5.000 minutes

Unit interval percentage of lag time = 102.4557

Hydrograph baseflow = 0.00(CFS)

Average maximum watershed loss rate(Fm) = 0.040(In/Hr)

Average low loss rate fraction (Yb) = 0.114 (decimal)

VALLEY DEVELOPED S-Graph Selected

Computed peak 5-minute rainfall = 0.299(In)

Computed peak 30-minute rainfall = 0.612(In)

Specified peak 1-hour rainfall = 0.808(In)

Computed peak 3-hour rainfall = 1.420(In)

Specified peak 6-hour rainfall = 1.990(In)

Specified peak 24-hour rainfall = 3.650(In)

Note: user specified rainfall values used.

Rainfall depth area reduction factors:

Using a total area of 2.24(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000            Adjusted rainfall = 0.299(In)

30-minute factor = 1.000        Adjusted rainfall = 0.612(In)

1-hour factor = 1.000            Adjusted rainfall = 0.808(In)

Post10yr

3-hour factor = 1.000      Adjusted rainfall = 1.420(In)  
 6-hour factor = 1.000      Adjusted rainfall = 1.990(In)  
 24-hour factor = 1.000      Adjusted rainfall = 3.650(In)

-----

U n i t   H y d r o g r a p h

+++++

Interval Number	'S' Graph Mean values	Unit Hydrograph (CFS)
--------------------	--------------------------	--------------------------

-----

(K =            27.14 (CFS))

1	17.997	4.884
2	80.801	17.044
3	98.116	4.699
4	100.000	0.511

-----

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.2990	0.2990
2	0.3946	0.0955
3	0.4640	0.0695
4	0.5206	0.0566
5	0.5692	0.0486
6	0.6123	0.0431
7	0.6512	0.0389
8	0.6870	0.0357
9	0.7201	0.0331
10	0.7511	0.0310
11	0.7803	0.0292
12	0.8079	0.0276
13	0.8418	0.0339
14	0.8744	0.0326
15	0.9060	0.0315
16	0.9365	0.0305
17	0.9661	0.0296
18	0.9948	0.0288
19	1.0228	0.0280
20	1.0501	0.0273
21	1.0768	0.0266
22	1.1028	0.0260
23	1.1282	0.0255
24	1.1532	0.0249
25	1.1776	0.0244
26	1.2015	0.0239
27	1.2250	0.0235
28	1.2481	0.0231
29	1.2708	0.0227

		Post10yr
30	1.2931	0.0223
31	1.3151	0.0219
32	1.3367	0.0216
33	1.3580	0.0213
34	1.3789	0.0210
35	1.3996	0.0207
36	1.4200	0.0204
37	1.4391	0.0191
38	1.4579	0.0188
39	1.4764	0.0186
40	1.4947	0.0183
41	1.5128	0.0181
42	1.5307	0.0179
43	1.5483	0.0176
44	1.5657	0.0174
45	1.5829	0.0172
46	1.6000	0.0170
47	1.6168	0.0168
48	1.6335	0.0167
49	1.6500	0.0165
50	1.6663	0.0163
51	1.6824	0.0161
52	1.6984	0.0160
53	1.7142	0.0158
54	1.7299	0.0157
55	1.7454	0.0155
56	1.7608	0.0154
57	1.7760	0.0152
58	1.7911	0.0151
59	1.8061	0.0150
60	1.8209	0.0148
61	1.8357	0.0147
62	1.8503	0.0146
63	1.8647	0.0145
64	1.8791	0.0144
65	1.8933	0.0142
66	1.9074	0.0141
67	1.9215	0.0140
68	1.9354	0.0139
69	1.9492	0.0138
70	1.9629	0.0137
71	1.9765	0.0136
72	1.9900	0.0135
73	2.0020	0.0120
74	2.0140	0.0120
75	2.0259	0.0119
76	2.0376	0.0118
77	2.0493	0.0117

		Post10yr
78	2.0609	0.0116
79	2.0724	0.0115
80	2.0839	0.0114
81	2.0952	0.0114
82	2.1065	0.0113
83	2.1177	0.0112
84	2.1288	0.0111
85	2.1399	0.0111
86	2.1509	0.0110
87	2.1618	0.0109
88	2.1726	0.0108
89	2.1834	0.0108
90	2.1941	0.0107
91	2.2047	0.0106
92	2.2153	0.0106
93	2.2258	0.0105
94	2.2362	0.0104
95	2.2466	0.0104
96	2.2569	0.0103
97	2.2672	0.0103
98	2.2774	0.0102
99	2.2875	0.0101
100	2.2976	0.0101
101	2.3076	0.0100
102	2.3176	0.0100
103	2.3275	0.0099
104	2.3374	0.0099
105	2.3472	0.0098
106	2.3569	0.0098
107	2.3666	0.0097
108	2.3763	0.0097
109	2.3859	0.0096
110	2.3955	0.0096
111	2.4050	0.0095
112	2.4144	0.0095
113	2.4238	0.0094
114	2.4332	0.0094
115	2.4425	0.0093
116	2.4518	0.0093
117	2.4610	0.0092
118	2.4702	0.0092
119	2.4793	0.0091
120	2.4884	0.0091
121	2.4975	0.0091
122	2.5065	0.0090
123	2.5155	0.0090
124	2.5244	0.0089
125	2.5333	0.0089

		Post10yr
126	2.5421	0.0088
127	2.5509	0.0088
128	2.5597	0.0088
129	2.5684	0.0087
130	2.5771	0.0087
131	2.5858	0.0087
132	2.5944	0.0086
133	2.6030	0.0086
134	2.6115	0.0085
135	2.6200	0.0085
136	2.6285	0.0085
137	2.6369	0.0084
138	2.6453	0.0084
139	2.6537	0.0084
140	2.6621	0.0083
141	2.6704	0.0083
142	2.6786	0.0083
143	2.6869	0.0082
144	2.6951	0.0082
145	2.7032	0.0082
146	2.7114	0.0081
147	2.7195	0.0081
148	2.7276	0.0081
149	2.7356	0.0080
150	2.7436	0.0080
151	2.7516	0.0080
152	2.7596	0.0080
153	2.7675	0.0079
154	2.7754	0.0079
155	2.7833	0.0079
156	2.7911	0.0078
157	2.7990	0.0078
158	2.8067	0.0078
159	2.8145	0.0078
160	2.8222	0.0077
161	2.8299	0.0077
162	2.8376	0.0077
163	2.8453	0.0077
164	2.8529	0.0076
165	2.8605	0.0076
166	2.8681	0.0076
167	2.8756	0.0075
168	2.8831	0.0075
169	2.8906	0.0075
170	2.8981	0.0075
171	2.9055	0.0074
172	2.9130	0.0074
173	2.9204	0.0074

		Post10yr
174	2.9277	0.0074
175	2.9351	0.0074
176	2.9424	0.0073
177	2.9497	0.0073
178	2.9570	0.0073
179	2.9643	0.0073
180	2.9715	0.0072
181	2.9787	0.0072
182	2.9859	0.0072
183	2.9931	0.0072
184	3.0002	0.0071
185	3.0073	0.0071
186	3.0144	0.0071
187	3.0215	0.0071
188	3.0286	0.0071
189	3.0356	0.0070
190	3.0426	0.0070
191	3.0496	0.0070
192	3.0566	0.0070
193	3.0636	0.0070
194	3.0705	0.0069
195	3.0774	0.0069
196	3.0843	0.0069
197	3.0912	0.0069
198	3.0980	0.0069
199	3.1049	0.0068
200	3.1117	0.0068
201	3.1185	0.0068
202	3.1253	0.0068
203	3.1320	0.0068
204	3.1388	0.0067
205	3.1455	0.0067
206	3.1522	0.0067
207	3.1589	0.0067
208	3.1656	0.0067
209	3.1722	0.0067
210	3.1788	0.0066
211	3.1855	0.0066
212	3.1921	0.0066
213	3.1986	0.0066
214	3.2052	0.0066
215	3.2117	0.0065
216	3.2183	0.0065
217	3.2248	0.0065
218	3.2313	0.0065
219	3.2378	0.0065
220	3.2442	0.0065
221	3.2507	0.0064

		Post10yr
222	3.2571	0.0064
223	3.2635	0.0064
224	3.2699	0.0064
225	3.2763	0.0064
226	3.2826	0.0064
227	3.2890	0.0063
228	3.2953	0.0063
229	3.3016	0.0063
230	3.3079	0.0063
231	3.3142	0.0063
232	3.3205	0.0063
233	3.3267	0.0063
234	3.3330	0.0062
235	3.3392	0.0062
236	3.3454	0.0062
237	3.3516	0.0062
238	3.3578	0.0062
239	3.3640	0.0062
240	3.3701	0.0062
241	3.3763	0.0061
242	3.3824	0.0061
243	3.3885	0.0061
244	3.3946	0.0061
245	3.4007	0.0061
246	3.4067	0.0061
247	3.4128	0.0061
248	3.4188	0.0060
249	3.4248	0.0060
250	3.4309	0.0060
251	3.4369	0.0060
252	3.4428	0.0060
253	3.4488	0.0060
254	3.4548	0.0060
255	3.4607	0.0059
256	3.4666	0.0059
257	3.4726	0.0059
258	3.4785	0.0059
259	3.4844	0.0059
260	3.4902	0.0059
261	3.4961	0.0059
262	3.5020	0.0059
263	3.5078	0.0058
264	3.5136	0.0058
265	3.5195	0.0058
266	3.5253	0.0058
267	3.5311	0.0058
268	3.5368	0.0058
269	3.5426	0.0058

		Post10yr
270	3.5484	0.0058
271	3.5541	0.0057
272	3.5598	0.0057
273	3.5656	0.0057
274	3.5713	0.0057
275	3.5770	0.0057
276	3.5826	0.0057
277	3.5883	0.0057
278	3.5940	0.0057
279	3.5996	0.0057
280	3.6053	0.0056
281	3.6109	0.0056
282	3.6165	0.0056
283	3.6221	0.0056
284	3.6277	0.0056
285	3.6333	0.0056
286	3.6389	0.0056
287	3.6444	0.0056
288	3.6500	0.0056

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0056	0.0006	0.0049
2	0.0056	0.0006	0.0049
3	0.0056	0.0006	0.0049
4	0.0056	0.0006	0.0050
5	0.0056	0.0006	0.0050
6	0.0056	0.0006	0.0050
7	0.0057	0.0006	0.0050
8	0.0057	0.0006	0.0050
9	0.0057	0.0006	0.0050
10	0.0057	0.0006	0.0051
11	0.0057	0.0006	0.0051
12	0.0057	0.0007	0.0051
13	0.0058	0.0007	0.0051
14	0.0058	0.0007	0.0051
15	0.0058	0.0007	0.0051
16	0.0058	0.0007	0.0051
17	0.0058	0.0007	0.0052
18	0.0058	0.0007	0.0052
19	0.0059	0.0007	0.0052
20	0.0059	0.0007	0.0052
21	0.0059	0.0007	0.0052
22	0.0059	0.0007	0.0052
23	0.0059	0.0007	0.0053
24	0.0060	0.0007	0.0053



		Post10yr	
25	0.0060	0.0007	0.0053
26	0.0060	0.0007	0.0053
27	0.0060	0.0007	0.0053
28	0.0060	0.0007	0.0054
29	0.0061	0.0007	0.0054
30	0.0061	0.0007	0.0054
31	0.0061	0.0007	0.0054
32	0.0061	0.0007	0.0054
33	0.0062	0.0007	0.0055
34	0.0062	0.0007	0.0055
35	0.0062	0.0007	0.0055
36	0.0062	0.0007	0.0055
37	0.0062	0.0007	0.0055
38	0.0063	0.0007	0.0055
39	0.0063	0.0007	0.0056
40	0.0063	0.0007	0.0056
41	0.0063	0.0007	0.0056
42	0.0063	0.0007	0.0056
43	0.0064	0.0007	0.0057
44	0.0064	0.0007	0.0057
45	0.0064	0.0007	0.0057
46	0.0064	0.0007	0.0057
47	0.0065	0.0007	0.0057
48	0.0065	0.0007	0.0058
49	0.0065	0.0007	0.0058
50	0.0065	0.0007	0.0058
51	0.0066	0.0007	0.0058
52	0.0066	0.0007	0.0058
53	0.0066	0.0008	0.0059
54	0.0067	0.0008	0.0059
55	0.0067	0.0008	0.0059
56	0.0067	0.0008	0.0059
57	0.0067	0.0008	0.0060
58	0.0068	0.0008	0.0060
59	0.0068	0.0008	0.0060
60	0.0068	0.0008	0.0060
61	0.0069	0.0008	0.0061
62	0.0069	0.0008	0.0061
63	0.0069	0.0008	0.0061
64	0.0069	0.0008	0.0061
65	0.0070	0.0008	0.0062
66	0.0070	0.0008	0.0062
67	0.0070	0.0008	0.0062
68	0.0071	0.0008	0.0063
69	0.0071	0.0008	0.0063
70	0.0071	0.0008	0.0063
71	0.0072	0.0008	0.0064
72	0.0072	0.0008	0.0064

		Post10yr	
73	0.0072	0.0008	0.0064
74	0.0073	0.0008	0.0064
75	0.0073	0.0008	0.0065
76	0.0073	0.0008	0.0065
77	0.0074	0.0008	0.0065
78	0.0074	0.0008	0.0066
79	0.0074	0.0008	0.0066
80	0.0075	0.0008	0.0066
81	0.0075	0.0009	0.0067
82	0.0075	0.0009	0.0067
83	0.0076	0.0009	0.0067
84	0.0076	0.0009	0.0068
85	0.0077	0.0009	0.0068
86	0.0077	0.0009	0.0068
87	0.0078	0.0009	0.0069
88	0.0078	0.0009	0.0069
89	0.0078	0.0009	0.0070
90	0.0079	0.0009	0.0070
91	0.0079	0.0009	0.0070
92	0.0080	0.0009	0.0071
93	0.0080	0.0009	0.0071
94	0.0080	0.0009	0.0071
95	0.0081	0.0009	0.0072
96	0.0081	0.0009	0.0072
97	0.0082	0.0009	0.0073
98	0.0082	0.0009	0.0073
99	0.0083	0.0009	0.0074
100	0.0083	0.0009	0.0074
101	0.0084	0.0010	0.0075
102	0.0084	0.0010	0.0075
103	0.0085	0.0010	0.0075
104	0.0085	0.0010	0.0076
105	0.0086	0.0010	0.0076
106	0.0087	0.0010	0.0077
107	0.0087	0.0010	0.0077
108	0.0088	0.0010	0.0078
109	0.0088	0.0010	0.0078
110	0.0089	0.0010	0.0079
111	0.0090	0.0010	0.0080
112	0.0090	0.0010	0.0080
113	0.0091	0.0010	0.0081
114	0.0091	0.0010	0.0081
115	0.0092	0.0010	0.0082
116	0.0093	0.0011	0.0082
117	0.0094	0.0011	0.0083
118	0.0094	0.0011	0.0083
119	0.0095	0.0011	0.0084
120	0.0096	0.0011	0.0085

		Post10yr	
121	0.0097	0.0011	0.0086
122	0.0097	0.0011	0.0086
123	0.0098	0.0011	0.0087
124	0.0099	0.0011	0.0087
125	0.0100	0.0011	0.0088
126	0.0100	0.0011	0.0089
127	0.0101	0.0012	0.0090
128	0.0102	0.0012	0.0090
129	0.0103	0.0012	0.0091
130	0.0104	0.0012	0.0092
131	0.0105	0.0012	0.0093
132	0.0106	0.0012	0.0094
133	0.0107	0.0012	0.0095
134	0.0108	0.0012	0.0095
135	0.0109	0.0012	0.0097
136	0.0110	0.0012	0.0097
137	0.0111	0.0013	0.0099
138	0.0112	0.0013	0.0099
139	0.0114	0.0013	0.0101
140	0.0114	0.0013	0.0101
141	0.0116	0.0013	0.0103
142	0.0117	0.0013	0.0104
143	0.0119	0.0013	0.0105
144	0.0120	0.0014	0.0106
145	0.0135	0.0015	0.0120
146	0.0136	0.0015	0.0121
147	0.0138	0.0016	0.0122
148	0.0139	0.0016	0.0123
149	0.0141	0.0016	0.0125
150	0.0142	0.0016	0.0126
151	0.0145	0.0016	0.0128
152	0.0146	0.0017	0.0129
153	0.0148	0.0017	0.0132
154	0.0150	0.0017	0.0133
155	0.0152	0.0017	0.0135
156	0.0154	0.0017	0.0136
157	0.0157	0.0018	0.0139
158	0.0158	0.0018	0.0140
159	0.0161	0.0018	0.0143
160	0.0163	0.0019	0.0145
161	0.0167	0.0019	0.0148
162	0.0168	0.0019	0.0149
163	0.0172	0.0020	0.0153
164	0.0174	0.0020	0.0154
165	0.0179	0.0020	0.0158
166	0.0181	0.0021	0.0160
167	0.0186	0.0021	0.0164
168	0.0188	0.0021	0.0167

		Post10yr	
169	0.0204	0.0023	0.0181
170	0.0207	0.0023	0.0183
171	0.0213	0.0024	0.0189
172	0.0216	0.0025	0.0192
173	0.0223	0.0025	0.0198
174	0.0227	0.0026	0.0201
175	0.0235	0.0027	0.0208
176	0.0239	0.0027	0.0212
177	0.0249	0.0028	0.0221
178	0.0255	0.0029	0.0226
179	0.0266	0.0030	0.0236
180	0.0273	0.0031	0.0242
181	0.0288	0.0033	0.0255
182	0.0296	0.0034	0.0262
183	0.0315	0.0034	0.0282
184	0.0326	0.0034	0.0293
185	0.0276	0.0031	0.0245
186	0.0292	0.0033	0.0259
187	0.0331	0.0034	0.0298
188	0.0357	0.0034	0.0324
189	0.0431	0.0034	0.0397
190	0.0486	0.0034	0.0452
191	0.0695	0.0034	0.0661
192	0.0955	0.0034	0.0922
193	0.2990	0.0034	0.2957
194	0.0566	0.0034	0.0532
195	0.0389	0.0034	0.0356
196	0.0310	0.0034	0.0276
197	0.0339	0.0034	0.0305
198	0.0305	0.0034	0.0272
199	0.0280	0.0032	0.0248
200	0.0260	0.0030	0.0231
201	0.0244	0.0028	0.0216
202	0.0231	0.0026	0.0205
203	0.0219	0.0025	0.0195
204	0.0210	0.0024	0.0186
205	0.0191	0.0022	0.0169
206	0.0183	0.0021	0.0162
207	0.0176	0.0020	0.0156
208	0.0170	0.0019	0.0151
209	0.0165	0.0019	0.0146
210	0.0160	0.0018	0.0142
211	0.0155	0.0018	0.0138
212	0.0151	0.0017	0.0134
213	0.0147	0.0017	0.0130
214	0.0144	0.0016	0.0127
215	0.0140	0.0016	0.0124
216	0.0137	0.0016	0.0121

		Post10yr	
217	0.0120	0.0014	0.0107
218	0.0118	0.0013	0.0104
219	0.0115	0.0013	0.0102
220	0.0113	0.0013	0.0100
221	0.0111	0.0013	0.0098
222	0.0108	0.0012	0.0096
223	0.0106	0.0012	0.0094
224	0.0104	0.0012	0.0093
225	0.0103	0.0012	0.0091
226	0.0101	0.0011	0.0089
227	0.0099	0.0011	0.0088
228	0.0098	0.0011	0.0086
229	0.0096	0.0011	0.0085
230	0.0095	0.0011	0.0084
231	0.0093	0.0011	0.0083
232	0.0092	0.0010	0.0081
233	0.0091	0.0010	0.0080
234	0.0089	0.0010	0.0079
235	0.0088	0.0010	0.0078
236	0.0087	0.0010	0.0077
237	0.0086	0.0010	0.0076
238	0.0085	0.0010	0.0075
239	0.0084	0.0010	0.0074
240	0.0083	0.0009	0.0073
241	0.0082	0.0009	0.0072
242	0.0081	0.0009	0.0072
243	0.0080	0.0009	0.0071
244	0.0079	0.0009	0.0070
245	0.0078	0.0009	0.0069
246	0.0077	0.0009	0.0069
247	0.0077	0.0009	0.0068
248	0.0076	0.0009	0.0067
249	0.0075	0.0009	0.0066
250	0.0074	0.0008	0.0066
251	0.0074	0.0008	0.0065
252	0.0073	0.0008	0.0065
253	0.0072	0.0008	0.0064
254	0.0071	0.0008	0.0063
255	0.0071	0.0008	0.0063
256	0.0070	0.0008	0.0062
257	0.0070	0.0008	0.0062
258	0.0069	0.0008	0.0061
259	0.0068	0.0008	0.0061
260	0.0068	0.0008	0.0060
261	0.0067	0.0008	0.0060
262	0.0067	0.0008	0.0059
263	0.0066	0.0008	0.0059
264	0.0066	0.0007	0.0058

		Post10yr	
265	0.0065	0.0007	0.0058
266	0.0065	0.0007	0.0057
267	0.0064	0.0007	0.0057
268	0.0064	0.0007	0.0056
269	0.0063	0.0007	0.0056
270	0.0063	0.0007	0.0056
271	0.0062	0.0007	0.0055
272	0.0062	0.0007	0.0055
273	0.0061	0.0007	0.0054
274	0.0061	0.0007	0.0054
275	0.0061	0.0007	0.0054
276	0.0060	0.0007	0.0053
277	0.0060	0.0007	0.0053
278	0.0059	0.0007	0.0053
279	0.0059	0.0007	0.0052
280	0.0059	0.0007	0.0052
281	0.0058	0.0007	0.0052
282	0.0058	0.0007	0.0051
283	0.0057	0.0007	0.0051
284	0.0057	0.0006	0.0051
285	0.0057	0.0006	0.0050
286	0.0056	0.0006	0.0050
287	0.0056	0.0006	0.0050
288	0.0056	0.0006	0.0049

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 Total soil rain loss = 0.36(In)  
 Total effective rainfall = 3.29(In)  
 Peak flow rate in flood hydrograph = 5.77(CFS)  
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 24 - H O U R S T O R M  
 R u n o f f H y d r o g r a p h  
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Hydrograph in 5 Minute intervals ((CFS))  
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Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0002	0.02	Q					
0+10	0.0009	0.11	Q					
0+15	0.0018	0.13	Q					
0+20	0.0027	0.13	Q					
0+25	0.0037	0.13	Q					
0+30	0.0046	0.14	Q					
0+35	0.0055	0.14	Q					
0+40	0.0065	0.14	Q					
0+45	0.0074	0.14	Q					

Post10yr

0+50	0.0083	0.14	Q
0+55	0.0093	0.14	Q
1+ 0	0.0102	0.14	Q
1+ 5	0.0112	0.14	Q
1+10	0.0121	0.14	Q
1+15	0.0131	0.14	Q
1+20	0.0141	0.14	Q
1+25	0.0150	0.14	Q
1+30	0.0160	0.14	QV
1+35	0.0170	0.14	QV
1+40	0.0179	0.14	QV
1+45	0.0189	0.14	QV
1+50	0.0199	0.14	QV
1+55	0.0209	0.14	QV
2+ 0	0.0218	0.14	QV
2+ 5	0.0228	0.14	QV
2+10	0.0238	0.14	QV
2+15	0.0248	0.14	QV
2+20	0.0258	0.14	QV
2+25	0.0268	0.15	QV
2+30	0.0278	0.15	QV
2+35	0.0288	0.15	QV
2+40	0.0298	0.15	QV
2+45	0.0309	0.15	Q V
2+50	0.0319	0.15	Q V
2+55	0.0329	0.15	Q V
3+ 0	0.0339	0.15	Q V
3+ 5	0.0349	0.15	Q V
3+10	0.0360	0.15	Q V
3+15	0.0370	0.15	Q V
3+20	0.0381	0.15	Q V
3+25	0.0391	0.15	Q V
3+30	0.0402	0.15	Q V
3+35	0.0412	0.15	Q V
3+40	0.0423	0.15	Q V
3+45	0.0433	0.15	Q V
3+50	0.0444	0.15	Q V
3+55	0.0455	0.16	Q V
4+ 0	0.0465	0.16	Q V
4+ 5	0.0476	0.16	Q V
4+10	0.0487	0.16	Q V
4+15	0.0498	0.16	Q V
4+20	0.0509	0.16	Q V
4+25	0.0519	0.16	Q V
4+30	0.0530	0.16	Q V
4+35	0.0541	0.16	Q V
4+40	0.0553	0.16	Q V
4+45	0.0564	0.16	Q V

				Post10yr		
4+50	0.0575	0.16	Q V			
4+55	0.0586	0.16	Q V			
5+ 0	0.0597	0.16	Q V			
5+ 5	0.0609	0.16	Q V			
5+10	0.0620	0.16	Q V			
5+15	0.0631	0.17	Q V			
5+20	0.0643	0.17	Q V			
5+25	0.0654	0.17	Q V			
5+30	0.0666	0.17	Q V			
5+35	0.0677	0.17	Q V			
5+40	0.0689	0.17	Q V			
5+45	0.0701	0.17	Q V			
5+50	0.0713	0.17	Q V			
5+55	0.0724	0.17	Q V			
6+ 0	0.0736	0.17	Q V			
6+ 5	0.0748	0.17	Q V			
6+10	0.0760	0.17	Q V			
6+15	0.0772	0.17	Q V			
6+20	0.0784	0.18	Q V			
6+25	0.0796	0.18	Q V			
6+30	0.0809	0.18	Q V			
6+35	0.0821	0.18	Q V			
6+40	0.0833	0.18	Q V			
6+45	0.0846	0.18	Q V			
6+50	0.0858	0.18	Q V			
6+55	0.0871	0.18	Q V			
7+ 0	0.0883	0.18	Q V			
7+ 5	0.0896	0.18	Q V			
7+10	0.0908	0.18	Q V			
7+15	0.0921	0.19	Q V			
7+20	0.0934	0.19	Q V			
7+25	0.0947	0.19	Q V			
7+30	0.0960	0.19	Q V			
7+35	0.0973	0.19	Q V			
7+40	0.0986	0.19	Q V			
7+45	0.0999	0.19	Q V			
7+50	0.1013	0.19	Q V			
7+55	0.1026	0.19	Q V			
8+ 0	0.1039	0.19	Q V			
8+ 5	0.1053	0.20	Q V			
8+10	0.1066	0.20	Q V			
8+15	0.1080	0.20	Q V			
8+20	0.1094	0.20	Q V			
8+25	0.1108	0.20	Q V			
8+30	0.1122	0.20	Q V			
8+35	0.1136	0.20	Q V			
8+40	0.1150	0.20	Q V			
8+45	0.1164	0.21	Q V			



Post10yr

8+50	0.1178	0.21	Q	V			
8+55	0.1192	0.21	Q	V			
9+ 0	0.1207	0.21	Q	V			
9+ 5	0.1221	0.21	Q	V			
9+10	0.1236	0.21	Q	V			
9+15	0.1251	0.21	Q	V			
9+20	0.1266	0.22	Q	V			
9+25	0.1281	0.22	Q	V			
9+30	0.1296	0.22	Q	V			
9+35	0.1311	0.22	Q	V			
9+40	0.1326	0.22	Q	V			
9+45	0.1341	0.22	Q	V			
9+50	0.1357	0.22	Q	V			
9+55	0.1373	0.23	Q	V			
10+ 0	0.1388	0.23	Q	V			
10+ 5	0.1404	0.23	Q	V			
10+10	0.1420	0.23	Q	V			
10+15	0.1436	0.23	Q	V			
10+20	0.1452	0.24	Q	V			
10+25	0.1469	0.24	Q	V			
10+30	0.1485	0.24	Q	V			
10+35	0.1502	0.24	Q	V			
10+40	0.1519	0.24	Q	V			
10+45	0.1536	0.25	Q	V			
10+50	0.1553	0.25	Q	V			
10+55	0.1570	0.25	Q	V			
11+ 0	0.1587	0.25	Q	V			
11+ 5	0.1605	0.25	Q	V			
11+10	0.1623	0.26	Q	V			
11+15	0.1640	0.26	Q	V			
11+20	0.1658	0.26	Q	V			
11+25	0.1677	0.26	Q	V			
11+30	0.1695	0.27	Q	V			
11+35	0.1714	0.27	Q	V			
11+40	0.1732	0.27	Q	V			
11+45	0.1751	0.28	Q	V			
11+50	0.1771	0.28	Q	V			
11+55	0.1790	0.28	Q	V			
12+ 0	0.1810	0.28	Q	V			
12+ 5	0.1830	0.29	Q	V			
12+10	0.1852	0.32	Q	V			
12+15	0.1874	0.33	Q	V			
12+20	0.1897	0.33	Q	V			
12+25	0.1920	0.34	Q	V			
12+30	0.1944	0.34	Q	V			
12+35	0.1967	0.34	Q	V			
12+40	0.1991	0.35	Q	V			
12+45	0.2015	0.35	Q	V			

				Post10yr			
12+50	0.2040	0.36	Q	V			
12+55	0.2065	0.36	Q	V			
13+ 0	0.2090	0.37	Q	V			
13+ 5	0.2115	0.37	Q	V			
13+10	0.2141	0.38	Q	V			
13+15	0.2168	0.38	Q	V			
13+20	0.2194	0.39	Q	V			
13+25	0.2221	0.39	Q	V			
13+30	0.2249	0.40	Q	V			
13+35	0.2277	0.41	Q	V			
13+40	0.2305	0.41	Q	V			
13+45	0.2334	0.42	Q	V			
13+50	0.2364	0.43	Q	V			
13+55	0.2394	0.44	Q	V			
14+ 0	0.2424	0.45	Q	V			
14+ 5	0.2456	0.46	Q	V			
14+10	0.2489	0.48	Q	V			
14+15	0.2524	0.50	Q	V			
14+20	0.2559	0.51	Q	V			
14+25	0.2595	0.52	Q	V			
14+30	0.2631	0.53	Q	V			
14+35	0.2669	0.55	Q	V			
14+40	0.2708	0.56	Q	V			
14+45	0.2748	0.58	Q	V			
14+50	0.2789	0.60	Q	V			
14+55	0.2831	0.61	Q	V			
15+ 0	0.2875	0.64	Q	V			
15+ 5	0.2921	0.66	Q	V			
15+10	0.2968	0.69	Q	V			
15+15	0.3017	0.72	Q	V			
15+20	0.3070	0.76	Q	V			
15+25	0.3122	0.76	Q	V			
15+30	0.3170	0.70	Q	V			
15+35	0.3220	0.72	Q	V			
15+40	0.3275	0.80	Q	V			
15+45	0.3337	0.90	Q	V			
15+50	0.3410	1.06	Q	V			
15+55	0.3499	1.30	Q	V			
16+ 0	0.3624	1.81	Q	V			
16+ 5	0.3854	3.35	Q	Q	V		
16+10	0.4252	5.77		Q	V		
16+15	0.4425	2.52	Q	Q	V		
16+20	0.4504	1.14	Q		V		
16+25	0.4560	0.81	Q		V		
16+30	0.4615	0.80	Q		V		
16+35	0.4666	0.74	Q		V		
16+40	0.4713	0.68	Q		V		
16+45	0.4756	0.63	Q		V		

Post10yr

16+50	0.4797	0.59	Q	V
16+55	0.4835	0.56	Q	V
17+ 0	0.4872	0.53	Q	V
17+ 5	0.4906	0.50	Q	V
17+10	0.4938	0.46	Q	V
17+15	0.4969	0.44	Q	V
17+20	0.4998	0.43	Q	V
17+25	0.5026	0.41	Q	V
17+30	0.5053	0.40	Q	V
17+35	0.5080	0.39	Q	V
17+40	0.5106	0.37	Q	V
17+45	0.5131	0.36	Q	V
17+50	0.5155	0.35	Q	V
17+55	0.5179	0.35	Q	V
18+ 0	0.5202	0.34	Q	V
18+ 5	0.5225	0.32	Q	V
18+10	0.5245	0.30	Q	V
18+15	0.5265	0.28	Q	V
18+20	0.5284	0.28	Q	V
18+25	0.5302	0.27	Q	V
18+30	0.5321	0.27	Q	V
18+35	0.5339	0.26	Q	V
18+40	0.5356	0.26	Q	V
18+45	0.5374	0.25	Q	V
18+50	0.5391	0.25	Q	V
18+55	0.5407	0.24	Q	V
19+ 0	0.5424	0.24	Q	V
19+ 5	0.5440	0.23	Q	V
19+10	0.5456	0.23	Q	V
19+15	0.5472	0.23	Q	V
19+20	0.5487	0.22	Q	V
19+25	0.5502	0.22	Q	V
19+30	0.5517	0.22	Q	V
19+35	0.5532	0.21	Q	V
19+40	0.5547	0.21	Q	V
19+45	0.5561	0.21	Q	V
19+50	0.5575	0.21	Q	V
19+55	0.5589	0.20	Q	V
20+ 0	0.5603	0.20	Q	V
20+ 5	0.5617	0.20	Q	V
20+10	0.5630	0.20	Q	V
20+15	0.5644	0.19	Q	V
20+20	0.5657	0.19	Q	V
20+25	0.5670	0.19	Q	V
20+30	0.5683	0.19	Q	V
20+35	0.5696	0.19	Q	V
20+40	0.5709	0.18	Q	V
20+45	0.5721	0.18	Q	V

				Post10yr		
20+50	0.5734	0.18	Q			V
20+55	0.5746	0.18	Q			V
21+ 0	0.5758	0.18	Q			V
21+ 5	0.5770	0.18	Q			V
21+10	0.5782	0.17	Q			V
21+15	0.5794	0.17	Q			V
21+20	0.5806	0.17	Q			V
21+25	0.5817	0.17	Q			V
21+30	0.5829	0.17	Q			V
21+35	0.5840	0.17	Q			V
21+40	0.5852	0.16	Q			V
21+45	0.5863	0.16	Q			V
21+50	0.5874	0.16	Q			V
21+55	0.5885	0.16	Q			V
22+ 0	0.5896	0.16	Q			V
22+ 5	0.5907	0.16	Q			V
22+10	0.5918	0.16	Q			V
22+15	0.5928	0.16	Q			V
22+20	0.5939	0.15	Q			V
22+25	0.5950	0.15	Q			V
22+30	0.5960	0.15	Q			V
22+35	0.5970	0.15	Q			V
22+40	0.5981	0.15	Q			V
22+45	0.5991	0.15	Q			V
22+50	0.6001	0.15	Q			V
22+55	0.6011	0.15	Q			V
23+ 0	0.6021	0.15	Q			V
23+ 5	0.6031	0.14	Q			V
23+10	0.6041	0.14	Q			V
23+15	0.6051	0.14	Q			V
23+20	0.6061	0.14	Q			V
23+25	0.6070	0.14	Q			V
23+30	0.6080	0.14	Q			V
23+35	0.6090	0.14	Q			V
23+40	0.6099	0.14	Q			V
23+45	0.6109	0.14	Q			V
23+50	0.6118	0.14	Q			V
23+55	0.6127	0.14	Q			V
24+ 0	0.6137	0.13	Q			V
24+ 5	0.6144	0.11	Q			V
24+10	0.6146	0.03	Q			V
24+15	0.6146	0.00	Q			V

Post100yr

U n i t   H y d r o g r a p h   A n a l y s i s

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Study date 09/11/20

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San Bernardino County Synthetic Unit Hydrology Method  
Manual date - August 1986

Program License Serial Number 6474

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ACRO AM/PM  
POST-DEVELOPEMENT 100-YR (SUB-BASINS SB1,SB2,SB3,SB4,SB5,SB6,SB7,SB8  
& SB9)  
11279 CEDAR AVENUE  
BLOOMINGTON CA 92316  
-----  
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Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
2.25	1	1.29
-----		
Rainfall data for year 100		
2.25	6	3.04
-----		

Post100yr

Rainfall data for year 100

2.25 24 5.57

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+++++

\*\*\*\*\* Area-averaged max loss rate, Fm \*\*\*\*\*

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
78.0	92.8	2.25	1.000	0.140	0.100	0.014

Area-averaged adjusted loss rate Fm (In/Hr) = 0.014

\*\*\*\*\* Area-Averaged low loss rate fraction, Yb \*\*\*\*\*

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
0.23	0.100	78.0	92.8	0.78	0.850
2.02	0.900	98.0	98.0	0.20	0.957

Area-averaged catchment yield fraction, Y = 0.947

Area-averaged low loss fraction, Yb = 0.053

User entry of time of concentration = 0.102 (hours)

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Watershed area = 2.25(Ac.)  
 Catchment Lag time = 0.082 hours  
 Unit interval = 5.000 minutes  
 Unit interval percentage of lag time = 102.1242  
 Hydrograph baseflow = 0.00(CFS)  
 Average maximum watershed loss rate(Fm) = 0.014(In/Hr)  
 Average low loss rate fraction (Yb) = 0.053 (decimal)  
 VALLEY DEVELOPED S-Graph Selected  
 Computed peak 5-minute rainfall = 0.477(In)  
 Computed peak 30-minute rainfall = 0.978(In)  
 Specified peak 1-hour rainfall = 1.290(In)  
 Computed peak 3-hour rainfall = 2.182(In)  
 Specified peak 6-hour rainfall = 3.040(In)  
 Specified peak 24-hour rainfall = 5.570(In)

Rainfall depth area reduction factors:

Using a total area of 2.25(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000	Adjusted rainfall = 0.477(In)
30-minute factor = 1.000	Adjusted rainfall = 0.978(In)
1-hour factor = 1.000	Adjusted rainfall = 1.290(In)
3-hour factor = 1.000	Adjusted rainfall = 2.182(In)

Post100yr

6-hour factor = 1.000      Adjusted rainfall = 3.040(In)  
 24-hour factor = 1.000      Adjusted rainfall = 5.570(In)

U n i t   H y d r o g r a p h

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Interval Number	'S' Graph Mean values	Unit Hydrograph (CFS)
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(K =            27.21 (CFS))

1	17.888	4.867
2	80.612	17.068
3	98.086	4.755
4	100.000	0.521

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
---------------------	--------------------------------	-----------------------

1	0.4774	0.4774
2	0.6299	0.1525
3	0.7408	0.1109
4	0.8312	0.0903
5	0.9088	0.0776
6	0.9775	0.0688
7	1.0397	0.0622
8	1.0967	0.0570
9	1.1497	0.0529
10	1.1991	0.0495
11	1.2457	0.0466
12	1.2899	0.0441
13	1.3402	0.0504
14	1.3886	0.0484
15	1.4352	0.0466
16	1.4802	0.0450
17	1.5238	0.0436
18	1.5660	0.0423
19	1.6071	0.0410
20	1.6470	0.0399
21	1.6859	0.0389
22	1.7239	0.0379
23	1.7609	0.0371
24	1.7972	0.0362
25	1.8326	0.0355
26	1.8673	0.0347
27	1.9014	0.0340
28	1.9347	0.0334
29	1.9675	0.0328
30	1.9997	0.0322

		Post100yr
31	2.0313	0.0316
32	2.0624	0.0311
33	2.0930	0.0306
34	2.1231	0.0301
35	2.1528	0.0297
36	2.1820	0.0292
37	2.2108	0.0288
38	2.2391	0.0284
39	2.2671	0.0280
40	2.2948	0.0276
41	2.3220	0.0273
42	2.3490	0.0269
43	2.3756	0.0266
44	2.4018	0.0263
45	2.4278	0.0260
46	2.4535	0.0257
47	2.4788	0.0254
48	2.5039	0.0251
49	2.5288	0.0248
50	2.5533	0.0246
51	2.5776	0.0243
52	2.6017	0.0241
53	2.6255	0.0238
54	2.6491	0.0236
55	2.6724	0.0234
56	2.6956	0.0231
57	2.7185	0.0229
58	2.7412	0.0227
59	2.7637	0.0225
60	2.7860	0.0223
61	2.8082	0.0221
62	2.8301	0.0219
63	2.8518	0.0217
64	2.8734	0.0216
65	2.8948	0.0214
66	2.9160	0.0212
67	2.9371	0.0211
68	2.9580	0.0209
69	2.9787	0.0207
70	2.9993	0.0206
71	3.0197	0.0204
72	3.0400	0.0203
73	3.0583	0.0184
74	3.0766	0.0182
75	3.0947	0.0181
76	3.1126	0.0180
77	3.1305	0.0178
78	3.1481	0.0177



		Post100yr
79	3.1657	0.0176
80	3.1832	0.0174
81	3.2005	0.0173
82	3.2177	0.0172
83	3.2348	0.0171
84	3.2517	0.0170
85	3.2686	0.0169
86	3.2853	0.0167
87	3.3019	0.0166
88	3.3185	0.0165
89	3.3349	0.0164
90	3.3512	0.0163
91	3.3674	0.0162
92	3.3835	0.0161
93	3.3996	0.0160
94	3.4155	0.0159
95	3.4313	0.0158
96	3.4470	0.0157
97	3.4627	0.0156
98	3.4782	0.0155
99	3.4937	0.0155
100	3.5090	0.0154
101	3.5243	0.0153
102	3.5395	0.0152
103	3.5546	0.0151
104	3.5697	0.0150
105	3.5846	0.0150
106	3.5995	0.0149
107	3.6143	0.0148
108	3.6290	0.0147
109	3.6437	0.0146
110	3.6582	0.0146
111	3.6727	0.0145
112	3.6871	0.0144
113	3.7015	0.0143
114	3.7157	0.0143
115	3.7299	0.0142
116	3.7441	0.0141
117	3.7581	0.0141
118	3.7721	0.0140
119	3.7861	0.0139
120	3.7999	0.0139
121	3.8137	0.0138
122	3.8275	0.0137
123	3.8411	0.0137
124	3.8547	0.0136
125	3.8683	0.0135
126	3.8818	0.0135

		Post100yr
127	3.8952	0.0134
128	3.9086	0.0134
129	3.9219	0.0133
130	3.9351	0.0133
131	3.9483	0.0132
132	3.9615	0.0131
133	3.9745	0.0131
134	3.9876	0.0130
135	4.0005	0.0130
136	4.0135	0.0129
137	4.0263	0.0129
138	4.0391	0.0128
139	4.0519	0.0128
140	4.0646	0.0127
141	4.0773	0.0127
142	4.0899	0.0126
143	4.1024	0.0126
144	4.1149	0.0125
145	4.1274	0.0125
146	4.1398	0.0124
147	4.1522	0.0124
148	4.1645	0.0123
149	4.1767	0.0123
150	4.1890	0.0122
151	4.2011	0.0122
152	4.2133	0.0121
153	4.2254	0.0121
154	4.2374	0.0120
155	4.2494	0.0120
156	4.2613	0.0120
157	4.2733	0.0119
158	4.2851	0.0119
159	4.2969	0.0118
160	4.3087	0.0118
161	4.3205	0.0117
162	4.3322	0.0117
163	4.3438	0.0117
164	4.3555	0.0116
165	4.3670	0.0116
166	4.3786	0.0115
167	4.3901	0.0115
168	4.4015	0.0115
169	4.4130	0.0114
170	4.4244	0.0114
171	4.4357	0.0113
172	4.4470	0.0113
173	4.4583	0.0113
174	4.4695	0.0112

		Post100yr
175	4.4807	0.0112
176	4.4919	0.0112
177	4.5030	0.0111
178	4.5141	0.0111
179	4.5252	0.0111
180	4.5362	0.0110
181	4.5472	0.0110
182	4.5582	0.0110
183	4.5691	0.0109
184	4.5800	0.0109
185	4.5908	0.0109
186	4.6016	0.0108
187	4.6124	0.0108
188	4.6232	0.0108
189	4.6339	0.0107
190	4.6446	0.0107
191	4.6553	0.0107
192	4.6659	0.0106
193	4.6765	0.0106
194	4.6871	0.0106
195	4.6976	0.0105
196	4.7081	0.0105
197	4.7186	0.0105
198	4.7290	0.0104
199	4.7395	0.0104
200	4.7499	0.0104
201	4.7602	0.0104
202	4.7705	0.0103
203	4.7808	0.0103
204	4.7911	0.0103
205	4.8014	0.0102
206	4.8116	0.0102
207	4.8218	0.0102
208	4.8319	0.0102
209	4.8421	0.0101
210	4.8522	0.0101
211	4.8622	0.0101
212	4.8723	0.0101
213	4.8823	0.0100
214	4.8923	0.0100
215	4.9023	0.0100
216	4.9122	0.0099
217	4.9222	0.0099
218	4.9321	0.0099
219	4.9419	0.0099
220	4.9518	0.0098
221	4.9616	0.0098
222	4.9714	0.0098

		Post100yr
223	4.9812	0.0098
224	4.9909	0.0097
225	5.0006	0.0097
226	5.0103	0.0097
227	5.0200	0.0097
228	5.0296	0.0096
229	5.0393	0.0096
230	5.0489	0.0096
231	5.0584	0.0096
232	5.0680	0.0096
233	5.0775	0.0095
234	5.0870	0.0095
235	5.0965	0.0095
236	5.1060	0.0095
237	5.1154	0.0094
238	5.1248	0.0094
239	5.1342	0.0094
240	5.1436	0.0094
241	5.1529	0.0094
242	5.1623	0.0093
243	5.1716	0.0093
244	5.1809	0.0093
245	5.1901	0.0093
246	5.1994	0.0092
247	5.2086	0.0092
248	5.2178	0.0092
249	5.2270	0.0092
250	5.2361	0.0092
251	5.2453	0.0091
252	5.2544	0.0091
253	5.2635	0.0091
254	5.2726	0.0091
255	5.2816	0.0091
256	5.2907	0.0090
257	5.2997	0.0090
258	5.3087	0.0090
259	5.3177	0.0090
260	5.3266	0.0090
261	5.3356	0.0089
262	5.3445	0.0089
263	5.3534	0.0089
264	5.3623	0.0089
265	5.3711	0.0089
266	5.3800	0.0088
267	5.3888	0.0088
268	5.3976	0.0088
269	5.4064	0.0088
270	5.4152	0.0088

		Post100yr
271	5.4239	0.0088
272	5.4326	0.0087
273	5.4414	0.0087
274	5.4501	0.0087
275	5.4587	0.0087
276	5.4674	0.0087
277	5.4760	0.0086
278	5.4847	0.0086
279	5.4933	0.0086
280	5.5019	0.0086
281	5.5104	0.0086
282	5.5190	0.0086
283	5.5275	0.0085
284	5.5361	0.0085
285	5.5446	0.0085
286	5.5531	0.0085
287	5.5615	0.0085
288	5.5700	0.0085

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0085	0.0005	0.0080
2	0.0085	0.0005	0.0080
3	0.0085	0.0005	0.0081
4	0.0085	0.0005	0.0081
5	0.0086	0.0005	0.0081
6	0.0086	0.0005	0.0081
7	0.0086	0.0005	0.0081
8	0.0086	0.0005	0.0082
9	0.0087	0.0005	0.0082
10	0.0087	0.0005	0.0082
11	0.0087	0.0005	0.0083
12	0.0087	0.0005	0.0083
13	0.0088	0.0005	0.0083
14	0.0088	0.0005	0.0083
15	0.0088	0.0005	0.0084
16	0.0088	0.0005	0.0084
17	0.0089	0.0005	0.0084
18	0.0089	0.0005	0.0084
19	0.0089	0.0005	0.0085
20	0.0090	0.0005	0.0085
21	0.0090	0.0005	0.0085
22	0.0090	0.0005	0.0085
23	0.0091	0.0005	0.0086
24	0.0091	0.0005	0.0086
25	0.0091	0.0005	0.0086

		Post100yr	
26	0.0091	0.0005	0.0087
27	0.0092	0.0005	0.0087
28	0.0092	0.0005	0.0087
29	0.0092	0.0005	0.0087
30	0.0093	0.0005	0.0088
31	0.0093	0.0005	0.0088
32	0.0093	0.0005	0.0088
33	0.0094	0.0005	0.0089
34	0.0094	0.0005	0.0089
35	0.0094	0.0005	0.0089
36	0.0095	0.0005	0.0090
37	0.0095	0.0005	0.0090
38	0.0095	0.0005	0.0090
39	0.0096	0.0005	0.0091
40	0.0096	0.0005	0.0091
41	0.0096	0.0005	0.0091
42	0.0097	0.0005	0.0092
43	0.0097	0.0005	0.0092
44	0.0097	0.0005	0.0092
45	0.0098	0.0005	0.0093
46	0.0098	0.0005	0.0093
47	0.0099	0.0005	0.0093
48	0.0099	0.0005	0.0094
49	0.0099	0.0005	0.0094
50	0.0100	0.0005	0.0094
51	0.0100	0.0005	0.0095
52	0.0101	0.0005	0.0095
53	0.0101	0.0005	0.0096
54	0.0101	0.0005	0.0096
55	0.0102	0.0005	0.0096
56	0.0102	0.0005	0.0097
57	0.0103	0.0005	0.0097
58	0.0103	0.0005	0.0098
59	0.0104	0.0006	0.0098
60	0.0104	0.0006	0.0098
61	0.0104	0.0006	0.0099
62	0.0105	0.0006	0.0099
63	0.0105	0.0006	0.0100
64	0.0106	0.0006	0.0100
65	0.0106	0.0006	0.0101
66	0.0107	0.0006	0.0101
67	0.0107	0.0006	0.0102
68	0.0108	0.0006	0.0102
69	0.0108	0.0006	0.0102
70	0.0109	0.0006	0.0103
71	0.0109	0.0006	0.0103
72	0.0110	0.0006	0.0104
73	0.0110	0.0006	0.0104

		Post100yr	
74	0.0111	0.0006	0.0105
75	0.0111	0.0006	0.0105
76	0.0112	0.0006	0.0106
77	0.0112	0.0006	0.0106
78	0.0113	0.0006	0.0107
79	0.0113	0.0006	0.0107
80	0.0114	0.0006	0.0108
81	0.0115	0.0006	0.0109
82	0.0115	0.0006	0.0109
83	0.0116	0.0006	0.0110
84	0.0116	0.0006	0.0110
85	0.0117	0.0006	0.0111
86	0.0117	0.0006	0.0111
87	0.0118	0.0006	0.0112
88	0.0119	0.0006	0.0112
89	0.0120	0.0006	0.0113
90	0.0120	0.0006	0.0114
91	0.0121	0.0006	0.0114
92	0.0121	0.0006	0.0115
93	0.0122	0.0007	0.0116
94	0.0123	0.0007	0.0116
95	0.0124	0.0007	0.0117
96	0.0124	0.0007	0.0117
97	0.0125	0.0007	0.0118
98	0.0126	0.0007	0.0119
99	0.0127	0.0007	0.0120
100	0.0127	0.0007	0.0120
101	0.0128	0.0007	0.0121
102	0.0129	0.0007	0.0122
103	0.0130	0.0007	0.0123
104	0.0130	0.0007	0.0123
105	0.0131	0.0007	0.0124
106	0.0132	0.0007	0.0125
107	0.0133	0.0007	0.0126
108	0.0134	0.0007	0.0127
109	0.0135	0.0007	0.0128
110	0.0135	0.0007	0.0128
111	0.0137	0.0007	0.0129
112	0.0137	0.0007	0.0130
113	0.0139	0.0007	0.0131
114	0.0139	0.0007	0.0132
115	0.0141	0.0008	0.0133
116	0.0141	0.0008	0.0134
117	0.0143	0.0008	0.0135
118	0.0143	0.0008	0.0136
119	0.0145	0.0008	0.0137
120	0.0146	0.0008	0.0138
121	0.0147	0.0008	0.0139

		Post100yr	
122	0.0148	0.0008	0.0140
123	0.0150	0.0008	0.0142
124	0.0150	0.0008	0.0142
125	0.0152	0.0008	0.0144
126	0.0153	0.0008	0.0145
127	0.0155	0.0008	0.0146
128	0.0155	0.0008	0.0147
129	0.0157	0.0008	0.0149
130	0.0158	0.0008	0.0150
131	0.0160	0.0009	0.0152
132	0.0161	0.0009	0.0153
133	0.0163	0.0009	0.0154
134	0.0164	0.0009	0.0155
135	0.0166	0.0009	0.0157
136	0.0167	0.0009	0.0158
137	0.0170	0.0009	0.0161
138	0.0171	0.0009	0.0162
139	0.0173	0.0009	0.0164
140	0.0174	0.0009	0.0165
141	0.0177	0.0009	0.0167
142	0.0178	0.0010	0.0169
143	0.0181	0.0010	0.0171
144	0.0182	0.0010	0.0173
145	0.0203	0.0011	0.0192
146	0.0204	0.0011	0.0193
147	0.0207	0.0011	0.0196
148	0.0209	0.0011	0.0198
149	0.0212	0.0011	0.0201
150	0.0214	0.0011	0.0203
151	0.0217	0.0012	0.0206
152	0.0219	0.0012	0.0208
153	0.0223	0.0012	0.0211
154	0.0225	0.0012	0.0213
155	0.0229	0.0012	0.0218
156	0.0231	0.0012	0.0220
157	0.0236	0.0012	0.0224
158	0.0238	0.0012	0.0227
159	0.0243	0.0012	0.0231
160	0.0246	0.0012	0.0234
161	0.0251	0.0012	0.0239
162	0.0254	0.0012	0.0242
163	0.0260	0.0012	0.0248
164	0.0263	0.0012	0.0251
165	0.0269	0.0012	0.0258
166	0.0273	0.0012	0.0261
167	0.0280	0.0012	0.0268
168	0.0284	0.0012	0.0272
169	0.0292	0.0012	0.0280



		Post100yr	
170	0.0297	0.0012	0.0285
171	0.0306	0.0012	0.0294
172	0.0311	0.0012	0.0299
173	0.0322	0.0012	0.0310
174	0.0328	0.0012	0.0316
175	0.0340	0.0012	0.0329
176	0.0347	0.0012	0.0336
177	0.0362	0.0012	0.0351
178	0.0371	0.0012	0.0359
179	0.0389	0.0012	0.0377
180	0.0399	0.0012	0.0388
181	0.0423	0.0012	0.0411
182	0.0436	0.0012	0.0424
183	0.0466	0.0012	0.0454
184	0.0484	0.0012	0.0472
185	0.0441	0.0012	0.0430
186	0.0466	0.0012	0.0454
187	0.0529	0.0012	0.0517
188	0.0570	0.0012	0.0559
189	0.0688	0.0012	0.0676
190	0.0776	0.0012	0.0764
191	0.1109	0.0012	0.1097
192	0.1525	0.0012	0.1514
193	0.4774	0.0012	0.4762
194	0.0903	0.0012	0.0892
195	0.0622	0.0012	0.0610
196	0.0495	0.0012	0.0483
197	0.0504	0.0012	0.0492
198	0.0450	0.0012	0.0438
199	0.0410	0.0012	0.0399
200	0.0379	0.0012	0.0368
201	0.0355	0.0012	0.0343
202	0.0334	0.0012	0.0322
203	0.0316	0.0012	0.0305
204	0.0301	0.0012	0.0289
205	0.0288	0.0012	0.0276
206	0.0276	0.0012	0.0265
207	0.0266	0.0012	0.0254
208	0.0257	0.0012	0.0245
209	0.0248	0.0012	0.0237
210	0.0241	0.0012	0.0229
211	0.0234	0.0012	0.0222
212	0.0227	0.0012	0.0215
213	0.0221	0.0012	0.0210
214	0.0216	0.0012	0.0204
215	0.0211	0.0011	0.0199
216	0.0206	0.0011	0.0195
217	0.0184	0.0010	0.0174

		Post100yr	
218	0.0180	0.0010	0.0170
219	0.0176	0.0009	0.0166
220	0.0172	0.0009	0.0163
221	0.0169	0.0009	0.0160
222	0.0165	0.0009	0.0156
223	0.0162	0.0009	0.0153
224	0.0159	0.0008	0.0151
225	0.0156	0.0008	0.0148
226	0.0154	0.0008	0.0146
227	0.0151	0.0008	0.0143
228	0.0149	0.0008	0.0141
229	0.0146	0.0008	0.0139
230	0.0144	0.0008	0.0136
231	0.0142	0.0008	0.0134
232	0.0140	0.0007	0.0132
233	0.0138	0.0007	0.0131
234	0.0136	0.0007	0.0129
235	0.0134	0.0007	0.0127
236	0.0133	0.0007	0.0125
237	0.0131	0.0007	0.0124
238	0.0129	0.0007	0.0122
239	0.0128	0.0007	0.0121
240	0.0126	0.0007	0.0119
241	0.0125	0.0007	0.0118
242	0.0123	0.0007	0.0117
243	0.0122	0.0006	0.0115
244	0.0120	0.0006	0.0114
245	0.0119	0.0006	0.0113
246	0.0118	0.0006	0.0112
247	0.0117	0.0006	0.0110
248	0.0115	0.0006	0.0109
249	0.0114	0.0006	0.0108
250	0.0113	0.0006	0.0107
251	0.0112	0.0006	0.0106
252	0.0111	0.0006	0.0105
253	0.0110	0.0006	0.0104
254	0.0109	0.0006	0.0103
255	0.0108	0.0006	0.0102
256	0.0107	0.0006	0.0101
257	0.0106	0.0006	0.0100
258	0.0105	0.0006	0.0099
259	0.0104	0.0006	0.0099
260	0.0103	0.0006	0.0098
261	0.0102	0.0005	0.0097
262	0.0102	0.0005	0.0096
263	0.0101	0.0005	0.0095
264	0.0100	0.0005	0.0095
265	0.0099	0.0005	0.0094

Post100yr

266	0.0098	0.0005	0.0093
267	0.0098	0.0005	0.0092
268	0.0097	0.0005	0.0092
269	0.0096	0.0005	0.0091
270	0.0096	0.0005	0.0090
271	0.0095	0.0005	0.0090
272	0.0094	0.0005	0.0089
273	0.0094	0.0005	0.0089
274	0.0093	0.0005	0.0088
275	0.0092	0.0005	0.0087
276	0.0092	0.0005	0.0087
277	0.0091	0.0005	0.0086
278	0.0090	0.0005	0.0086
279	0.0090	0.0005	0.0085
280	0.0089	0.0005	0.0084
281	0.0089	0.0005	0.0084
282	0.0088	0.0005	0.0083
283	0.0088	0.0005	0.0083
284	0.0087	0.0005	0.0082
285	0.0086	0.0005	0.0082
286	0.0086	0.0005	0.0081
287	0.0085	0.0005	0.0081
288	0.0085	0.0005	0.0080

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 Total soil rain loss = 0.22(In)  
 Total effective rainfall = 5.35(In)  
 Peak flow rate in flood hydrograph = 9.34(CFS)  
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 24 - H O U R S T O R M  
 R u n o f f H y d r o g r a p h  
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Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0003	0.04	Q				
0+10	0.0015	0.18	Q				
0+15	0.0030	0.21	Q				
0+20	0.0045	0.22	Q				
0+25	0.0060	0.22	Q				
0+30	0.0075	0.22	Q				
0+35	0.0090	0.22	Q				
0+40	0.0105	0.22	Q				
0+45	0.0121	0.22	Q				
0+50	0.0136	0.22	Q				

Post100yr

0+55	0.0151	0.22	Q
1+ 0	0.0167	0.22	Q
1+ 5	0.0182	0.23	Q
1+10	0.0198	0.23	Q
1+15	0.0214	0.23	Q
1+20	0.0229	0.23	Q
1+25	0.0245	0.23	Q
1+30	0.0261	0.23	QV
1+35	0.0276	0.23	QV
1+40	0.0292	0.23	QV
1+45	0.0308	0.23	QV
1+50	0.0324	0.23	QV
1+55	0.0340	0.23	QV
2+ 0	0.0356	0.23	QV
2+ 5	0.0372	0.23	QV
2+10	0.0388	0.23	QV
2+15	0.0405	0.24	QV
2+20	0.0421	0.24	QV
2+25	0.0437	0.24	QV
2+30	0.0454	0.24	QV
2+35	0.0470	0.24	QV
2+40	0.0487	0.24	QV
2+45	0.0503	0.24	Q V
2+50	0.0520	0.24	Q V
2+55	0.0536	0.24	Q V
3+ 0	0.0553	0.24	Q V
3+ 5	0.0570	0.24	Q V
3+10	0.0587	0.24	Q V
3+15	0.0604	0.25	Q V
3+20	0.0621	0.25	Q V
3+25	0.0638	0.25	Q V
3+30	0.0655	0.25	Q V
3+35	0.0672	0.25	Q V
3+40	0.0689	0.25	QV
3+45	0.0707	0.25	QV
3+50	0.0724	0.25	QV
3+55	0.0741	0.25	QV
4+ 0	0.0759	0.25	Q V
4+ 5	0.0776	0.25	Q V
4+10	0.0794	0.26	Q V
4+15	0.0812	0.26	Q V
4+20	0.0830	0.26	Q V
4+25	0.0847	0.26	Q V
4+30	0.0865	0.26	Q V
4+35	0.0883	0.26	Q V
4+40	0.0901	0.26	Q V
4+45	0.0919	0.26	Q V
4+50	0.0938	0.26	Q V

Post100yr

4+55	0.0956	0.27	Q V			
5+ 0	0.0974	0.27	Q V			
5+ 5	0.0993	0.27	Q V			
5+10	0.1011	0.27	Q V			
5+15	0.1030	0.27	Q V			
5+20	0.1049	0.27	Q V			
5+25	0.1067	0.27	Q V			
5+30	0.1086	0.27	Q V			
5+35	0.1105	0.27	Q V			
5+40	0.1124	0.28	Q V			
5+45	0.1143	0.28	Q V			
5+50	0.1162	0.28	Q V			
5+55	0.1182	0.28	Q V			
6+ 0	0.1201	0.28	Q V			
6+ 5	0.1220	0.28	Q V			
6+10	0.1240	0.28	Q V			
6+15	0.1260	0.29	Q V			
6+20	0.1279	0.29	Q V			
6+25	0.1299	0.29	Q V			
6+30	0.1319	0.29	Q V			
6+35	0.1339	0.29	Q V			
6+40	0.1359	0.29	Q V			
6+45	0.1379	0.29	Q V			
6+50	0.1400	0.30	Q V			
6+55	0.1420	0.30	Q V			
7+ 0	0.1441	0.30	Q V			
7+ 5	0.1461	0.30	Q V			
7+10	0.1482	0.30	Q V			
7+15	0.1503	0.30	Q V			
7+20	0.1524	0.30	Q V			
7+25	0.1545	0.31	Q V			
7+30	0.1566	0.31	Q V			
7+35	0.1587	0.31	Q V			
7+40	0.1609	0.31	Q V			
7+45	0.1630	0.31	Q V			
7+50	0.1652	0.31	Q V			
7+55	0.1674	0.32	Q V			
8+ 0	0.1696	0.32	Q V			
8+ 5	0.1718	0.32	Q V			
8+10	0.1740	0.32	Q V			
8+15	0.1762	0.32	Q V			
8+20	0.1785	0.33	Q V			
8+25	0.1807	0.33	Q V			
8+30	0.1830	0.33	Q V			
8+35	0.1853	0.33	Q V			
8+40	0.1876	0.33	Q V			
8+45	0.1899	0.34	Q V			
8+50	0.1922	0.34	Q V			

				Post100yr		
8+55	0.1946	0.34	Q	V		
9+ 0	0.1969	0.34	Q	V		
9+ 5	0.1993	0.34	Q	V		
9+10	0.2017	0.35	Q	V		
9+15	0.2041	0.35	Q	V		
9+20	0.2065	0.35	Q	V		
9+25	0.2089	0.35	Q	V		
9+30	0.2114	0.36	Q	V		
9+35	0.2139	0.36	Q	V		
9+40	0.2164	0.36	Q	V		
9+45	0.2189	0.36	Q	V		
9+50	0.2214	0.37	Q	V		
9+55	0.2240	0.37	Q	V		
10+ 0	0.2265	0.37	Q	V		
10+ 5	0.2291	0.38	Q	V		
10+10	0.2317	0.38	Q	V		
10+15	0.2343	0.38	Q	V		
10+20	0.2370	0.38	Q	V		
10+25	0.2397	0.39	Q	V		
10+30	0.2423	0.39	Q	V		
10+35	0.2451	0.39	Q	V		
10+40	0.2478	0.40	Q	V		
10+45	0.2506	0.40	Q	V		
10+50	0.2533	0.40	Q	V		
10+55	0.2562	0.41	Q	V		
11+ 0	0.2590	0.41	Q	V		
11+ 5	0.2619	0.42	Q	V		
11+10	0.2647	0.42	Q	V		
11+15	0.2677	0.42	Q	V		
11+20	0.2706	0.43	Q	V		
11+25	0.2736	0.43	Q	V		
11+30	0.2766	0.44	Q	V		
11+35	0.2796	0.44	Q	V		
11+40	0.2827	0.45	Q	V		
11+45	0.2858	0.45	Q	V		
11+50	0.2889	0.46	Q	V		
11+55	0.2921	0.46	Q	V		
12+ 0	0.2953	0.47	Q	V		
12+ 5	0.2986	0.48	Q	V		
12+10	0.3021	0.51	Q	V		
12+15	0.3057	0.53	Q	V		
12+20	0.3094	0.53	Q	V		
12+25	0.3131	0.54	Q	V		
12+30	0.3169	0.55	Q	V		
12+35	0.3207	0.55	Q	V		
12+40	0.3245	0.56	Q	V		
12+45	0.3284	0.57	Q	V		
12+50	0.3324	0.57	Q	V		

				Post100yr			
12+55	0.3364	0.58	Q	V			
13+ 0	0.3404	0.59	Q	V			
13+ 5	0.3446	0.60	Q	V			
13+10	0.3488	0.61	Q	V			
13+15	0.3530	0.62	Q	V			
13+20	0.3573	0.63	Q	V			
13+25	0.3617	0.64	Q	V			
13+30	0.3662	0.65	Q	V			
13+35	0.3708	0.66	Q	V			
13+40	0.3754	0.67	Q	V			
13+45	0.3801	0.68	Q	V			
13+50	0.3849	0.70	Q	V			
13+55	0.3898	0.71	Q	V			
14+ 0	0.3948	0.73	Q	V			
14+ 5	0.3999	0.74	Q	V			
14+10	0.4052	0.76	Q	V			
14+15	0.4105	0.78	Q	V			
14+20	0.4160	0.80	Q	V			
14+25	0.4217	0.82	Q	V			
14+30	0.4274	0.84	Q	V			
14+35	0.4334	0.86	Q	V			
14+40	0.4395	0.89	Q	V			
14+45	0.4458	0.92	Q	V			
14+50	0.4524	0.95	Q	V			
14+55	0.4591	0.98	Q	V			
15+ 0	0.4662	1.02	Q	V			
15+ 5	0.4734	1.06	Q	V			
15+10	0.4811	1.11	Q	V			
15+15	0.4891	1.16	Q	V			
15+20	0.4976	1.23	Q	V			
15+25	0.5062	1.25	Q	V			
15+30	0.5145	1.20	Q	V			
15+35	0.5231	1.26	Q	V			
15+40	0.5327	1.39	Q	V			
15+45	0.5434	1.55	Q	V			
15+50	0.5559	1.82	Q	V			
15+55	0.5710	2.19	Q	V			
16+ 0	0.5917	3.01		Q			
16+ 5	0.6294	5.46		Q	V		
16+10	0.6937	9.34			V		Q
16+15	0.7223	4.16		Q	V		
16+20	0.7358	1.95	Q		V		
16+25	0.7454	1.40	Q		V		
16+30	0.7545	1.31	Q		V		
16+35	0.7627	1.20	Q		V		
16+40	0.7703	1.09	Q		V		
16+45	0.7772	1.01	Q		V		
16+50	0.7837	0.94	Q		V		

				Post100yr	
16+55	0.7897	0.88	Q		V
17+ 0	0.7954	0.83	Q		V
17+ 5	0.8009	0.79	Q		V
17+10	0.8061	0.75	Q		V
17+15	0.8110	0.72	Q		V
17+20	0.8158	0.69	Q		V
17+25	0.8204	0.67	Q		V
17+30	0.8249	0.64	Q		V
17+35	0.8292	0.62	Q		V
17+40	0.8333	0.60	Q		V
17+45	0.8374	0.59	Q		V
17+50	0.8413	0.57	Q		V
17+55	0.8451	0.56	Q		V
18+ 0	0.8489	0.54	Q		V
18+ 5	0.8525	0.52	Q		V
18+10	0.8558	0.48	Q		V
18+15	0.8590	0.46	Q		V
18+20	0.8621	0.45	Q		V
18+25	0.8652	0.44	Q		V
18+30	0.8682	0.43	Q		V
18+35	0.8711	0.43	Q		V
18+40	0.8740	0.42	Q		V
18+45	0.8768	0.41	Q		V
18+50	0.8796	0.40	Q		V
18+55	0.8823	0.40	Q		V
19+ 0	0.8850	0.39	Q		V
19+ 5	0.8876	0.38	Q		V
19+10	0.8902	0.38	Q		V
19+15	0.8928	0.37	Q		V
19+20	0.8953	0.37	Q		V
19+25	0.8978	0.36	Q		V
19+30	0.9002	0.36	Q		V
19+35	0.9027	0.35	Q		V
19+40	0.9050	0.35	Q		V
19+45	0.9074	0.34	Q		V
19+50	0.9097	0.34	Q		V
19+55	0.9120	0.33	Q		V
20+ 0	0.9143	0.33	Q		V
20+ 5	0.9165	0.32	Q		V
20+10	0.9187	0.32	Q		V
20+15	0.9209	0.32	Q		V
20+20	0.9231	0.31	Q		V
20+25	0.9252	0.31	Q		V
20+30	0.9273	0.31	Q		V
20+35	0.9294	0.30	Q		V
20+40	0.9315	0.30	Q		V
20+45	0.9335	0.30	Q		V
20+50	0.9356	0.29	Q		V



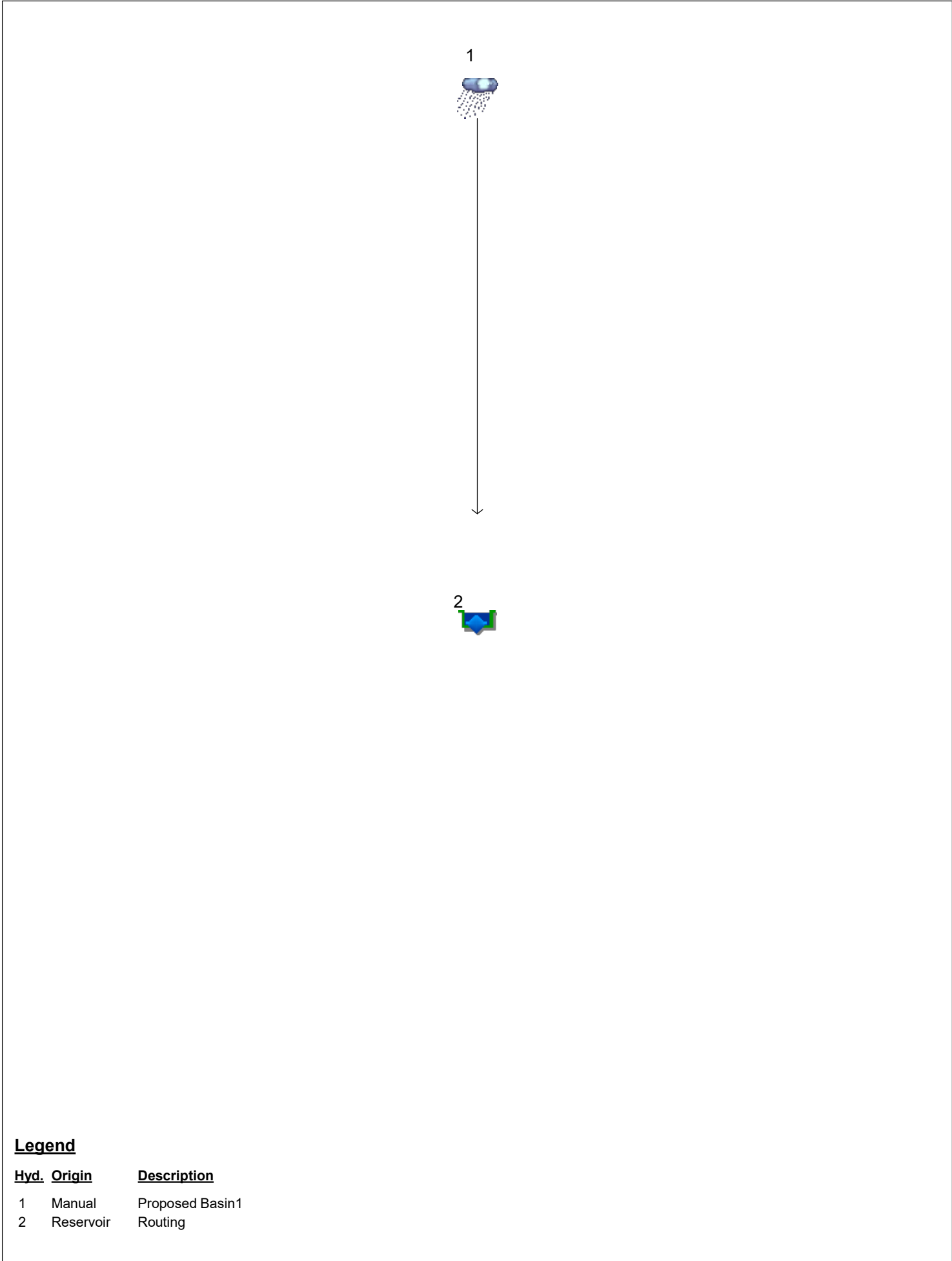
				Post100yr		
20+55	0.9376	0.29	Q			V
21+ 0	0.9396	0.29	Q			V
21+ 5	0.9415	0.29	Q			V
21+10	0.9435	0.28	Q			V
21+15	0.9454	0.28	Q			V
21+20	0.9473	0.28	Q			V
21+25	0.9492	0.28	Q			V
21+30	0.9511	0.27	Q			V
21+35	0.9530	0.27	Q			V
21+40	0.9548	0.27	Q			V
21+45	0.9566	0.27	Q			V
21+50	0.9585	0.26	Q			V
21+55	0.9603	0.26	Q			V
22+ 0	0.9621	0.26	Q			V
22+ 5	0.9638	0.26	Q			V
22+10	0.9656	0.26	Q			V
22+15	0.9673	0.25	Q			V
22+20	0.9691	0.25	Q			V
22+25	0.9708	0.25	Q			V
22+30	0.9725	0.25	Q			V
22+35	0.9742	0.25	Q			V
22+40	0.9759	0.24	Q			V
22+45	0.9775	0.24	Q			V
22+50	0.9792	0.24	Q			V
22+55	0.9809	0.24	Q			V
23+ 0	0.9825	0.24	Q			V
23+ 5	0.9841	0.24	Q			V
23+10	0.9857	0.23	Q			V
23+15	0.9873	0.23	Q			V
23+20	0.9889	0.23	Q			V
23+25	0.9905	0.23	Q			V
23+30	0.9921	0.23	Q			V
23+35	0.9936	0.23	Q			V
23+40	0.9952	0.23	Q			V
23+45	0.9967	0.22	Q			V
23+50	0.9983	0.22	Q			V
23+55	0.9998	0.22	Q			V
24+ 0	1.0013	0.22	Q			V
24+ 5	1.0026	0.18	Q			V
24+10	1.0028	0.04	Q			V
24+15	1.0029	0.00	Q			V

***APPENDIX E***

Hydraflow Hydrographs Report

# Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021



**Legend**

<u>Hyd. Origin</u>	<u>Description</u>
1 Manual	Proposed Basin1
2 Reservoir	Routing

# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	5.770	5	965	26,778	-----	-----	-----	Proposed Basin1
2	Reservoir	0.000	5	700	0	1	993.55	7,100	Routing
Stormtech.gpw					Return Period: 10 Year			Monday, 09 / 14 / 2020	

# Hydrograph Report

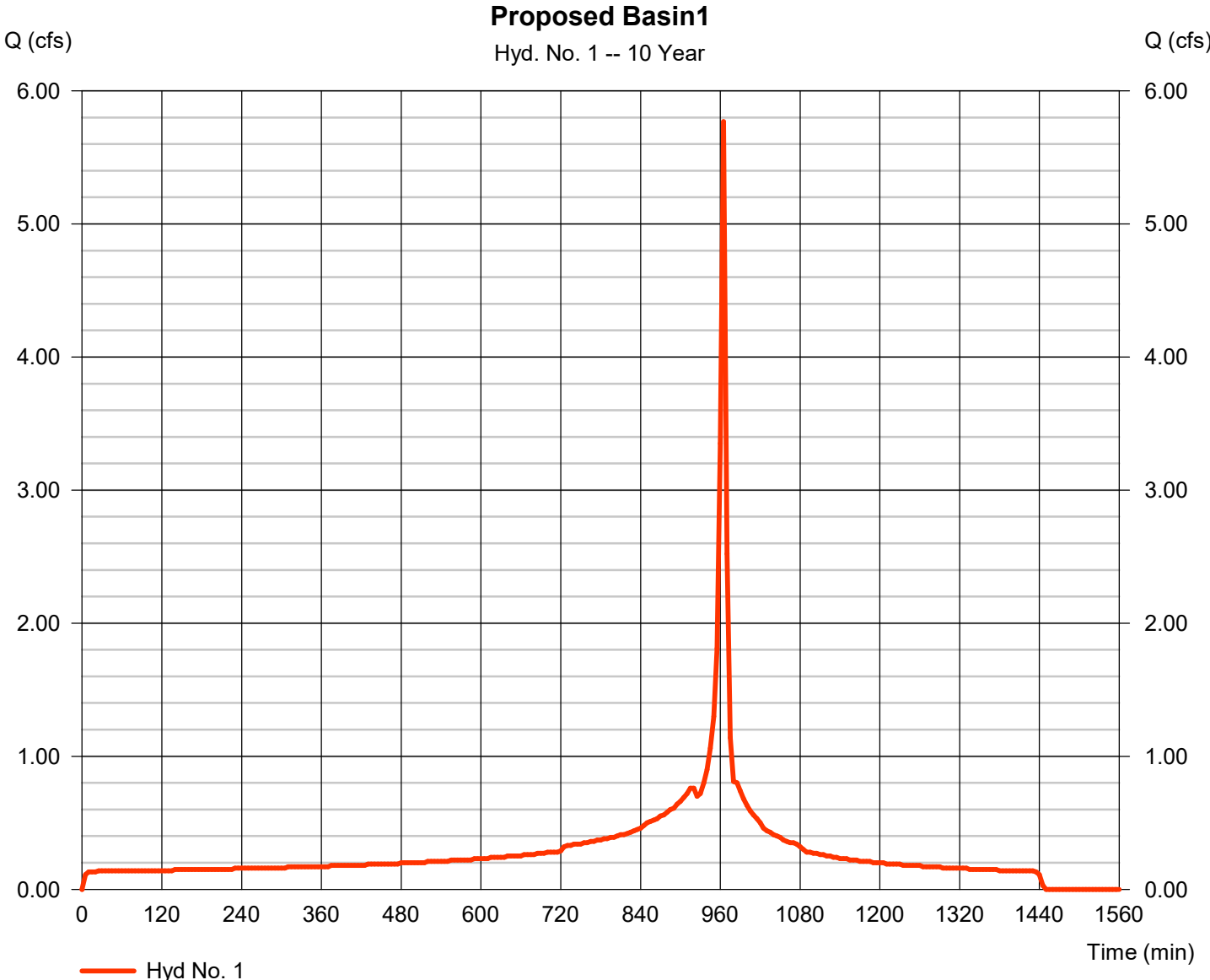
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Monday, 09 / 14 / 2020

## Hyd. No. 1

Proposed Basin1

Hydrograph type	= Manual	Peak discharge	= 5.770 cfs
Storm frequency	= 10 yrs	Time to peak	= 965 min
Time interval	= 5 min	Hyd. volume	= 26,778 cuft



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

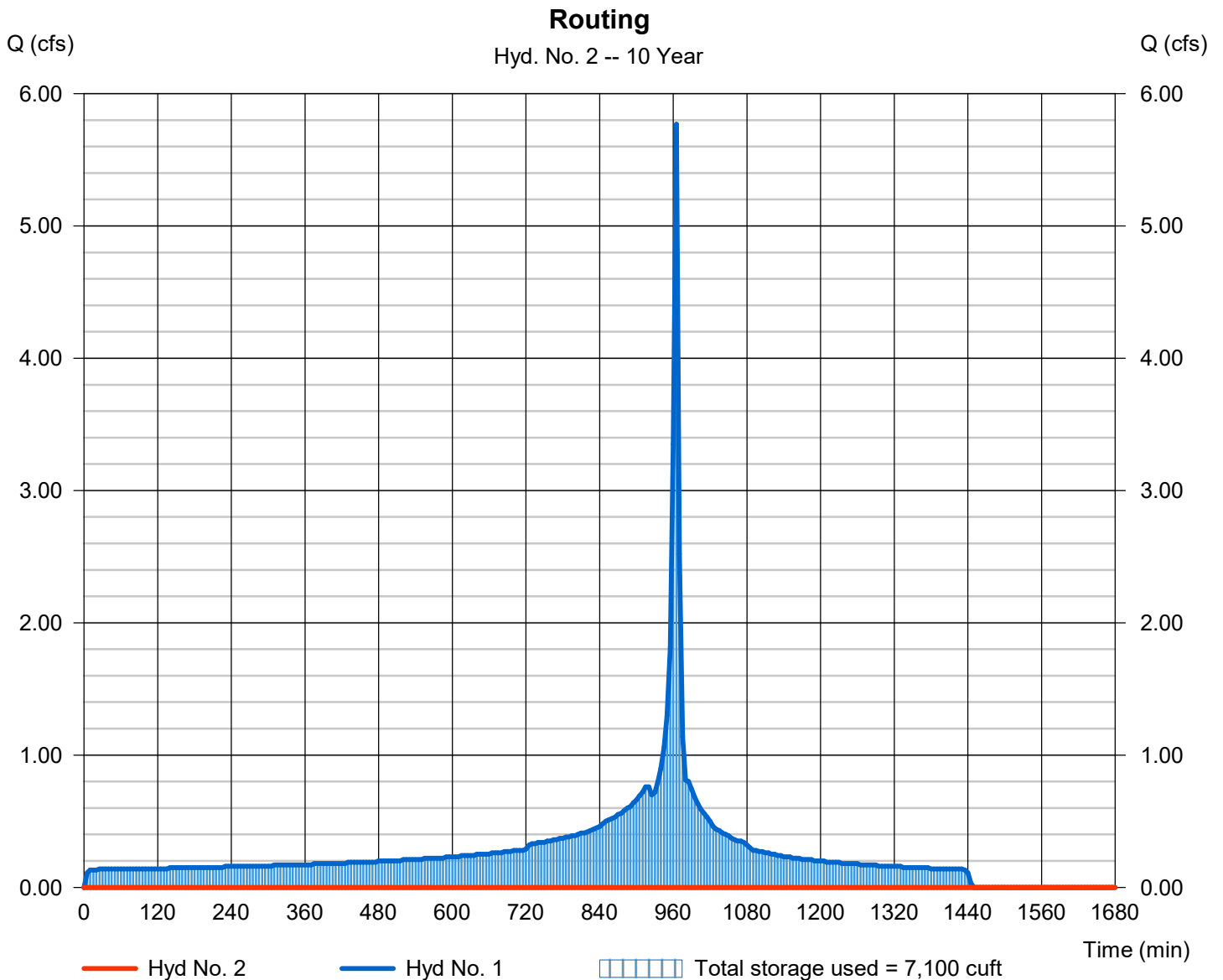
Monday, 09 / 14 / 2020

## Hyd. No. 2

### Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= 700 min
Time interval	= 5 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - Proposed Basin1	Max. Elevation	= 993.55 ft
Reservoir name	= MC-3500	Max. Storage	= 7,100 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



## Pond No. 1 - MC-3500

### Pond Data

**UG Chambers** -Invert elev. = 994.25 ft, Rise x Span = 3.25 x 5.95 ft, Barrel Len = 123.15 ft, No. Barrels = 4, Slope = 0.00%, Headers = No  
**Encasement** -Invert elev. = 993.50 ft, Width = 7.10 ft, Height = 5.50 ft, Voids = 40.00%

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	993.50	n/a	0	0
0.55	994.05	n/a	770	770
1.10	994.60	n/a	1,384	2,154
1.65	995.15	n/a	1,718	3,871
2.20	995.70	n/a	1,670	5,542
2.75	996.25	n/a	1,588	7,129
3.30	996.80	n/a	1,457	8,586
3.85	997.35	n/a	1,238	9,824
4.40	997.90	n/a	823	10,647
4.95	998.45	n/a	770	11,416
5.50	999.00	n/a	770	12,186

### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 3.50	0.00	0.00	0.00
Span (in)	= 60.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 998.30	0.00	0.00	0.00
Length (ft)	= 13.00	0.00	0.00	0.00
Slope (%)	= 1.10	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

### Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 4.500 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

### Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	993.50	0.00	---	---	---	---	---	---	---	0.000	---	0.000
0.55	770	994.05	0.00	---	---	---	---	---	---	---	0.364	---	0.364
1.10	2,154	994.60	0.00	---	---	---	---	---	---	---	0.364	---	0.364
1.65	3,871	995.15	0.00	---	---	---	---	---	---	---	0.364	---	0.364
2.20	5,542	995.70	0.00	---	---	---	---	---	---	---	0.364	---	0.364
2.75	7,129	996.25	0.00	---	---	---	---	---	---	---	0.364	---	0.364
3.30	8,586	996.80	0.00	---	---	---	---	---	---	---	0.364	---	0.364
3.85	9,824	997.35	0.00	---	---	---	---	---	---	---	0.364	---	0.364
4.40	10,647	997.90	0.00	---	---	---	---	---	---	---	0.364	---	0.364
4.95	11,416	998.45	0.99 ic	---	---	---	---	---	---	---	0.364	---	1.354
5.50	12,186	999.00	5.23 ic	---	---	---	---	---	---	---	0.364	---	5.592

# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	9.340	5	965	43,674	-----	-----	-----	Proposed Basin1
2	Reservoir	5.109	5	970	5,779	1	998.98	12,151	Routing
Stormtech.gpw					Return Period: 100 Year			Monday, 09 / 14 / 2020	



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

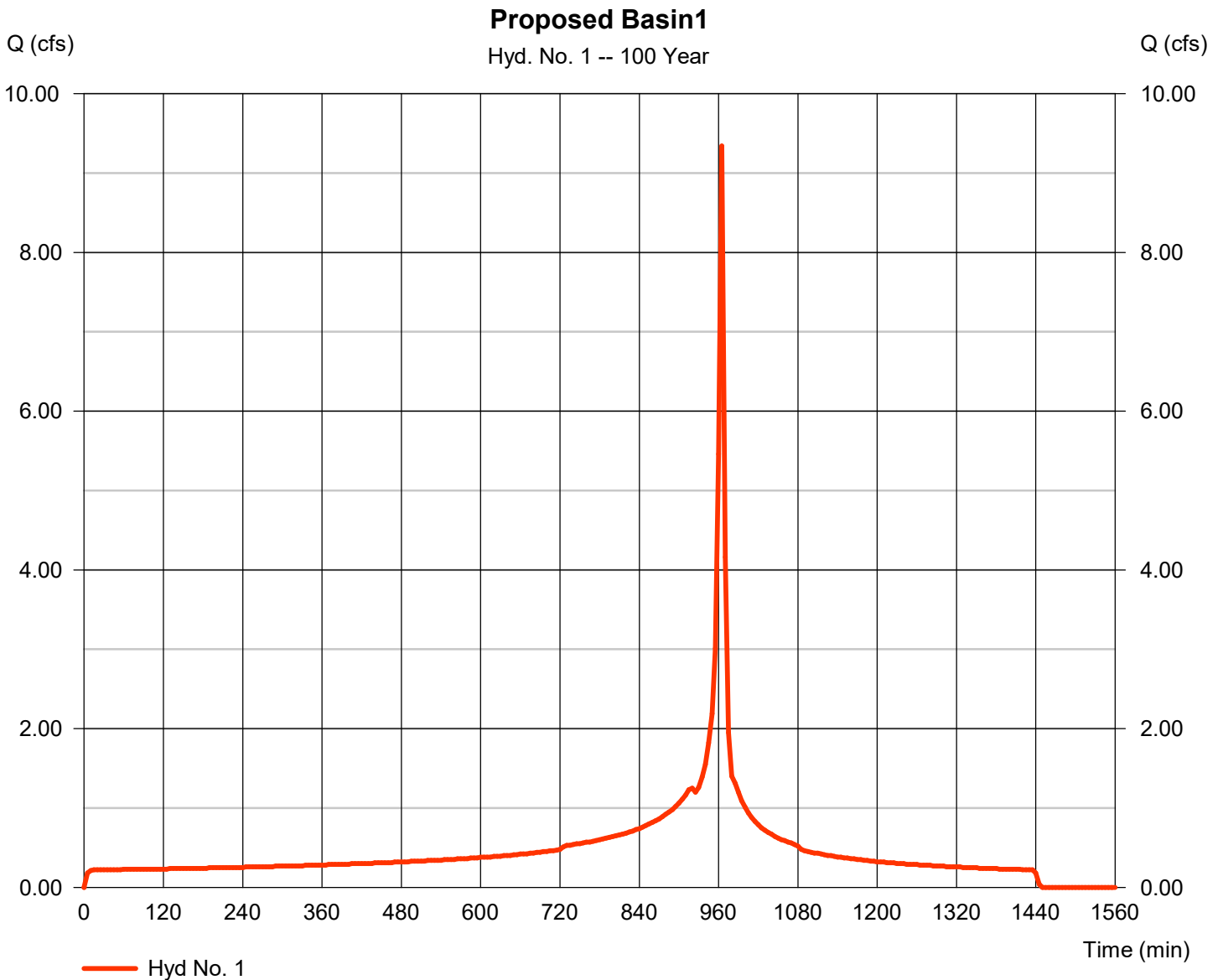
Monday, 09 / 14 / 2020

## Hyd. No. 1

Proposed Basin1

Hydrograph type = Manual  
Storm frequency = 100 yrs  
Time interval = 5 min

Peak discharge = 9.340 cfs  
Time to peak = 965 min  
Hyd. volume = 43,674 cuft



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

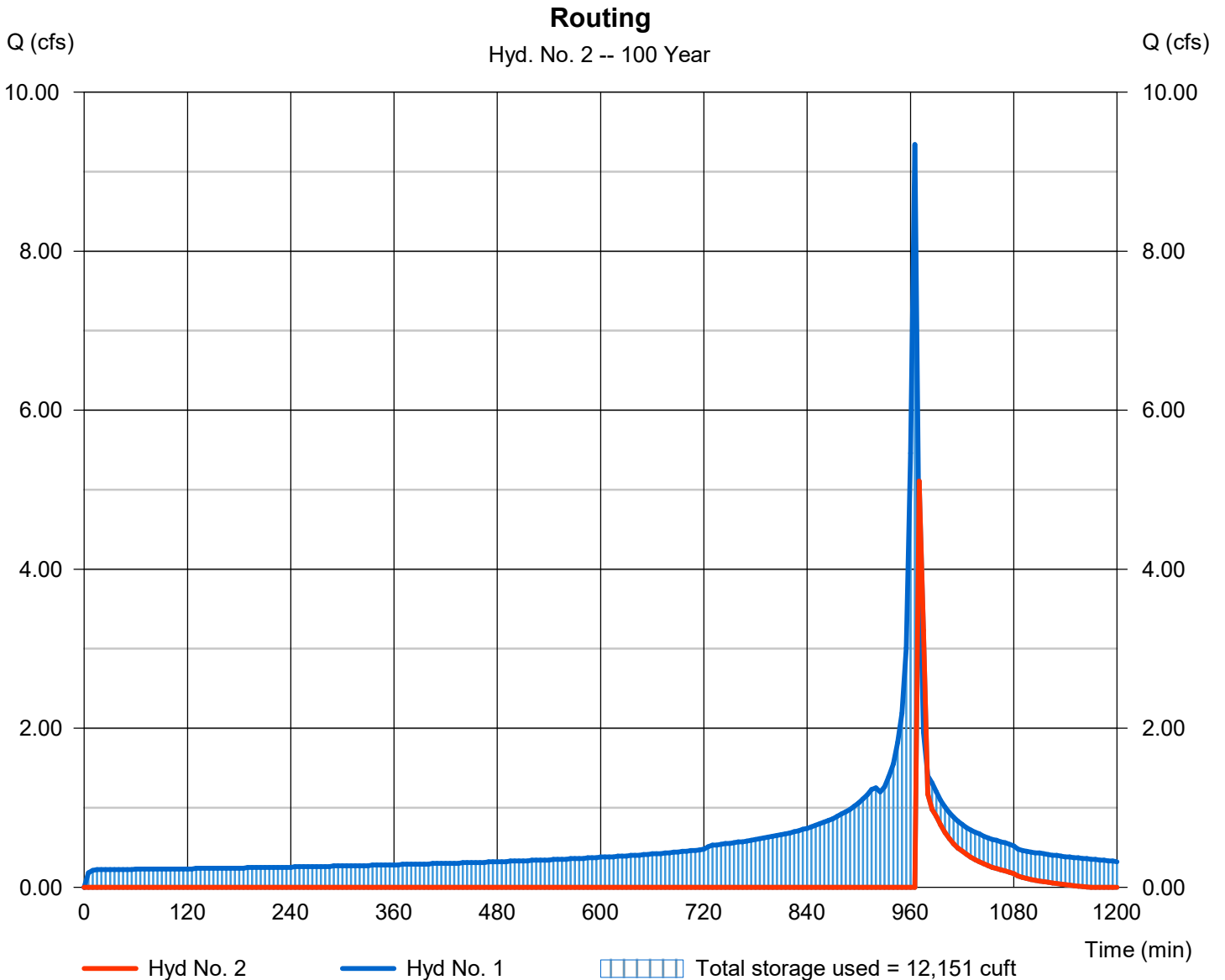
Monday, 09 / 14 / 2020

## Hyd. No. 2

### Routing

Hydrograph type	= Reservoir	Peak discharge	= 5.109 cfs
Storm frequency	= 100 yrs	Time to peak	= 970 min
Time interval	= 5 min	Hyd. volume	= 5,779 cuft
Inflow hyd. No.	= 1 - Proposed Basin1	Max. Elevation	= 998.98 ft
Reservoir name	= MC-3500	Max. Storage	= 12,151 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



<b>Watershed Model Schematic.....</b>	<b>1</b>
<b>10 - Year</b>	
<b>Summary Report.....</b>	<b>2</b>
<b>Hydrograph Reports.....</b>	<b>3</b>
Hydrograph No. 1, Manual, Proposed Basin1.....	3
Hydrograph No. 2, Reservoir, Routing.....	4
Pond Report - MC-3500.....	5
<b>100 - Year</b>	
<b>Summary Report.....</b>	<b>6</b>
<b>Hydrograph Reports.....</b>	<b>7</b>
Hydrograph No. 1, Manual, Proposed Basin1.....	7
Hydrograph No. 2, Reservoir, Routing.....	8

***APPENDIX F***

Existing Hydrology Map – Rational Method  
Post-developed Hydrology Map – Rational Method  
Post-developed Hydrology Map – Synthetic Unit Hydrograph  
Method

CEDAR AVENUE



**ABBREVIATIONS:**

- FL - FLOWLINE
- FG - FINISHED GROUND
- GFF - GARAGE FINISHED FLOOR
- FFE - FINISHED FLOOR ELEVATION

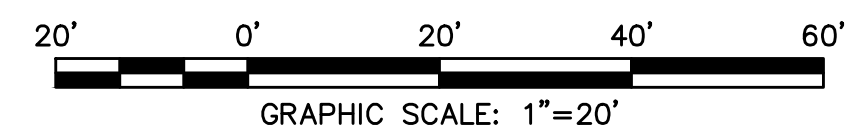
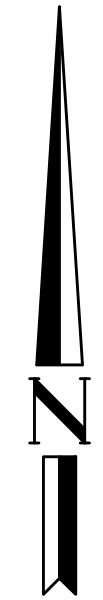
**LEGEND:**

- DRAINAGE SUBAREA BOUNDARY
- DRAINAGE FLOW PATH
- DRAINAGE AREA NUMBER

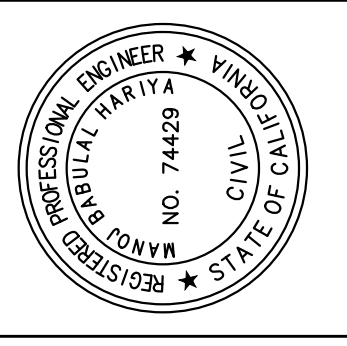
SUMMARY						
DRAINAGE AREA NO	TOTAL (ACRE)	IMPERVIOUS (ACRE)	PERMEABLE (ACRE)	IMPERVIOUS (%)	FLOW PATH (FT)	SLOPE (%)
1	2.246	0.00	2.246	0.00	408	2.14

$Q_{10} = 3.01$  CFS  
 $Q_{100} = 6.09$  CFS  
 998.25 FL

PRE-DEVELOPED HYDROLOGY MAP-RATIONAL METHOD  
 SCALE 1" = 20'



PREPARED BY:  
**HARIYA INC**  
 26121 Wallack Place  
 Loma Linda, CA 92354  
 (909) 499-8270  
 MANOJ HARIYA  
 R.C.E. 74429  
 DATE



NO.	REVISION	DATE

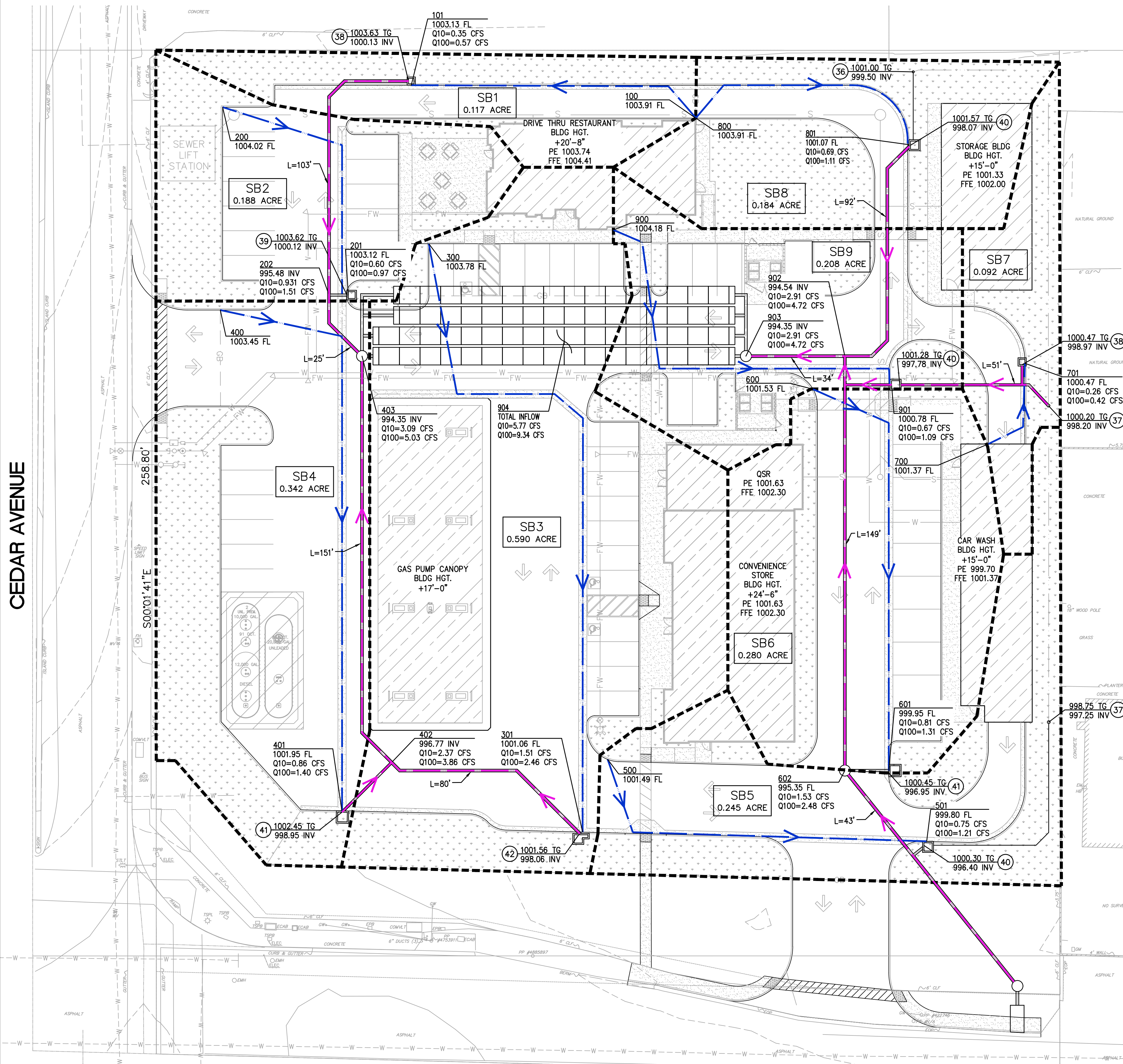
PROJECT: ARCO AM/PM - BLOOMINGTON  
 11279 CEDAR AVE  
 BLOOMINGTON, CA 92316  
 DRAWING NAME: PRE-DEVELOPED HYDROLOGY MAP  
 RATIONAL METHOD

ISSUE:	HME
DATE:	14/09/2020
CHECKED: DA	DRAWN: PS
DRAWING FILE: 19-029 HME	
PROJECT NO.: 19-029	
SHEET NUMBER:	
01	OF 03 SHEETS
SCALE: AS SHOWN	

EXTERNAL REFERENCES: 19-029 BDRY - CEDAR - TOPO Contour  
 FILENAME: C:\Project\19-029 Geot Station BLOOMINGTON\19-029 PG.HME.dwg, LAST SAVED ON: Sep 14 2020 7:00pm PLOTTED BY: SANTOSH KARNALE, ON: Sep 14 2020 7:11pm, CFC:



CEDAR AVENUE



JURUPA AVENUE

POST-DEVELOPED HYDROLOGY MAP  
RATIONAL METHOD  
SCALE 1" = 20'

**STORM DRAIN CONSTRUCTION NOTES**

- 36—INSTALL 9" ATRIUM GRATE INLET
- 37—INSTALL 12" ATRIUM GRATE INLET
- 38—INSTALL 2' CURB INLET WITH FLOGARD FILTER
- 39—INSTALL 2.5' CURB INLET WITH FLOGARD FILTER
- 40—INSTALL 3' CURB INLET WITH FLOGARD FILTER
- 41—INSTALL 3.5' CURB INLET WITH FLOGARD FILTER
- 42—INSTALL 6' CURB INLET WITH FLOGARD FILTER

**NOTE:**  
FLOW RATES ARE DETERMINED USING RATIONAL METHOD IN CONFORMANCE WITH SAN BERNARDINO COUNTY HYDROLOGY MANUAL

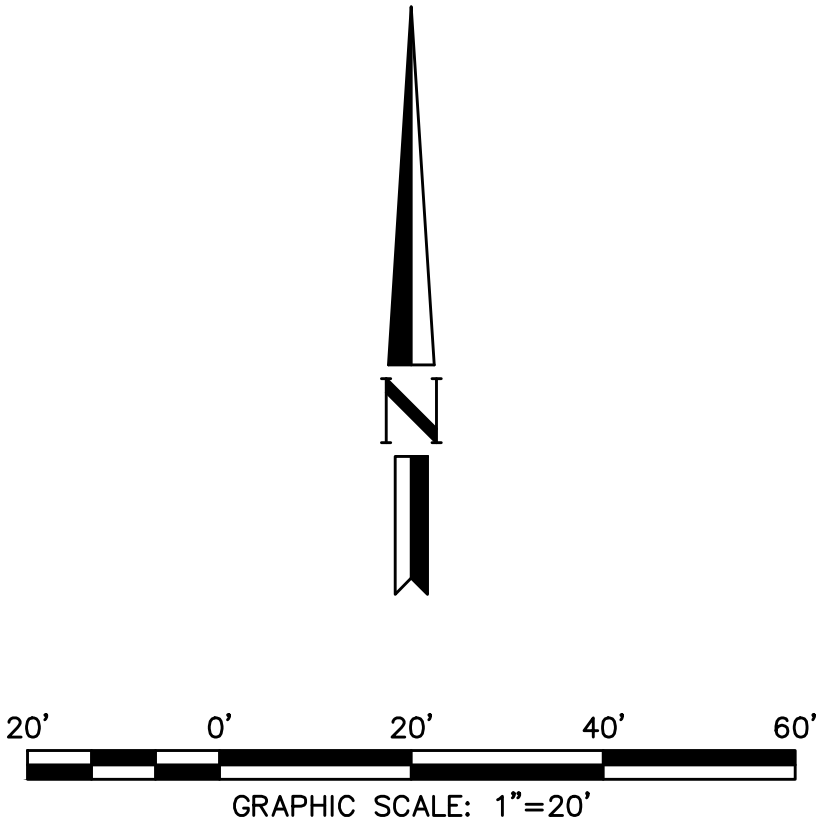
**ABBREVIATIONS:**

- FL — FLOWLINE
- FG — FINISHED GROUND
- FFE — FINISHED FLOOR ELEVATION
- S — SLOPE

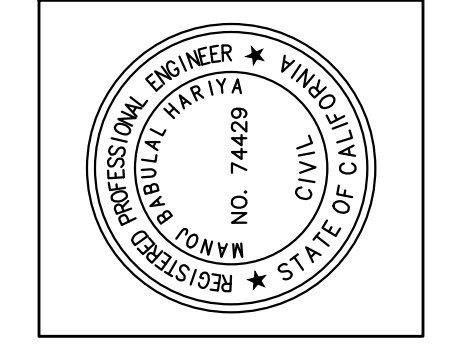
**LEGEND:**

- XXX — TRIBUTARY SUB-AREA NODE NUMBER
- XXXX.XX FL — FLOW LINE
- Q10=X.XX CFS — 10-YEAR FLOW RATE
- Q100=X.XX CFS — 100-YEAR FLOW RATE
- DRAINAGE SUBAREA BOUNDARY
- SURFACE FLOW PATH
- PIPE FLOW PATH
- SBX — DRAINAGE AREA SUB-BASIN NUMBER
- X.XXX ACRE — SUB-BASIN AREA IN ACERS

SUB BASIN	AREA (ACRE)	FLOW PATH (FT)	SLOPE (%)	IMPERVIOUS (%)	Q100 CFS	INLET TYPE	CAPACITY OF INLET (CFS)	REMARK
SB1	0.117	109	0.71	57.02	0.57	2' FLOGARD CURB INLET	0.75	INLET CAPACITY IS MORE THAN Q100 CFS, SO ITS OK
SB2	0.188	100	0.90	68.28	0.97	2.5' FLOGARD CURB INLET	1.00	INLET CAPACITY IS MORE THAN Q100 CFS, SO ITS OK
SB3	0.590	256	1.06	91.20	2.46	6' FLOGARD CURB INLET	2.51	INLET CAPACITY IS MORE THAN Q100 CFS, SO ITS OK
SB4	0.342	219	0.68	68.82	1.40	3.5' FLOGARD CURB INLET	1.50	INLET CAPACITY IS MORE THAN Q100 CFS, SO ITS OK
SB5	0.245	136	1.25	52.72	1.21	3' FLOGARD CURB INLET	1.25	INLET CAPACITY IS MORE THAN Q100 CFS, SO ITS OK
SB6	0.280	157	1.01	88.49	1.31	3.5' FLOGARD CURB INLET	1.50	INLET CAPACITY IS MORE THAN Q100 CFS, SO ITS OK
SB7	0.092	136	2.41	55.55	0.42	2' FLOGARD CURB INLET	0.75	INLET CAPACITY IS MORE THAN Q100 CFS, SO ITS OK
SB8	0.184	95	2.97	48.35	1.11	3' FLOGARD CURB INLET	1.25	INLET CAPACITY IS MORE THAN Q100 CFS, SO ITS OK
SB9	0.208	147	2.46	83.41	1.09	3' FLOGARD CURB INLET	1.25	INLET CAPACITY IS MORE THAN Q100 CFS, SO ITS OK



PREPARED BY:  
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(909)499-8270  
MANOJ HARIYA  
R.C.E. 74429



NO.	REVISION	DATE

PROJECT: ARCO AM/PM - BLOOMINGTON  
11279 CEDAR AVE  
BLOOMINGTON, CA 92316  
DRAWING NAME: POST-DEVELOPED HYDROLOGY MAP  
RATIONAL METHOD

ISSUE: SB  
DATE: 14/09/2020  
CHECKED: DA DRAWN: PS  
DRAWING FILE: 19-029 SD  
PROJECT NO.: 19-029  
SHEET NUMBER:  
**02**  
OF 03 SHEETS  
SCALE: AS SHOWN

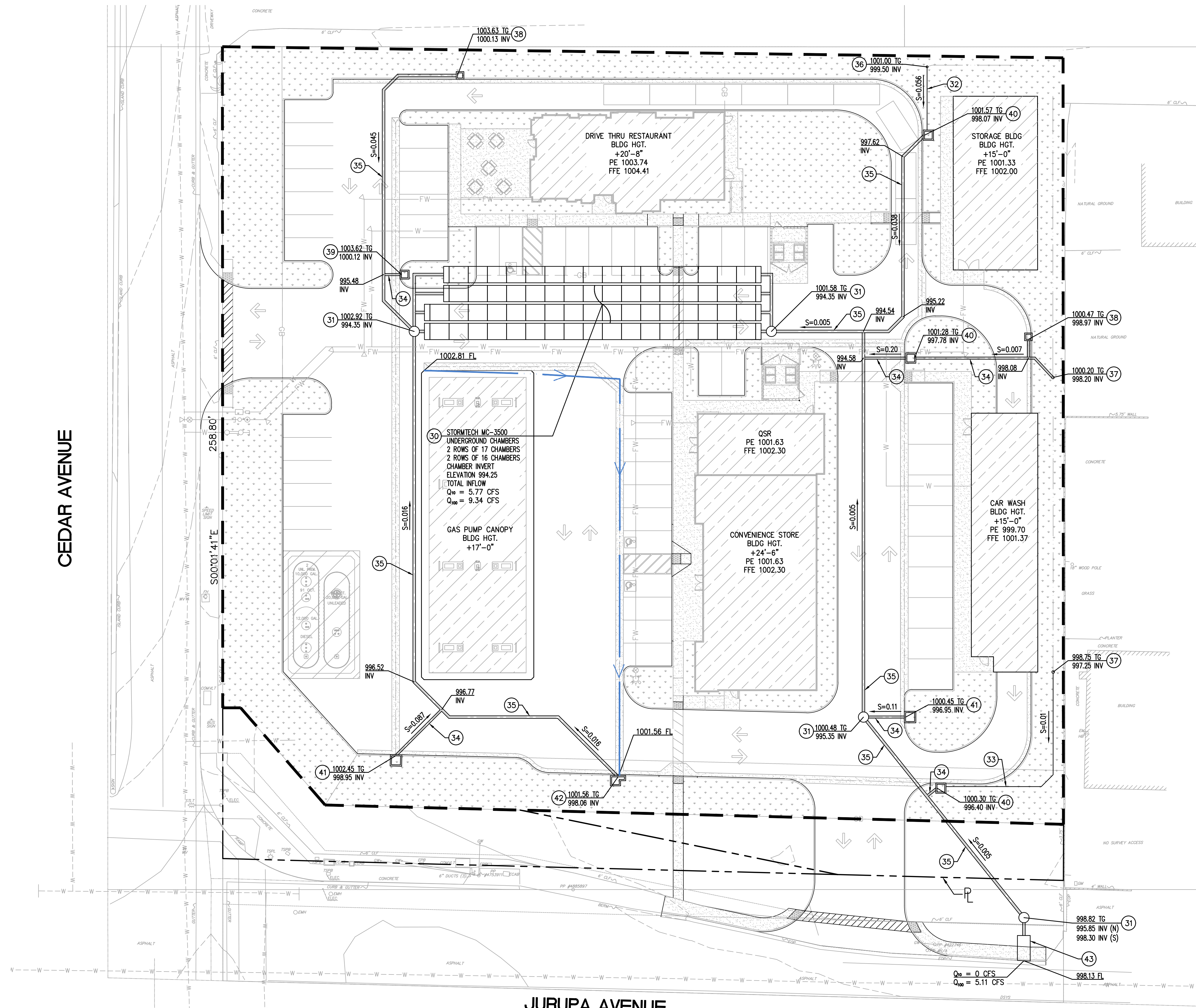
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CEDAR AVENUE

JURUPA AVENUE

POST-DEVELOPED HYDROLOGY MAP  
SYNTHETIC UNIT HYDROGRAPH METHOD  
SCALE 1" = 20'



- STORM DRAIN CONSTRUCTION NOTES**
- 30—INSTALL STORMTECH MC-3500 UNDERGROUND CHAMBER
  - 31—INSTALL 48" STORM DRAIN MANHOLE
  - 32—INSTALL 4" HDPE STORM DRAIN PIPE.
  - 33—INSTALL 6" HDPE STORM DRAIN PIPE.
  - 34—INSTALL 10" HDPE STORM DRAIN PIPE.
  - 35—INSTALL 12" HDPE STORM DRAIN PIPE.
  - 36—INSTALL 9" ATRIUM GRATE INLET
  - 37—INSTALL 12" ATRIUM GRATE INLET
  - 38—INSTALL 2' CURB INLET WITH FLOGARD FILTER
  - 39—INSTALL 2.5' CURB INLET WITH FLOGARD FILTER
  - 40—INSTALL 3' CURB INLET WITH FLOGARD FILTER
  - 41—INSTALL 3.5' CURB INLET WITH FLOGARD FILTER
  - 42—INSTALL 6' CURB INLET WITH FLOGARD FILTER
  - 43—INSTALL 3.5" X 60" PARKWAY DRAIN

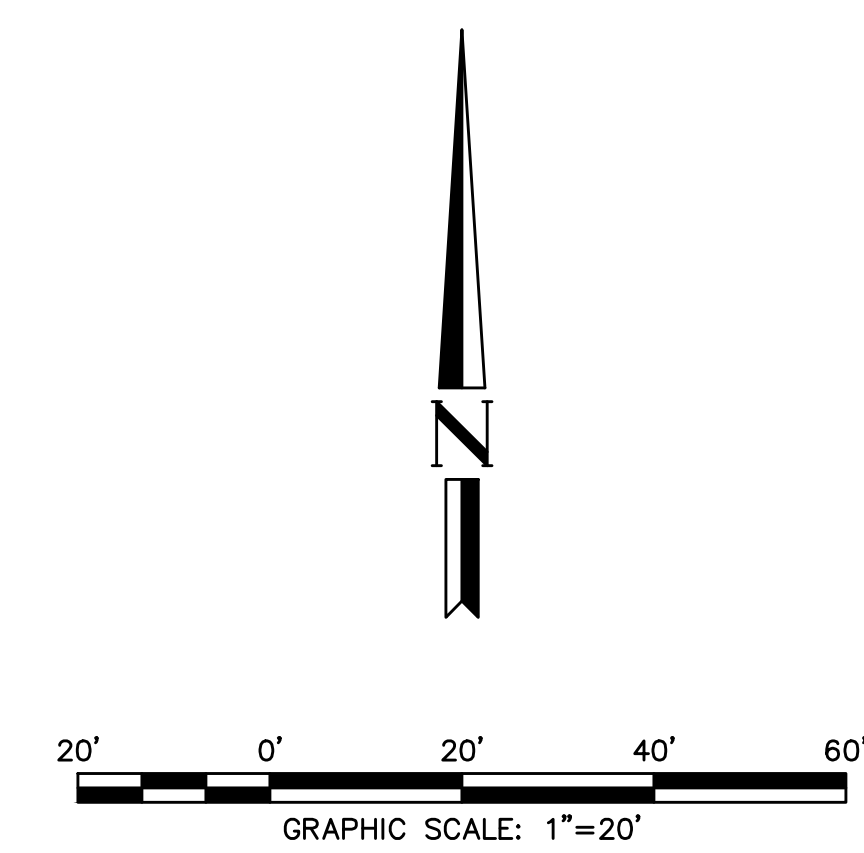
**ABBREVIATIONS:**  
 FL - FLOWLINE  
 FS - FINISHED SURFACE  
 PE - PAD ELEVATION

**LEGEND:**

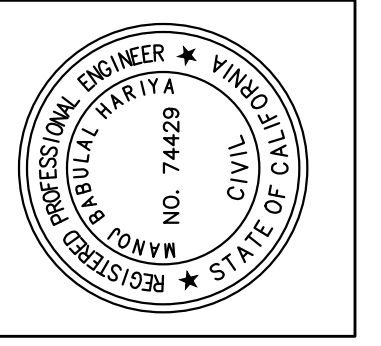
- DRAINAGE SUBAREA BOUNDARY
- SURFACE FLOW PATH
- DRAINAGE AREA NUMBER

**SUMMARY**

DRAINAGE AREA NO	TOTAL (ACRE)	IMPERVIOUS (ACRE)	PERMEABLE (ACRE)	IMPERVIOUS (%)	FLOW PATH (FT)	SLOPE (%)
1	2.246	1.646	0.600	73.28	232	0.54



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DATE



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DRAWING NAME: POST-DEVELOPED HYDROLOGY MAP  
SYNTHETIC UNIT HYDROGRAPH METHOD  
EXTERNAL REFERENCES: 19-029, 19-029, 11279 - CEDAR - UTILITY - Xref Contour - 11279 - CEDAR - SITE PLAN  
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 DATE: 14/09/2020  
 CHECKED: DA DRAWN: PS  
 DRAWING FILE: 19-029 SD  
 PROJECT NO.: 19-029  
 SHEET NUMBER:  
 03  
 OF 03 SHEETS  
 SCALE: AS SHOWN



## MC-3500 Site Calculator

### Project Information:

Project Name: Gas station Bloomington  
Location: Bloomington CA  
Date: 12-06-2020  
Engineer: Deepak  
StormTech RPM:

### System Requirements

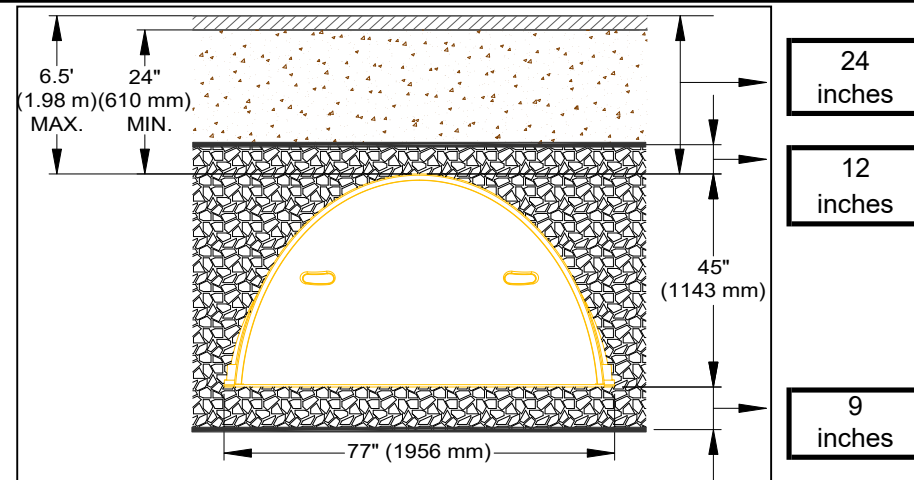
Units	Imperial	
Required Storage Volume	12100	CF
Stone Porosity (Industry Standard = 40%)	40	%
Stone Above Chambers (12 inch min.)	12	inches
Stone Foundation Depth (9 inch min.)	9	inches
Average Cover over Chambers (24 inch min.)	24	inches
Bed size controlled by WIDTH or LENGTH?	WIDTH	
Limiting WIDTH or LENGTH dimension	35	feet
Storage Volume per Chamber	178.9	CF
Storage Volume per End Cap	46.9	CF

### System Sizing

Number of Chambers Required	66	each
Number of End Caps Required	8	each
Bed Size (including perimeter stone)	3,685	square feet
Stone Required (including perimeter stone)	666	tons
Volume of Excavation	887	cubic yards
Non-woven Filter Fabric Required (20% Safety Factor)	1212	square yards
Length of Isolator Row	126.6	feet
Non-woven Isolator Row Fabric (20% Safety Factor)	219	square yards
Woven Isolator Row Fabric (20% Safety Factor)	279	square yards
Installed Storage Volume	12,183	cubic feet

### Controlled by Width (Rows)

Maximum Width =	35	feet
2 rows of	17	chambers
2 row of	16	chambers
Maximum Length =	126.6	feet
Maximum Width =	29.9	feet



\*This represents the estimated material and site work costs (US dollars) for the project. Materials excluded from this estimate are conveyance pipe, pavement design, etc. It is always advisable to seek detailed construction costs from local installers. Please contact STORMTECH at 888-892-2694 for additional cost information.