PRIORITY PROJECT
HYDROLOGY STUDY

FOR:
CORNERSTONE COMMUNITIES WOODWARD
APN No. 220-210-49
Woodward St, San Marcos, California

PREPARED FOR:
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Project No: 22-027

DATE PREPARED:
2/13/2023

DATE REVISED:
06/14/2023

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1.0 Project Description

1.1 Project Purpose

The objective of this study is to determine the amount of 100-year runoff that the existing site is generating right now and compare it to the 100 year runoff that the proposed project will be generating. We will also calculate adequacy of the proposed storm drain facilities and mitigation measures.

1.2 Project Proposed Facilities

The 8.57-acre project site is located Woodward Street in San Marcos, California. The site is currently undeveloped. The project site is face to Woodward Street to the east and bordered by East Mission Road to the north. The fill slopes have a gradient of about 2:1 (horizontal:vertical).

The project is proposing to build multifamily residential. As part of this project, associated improvements will include two biofiltration basins (BMP-A and BMP-B) located at the north and west edge of the project site, respectively. All necessary utilities (storm, sewer, water, etc.) will be installed as part of the project.

2.0 Vicinity Map

The project is located on the east side of Woodward Street and bounded by the East Mission Road to the north in San Marcos, California.

Fig. 1 Vicinity Map

3.0 Site Map

Please see Attachment 1 – Site Map

4.0 Description of Watershed

4.1 Existing Conditions Topography and Drainage Patterns

The existing project onsite is currently undeveloped. The project fronts onto Woodward Street and East Mission Road. The property drains primarily by overland flow to an existing storm drain system located at the southwest corner of the project site. According to the Web Soil Survey, the soil type in this project is Type C and Type D. The same runoff factors will be used for the overall project calculations.

The upper east side of the project site drains westerly to the existing 18 inches and 24 inches storm drain pipe then drains to poc-1, which is located at the southwest corner of the project site. The lower east side of the project site drains southerly to the existing 12 and 18 inches storm drain pipe then to poc-2, which is located at the southeast corner of the project site. At the north edge of the project site, surface runoff drains northerly to poc-3, which is located at the north west edge of the project site.

The **pre-development onsite** area is approximately 8.57 acre. The impervious square footage of the site was estimated based on aerial photography and detailed aerial topographic mapping to be approximately 0% of the site. From table 3-1 "RUNOFF COEFFICIENTS FOR URBAN AREAs", runoff coefficients for 0% impervious will be used in the pre-development runoff calculations.

A pre-developed drainage map can be found as Attachment 4 in this report.

4.2 Post Conditions Topography and Drainage Patterns

This project proposed to install residential houses. The project is proposed to build two biofiltration basins (BMP-A and BMP-B) for storm water quality, which located at the northeast corner and northwest edge of the project site, respectively, to incorporate the collection of storm water from the building and street and direct the storm water through storm water drainage pipes to POCs.

At the east side of the property, the project proposed to build brow ditch to direct surface flow northerly to the proposed 36 inches storage pipe 2 then follow the existing site slope drains to poc-3, which is located at the north edge along the Woodward Street of the project site. The middle part of the project site is proposed to build multifamily, park, and street improvement. The proposed impervious area routes surface runoff northerly through proposed storm drain storage pipe 1 then to BMP-A, which is located at northeast side of the project site. After runoff get treated in BMP-A, it outlets to a brow ditch down the slope to Woodward Street POC-1. The west part of the project site includes proposed graded slope, existing slope, and the proposed driveway. This part of the project drains surface flow southwesterly to poc-1. The rest of the project, the east part, routes stormwater southeasterly to existing 12 and 18 inches storm drain pipe then to poc-2, which is located at the southeast corner of the project site.

The average impervious square footage of the post-development condition was estimated based on aerial photography and detailed aerial topographic mapping. to be approximately

100%, 65%, and 0% of the site. From table 3-1 “RUNOFF COEFFICIENTS FOR URBAN AREAs”, runoff coefficient for 100%, 65%, and 0% impervious will be used in the post-development runoff calculations.

As calculated below and summarized further in section 6, the pre-development discharges a peak 100-year flow of 16.14 CFS to POC-1, 7.87 CFS to POC-2, and 2.17 CFS to POC-3. The project proposed post-development discharge a peak 100-year flow of 21.37 CFS to POC-1, 4.70 CFS to POC-2, and 3.61 CFS to POC-3, which need storage detention at POC-1 and POC-3 in post development. After mitigation, the peak 100-year flow of the post-development is 11.76 CFS at POC-1 and 2.05 CFS at POC-3. The northeast biofiltration basin (BMP-A) and storage pipe 1 perform peak flow detention purposes for POC-1, and the storage pipe 2 at the east side perform peak flow detention purposes for POC-3.

The mitigation for POC-1 has two parts. Part 1 is for flow being detained in storage pipe 1, part 2 is for flow after storage pipe 1 and being detained in BMP-A due to confluence. The final mitigated result for POC-1 is shown in part 2.

A post-developed drainage map can be found as Attachment 5 in this report.

4.3 Hydrologic Unit Contribution

The project site is located in Richland Hydrologic Sub Area of the San Marcos Hydrologic Area of the Carlsbad Hydrologic Unit (904.52).

5.0 Methodology

This report is prepared in accordance with the 2003 San Diego County Hydrology Manual. Based on the overall tributary study area, calculations are based on the Rational Method.

5.1 Hydrology Software

We are using **the CivilCadd**/CivilDesign® software to analyze the runoff. The module we are using is the one for the *San Diego County Flood Control Division 2003 Hydrology Manual.* Please see the detailed hydrology calculations in Attachment 6.

5.2 Routing Software

Hydrologic Modeling System (HEC-HMS), Version 4.9 is used for hydrologic routing of the entire project site. The hydrograph developed from the rational method is then manually entered into this software and routed into each detention pipe. The HEC-HMS simulation results can be found in Attachment 7 in this report.

5.3 Soil Type Determination

The soil type for the proposed project was determined by mapping the project limits on the EPA Web Soil Survey website. The Web soil Survey indicate that the site is composed of

soil type C and type D. The soil report and soil index map can be found in Attachment 3 of this report.

5.4 Isopluvial Value Determination

The isopluvial values for the 100-year 6 hour and 24 hour storm events were determined by plotting the projects location on the respective exhibits from Appendix B of the Hydrology Manual. The rainfall isopluvial maps can be found in Attachment 3 of this report.

6.0 Calculations

The intent of the post-development calculation done as part of this report is to verify the 100-year flowrates expected from the post-developed conditions are lower than the pre-developed conditions. These numbers will be used to size the proposed storm drainage pipes and to doublecheck if the existing storm drain outlet facilities are adequate.

6.1 Calculate Runoff Coefficient

The runoff coefficients for each of the drainage areas are taken from Table 3-1 of the Hydrology Manual. Based on the EPA Web Soil Survey, this project site is in type D and type C soil. The runoff coefficients C are based on the %IMPER. for this project. Table 3-1 is included in the CIVILD software, and the values chosen based on the program input parameters. The output file was checked to ensure that the correct C values are used.

In order to not have a negative impact on the post development downstream facilities, detention structure is needed in this project. The method we are using here on how to use the resulting values of the outflow hydrograph is to recalculate the runoff coefficient C value based on the fix values of the outflow hydrograph to achieve a C_{out}. The detailed description and calculation of the C_{out} value can be found in Attachment 7 in this report.

6.2 Manning Roughness Coefficient

Manning Roughness Coefficients are taken from San Diego County Drainage Design Manual. Values are taken from Table A-1, Average Manning Roughness Coefficients for Pavement and Gutters, Table A-2, Average Manning Roughness Coefficients for Closed Conduits, and Table A-5, Average Manning roughness Coefficient for Natural Channels. Values of 0.015 for Concrete Gutter, 0.016 for Concrete Pavement, 0.013 for PVC Pipe, and 0.03 for Fairly Regular Section Some Grass and Weeds, Little or No Brush are used in the hydrology calculations. Table of Manning's n value can be found in Attachment 2 in this report.

6.3 Rational Method Calculation Summary

The peak runoff values for the 100-year storm are calculated according to the Hydrology Manual Rational Method. The calculations are performed using the CIVILD software. A summary of the initial calculations is summarized in the table below:

Summary of Q100 Runoff

	PRE			POST			POST MITIGATION	
	POC-1	POC-2	POC-3	POC-1	POC-2	POC-3	POC-1	POC-3
Q (CFS)	16.14	7.87	2.17	21.37	4.70	3.61	11.76	2.05
A (Acres)	7.10	2.88	0.89	6.59	2.34	1.46	6.59	1.46
TC (MIN)	8.54	6.29	6.98	11.17	7.34	7.57	17.27	11.73

Table 1. Q100 Analysis Results

Structures that are used for detention are the biofiltration basin (BMP-A) and storage pipe 1 located at the northeast side of the project site, and storage pipe 2 located at the east side of the project site.

The total volume of BMP-A is 13387.08 cu ft. The total volume for storage pipe 1 and storage pipe 2 is 57937.32 cu ft and 15020.29 cu ft, respectively. The figures of stage versus volume of the detention structures are shown below:

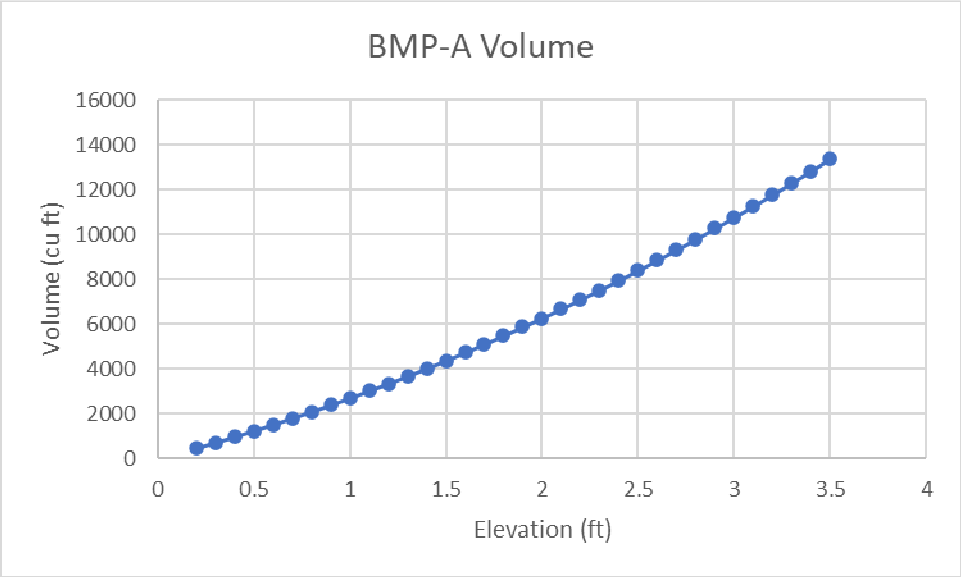

Fig. 2 BMP-A Volume

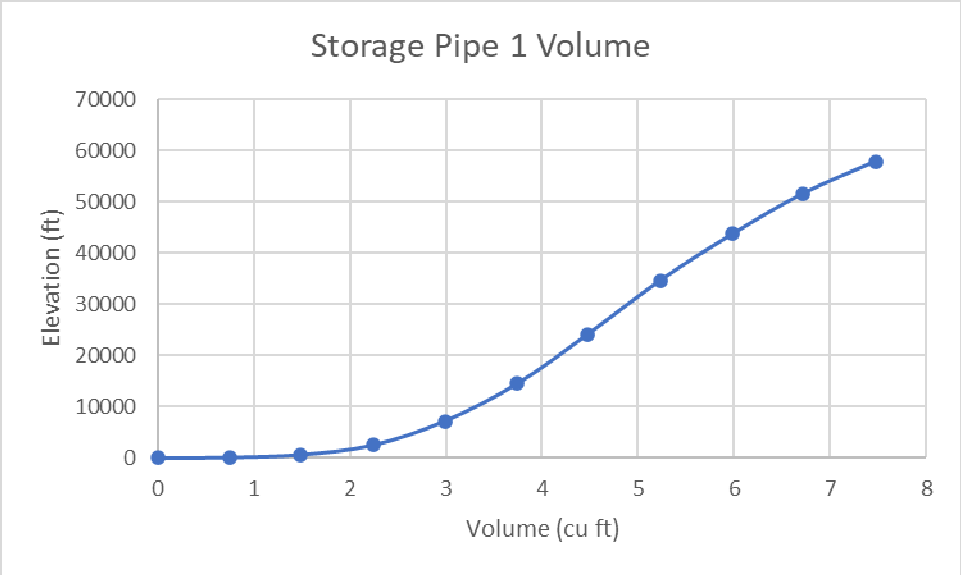

Fig. 3 Storage Pipe 1 Volume

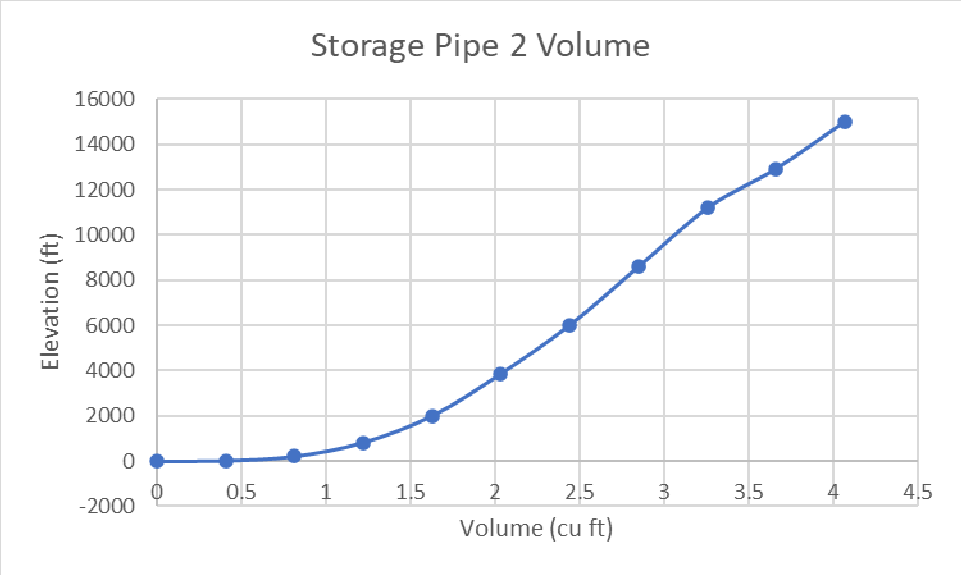

Fig. 4 Storage Pipe 2 Volume

CIVILD data and output files can be found in Attachment 6 of this report.

By observation of the results in the summary table, the mitigated developed condition of the site will have an overall decrease in the 100 year peak flow discharge from the site.

7.0 Summary

This project will not negatively impact the existing downstream storm drain facilities. Based on the results of this report, the project does not increase the 100-year peak flow rate of the Mitigated Post Development stormwater discharge from the site as flows are lower than those of the Pre Development condition.

8.0 References

County of San Diego, Department of Public Works, Flood Control Section, June 2003 San Diego County Hydrology Manual.

County of San Diego, Department of Public Works, Flood Control Section, September 2014 San Diego County Hydraulic Design Manual.

9.0 DECLARATION OF RESPONSIBLE CHARGE

I hereby declare that I am the engineer of work for this project. That I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions codes, and that the design is consistent with current design.

I understand that the check of the project drawings and specifications by the City of San Marcos is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

ENGINEER OF WORK
Excel Engineering
440 State Place
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Tel – (760)745-8118
Fax – (760)745-1890

Project Number: 22-027

Robert D. Dentino, RCE 45629 — 06/23/23
Registration Expire: December 31, 2023 — Date

ATTACHMENTS

Attachment 1 – Site Map

Attachment 2 – Figures & Tables from the San Diego County Hydrology Manual 2003

Attachment 3 – Watershed Information
- **Watershed Map**
- **Soils Index Map**
- **Soil Report**
- **Rainfall Isopluvial Maps**

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ATTACHMENT 1
SITE MAP

SCALE: 1"=60"

0 60 120 180 240

CORNERSTONE COMMUNITIES
WOODWARD SITE MAP

EXCEL ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
440 STATE PLACE, ESCONDIDO, CA 92029
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ATTACHMENT 2

FIGURES & TABLES FROM THE SAN DIEGO COUNTY HYDROLOGY MANUAL 2003

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

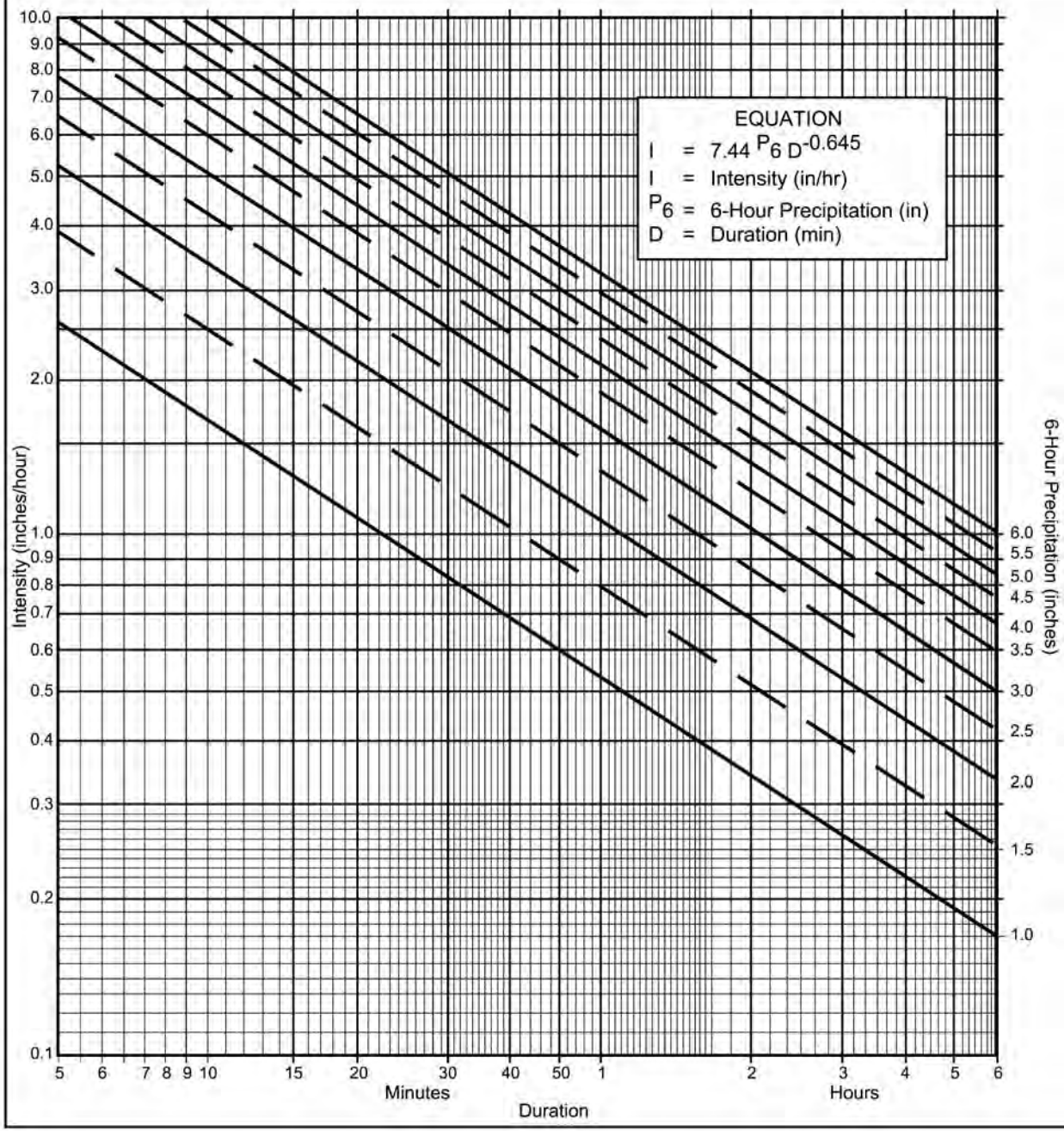
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M)
& INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency _____ year

(b) P_6 = _____ in., P_{24} = _____, $\frac{P_6}{P_{24}}$ = _____ %(2)

(c) Adjusted P_6(2) = _____ in.

(d) t_x = _____ min.

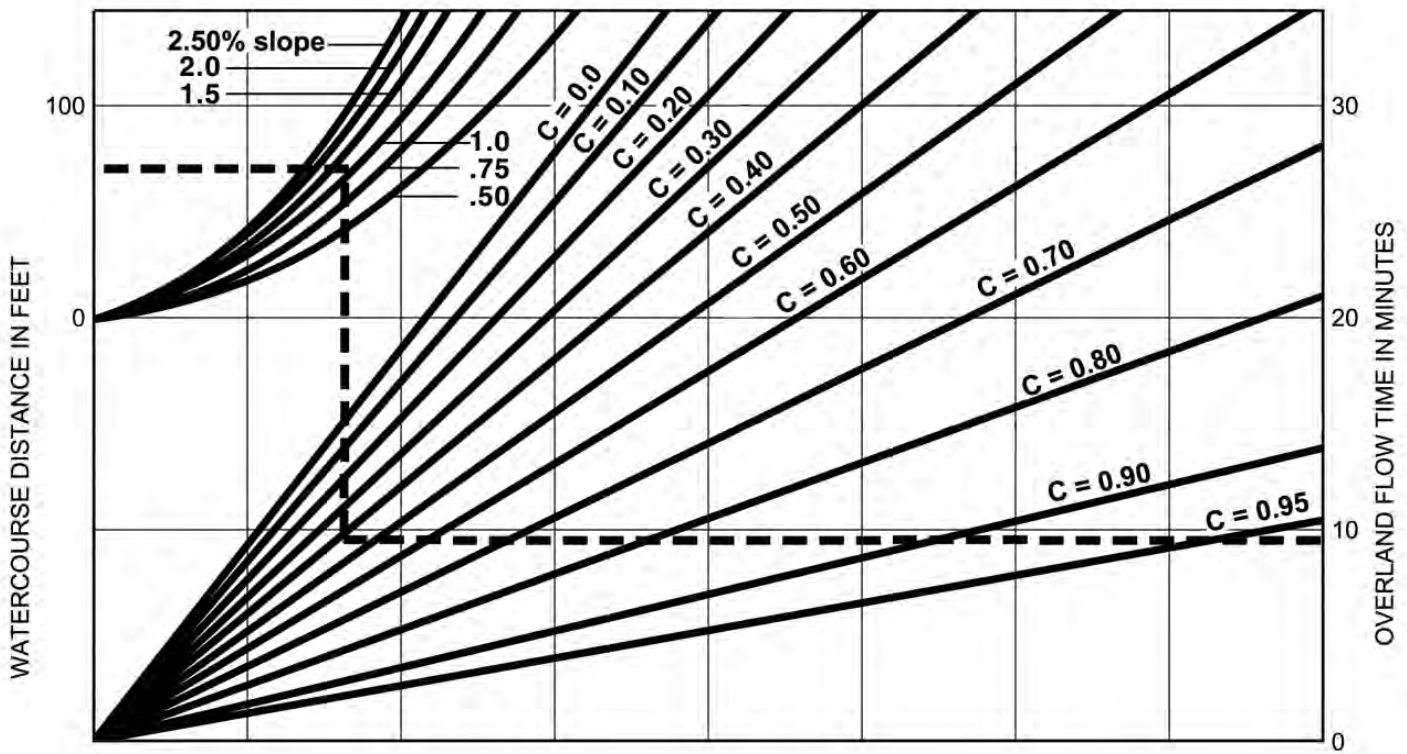
(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1



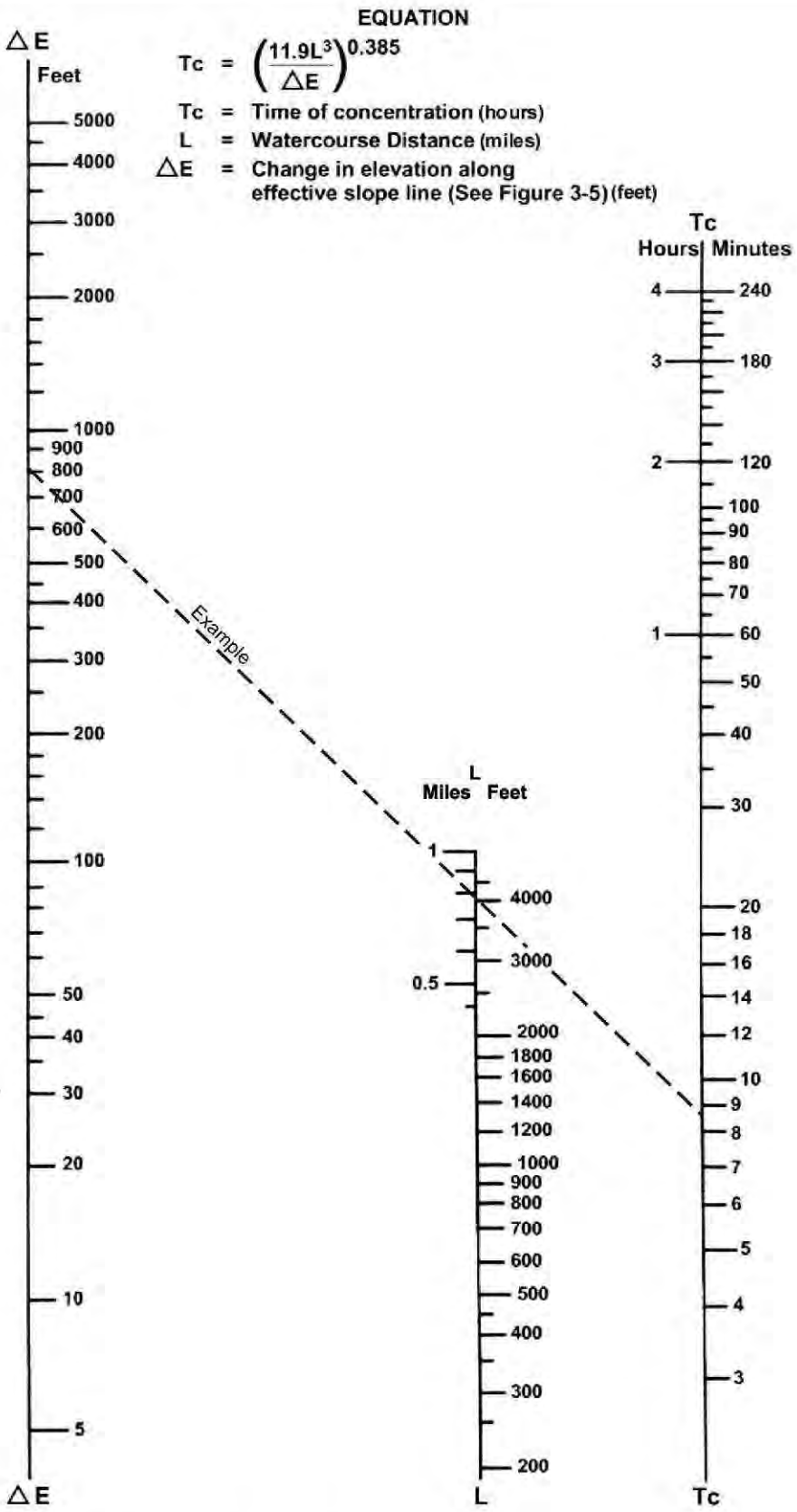
EXAMPLE:
Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1\text{-}C)\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE 3-3

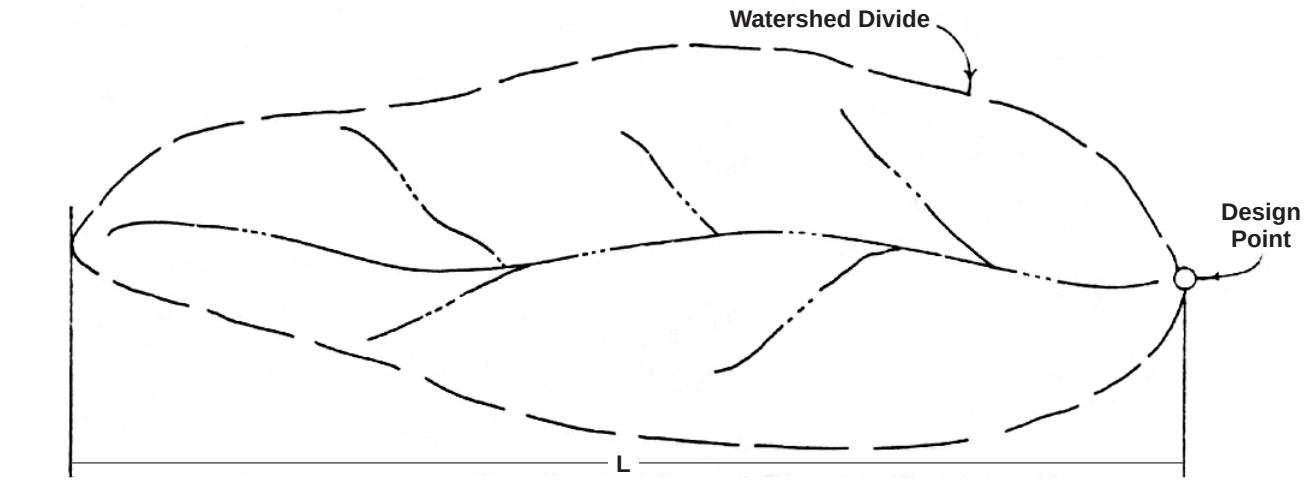
Rational Formula - Overland Time of Flow Nomograph

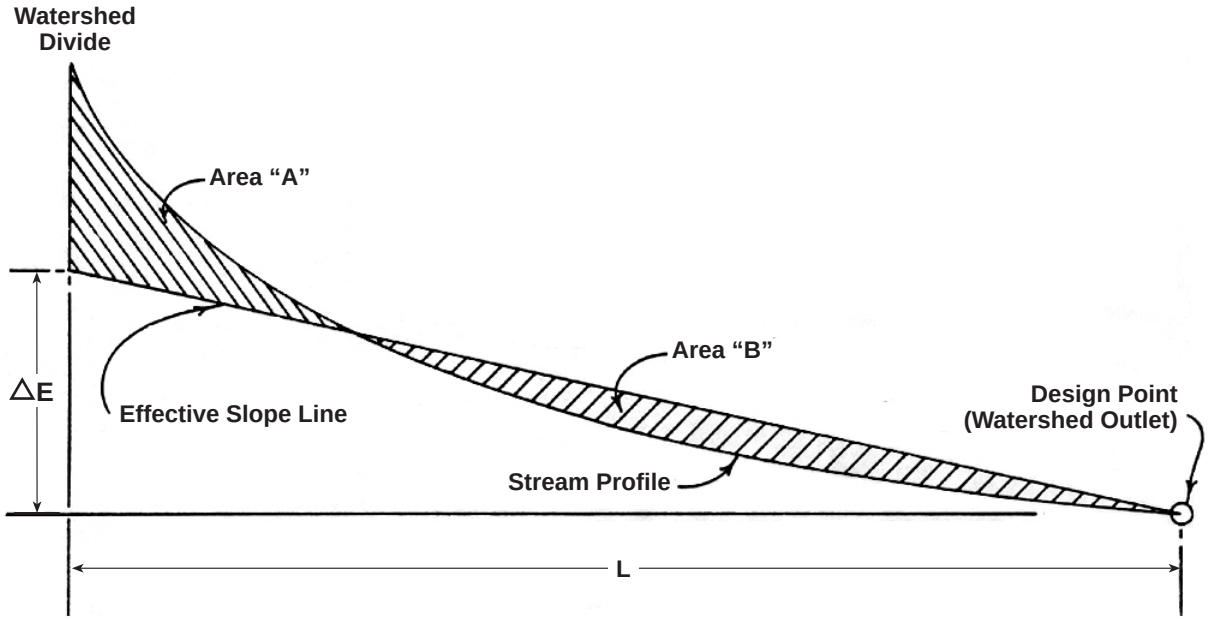


SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE 3-4

Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds



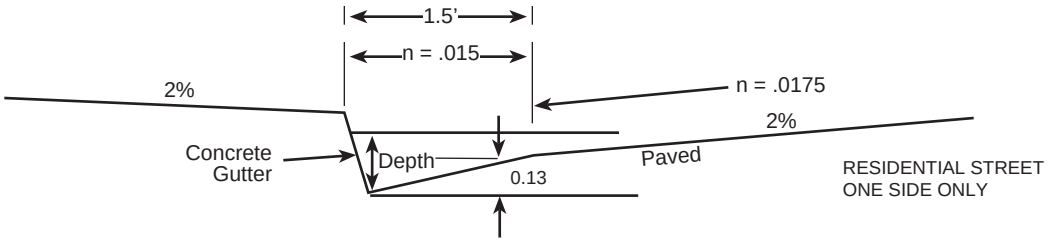


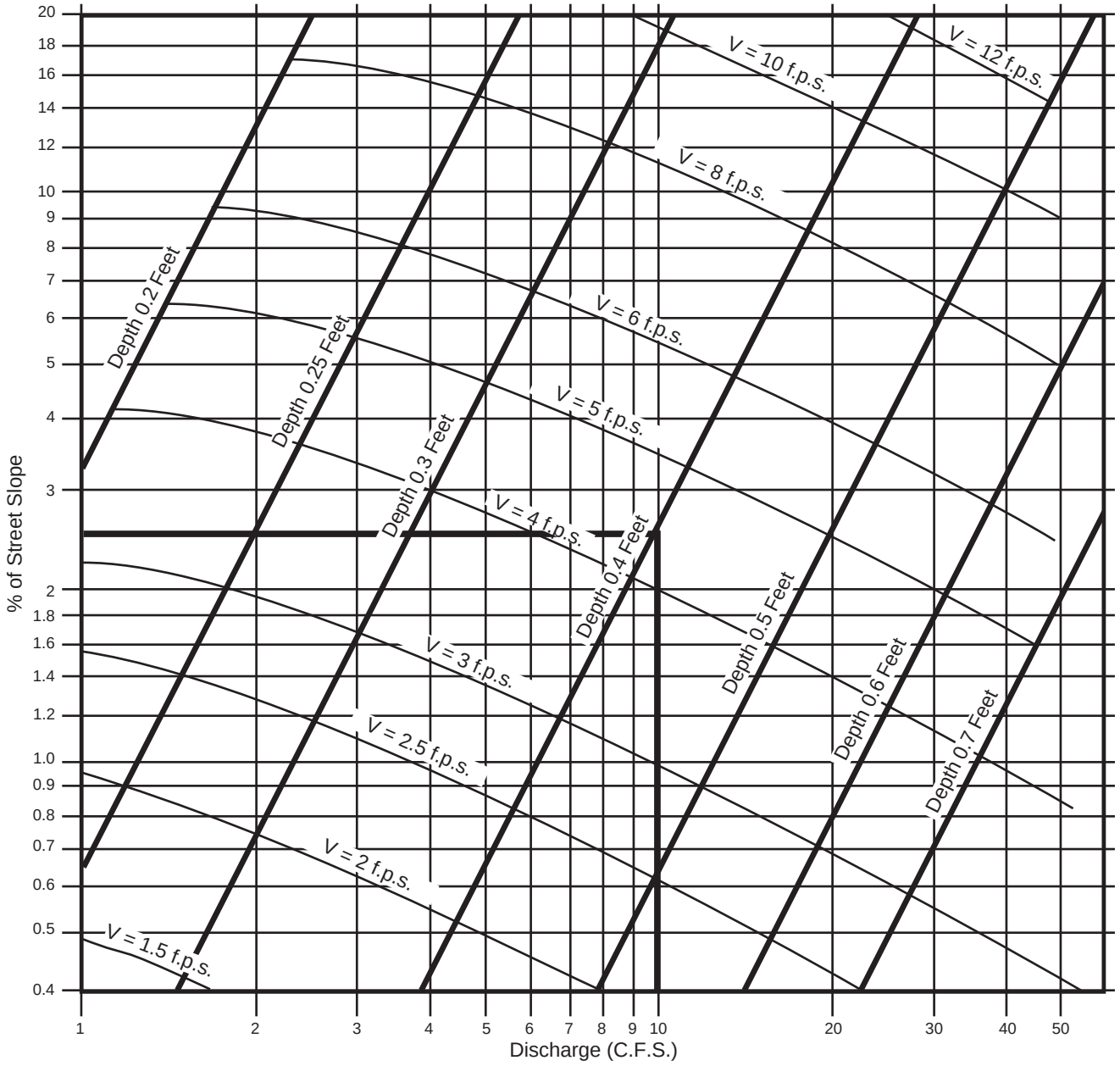
Area "A" = Area "B"

SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE 3-5

Computation of Effective Slope for Natural Watersheds





EXAMPLE:

Given: Q = 10 S = 2.5%

Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

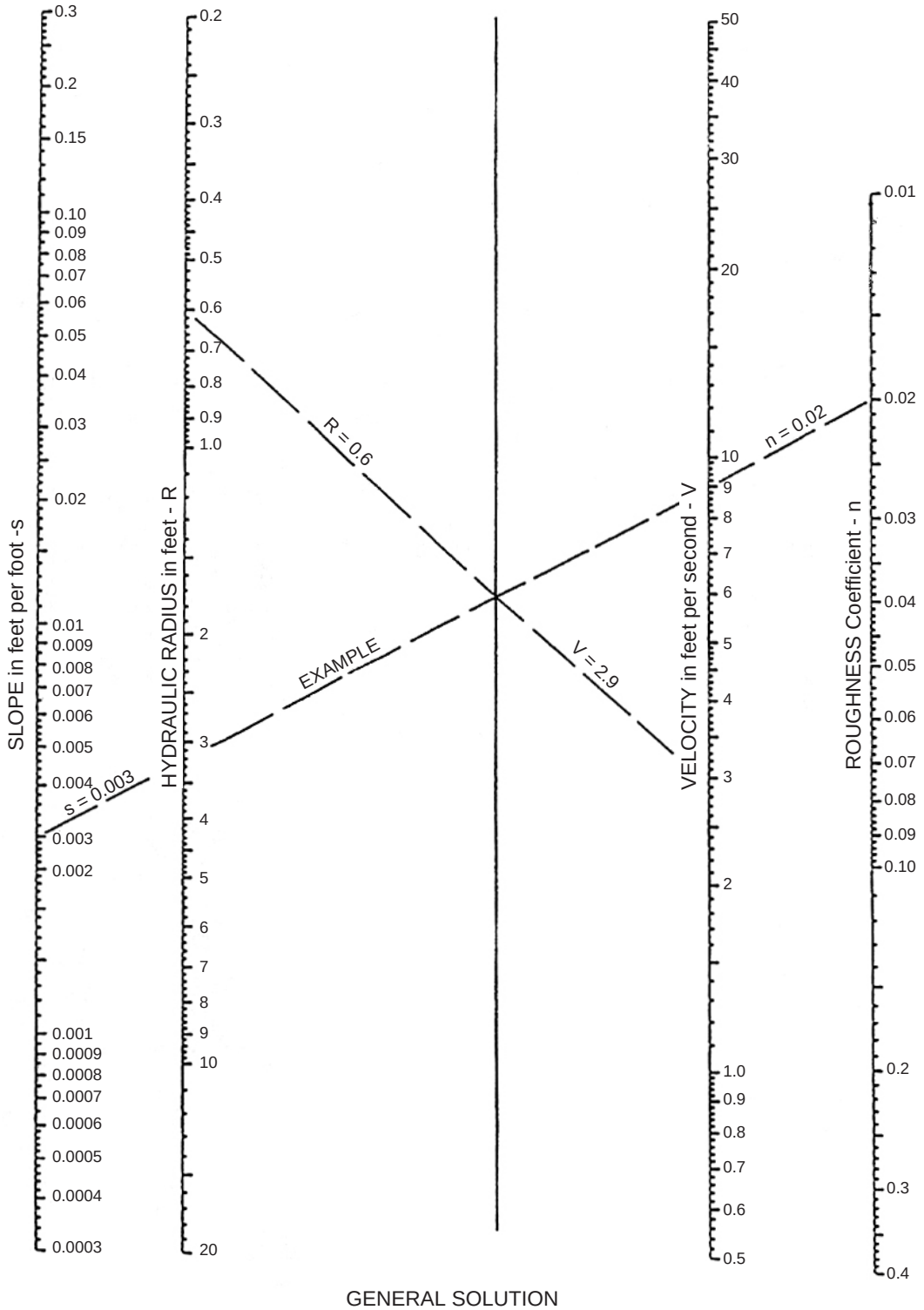
SOURCE: San Diego County Department of Special District Services Design Manual

F I G U R E

3-6

Gutter and Roadway Discharge - Velocity Chart

EQUATION: $V = \frac{1.49}{n} R^{2/3} s^{1/2}$



GENERAL SOLUTION

SOURCE: USDOT, FHWA, HDS-3 (1961)

FIGURE 3-7

Manning's Equation Nomograph

Table A-1 Average Manning Roughness Coefficients for Pavement and Gutters[1]

Concrete Gutter[2]	0.015
Concrete Pavement	
Float Finish	0.014
Broom Finish	0.016
Concrete Gutter with Asphalt Pavement	
Smooth Finish	0.013
Rough Texture	0.015
Asphalt Pavement	
Smooth Finish	0.013
Rough Texture	0.016

Based on FHWA HEC-22.

[1] Based on materials and workmanship required by standard specifications.
[2] Increase roughness coefficient in gutters with mild slopes where sediment might accumulate by 0.020.

Table A-2 Average Manning Roughness Coefficients for Closed Conduits[3]

Reinforced Concrete Pipe (RCP)	0.013
Corrugated Metal Pipe and Pipe Arch	
2-3/8 x 1/2 inch Corrugations	
Unlined	0.024
Half Lined	
Full Flow	0.018
d/D>=0.60	0.016
d/D<0.60	0.013
Fully Lined	0.013
3 x 1 inch Corrugations	0.027
6 x 2 inch Corrugations	0.032
Spiral Rib Pipe	0.013
Helically Wound Pipe	
18-inch	0.015
24-inch	0.017
30-inch	0.019
36-inch	0.021
42-inch	0.022
48-inch	0.023
Plastic Pipe (HPDE and PVC)	
Smooth	0.013
Corrugated	0.024
Vitrified Clay Pipe	0.014
Cast-Iron Pipe (Uncoated)	0.013
Steel Pipe	0.011
Brick	0.017
Cast-In-Place Concrete Pipe	
Rough Wood Forms	0.017
Smooth Wood or Steel Forms	0.014

[3] Based on materials and workmanship required by standard specifications.

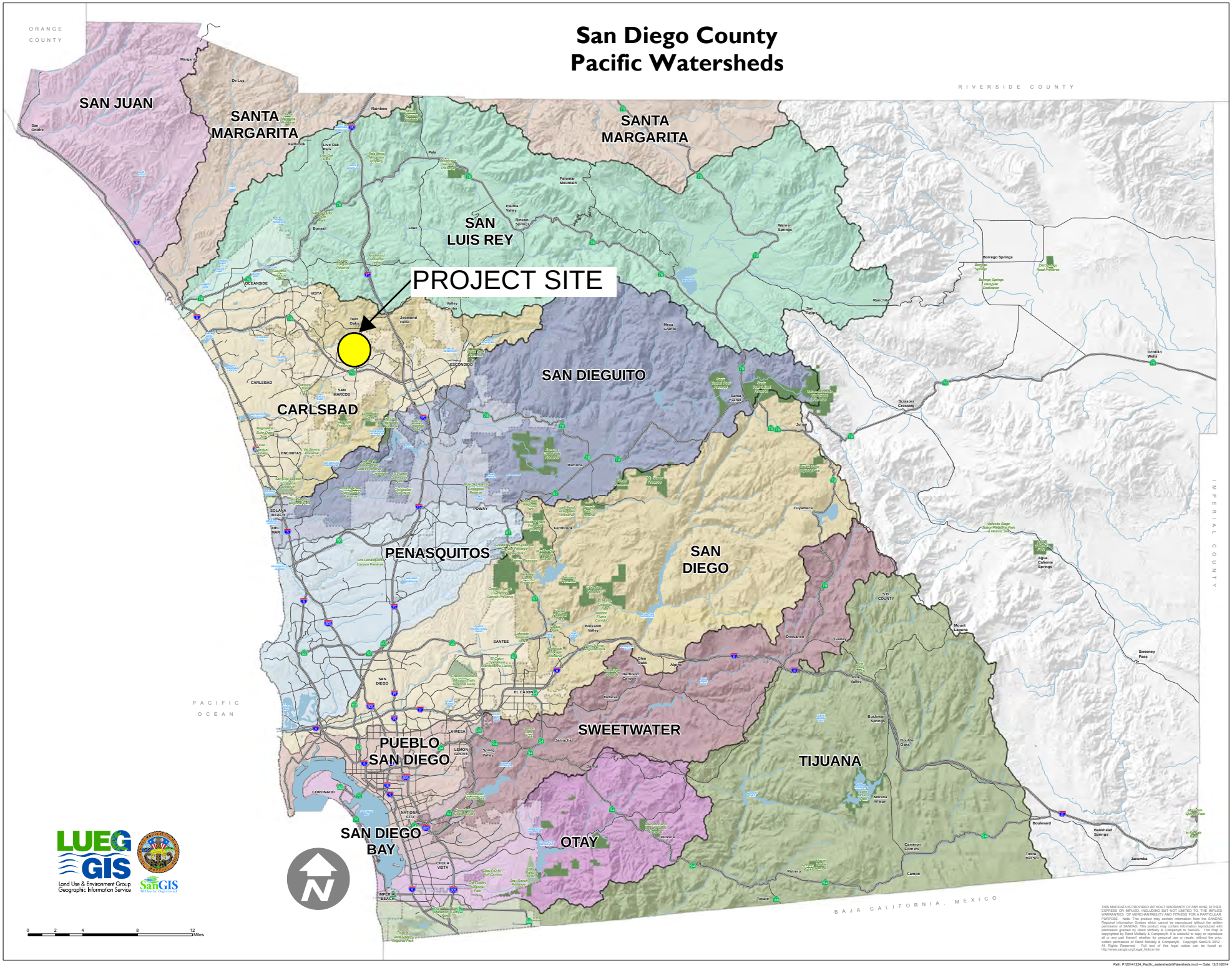
Table A-5 Average Manning Roughness Coefficients for Natural Channels

Minor Streams (Surface Width at Flood Stage < 100 ft)	
Fairly Regular Section	
(A) Some Grass and Weeds, Little or No Brush	0.030
(B) Dense Growth of Weeds, Depth of Flow Materially Greater Than Weed Height	0.040
(C) Some Weeds, Light Brush on Banks	0.040
(D) Some Weeds, Heavy Brush on Banks	0.060
(E) For Trees within Channel with Branches Submerged at High Stage, Increase All Above Values By	0.015
Irregular Section, with Pools, Slight Channel Meander	
Channels (A) to (E) Above, Increase All Values By	0.015
Mountain Streams; No Vegetation in Channel, Banks Usually Steep, Trees and Brush along Banks Submerged at High Stage	
(A) Bottom, Gravel, Cobbles and Few Boulders	0.050
(B) Bottom, Cobbles with Large Boulders	0.060
Flood Plains (Adjacent To Natural Streams)	
Pasture, No Brush	
(A) Short Grass	0.030
(B) High Grass	0.040
Cultivated Areas	
(A) No Crop	0.040
(B) Mature Row Crops	0.040
(C) Mature Field Crops	0.050
Heavy Weeds, Scattered Brush	0.050
Light Brush and Trees	0.060
Medium To Dense Brush	0.090
Dense Willows	0.170
Cleared Land with Tree Stumps, 100-150 Per Acre	0.060
Heavy Stand of Timber, Little Undergrowth	
(A) Flood Depth below Branches	0.110
(B) Flood Depth Reaches Branches	0.140

ATTACHMENT 3
WATERSHED INFORMATION

WATERSHED MAP

San Diego County
Pacific Watersheds



Path: P:\20141224_Pacific_watersheds\Watersheds.mxd — Date: 12/31/2014

SOIL INDEX MAP

County of San Diego Hydrology Manual

Soil Hydrologic Groups

Orange County

Riverside County

PROJECT SITE

OCEANSIDE

VISTA

CARLSBAD

ESCONDIDO

ENCINITAS

SOLANA BEACH

DEL MAR

POWAY

S.D. COUNTY

SANTEE

SAN DIEGO

EL CAJON

LA MESA

LEMON GROVE

CORONADO

CHULA VISTA

IMPERIAL BEACH

Pacific Ocean

Imperial County

M e x i c o

117°30'
117°15'
117°00'
116°45'
116°30'
116°15'
33°30'
33°15'
33°00'
32°45'
32°30'

Legend

Soil Groups

- Group A
- Group B
- Group C
- Group D
- Undetermined
- Data Unavailable

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles

SOIL REPORT


117° 9' 39" W
117° 9' 26" W
485010
485060
485110
485160
485210
485260
485310
33° 8' 45" N
33° 8' 30" N
3667450
3667400
3667350
3667300
3667250
3667200
3667150
3667100
3667050
Vineyard Rd
CmE2
PeC
PeC
HrC
S14
Soil Map may not be valid at this scale.
Map Scale: 1:2,160 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 30 60 120 180
Feet
0 100 200 400 600
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 16, Sep 13, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CmE2	Cieneba rocky coarse sandy loam, 9 to 30 percent slopes, eroded	D	11.6	90.8%
HrC	Huerhuero loam, 2 to 9 percent slopes	D	0.2	1.4%
PeC	Placentia sandy loam, 2 to 9 percent slopes, warm MAAT, MLRA 19	C	1.0	7.8%
Totals for Area of Interest			**12.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

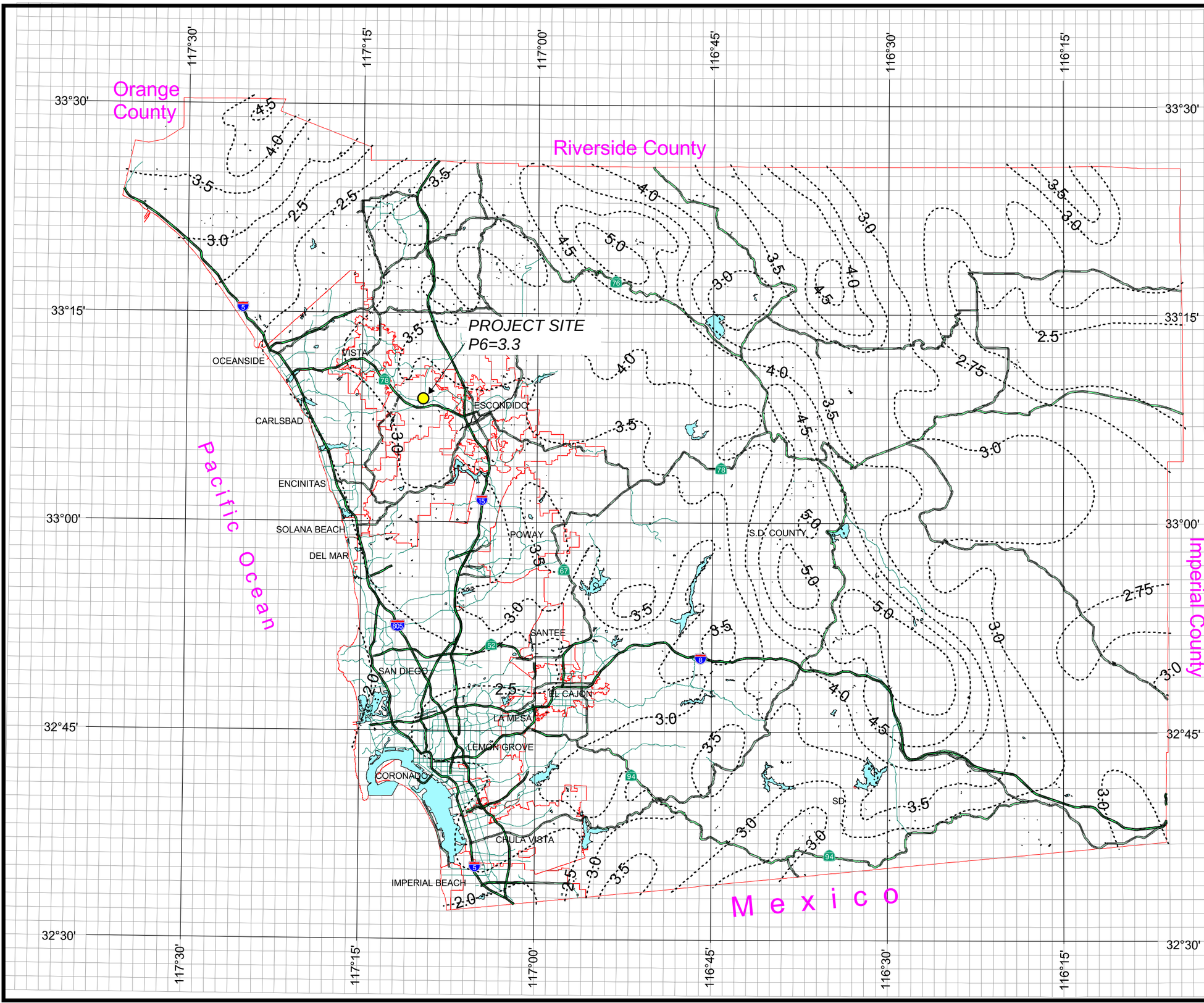
RAINFALL ISOPLUVIAL MAPS

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)



N W E S

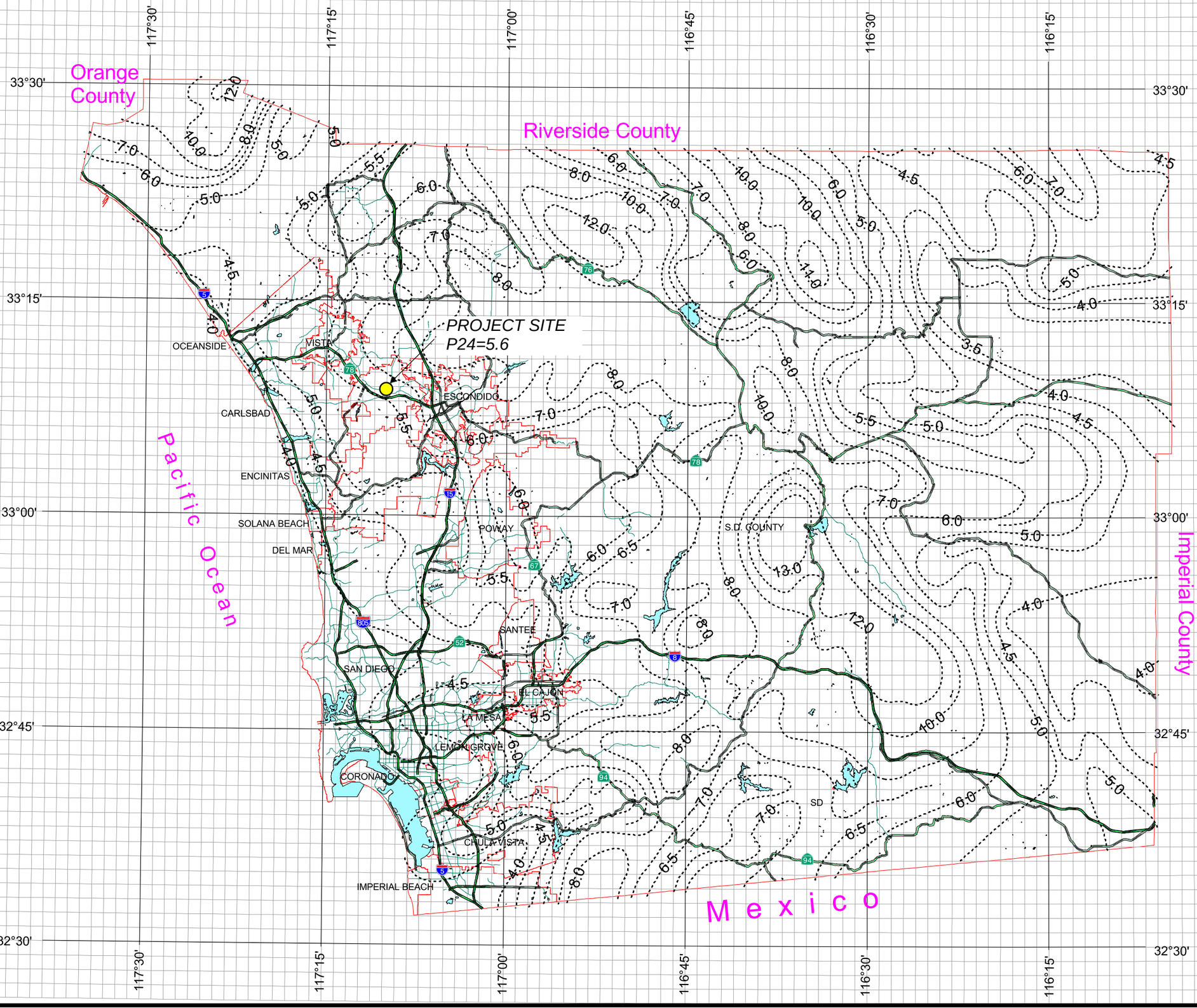
3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

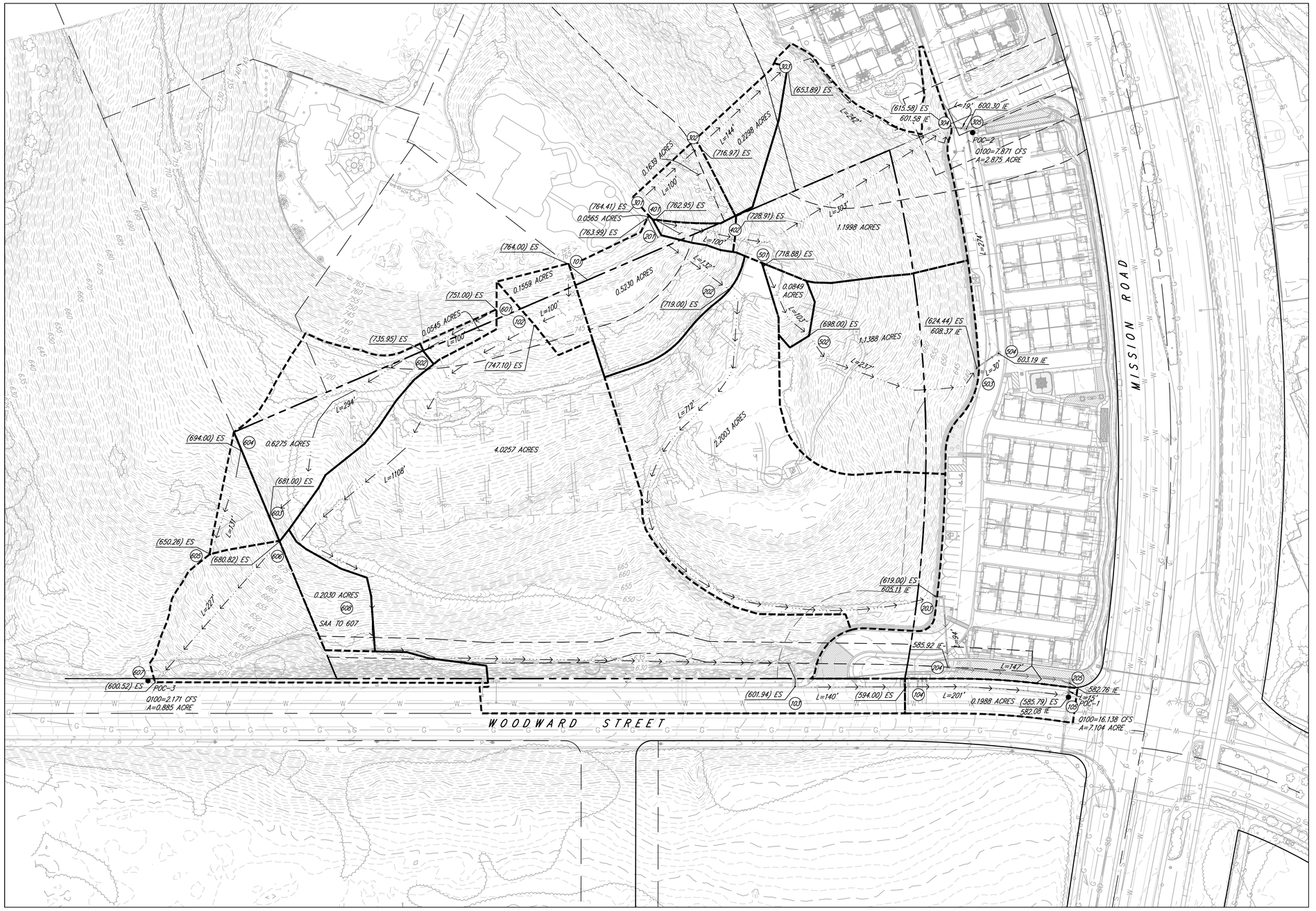
Isopluvial (inches)



N W E S

3 0 3 Miles

ATTACHMENT 4
PRE-DEVELOPMENT CONDITION EXHIBIT



LEGEND

- (120) NODE NUMBER
- SURFACE FLOW
- PIPE FLOW
- HYDROLOGY BASIN BOUNDARY
- ELEVATION

HYDROLOGIC SOIL GROUP

THE HYDROLOGIC SOIL GROUP FOR THIS SITE IS TYPE C AND TYPE D

NOTE:

APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 20'

SCALE: 1'=60'

0 60 120 180 240

CORNERSTONE COMMUNITIES WOODWARD
PRE DEVELOPMENT HYDROLOGY EXHIBIT

EXCEL ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
440 STATE PLACE, ESCONDIDO, CA 92029
PH (760)745-8118 FX (760)745-1890

ATTACHMENT 5
POST-DEVELOPMENT CONDITION EXHIBIT

5a. Hydrology Map of Post-Development Condition Exhibit

LEGEND

- (100) NODE NUMBER
- SURFACE FLOW
- PIPE FLOW
- HYDROLOGY BASIN BOUNDARY
- ELEVATION

HYDROLOGIC SOIL GROUP

THE HYDROLOGIC SOIL GROUP FOR THIS SITE IS TYPE C AND TYPE D

NOTE:

APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 20'

SCALE: 1"=60'

0 60 120 180 240

CORNERSTONE COMMUNITIES WOODWARD
POST DEVELOPMENT HYDROLOGY EXHIBIT

EXCEL ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
440 STATE PLACE, ESCONDIDO, CA 92029
PH (760)745-8118 FX (760)745-1890

5b. Hydrology Map of Post-Development Mitigation Condition Exhibit

ONSITE IS MITIGATED (SEE POST DEVELOPMENT MAP FOR SUB BASINS)

0.9234 ACRES
0.4728 ACRES
0.0620 ACRES
0.1138 ACRES
0.2509 ACRES
0.0853 ACRES
0.1250 ACRES
0.5376 ACRES
0.0412 ACRES
0.0675 ACRES
0.2296 ACRES
0.4168 ACRES
1.0470 ACRES
0.3748 ACRES
0.3970 ACRES
0.8983 ACRES
0.1932 ACRES
0.1623 ACRES
0.1255 ACRES
0.2027 ACRES

(616.00) ES
601.58 IE
L=19'
600.30 IE
(687.00) ES
L=161'
711.85 FS
709.95 FS
(755.27) ES
L=21'
699.59 FS
(763.85) ES
L=100'
L=102'
(749.00) ES
L=165'
L=244'
697.47 FS
L=106'
(665.27) ES
699.82 FS
(626.61) ES
L=341'
(700.17) ES
(696.87) ES
L=146'
700.09 FS
693.52 FS
684.38 FS
687.65 FS
709.36 FS
L=100'
L=137'
L=717'
685.50 FS
(651.54) ES
(680.82) ES
L=227'
L=357'
(619.00) ES
605.11 IE
L=465'
(600.49) ES
L=390'
(611.40) ES
L=162'
(608.55) ES
L=170'
(601.45) ES
L=130'
(393.87) ES
L=199'
L=230'
582.76 IE
L=15'
(585.80) ES
582.08 IE
L=157'
(673.15) ES
697.61 FS

POC-2
Q100=4.704 CFS
A=2.339 ACRE

POC-3
Q100=2.05 CFS
A=1.460 ACRE

POC-1
AT POC-1:
Q100=14.76 CFS
A=6.59 ACRE

MISSION ROAD

WOODWARD STREET

LEGEND

- (100) NODE NUMBER
- SURFACE FLOW
- PIPE FLOW
- HYDROLOGY BASIN BOUNDARY
- ELEVATION

HYDROLOGIC SOIL GROUP

THE HYDROLOGIC SOIL GROUP FOR THIS SITE IS TYPE C AND TYPE D

NOTE:

APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 20'

SCALE: 1"=60'

0 60 120 180 240

CORNERSTONE COMMUNITIES
WOODWARD POST DEVELOPMENT MITIGATION HYDROLOGY EXHIBIT

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440 STATE PLACE, ESCONDIDO, CA 92029
PH (760)745-8118 FX (760)745-1890

ATTACHMENT 6
MODIFIED RATIONAL METHOD RUNOFF CALCULATIONS

Steps Taken To Analyze This Condition

The Rational Method Runoff Calculations are followed here. The software that we are using is the "Rational Hydrology Method, San Diego County (2003 Manual)" module of the CIVILCADD/CIVILDESIGN Engineering Software, Version 9.1.

Please see the subsequent pages for the calculations. These calculations are for the $\mathbf{Q_{100}}$. The results are outlined/summarized in Section 6.

6a. CivilD Pre-Development Calculations

```
        San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
    Rational Hydrology Study        Date: 09/08/22
------------------------------------------------------------------------
22027 PRE POC1



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

------------------------------------------------------------------------


Program License Serial Number 6332

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.300
24 hour precipitation(inches) =  5.600
P6/P24 =    58.9%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  764.000(Ft.)
Lowest elevation =  747.100(Ft.)
Elevation difference =   16.900(Ft.) Slope = 16.900 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  16.90 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.26 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  16.900^(1/3)]=   5.26
Rainfall intensity (I) =      8.414(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.459(CFS)
Total initial stream area =        0.156(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      5.065(CFS)
Depth of flow =   0.807(Ft.), Average velocity =   7.772(Ft/s)
    ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              2.00
    2              2.00              0.00
    3              4.00              2.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      5.065(CFS)
  '     '    flow top width =      1.615(Ft.)
  '     '    velocity=    7.772(Ft/s)
  '     '    area =      0.652(Sq.Ft)
  '     '    Froude number =     2.156

Upstream point elevation =   747.100(Ft.)
Downstream point elevation =   601.940(Ft.)
Flow length =  1108.000(Ft.)
Travel time  =    2.38 min.
Time of concentration =    7.64 min.
Depth of flow =   0.807(Ft.)
Average velocity =   7.772(Ft/s)
Total irregular channel flow =     5.065(CFS)
Irregular channel normal depth above invert elev. =   0.807(Ft.)
Average velocity of channel(s) =   7.772(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.616(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.050
Decimal fraction soil group D = 0.950
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.347
Rainfall intensity =      6.616(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.348  CA =      1.454
Subarea runoff =      9.158(CFS) for      4.026(Ac.)
Total runoff =      9.618(CFS)  Total area =       4.182(Ac.)
Depth of flow =   1.027(Ft.), Average velocity =   9.123(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________
Depth of flow =   0.718(Ft.), Average velocity =   4.208(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.72
    2             30.00              0.60
    3             31.50              0.00
    4             31.50              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      9.618(CFS)
  '     '    flow top width =     29.719(Ft.)
  '     '    velocity=    4.208(Ft/s)
  '     '    area =      2.285(Sq.Ft)
  '     '    Froude number =     2.674

Upstream point elevation =   601.940(Ft.)
Downstream point elevation =   594.000(Ft.)
Flow length =   140.000(Ft.)
Travel time  =    0.55 min.
Time of concentration =    8.19 min.
Depth of flow =   0.718(Ft.)
```

```
Average velocity =   4.208(Ft/s)
Total irregular channel flow =     9.618(CFS)
Irregular channel normal depth above invert elev. =   0.718(Ft.)
Average velocity of channel(s) =   4.208(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      9.846(CFS)
Depth of flow =   1.472(Ft.), Average velocity =   9.690(Ft/s)
    ******* Irregular Channel Data **********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              2.00
    2             33.00              1.60
    3             34.50              0.00
    4             34.50              1.00
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      9.846(CFS)
  '     '    flow top width =      1.380(Ft.)
  '     '    velocity=    9.690(Ft/s)
  '     '    area =      1.016(Sq.Ft)
  '     '    Froude number =     1.990

Upstream point elevation =   594.000(Ft.)
Downstream point elevation =   585.790(Ft.)
Flow length =   201.000(Ft.)
Travel time  =    0.35 min.
Time of concentration =    8.54 min.
Depth of flow =   1.472(Ft.)
Average velocity =   9.690(Ft/s)
Total irregular channel flow =     9.846(CFS)
Irregular channel normal depth above invert elev. =   1.472(Ft.)
Average velocity of channel(s) =   9.690(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.157(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[INDUSTRIAL area type                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      6.157(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.371  CA =      1.627
Subarea runoff =      0.399(CFS) for      0.199(Ac.)
Total runoff =     10.017(CFS)  Total area =       4.381(Ac.)
Depth of flow =   1.481(Ft.), Average velocity =   9.741(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.381(Ac.)
Runoff from this stream =     10.017(CFS)
Time of concentration =    8.54 min.
Rainfall intensity =     6.157(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
```

```
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  132.000(Ft.)
Highest elevation =  763.990(Ft.)
Lowest elevation =  719.000(Ft.)
Elevation difference =   44.990(Ft.) Slope = 34.083 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  34.08 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.16 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  34.083^(1/3)]=   4.16
Calculated TC of    4.164 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      1.592(CFS)
Total initial stream area =        0.523(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      4.655(CFS)
Depth of flow =   0.772(Ft.), Average velocity =   7.811(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      4.655(CFS)
  '     '    flow top width =      1.544(Ft.)
  '     '    velocity=    7.811(Ft/s)
  '     '    area =      0.596(Sq.Ft)
  '     '    Froude number =     2.216

Upstream point elevation =   719.000(Ft.)
Downstream point elevation =   619.000(Ft.)
Flow length =   712.000(Ft.)
Travel time  =    1.52 min.
Time of concentration =    5.68 min.
Depth of flow =   0.772(Ft.)
Average velocity =   7.811(Ft/s)
Total irregular channel flow =     4.655(CFS)
Irregular channel normal depth above invert elev. =   0.772(Ft.)
Average velocity of channel(s) =   7.811(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.005(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
```

```
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      8.005(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.953
Subarea runoff =      6.038(CFS) for      2.200(Ac.)
Total runoff =      7.630(CFS)  Total area =       2.723(Ac.)
Depth of flow =   0.929(Ft.), Average velocity =   8.838(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   605.110(Ft.)
Downstream point/station elevation =   585.920(Ft.)
Pipe length  =    94.00(Ft.) Slope =   0.2041  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.630(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     7.630(CFS)
Normal flow depth in pipe =    4.88(In.)
Flow top width inside pipe =   16.00(In.)
Critical Depth =   12.84(In.)
Pipe flow velocity =     19.71(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     5.76 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   585.920(Ft.)
Downstream point/station elevation =   582.760(Ft.)
Pipe length  =   147.00(Ft.) Slope =   0.0215  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.630(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     7.630(CFS)
Normal flow depth in pipe =    8.95(In.)
Flow top width inside pipe =   18.00(In.)
Critical Depth =   12.84(In.)
Pipe flow velocity =      8.70(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     6.04 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   582.760(Ft.)
Downstream point/station elevation =   582.080(Ft.)
Pipe length  =    15.00(Ft.) Slope =   0.0453  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.630(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     7.630(CFS)
Normal flow depth in pipe =    6.46(In.)
Flow top width inside pipe =   21.29(In.)
Critical Depth =   11.79(In.)
Pipe flow velocity =     11.20(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     6.07 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
```

```
      Stream flow area =      2.723(Ac.)
      Runoff from this stream =      7.630(CFS)
      Time of concentration =    6.07 min.
      Rainfall intensity =     7.675(In/Hr)
      Summary of stream data:

      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                (In/Hr)


      1       10.017      8.54             6.157
      2        7.630      6.07             7.675
      Qmax(1) =
             1.000 *    1.000 *    10.017) +
             0.802 *    1.000 *     7.630) + =      16.138
      Qmax(2) =
             1.000 *    0.711 *    10.017) +
             1.000 *    1.000 *     7.630) + =      14.748

      Total of 2 streams to confluence:
      Flow rates before confluence point:
            10.017       7.630
      Maximum flow rates at confluence using above data:
             16.138       14.748
      Area of streams before confluence:
              4.381        2.723
      Results of confluence:
      Total flow rate =     16.138(CFS)
      Time of concentration =     8.537 min.
      Effective stream area after confluence =      7.104(Ac.)
      End of computations, total study area =          7.104 (Ac.)
```

```
        San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
    Rational Hydrology Study        Date: 02/07/23
--------------------------------------------------------------------------


22027 PRE POC2
UPDATED
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 6332

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.300
24 hour precipitation(inches) =  5.600
P6/P24 =    58.9%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  764.410(Ft.)
Lowest elevation =  716.970(Ft.)
Elevation difference =   47.440(Ft.) Slope = 47.440 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  47.44 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.73 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  47.440^(1/3)]=   3.73
Calculated TC of    3.729 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.499(CFS)
Total initial stream area =        0.164(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.849(CFS)
```

```
Depth of flow =   0.330(Ft.), Average velocity =   7.820(Ft/s)
    ******* Irregular Channel Data **********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      0.849(CFS)
  '     '    flow top width =      0.659(Ft.)
  '     '    velocity=    7.820(Ft/s)
  '     '    area =      0.109(Sq.Ft)
  '     '    Froude number =     3.395

Upstream point elevation =   716.970(Ft.)
Downstream point elevation =   653.890(Ft.)
Flow length =   144.000(Ft.)
Travel time  =    0.31 min.
Time of concentration =    4.04 min.
Depth of flow =   0.330(Ft.)
Average velocity =   7.820(Ft/s)
Total irregular channel flow =     0.849(CFS)
Irregular channel normal depth above invert elev. =   0.330(Ft.)
Average velocity of channel(s) =   7.820(Ft/s)
 Adding area flow to channel
Calculated TC of    4.036 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.138
Subarea runoff =      0.700(CFS) for      0.230(Ac.)
Total runoff =      1.199(CFS)  Total area =      0.394(Ac.)
Depth of flow =   0.375(Ft.), Average velocity =   8.525(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Depth of flow =   0.454(Ft.), Average velocity =   5.820(Ft/s)
    ******* Irregular Channel Data **********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      1.199(CFS)
  '     '    flow top width =      0.908(Ft.)
  '     '    velocity=    5.820(Ft/s)
  '     '    area =      0.206(Sq.Ft)
  '     '    Froude number =     2.153

Upstream point elevation =   653.890(Ft.)
Downstream point elevation =   615.580(Ft.)
Flow length =   242.000(Ft.)
```

```
      Travel time  =    0.69 min.
      Time of concentration =    4.73 min.
      Depth of flow =   0.454(Ft.)
      Average velocity =   5.820(Ft/s)
      Total irregular channel flow =     1.199(CFS)
      Irregular channel normal depth above invert elev. =   0.454(Ft.)
      Average velocity of channel(s) =   5.820(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      304.000 to Point/Station      304.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ----------------------------------------------------------------------
      Along Main Stream number: 1 in normal stream number 1
      Stream flow area =      0.394(Ac.)
      Runoff from this stream =      1.199(CFS)
      Time of concentration =    4.73 min.
      Rainfall intensity =     8.695(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      401.000 to Point/Station      402.000
      **** INITIAL AREA EVALUATION ****
      ----------------------------------------------------------------------
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.350
      Initial subarea total flow distance  =  100.000(Ft.)
      Highest elevation =  762.950(Ft.)
      Lowest elevation =  728.910(Ft.)
      Elevation difference =   34.040(Ft.) Slope = 34.040 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  34.04 %, in a development type of
       Permanent Open Space
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   4.17 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  34.040^(1/3)]=   4.17
      Calculated TC of    4.166 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
      Subarea runoff =      0.173(CFS)
      Total initial stream area =       0.057(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      402.000 to Point/Station      304.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ----------------------------------------------------------------------
      Estimated mean flow rate at midpoint of channel =      1.999(CFS)
      Depth of flow =   0.468(Ft.), Average velocity =   9.130(Ft/s)
          ******* Irregular Channel Data ***********
      ------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
          1              0.00              1.00
          2              1.00              0.00
          3              2.00              1.00
      Manning's 'N' friction factor =   0.030
      ------------------------------------------------------------
      Sub-Channel flow  =      1.999(CFS)
        '     '    flow top width =      0.936(Ft.)
```

```
'     '    velocity=    9.130(Ft/s)
'     '    area =      0.219(Sq.Ft)
'     '    Froude number =     3.326

Upstream point elevation =   728.910(Ft.)
Downstream point elevation =   615.580(Ft.)
Flow length =   303.000(Ft.)
Travel time  =    0.55 min.
Time of concentration =    4.72 min.
Depth of flow =   0.468(Ft.)
Average velocity =   9.130(Ft/s)
Total irregular channel flow =     1.999(CFS)
Irregular channel normal depth above invert elev. =   0.468(Ft.)
Average velocity of channel(s) =   9.130(Ft/s)
 Adding area flow to channel
Calculated TC of    4.719 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.440
Subarea runoff =      3.652(CFS) for      1.200(Ac.)
Total runoff =      3.825(CFS)  Total area =       1.257(Ac.)
Depth of flow =   0.597(Ft.), Average velocity =  10.737(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      304.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.257(Ac.)
Runoff from this stream =      3.825(CFS)
Time of concentration =    4.72 min.
Rainfall intensity =     8.695(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        1.199      4.73             8.695
2        3.825      4.72             8.695
Qmax(1) =
       1.000 *    1.000 *     1.199) +
       1.000 *    1.000 *     3.825) + =       5.024
Qmax(2) =
       1.000 *    0.998 *     1.199) +
       1.000 *    1.000 *     3.825) + =       5.022

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.199       3.825
Maximum flow rates at confluence using above data:
        5.024       5.022
Area of streams before confluence:
        0.394       1.257
Results of confluence:
Total flow rate =      5.024(CFS)
Time of concentration =     4.729 min.
Effective stream area after confluence =      1.651(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      305.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   601.580(Ft.)
Downstream point/station elevation =   600.300(Ft.)
Pipe length  =    19.00(Ft.) Slope =   0.0674  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.024(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     5.024(CFS)
Normal flow depth in pipe =    5.23(In.)
Flow top width inside pipe =   16.35(In.)
Critical Depth =   10.35(In.)
Pipe flow velocity =     11.77(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     4.76 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      305.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.651(Ac.)
Runoff from this stream =      5.024(CFS)
Time of concentration =    4.76 min.
Rainfall intensity =     8.695(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  103.000(Ft.)
Highest elevation =  718.880(Ft.)
Lowest elevation =  698.000(Ft.)
Elevation difference =   20.880(Ft.) Slope = 20.272 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  20.27 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.95 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  20.272^(1/3)]=   4.95
Calculated TC of    4.951 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.259(CFS)
Total initial stream area =        0.085(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station      503.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      1.945(CFS)
Depth of flow =   0.480(Ft.), Average velocity =   8.454(Ft/s)
```

```
      ******* Irregular Channel Data ***********
-------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.030
-------------------------------------------------------------
Sub-Channel flow  =      1.945(CFS)
  '     '    flow top width =      0.959(Ft.)
  '     '    velocity=    8.455(Ft/s)
  '     '    area =      0.230(Sq.Ft)
  '     '    Froude number =     3.042

Upstream point elevation =   698.000(Ft.)
Downstream point elevation =   624.440(Ft.)
Flow length =   237.000(Ft.)
Travel time  =    0.47 min.
Time of concentration =    5.42 min.
Depth of flow =   0.480(Ft.)
Average velocity =   8.454(Ft/s)
Total irregular channel flow =     1.945(CFS)
Irregular channel normal depth above invert elev. =   0.480(Ft.)
Average velocity of channel(s) =   8.454(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.256(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      8.256(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.428
Subarea runoff =      3.278(CFS) for      1.139(Ac.)
Total runoff =      3.537(CFS)  Total area =       1.224(Ac.)
Depth of flow =   0.600(Ft.), Average velocity =   9.818(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      504.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   608.370(Ft.)
Downstream point/station elevation =   603.190(Ft.)
Pipe length  =    30.00(Ft.) Slope =   0.1727  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.537(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     3.537(CFS)
Normal flow depth in pipe =    3.99(In.)
Flow top width inside pipe =   11.31(In.)
Critical Depth =    9.64(In.)
Pipe flow velocity =     15.47(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     5.45 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      504.000 to Point/Station      305.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   603.190(Ft.)
Downstream point/station elevation =   600.300(Ft.)
Pipe length  =   274.00(Ft.) Slope =   0.0105  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.537(CFS)
```

```
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     3.537(CFS)
Normal flow depth in pipe =    7.09(In.)
Flow top width inside pipe =   17.59(In.)
Critical Depth =    8.61(In.)
Pipe flow velocity =      5.47(Ft/s)
Travel time through pipe =    0.84 min.
Time of concentration (TC) =     6.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      305.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.224(Ac.)
Runoff from this stream =      3.537(CFS)
Time of concentration =    6.29 min.
Rainfall intensity =     7.501(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        5.024      4.76             8.695
2        3.537      6.29             7.501
Qmax(1) =
       1.000 *    1.000 *     5.024) +
       1.000 *    0.757 *     3.537) + =       7.700
Qmax(2) =
       0.863 *    1.000 *     5.024) +
       1.000 *    1.000 *     3.537) + =       7.871

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.024       3.537
Maximum flow rates at confluence using above data:
        7.700        7.871
Area of streams before confluence:
        1.651        1.224
Results of confluence:
Total flow rate =      7.871(CFS)
Time of concentration =     6.286 min.
Effective stream area after confluence =      2.875(Ac.)
End of computations, total study area =          2.875 (Ac.)
```

```
        San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
    Rational Hydrology Study        Date: 09/08/22
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22027 PRE POC3



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 *********   Hydrology Study Control Information **********

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Program License Serial Number 6332

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.300
24 hour precipitation(inches) =  5.600
P6/P24 =    58.9%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      601.000 to Point/Station      602.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  751.000(Ft.)
Lowest elevation =  735.950(Ft.)
Elevation difference =   15.050(Ft.) Slope = 15.050 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  15.05 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.47 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  15.050^(1/3)]=   5.47
Rainfall intensity (I) =      8.207(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.158(CFS)
Total initial stream area =        0.055(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      602.000 to Point/Station      603.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.016(CFS)
Depth of flow =   0.414(Ft.), Average velocity =   5.943(Ft/s)
    ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      1.016(CFS)
  '     '    flow top width =      0.827(Ft.)
  '     '    velocity=    5.943(Ft/s)
  '     '    area =      0.171(Sq.Ft)
  '     '    Froude number =     2.303

Upstream point elevation =   735.950(Ft.)
Downstream point elevation =   681.000(Ft.)
Flow length =   294.000(Ft.)
Travel time  =    0.82 min.
Time of concentration =    6.29 min.
Depth of flow =   0.414(Ft.)
Average velocity =   5.943(Ft/s)
Total irregular channel flow =     1.016(CFS)
Irregular channel normal depth above invert elev. =   0.414(Ft.)
Average velocity of channel(s) =   5.943(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      7.496(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      7.496(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.239
Subarea runoff =      1.631(CFS) for      0.627(Ac.)
Total runoff =      1.789(CFS)  Total area =       0.682(Ac.)
Depth of flow =   0.511(Ft.), Average velocity =   6.846(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      604.000 to Point/Station      605.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________
Depth of flow =   0.459(Ft.), Average velocity =   8.510(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      1.789(CFS)
  '     '    flow top width =      0.917(Ft.)
  '     '    velocity=    8.510(Ft/s)
  '     '    area =      0.210(Sq.Ft)
  '     '    Froude number =     3.132

Upstream point elevation =   694.000(Ft.)
Downstream point elevation =   650.260(Ft.)
Flow length =   131.000(Ft.)
Travel time  =    0.26 min.
Time of concentration =    6.55 min.
Depth of flow =   0.459(Ft.)
Average velocity =   8.510(Ft/s)
```

```
Total irregular channel flow =     1.789(CFS)
Irregular channel normal depth above invert elev. =   0.459(Ft.)
Average velocity of channel(s) =   8.510(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      606.000 to Point/Station      607.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.454(Ft.), Average velocity =   8.696(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      1.789(CFS)
  '     '    flow top width =      0.907(Ft.)
  '     '    velocity=    8.696(Ft/s)
  '     '    area =      0.206(Sq.Ft)
  '     '    Froude number =     3.218

Upstream point elevation =   680.820(Ft.)
Downstream point elevation =   600.520(Ft.)
Flow length =   227.000(Ft.)
Travel time  =    0.44 min.
Time of concentration =    6.98 min.
Depth of flow =   0.454(Ft.)
Average velocity =   8.696(Ft/s)
Total irregular channel flow =     1.789(CFS)
Irregular channel normal depth above invert elev. =   0.454(Ft.)
Average velocity of channel(s) =   8.696(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      608.000 to Point/Station      607.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Rainfall intensity (I) =      7.009(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Time of concentration =     6.98 min.
Rainfall intensity =      7.009(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.310
Subarea runoff =      0.382(CFS) for      0.203(Ac.)
Total runoff =      2.171(CFS)  Total area =       0.885(Ac.)
End of computations, total study area =          0.885 (Ac.)
```

6b. CivilD Post-Development Calculations

```
        San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
    Rational Hydrology Study        Date: 06/14/23
--------------------------------------------------------------------------
22027 POST POC1
UPDATED


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

--------------------------------------------------------------------------


Program License Serial Number 6332

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.300
24 hour precipitation(inches) =  5.600
P6/P24 =    58.9%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =   27.000(Ft.)
Highest elevation =  711.850(Ft.)
Lowest elevation =  711.150(Ft.)
Elevation difference =    0.700(Ft.) Slope =  2.593 %
Top of Initial Area Slope adjusted by User to  0.750 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   0.75 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.53 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  60.000^.5)/(   0.750^(1/3)]=   3.53
Calculated TC of    3.530 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      0.325(CFS)
Total initial stream area =        0.043(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      102.100
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
```

```
Estimated mean flow rate at midpoint of channel =      1.589(CFS)
Depth of flow =   0.877(Ft.), Average velocity =   1.598(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2             14.00              0.70
    3             14.50              0.00
    4             14.50              1.00
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.589(CFS)
  '     '    flow top width =      8.758(Ft.)
  '     '    velocity=    1.598(Ft/s)
  '     '    area =      0.994(Sq.Ft)
  '     '    Froude number =     0.836

Upstream point elevation =   711.150(Ft.)
Downstream point elevation =   709.890(Ft.)
Flow length =   223.000(Ft.)
Travel time  =    2.33 min.
Time of concentration =    5.85 min.
Depth of flow =   0.877(Ft.)
Average velocity =   1.598(Ft/s)
Total irregular channel flow =     1.589(CFS)
Irregular channel normal depth above invert elev. =   0.877(Ft.)
Average velocity of channel(s) =   1.598(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      7.853(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      7.853(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.353
Subarea runoff =      2.449(CFS) for      0.363(Ac.)
Total runoff =      2.774(CFS)  Total area =       0.406(Ac.)
Depth of flow =   0.929(Ft.), Average velocity =   1.826(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.100 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      4.012(CFS)
Depth of flow =   0.944(Ft.), Average velocity =   2.373(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2             14.00              0.70
    3             14.50              0.00
    4             14.50              1.00
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      4.012(CFS)
  '     '    flow top width =     11.903(Ft.)
  '     '    velocity=    2.373(Ft/s)
  '     '    area =      1.690(Sq.Ft)
  '     '    Froude number =     1.110

Upstream point elevation =   709.890(Ft.)
```

```
Downstream point elevation =   706.410(Ft.)
Flow length =   391.000(Ft.)
Travel time  =    2.75 min.
Time of concentration =    8.60 min.
Depth of flow =   0.944(Ft.)
Average velocity =   2.373(Ft/s)
Total irregular channel flow =     4.012(CFS)
Irregular channel normal depth above invert elev. =   0.944(Ft.)
Average velocity of channel(s) =   2.373(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.128(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                         ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      6.128(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.848
Subarea runoff =      2.424(CFS) for      0.569(Ac.)
Total runoff =      5.198(CFS)  Total area =       0.975(Ac.)
Depth of flow =   0.973(Ft.), Average velocity =   2.530(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.975(Ac.)
Runoff from this stream =      5.198(CFS)
Time of concentration =    8.60 min.
Rainfall intensity =     6.128(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                         ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =   60.000(Ft.)
Highest elevation =  711.570(Ft.)
Lowest elevation =  711.050(Ft.)
Elevation difference =    0.520(Ft.) Slope =  0.867 %
Top of Initial Area Slope adjusted by User to  1.430 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.43 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.85 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  60.000^.5)/(   1.430^(1/3)]=   2.85
Calculated TC of    2.846 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      0.530(CFS)
Total initial stream area =        0.070(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      202.100
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      4.122(CFS)
Depth of flow =   1.317(Ft.), Average velocity =   2.267(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.50
    2             14.00              1.00
    3             14.50              0.00
    4             14.50              1.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      4.122(CFS)
  '     '    flow top width =      9.384(Ft.)
  '     '    velocity=    2.267(Ft/s)
  '     '    area =      1.818(Sq.Ft)
  '     '    Froude number =     0.908

Upstream point elevation =   711.050(Ft.)
Downstream point elevation =   707.400(Ft.)
Flow length =   608.000(Ft.)
Travel time  =    4.47 min.
Time of concentration =    7.32 min.
Depth of flow =   1.317(Ft.)
Average velocity =   2.267(Ft/s)
Total irregular channel flow =     4.122(CFS)
Irregular channel normal depth above invert elev. =   1.317(Ft.)
Average velocity of channel(s) =   2.267(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.802(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                         ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.850
Rainfall intensity =      6.802(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.851  CA =      1.126
Subarea runoff =      7.129(CFS) for      1.253(Ac.)
Total runoff =      7.659(CFS)  Total area =      1.323(Ac.)
Depth of flow =   1.416(Ft.), Average velocity =   2.653(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.100 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   704.400(Ft.)
Downstream point/station elevation =   695.330(Ft.)
Pipe length  =    17.00(Ft.) Slope =   0.5335  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.659(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     7.659(CFS)
Normal flow depth in pipe =    3.84(In.)
Flow top width inside pipe =   14.75(In.)
Critical Depth =   12.87(In.)
Pipe flow velocity =     27.75(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =     7.33 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.323(Ac.)
Runoff from this stream =      7.659(CFS)
Time of concentration =    7.33 min.
Rainfall intensity =     6.796(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        5.198      8.60             6.128
2        7.659      7.33             6.796
Qmax(1) =
       1.000 *    1.000 *     5.198) +
       0.902 *    1.000 *     7.659) + =      12.104
Qmax(2) =
       1.000 *    0.852 *     5.198) +
       1.000 *    1.000 *     7.659) + =      12.086

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.198       7.659
Maximum flow rates at confluence using above data:
       12.104       12.086
Area of streams before confluence:
        0.975        1.323
Results of confluence:
Total flow rate =     12.104(CFS)
Time of concentration =     8.601 min.
Effective stream area after confluence =      2.298(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** 6 HOUR HYDROGRAPH ****
------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003


Time of Concentration =   8.60
Basin Area =     2.30 Acres
6 Hour Rainfall =  3.300 Inches
Runoff Coefficient =  0.859
Peak Discharge =    12.10 CFS
     Time (Min)     Discharge (CFS)
       0              0.000
       8              0.389
       16              0.395
       24              0.407
       32              0.413
       40              0.427
       48              0.434
       56              0.450
       64              0.458
       72              0.477
       80              0.486
       88              0.507
       96              0.519
       104              0.544
       112              0.557
       120              0.587
       128              0.604
```

136	0.641	
144	0.663	
152	0.710	
160	0.738	
168	0.802	
176	0.840	
184	0.932	
192	0.988	
200	1.132	
208	1.228	
216	1.501	
224	1.709	
232	2.510	
240	3.536	
248	12.104	
256	2.013	
264	1.347	
272	1.054	
280	0.883	
288	0.768	
296	0.685	
304	0.622	
312	0.572	
320	0.531	
328	0.496	
336	0.467	
344	0.442	
352	0.420	
360	0.401	
368	0.384	

++

6 - 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

Hydrograph in 1 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	3.0	6.1	9.1	12.1
0+ 0	0.0000	0.00	Q	|	|	|	|
0+ 1	0.0001	0.05	Q	|	|	|	|
0+ 2	0.0002	0.10	Q	|	|	|	|
0+ 3	0.0004	0.15	Q	|	|	|	|
0+ 4	0.0007	0.19	Q	|	|	|	|
0+ 5	0.0010	0.24	Q	|	|	|	|
0+ 6	0.0014	0.29	Q	|	|	|	|
0+ 7	0.0019	0.34	VQ	|	|	|	|
0+ 8	0.0024	0.39	VQ	|	|	|	|
0+ 9	0.0029	0.39	VQ	|	|	|	|
0+10	0.0035	0.39	VQ	|	|	|	|
0+11	0.0040	0.39	VQ	|	|	|	|
0+12	0.0046	0.39	VQ	|	|	|	|
0+13	0.0051	0.39	VQ	|	|	|	|
0+14	0.0056	0.39	VQ	|	|	|	|
0+15	0.0062	0.39	VQ	|	|	|	|
0+16	0.0067	0.39	VQ	|	|	|	|
0+17	0.0073	0.40	VQ	|	|	|	|
0+18	0.0078	0.40	VQ	|	|	|	|
0+19	0.0084	0.40	VQ	|	|	|	|
0+20	0.0089	0.40	VQ	|	|	|	|
0+21	0.0095	0.40	VQ	|	|	|	|
0+22	0.0100	0.40	VQ	|	|	|	|
0+23	0.0106	0.41	VQ	|	|	|	|
0+24	0.0112	0.41	VQ	|	|	|	|
0+25	0.0117	0.41	VQ	|	|	|	|
0+26	0.0123	0.41	VQ	|	|	|	|
0+27	0.0128	0.41	VQ	|	|	|	|
0+28	0.0134	0.41	|Q	|	|	|	|
0+29	0.0140	0.41	|Q	|	|	|	|

```
415       0+30       0.0145      0.41  |Q         |          |          |          |
416       0+31       0.0151      0.41  |Q         |          |          |          |
417       0+32       0.0157      0.41  |Q         |          |          |          |
418       0+33       0.0163      0.42  |Q         |          |          |          |
419       0+34       0.0168      0.42  |Q         |          |          |          |
420       0+35       0.0174      0.42  |Q         |          |          |          |
421       0+36       0.0180      0.42  |Q         |          |          |          |
422       0+37       0.0186      0.42  |Q         |          |          |          |
423       0+38       0.0192      0.42  |Q         |          |          |          |
424       0+39       0.0197      0.43  |Q         |          |          |          |
425       0+40       0.0203      0.43  |Q         |          |          |          |
426       0+41       0.0209      0.43  |Q         |          |          |          |
427       0+42       0.0215      0.43  |Q         |          |          |          |
428       0+43       0.0221      0.43  |Q         |          |          |          |
429       0+44       0.0227      0.43  |Q         |          |          |          |
430       0+45       0.0233      0.43  |Q         |          |          |          |
431       0+46       0.0239      0.43  |Q         |          |          |          |
432       0+47       0.0245      0.43  |Q         |          |          |          |
433       0+48       0.0251      0.43  |Q         |          |          |          |
434       0+49       0.0257      0.44  |Q         |          |          |          |
435       0+50       0.0263      0.44  |Q         |          |          |          |
436       0+51       0.0269      0.44  |QV        |          |          |          |
437       0+52       0.0275      0.44  |QV        |          |          |          |
438       0+53       0.0281      0.44  |QV        |          |          |          |
439       0+54       0.0287      0.45  |QV        |          |          |          |
440       0+55       0.0293      0.45  |QV        |          |          |          |
441       0+56       0.0300      0.45  |QV        |          |          |          |
442       0+57       0.0306      0.45  |QV        |          |          |          |
443       0+58       0.0312      0.45  |QV        |          |          |          |
444       0+59       0.0318      0.45  |QV        |          |          |          |
445       1+ 0       0.0325      0.45  |QV        |          |          |          |
446       1+ 1       0.0331      0.46  |QV        |          |          |          |
447       1+ 2       0.0337      0.46  |QV        |          |          |          |
448       1+ 3       0.0343      0.46  |QV        |          |          |          |
449       1+ 4       0.0350      0.46  |QV        |          |          |          |
450       1+ 5       0.0356      0.46  |QV        |          |          |          |
451       1+ 6       0.0362      0.46  |QV        |          |          |          |
452       1+ 7       0.0369      0.47  |QV        |          |          |          |
453       1+ 8       0.0375      0.47  |QV        |          |          |          |
454       1+ 9       0.0382      0.47  |QV        |          |          |          |
455       1+10       0.0388      0.47  |QV        |          |          |          |
456       1+11       0.0395      0.47  |QV        |          |          |          |
457       1+12       0.0401      0.48  |QV        |          |          |          |
458       1+13       0.0408      0.48  |Q V       |          |          |          |
459       1+14       0.0415      0.48  |Q V       |          |          |          |
460       1+15       0.0421      0.48  |Q V       |          |          |          |
461       1+16       0.0428      0.48  |Q V       |          |          |          |
462       1+17       0.0434      0.48  |Q V       |          |          |          |
463       1+18       0.0441      0.48  |Q V       |          |          |          |
464       1+19       0.0448      0.48  |Q V       |          |          |          |
465       1+20       0.0455      0.49  |Q V       |          |          |          |
466       1+21       0.0461      0.49  |Q V       |          |          |          |
467       1+22       0.0468      0.49  |Q V       |          |          |          |
468       1+23       0.0475      0.49  |Q V       |          |          |          |
469       1+24       0.0482      0.50  |Q V       |          |          |          |
470       1+25       0.0489      0.50  |Q V       |          |          |          |
471       1+26       0.0495      0.50  |Q V       |          |          |          |
472       1+27       0.0502      0.50  |Q V       |          |          |          |
473       1+28       0.0509      0.51  |Q V       |          |          |          |
474       1+29       0.0516      0.51  |Q V       |          |          |          |
475       1+30       0.0523      0.51  |Q V       |          |          |          |
476       1+31       0.0530      0.51  |Q V       |          |          |          |
477       1+32       0.0538      0.51  |Q  V      |          |          |          |
478       1+33       0.0545      0.51  |Q  V      |          |          |          |
479       1+34       0.0552      0.52  |Q  V      |          |          |          |
480       1+35       0.0559      0.52  |Q  V      |          |          |          |
481       1+36       0.0566      0.52  |Q  V      |          |          |          |
482       1+37       0.0573      0.52  |Q  V      |          |          |          |
483       1+38       0.0580      0.52  |Q  V      |          |          |          |
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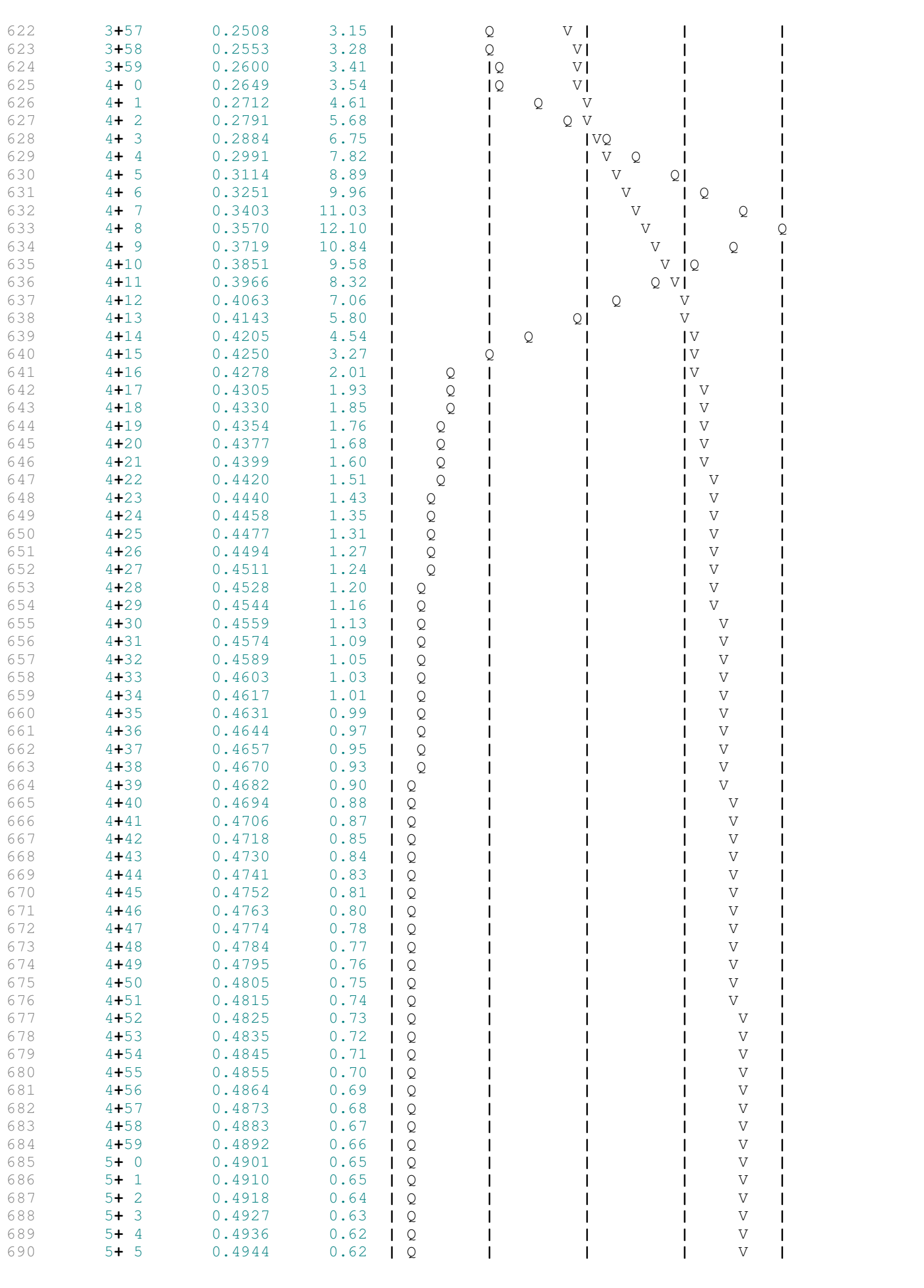
484	1+39	0.0588	0.53	|Q V |	|	|	|
485	1+40	0.0595	0.53	|Q V |	|	|	|
486	1+41	0.0602	0.53	|Q V |	|	|	|
487	1+42	0.0610	0.54	|Q V |	|	|	|
488	1+43	0.0617	0.54	|Q V |	|	|	|
489	1+44	0.0625	0.54	|Q V |	|	|	|
490	1+45	0.0632	0.55	|Q V |	|	|	|
491	1+46	0.0640	0.55	|Q V |	|	|	|
492	1+47	0.0647	0.55	|Q V |	|	|	|
493	1+48	0.0655	0.55	|Q V |	|	|	|
494	1+49	0.0662	0.55	|Q V |	|	|	|
495	1+50	0.0670	0.55	|Q V |	|	|	|
496	1+51	0.0678	0.56	|Q V |	|	|	|
497	1+52	0.0685	0.56	|Q V |	|	|	|
498	1+53	0.0693	0.56	|Q V |	|	|	|
499	1+54	0.0701	0.56	|Q V |	|	|	|
500	1+55	0.0709	0.57	|Q V |	|	|	|
501	1+56	0.0717	0.57	|Q V |	|	|	|
502	1+57	0.0725	0.58	|Q V |	|	|	|
503	1+58	0.0733	0.58	|Q V |	|	|	|
504	1+59	0.0741	0.58	|Q V |	|	|	|
505	2+ 0	0.0749	0.59	|Q V |	|	|	|
506	2+ 1	0.0757	0.59	|Q V |	|	|	|
507	2+ 2	0.0765	0.59	|Q V |	|	|	|
508	2+ 3	0.0773	0.59	|Q V |	|	|	|
509	2+ 4	0.0781	0.60	|Q V |	|	|	|
510	2+ 5	0.0790	0.60	|Q V |	|	|	|
511	2+ 6	0.0798	0.60	|Q V |	|	|	|
512	2+ 7	0.0806	0.60	|Q V |	|	|	|
513	2+ 8	0.0814	0.60	|Q V |	|	|	|
514	2+ 9	0.0823	0.61	| Q V |	|	|	|
515	2+10	0.0831	0.61	| Q V |	|	|	|
516	2+11	0.0840	0.62	| Q V |	|	|	|
517	2+12	0.0848	0.62	| Q V |	|	|	|
518	2+13	0.0857	0.63	| Q V |	|	|	|
519	2+14	0.0866	0.63	| Q V |	|	|	|
520	2+15	0.0874	0.64	| Q V |	|	|	|
521	2+16	0.0883	0.64	| Q V |	|	|	|
522	2+17	0.0892	0.64	| Q V |	|	|	|
523	2+18	0.0901	0.65	| Q V |	|	|	|
524	2+19	0.0910	0.65	| Q V |	|	|	|
525	2+20	0.0919	0.65	| Q V |	|	|	|
526	2+21	0.0928	0.65	| Q V |	|	|	|
527	2+22	0.0937	0.66	| Q V |	|	|	|
528	2+23	0.0946	0.66	| Q V |	|	|	|
529	2+24	0.0955	0.66	| Q V |	|	|	|
530	2+25	0.0965	0.67	| Q V |	|	|	|
531	2+26	0.0974	0.67	| Q V |	|	|	|
532	2+27	0.0983	0.68	| Q V |	|	|	|
533	2+28	0.0993	0.69	| Q V |	|	|	|
534	2+29	0.1002	0.69	| Q V |	|	|	|
535	2+30	0.1012	0.70	| Q V |	|	|	|
536	2+31	0.1022	0.70	| Q V |	|	|	|
537	2+32	0.1031	0.71	| Q V |	|	|	|
538	2+33	0.1041	0.71	| Q V |	|	|	|
539	2+34	0.1051	0.72	| Q V |	|	|	|
540	2+35	0.1061	0.72	| Q V |	|	|	|
541	2+36	0.1071	0.72	| Q V |	|	|	|
542	2+37	0.1081	0.73	| Q V |	|	|	|
543	2+38	0.1091	0.73	| Q V |	|	|	|
544	2+39	0.1101	0.73	| Q V |	|	|	|
545	2+40	0.1111	0.74	| Q V |	|	|	|
546	2+41	0.1122	0.75	| Q V |	|	|	|
547	2+42	0.1132	0.75	| Q V |	|	|	|
548	2+43	0.1142	0.76	| Q V |	|	|	|
549	2+44	0.1153	0.77	| Q V |	|	|	|
550	2+45	0.1164	0.78	| Q V |	|	|	|
551	2+46	0.1175	0.79	| Q V |	|	|	|
552	2+47	0.1186	0.79	| Q V |	|	|	|

553	2+48	0.1197	0.80	Q V			
554	2+49	0.1208	0.81	Q V			
555	2+50	0.1219	0.81	Q V			
556	2+51	0.1230	0.82	Q V			
557	2+52	0.1241	0.82	Q V			
558	2+53	0.1253	0.83	Q V			
559	2+54	0.1264	0.83	Q V			
560	2+55	0.1276	0.84	Q V			
561	2+56	0.1287	0.84	Q V			
562	2+57	0.1299	0.85	Q V			
563	2+58	0.1311	0.86	Q V			
564	2+59	0.1323	0.87	Q V			
565	3+ 0	0.1335	0.89	Q V			
566	3+ 1	0.1348	0.90	Q V			
567	3+ 2	0.1360	0.91	Q V			
568	3+ 3	0.1373	0.92	Q V			
569	3+ 4	0.1386	0.93	Q V			
570	3+ 5	0.1398	0.94	Q V			
571	3+ 6	0.1411	0.95	Q V			
572	3+ 7	0.1425	0.95	Q V			
573	3+ 8	0.1438	0.96	Q V			
574	3+ 9	0.1451	0.97	Q V			
575	3+10	0.1465	0.97	Q V			
576	3+11	0.1478	0.98	Q V			
577	3+12	0.1492	0.99	Q V			
578	3+13	0.1506	1.01	Q V			
579	3+14	0.1520	1.02	Q V			
580	3+15	0.1534	1.04	Q V			
581	3+16	0.1549	1.06	Q V			
582	3+17	0.1563	1.08	Q V			
583	3+18	0.1579	1.10	Q V			
584	3+19	0.1594	1.11	Q V			
585	3+20	0.1609	1.13	Q V			
586	3+21	0.1625	1.14	Q V			
587	3+22	0.1641	1.16	Q V			
588	3+23	0.1657	1.17	Q V			
589	3+24	0.1674	1.18	Q V			
590	3+25	0.1690	1.19	Q V			
591	3+26	0.1707	1.20	Q V			
592	3+27	0.1723	1.22	Q V			
593	3+28	0.1740	1.23	Q V			
594	3+29	0.1758	1.26	Q V			
595	3+30	0.1775	1.30	Q V			
596	3+31	0.1794	1.33	Q V			
597	3+32	0.1813	1.36	Q V			
598	3+33	0.1832	1.40	Q V			
599	3+34	0.1852	1.43	Q V			
600	3+35	0.1872	1.47	Q V			
601	3+36	0.1892	1.50	Q V			
602	3+37	0.1913	1.53	Q V			
603	3+38	0.1935	1.55	Q V			
604	3+39	0.1957	1.58	Q V			
605	3+40	0.1979	1.61	Q V			
606	3+41	0.2001	1.63	Q V			
607	3+42	0.2024	1.66	Q V			
608	3+43	0.2047	1.68	Q V			
609	3+44	0.2071	1.71	Q V			
610	3+45	0.2096	1.81	Q V			
611	3+46	0.2122	1.91	Q V			
612	3+47	0.2150	2.01	Q V			
613	3+48	0.2179	2.11	Q V			
614	3+49	0.2209	2.21	Q V			
615	3+50	0.2241	2.31	Q V			
616	3+51	0.2274	2.41	Q V			
617	3+52	0.2309	2.51	Q V			
618	3+53	0.2345	2.64	Q V			
619	3+54	0.2383	2.77	Q V			
620	3+55	0.2423	2.89	Q V			
621	3+56	0.2465	3.02	Q V			



	5+ 6	0.4952	0.61	| Q	|	|	|	V |
	5+ 7	0.4961	0.60	|Q	|	|	|	V |
	5+ 8	0.4969	0.60	|Q	|	|	|	V |
	5+ 9	0.4977	0.59	|Q	|	|	|	V |
	5+10	0.4985	0.58	|Q	|	|	|	V |
	5+11	0.4993	0.58	|Q	|	|	|	V |
	5+12	0.5001	0.57	|Q	|	|	|	V |
	5+13	0.5009	0.57	|Q	|	|	|	V |
	5+14	0.5017	0.56	|Q	|	|	|	V |
	5+15	0.5024	0.56	|Q	|	|	|	V |
	5+16	0.5032	0.55	|Q	|	|	|	V |
	5+17	0.5039	0.55	|Q	|	|	|	V |
	5+18	0.5047	0.54	|Q	|	|	|	V |
	5+19	0.5054	0.54	|Q	|	|	|	V |
	5+20	0.5061	0.53	|Q	|	|	|	V |
	5+21	0.5069	0.53	|Q	|	|	|	V |
	5+22	0.5076	0.52	|Q	|	|	|	V |
	5+23	0.5083	0.52	|Q	|	|	|	V |
	5+24	0.5090	0.51	|Q	|	|	|	V |
	5+25	0.5097	0.51	|Q	|	|	|	V |
	5+26	0.5104	0.51	|Q	|	|	|	V |
	5+27	0.5111	0.50	|Q	|	|	|	V |
	5+28	0.5118	0.50	|Q	|	|	|	V |
	5+29	0.5125	0.49	|Q	|	|	|	V |
	5+30	0.5131	0.49	|Q	|	|	|	V |
	5+31	0.5138	0.49	|Q	|	|	|	V |
	5+32	0.5145	0.48	|Q	|	|	|	V |
	5+33	0.5151	0.48	|Q	|	|	|	V |
	5+34	0.5158	0.47	|Q	|	|	|	V |
	5+35	0.5164	0.47	|Q	|	|	|	V |
	5+36	0.5171	0.47	|Q	|	|	|	V |
	5+37	0.5177	0.46	|Q	|	|	|	V |
	5+38	0.5183	0.46	|Q	|	|	|	V |
	5+39	0.5190	0.46	|Q	|	|	|	V |
	5+40	0.5196	0.45	|Q	|	|	|	V |
	5+41	0.5202	0.45	|Q	|	|	|	V |
	5+42	0.5208	0.45	|Q	|	|	|	V |
	5+43	0.5215	0.45	|Q	|	|	|	V |
	5+44	0.5221	0.44	|Q	|	|	|	V |
	5+45	0.5227	0.44	|Q	|	|	|	V|
	5+46	0.5233	0.44	|Q	|	|	|	V|
	5+47	0.5239	0.43	|Q	|	|	|	V|
	5+48	0.5245	0.43	|Q	|	|	|	V|
	5+49	0.5251	0.43	|Q	|	|	|	V|
	5+50	0.5256	0.43	|Q	|	|	|	V|
	5+51	0.5262	0.42	|Q	|	|	|	V|
	5+52	0.5268	0.42	|Q	|	|	|	V|
	5+53	0.5274	0.42	|Q	|	|	|	V|
	5+54	0.5279	0.42	|Q	|	|	|	V|
	5+55	0.5285	0.41	|Q	|	|	|	V|
	5+56	0.5291	0.41	|Q	|	|	|	V|
	5+57	0.5296	0.41	|Q	|	|	|	V|
	5+58	0.5302	0.41	|Q	|	|	|	V|
	5+59	0.5308	0.40	|Q	|	|	|	V|
	6+ 0	0.5313	0.40	|Q	|	|	|	V|
	6+ 1	0.5319	0.40	|Q	|	|	|	V|
	6+ 2	0.5324	0.40	|Q	|	|	|	V|
	6+ 3	0.5329	0.39	|Q	|	|	|	V|
	6+ 4	0.5335	0.39	|Q	|	|	|	V|
	6+ 5	0.5340	0.39	|Q	|	|	|	V|
	6+ 6	0.5346	0.39	|Q	|	|	|	V|
	6+ 7	0.5351	0.39	|Q	|	|	|	V|
	6+ 8	0.5356	0.38	|Q	|	|	|	V
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   695.330(Ft.)
Downstream point/station elevation =   693.410(Ft.)
Pipe length  =   105.00(Ft.) Slope =   0.0183  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.104(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    12.104(CFS)
Normal flow depth in pipe =    8.12(In.)
Flow top width inside pipe =   35.99(In.)
Critical Depth =   12.19(In.)
Pipe flow velocity =      8.60(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     8.80 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Rainfall intensity (I) =      6.036(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Time of concentration =     8.80 min.
Rainfall intensity =      6.036(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.807  CA =      2.065
Subarea runoff =      0.362(CFS) for      0.260(Ac.)
Total runoff =     12.466(CFS)  Total area =       2.558(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Rainfall intensity (I) =      6.036(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[HIGH DENSITY RESIDENTIAL                   ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.790
Time of concentration =     8.80 min.
Rainfall intensity =      6.036(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.806  CA =      2.290
Subarea runoff =      1.354(CFS) for      0.284(Ac.)
Total runoff =     13.820(CFS)  Total area =       2.842(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** 6 HOUR HYDROGRAPH ****
------------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003


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Time of Concentration = 8.80
Basin Area = 2.84 Acres
6 Hour Rainfall = 3.300 Inches
Runoff Coefficient = 0.806
Peak Discharge = 13.82 CFS

Time (Min)	Discharge (CFS)
0	0.000
8	0.451
16	0.458
24	0.472
32	0.479
40	0.495
48	0.504
56	0.522
64	0.532
72	0.553
80	0.564
88	0.588
96	0.601
104	0.630
112	0.646
120	0.681
128	0.701
136	0.744
144	0.768
152	0.824
160	0.856
168	0.930
176	0.974
184	1.080
192	1.146
200	1.313
208	1.424
216	1.741
224	1.982
232	2.911
240	4.101
248	13.820
256	2.335
264	1.562
272	1.222
280	1.024
288	0.891
296	0.795
304	0.721
312	0.663
320	0.616
328	0.576
336	0.542
344	0.513
352	0.487
360	0.465
368	0.445

++

6 - 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

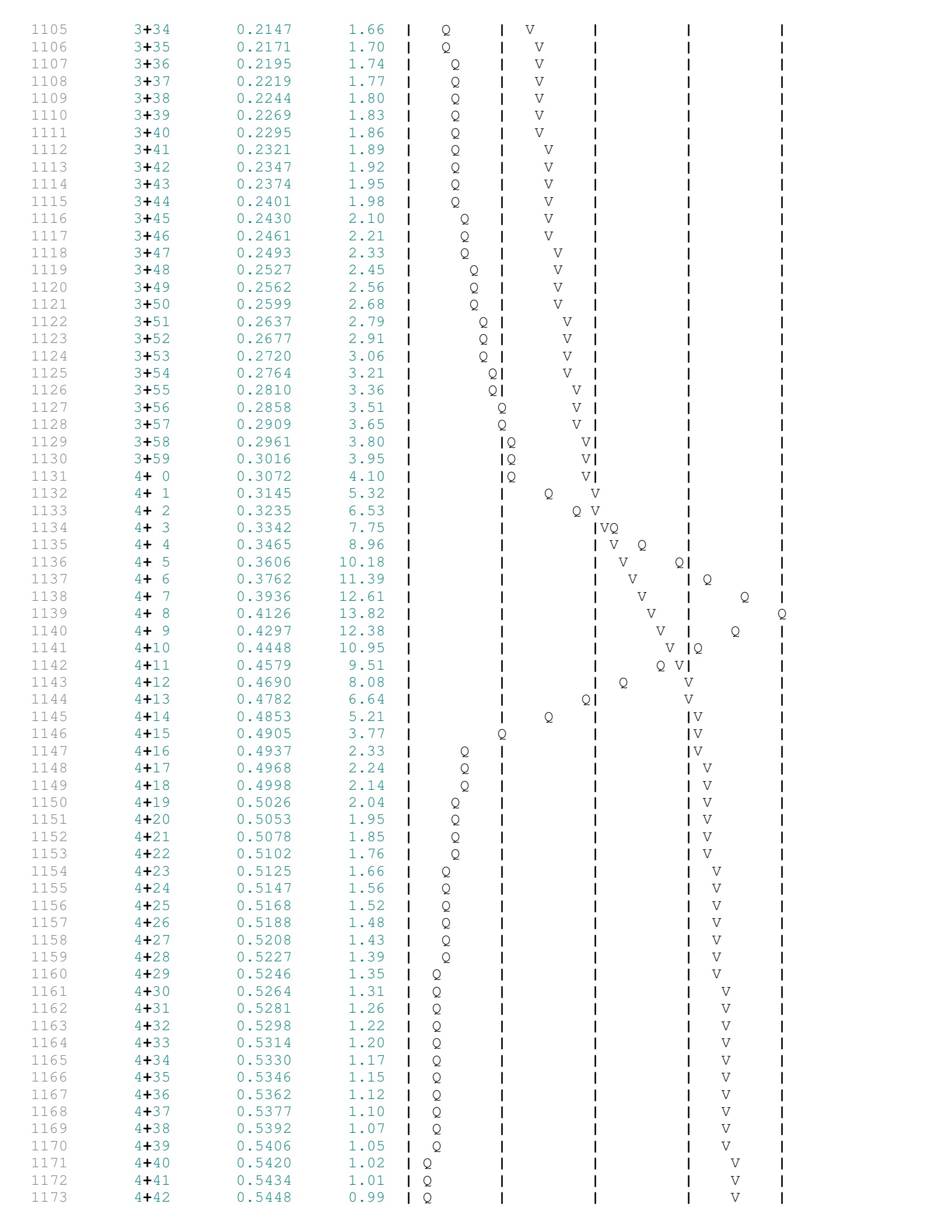
Hydrograph in 1 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	3.5	6.9	10.4	13.8
0+ 0	0.0000	0.00	Q	|	|	|	|
0+ 1	0.0001	0.06	Q	|	|	|	|
0+ 2	0.0002	0.11	Q	|	|	|	|
0+ 3	0.0005	0.17	Q	|	|	|	|
0+ 4	0.0008	0.23	Q	|	|	|	|
0+ 5	0.0012	0.28	Q	|	|	|	|
0+ 6	0.0016	0.34	Q	|	|	|	|

898	0+ 7	0.0022	0.39	VQ	|	|	|	|
899	0+ 8	0.0028	0.45	VQ	|	|	|	|
900	0+ 9	0.0034	0.45	VQ	|	|	|	|
901	0+10	0.0040	0.45	VQ	|	|	|	|
902	0+11	0.0047	0.45	VQ	|	|	|	|
903	0+12	0.0053	0.45	VQ	|	|	|	|
904	0+13	0.0059	0.46	VQ	|	|	|	|
905	0+14	0.0066	0.46	VQ	|	|	|	|
906	0+15	0.0072	0.46	VQ	|	|	|	|
907	0+16	0.0078	0.46	VQ	|	|	|	|
908	0+17	0.0084	0.46	VQ	|	|	|	|
909	0+18	0.0091	0.46	VQ	|	|	|	|
910	0+19	0.0097	0.46	VQ	|	|	|	|
911	0+20	0.0104	0.46	VQ	|	|	|	|
912	0+21	0.0110	0.47	VQ	|	|	|	|
913	0+22	0.0116	0.47	VQ	|	|	|	|
914	0+23	0.0123	0.47	VQ	|	|	|	|
915	0+24	0.0129	0.47	VQ	|	|	|	|
916	0+25	0.0136	0.47	VQ	|	|	|	|
917	0+26	0.0142	0.47	VQ	|	|	|	|
918	0+27	0.0149	0.47	VQ	|	|	|	|
919	0+28	0.0156	0.48	|Q	|	|	|	|
920	0+29	0.0162	0.48	|Q	|	|	|	|
921	0+30	0.0169	0.48	|Q	|	|	|	|
922	0+31	0.0175	0.48	|Q	|	|	|	|
923	0+32	0.0182	0.48	|Q	|	|	|	|
924	0+33	0.0189	0.48	|Q	|	|	|	|
925	0+34	0.0195	0.48	|Q	|	|	|	|
926	0+35	0.0202	0.49	|Q	|	|	|	|
927	0+36	0.0209	0.49	|Q	|	|	|	|
928	0+37	0.0215	0.49	|Q	|	|	|	|
929	0+38	0.0222	0.49	|Q	|	|	|	|
930	0+39	0.0229	0.49	|Q	|	|	|	|
931	0+40	0.0236	0.50	|Q	|	|	|	|
932	0+41	0.0243	0.50	|Q	|	|	|	|
933	0+42	0.0249	0.50	|Q	|	|	|	|
934	0+43	0.0256	0.50	|Q	|	|	|	|
935	0+44	0.0263	0.50	|Q	|	|	|	|
936	0+45	0.0270	0.50	|Q	|	|	|	|
937	0+46	0.0277	0.50	|Q	|	|	|	|
938	0+47	0.0284	0.50	|Q	|	|	|	|
939	0+48	0.0291	0.50	|Q	|	|	|	|
940	0+49	0.0298	0.51	|Q	|	|	|	|
941	0+50	0.0305	0.51	|Q	|	|	|	|
942	0+51	0.0312	0.51	|QV	|	|	|	|
943	0+52	0.0319	0.51	|QV	|	|	|	|
944	0+53	0.0326	0.52	|QV	|	|	|	|
945	0+54	0.0333	0.52	|QV	|	|	|	|
946	0+55	0.0340	0.52	|QV	|	|	|	|
947	0+56	0.0347	0.52	|QV	|	|	|	|
948	0+57	0.0355	0.52	|QV	|	|	|	|
949	0+58	0.0362	0.52	|QV	|	|	|	|
950	0+59	0.0369	0.53	|QV	|	|	|	|
951	1+ 0	0.0376	0.53	|QV	|	|	|	|
952	1+ 1	0.0384	0.53	|QV	|	|	|	|
953	1+ 2	0.0391	0.53	|QV	|	|	|	|
954	1+ 3	0.0398	0.53	|QV	|	|	|	|
955	1+ 4	0.0406	0.53	|QV	|	|	|	|
956	1+ 5	0.0413	0.53	|QV	|	|	|	|
957	1+ 6	0.0420	0.54	|QV	|	|	|	|
958	1+ 7	0.0428	0.54	|QV	|	|	|	|
959	1+ 8	0.0435	0.54	|QV	|	|	|	|
960	1+ 9	0.0443	0.54	|QV	|	|	|	|
961	1+10	0.0450	0.55	|QV	|	|	|	|
962	1+11	0.0458	0.55	|QV	|	|	|	|
963	1+12	0.0466	0.55	|Q V	|	|	|	|
964	1+13	0.0473	0.55	|Q V	|	|	|	|
965	1+14	0.0481	0.56	|Q V	|	|	|	|
966	1+15	0.0488	0.56	|Q V	|	|	|	|

967	1+16	0.0496	0.56	|Q V |	|	|	|
968	1+17	0.0504	0.56	|Q V |	|	|	|
969	1+18	0.0512	0.56	|Q V |	|	|	|
970	1+19	0.0519	0.56	|Q V |	|	|	|
971	1+20	0.0527	0.56	|Q V |	|	|	|
972	1+21	0.0535	0.57	|Q V |	|	|	|
973	1+22	0.0543	0.57	|Q V |	|	|	|
974	1+23	0.0551	0.57	|Q V |	|	|	|
975	1+24	0.0559	0.58	|Q V |	|	|	|
976	1+25	0.0567	0.58	|Q V |	|	|	|
977	1+26	0.0575	0.58	|Q V |	|	|	|
978	1+27	0.0583	0.59	|Q V |	|	|	|
979	1+28	0.0591	0.59	|Q V |	|	|	|
980	1+29	0.0599	0.59	|Q V |	|	|	|
981	1+30	0.0607	0.59	|Q V |	|	|	|
982	1+31	0.0615	0.59	|Q V |	|	|	|
983	1+32	0.0623	0.59	|Q V |	|	|	|
984	1+33	0.0632	0.60	|Q V |	|	|	|
985	1+34	0.0640	0.60	|Q V |	|	|	|
986	1+35	0.0648	0.60	|Q V |	|	|	|
987	1+36	0.0656	0.60	|Q V |	|	|	|
988	1+37	0.0665	0.61	|Q V |	|	|	|
989	1+38	0.0673	0.61	|Q V |	|	|	|
990	1+39	0.0682	0.61	|Q V |	|	|	|
991	1+40	0.0690	0.62	|Q V |	|	|	|
992	1+41	0.0699	0.62	|Q V |	|	|	|
993	1+42	0.0707	0.62	|Q V |	|	|	|
994	1+43	0.0716	0.63	|Q V |	|	|	|
995	1+44	0.0724	0.63	|Q V |	|	|	|
996	1+45	0.0733	0.63	|Q V |	|	|	|
997	1+46	0.0742	0.63	|Q V |	|	|	|
998	1+47	0.0751	0.64	|Q V |	|	|	|
999	1+48	0.0759	0.64	|Q V |	|	|	|
1000	1+49	0.0768	0.64	|Q V |	|	|	|
1001	1+50	0.0777	0.64	|Q V |	|	|	|
1002	1+51	0.0786	0.64	|Q V |	|	|	|
1003	1+52	0.0795	0.65	|Q V |	|	|	|
1004	1+53	0.0804	0.65	|Q V |	|	|	|
1005	1+54	0.0813	0.65	|Q V |	|	|	|
1006	1+55	0.0822	0.66	|Q V |	|	|	|
1007	1+56	0.0831	0.66	|Q V |	|	|	|
1008	1+57	0.0840	0.67	|Q V |	|	|	|
1009	1+58	0.0850	0.67	|Q V |	|	|	|
1010	1+59	0.0859	0.68	|Q V |	|	|	|
1011	2+ 0	0.0868	0.68	|Q V |	|	|	|
1012	2+ 1	0.0878	0.68	|Q V |	|	|	|
1013	2+ 2	0.0887	0.69	|Q V |	|	|	|
1014	2+ 3	0.0897	0.69	|Q V |	|	|	|
1015	2+ 4	0.0906	0.69	|Q V |	|	|	|
1016	2+ 5	0.0916	0.69	| Q V |	|	|	|
1017	2+ 6	0.0925	0.70	| Q V |	|	|	|
1018	2+ 7	0.0935	0.70	| Q V |	|	|	|
1019	2+ 8	0.0945	0.70	| Q V |	|	|	|
1020	2+ 9	0.0954	0.71	| Q V |	|	|	|
1021	2+10	0.0964	0.71	| Q V |	|	|	|
1022	2+11	0.0974	0.72	| Q V |	|	|	|
1023	2+12	0.0984	0.72	| Q V |	|	|	|
1024	2+13	0.0994	0.73	| Q V |	|	|	|
1025	2+14	0.1004	0.73	| Q V |	|	|	|
1026	2+15	0.1014	0.74	| Q V |	|	|	|
1027	2+16	0.1024	0.74	| Q V |	|	|	|
1028	2+17	0.1035	0.75	| Q V |	|	|	|
1029	2+18	0.1045	0.75	| Q V |	|	|	|
1030	2+19	0.1055	0.75	| Q V |	|	|	|
1031	2+20	0.1066	0.76	| Q V |	|	|	|
1032	2+21	0.1076	0.76	| Q V |	|	|	|
1033	2+22	0.1087	0.76	| Q V |	|	|	|
1034	2+23	0.1097	0.77	| Q V |	|	|	|
1035	2+24	0.1108	0.77	| Q V |	|	|	|

1036	2+25	0.1119	0.78	Q V				
1037	2+26	0.1129	0.78	Q V				
1038	2+27	0.1140	0.79	Q V				
1039	2+28	0.1151	0.80	Q V				
1040	2+29	0.1162	0.80	Q V				
1041	2+30	0.1173	0.81	Q V				
1042	2+31	0.1185	0.82	Q V				
1043	2+32	0.1196	0.82	Q V				
1044	2+33	0.1207	0.83	Q V				
1045	2+34	0.1219	0.83	Q V				
1046	2+35	0.1230	0.84	Q V				
1047	2+36	0.1242	0.84	Q V				
1048	2+37	0.1254	0.84	Q V				
1049	2+38	0.1265	0.85	Q V				
1050	2+39	0.1277	0.85	Q V				
1051	2+40	0.1289	0.86	Q V				
1052	2+41	0.1301	0.87	Q V				
1053	2+42	0.1313	0.87	Q V				
1054	2+43	0.1325	0.88	Q V				
1055	2+44	0.1337	0.89	Q V				
1056	2+45	0.1350	0.90	Q V				
1057	2+46	0.1362	0.91	Q V				
1058	2+47	0.1375	0.92	Q V				
1059	2+48	0.1388	0.93	Q V				
1060	2+49	0.1401	0.94	Q V				
1061	2+50	0.1414	0.94	Q V				
1062	2+51	0.1427	0.95	Q V				
1063	2+52	0.1440	0.95	Q V				
1064	2+53	0.1453	0.96	Q V				
1065	2+54	0.1466	0.96	Q V				
1066	2+55	0.1480	0.97	Q V				
1067	2+56	0.1493	0.97	Q V				
1068	2+57	0.1507	0.99	Q V				
1069	2+58	0.1520	1.00	Q V				
1070	2+59	0.1534	1.01	Q V				
1071	3+ 0	0.1548	1.03	Q V				
1072	3+ 1	0.1563	1.04	Q V				
1073	3+ 2	0.1577	1.05	Q V				
1074	3+ 3	0.1592	1.07	Q V				
1075	3+ 4	0.1607	1.08	Q V				
1076	3+ 5	0.1622	1.09	Q V				
1077	3+ 6	0.1637	1.10	Q V				
1078	3+ 7	0.1652	1.10	Q V				
1079	3+ 8	0.1668	1.11	Q V				
1080	3+ 9	0.1683	1.12	Q V				
1081	3+10	0.1699	1.13	Q V				
1082	3+11	0.1714	1.14	Q V				
1083	3+12	0.1730	1.15	Q V				
1084	3+13	0.1746	1.17	Q V				
1085	3+14	0.1762	1.19	Q V				
1086	3+15	0.1779	1.21	Q V				
1087	3+16	0.1796	1.23	Q V				
1088	3+17	0.1813	1.25	Q V				
1089	3+18	0.1831	1.27	Q V				
1090	3+19	0.1849	1.29	Q V				
1091	3+20	0.1867	1.31	Q V				
1092	3+21	0.1885	1.33	Q V				
1093	3+22	0.1903	1.34	Q V				
1094	3+23	0.1922	1.35	Q V				
1095	3+24	0.1941	1.37	Q V				
1096	3+25	0.1960	1.38	Q V				
1097	3+26	0.1979	1.40	Q V				
1098	3+27	0.1999	1.41	Q V				
1099	3+28	0.2018	1.42	Q V				
1100	3+29	0.2038	1.46	Q V				
1101	3+30	0.2059	1.50	Q V				
1102	3+31	0.2080	1.54	Q V				
1103	3+32	0.2102	1.58	Q V				
1104	3+33	0.2124	1.62	Q V				



1174	4+43	0.5461	0.97	| Q	|	|	| V	|
1175	4+44	0.5474	0.96	| Q	|	|	| V	|
1176	4+45	0.5487	0.94	| Q	|	|	| V	|
1177	4+46	0.5500	0.92	| Q	|	|	| V	|
1178	4+47	0.5512	0.91	| Q	|	|	| V	|
1179	4+48	0.5525	0.89	| Q	|	|	| V	|
1180	4+49	0.5537	0.88	| Q	|	|	| V	|
1181	4+50	0.5549	0.87	| Q	|	|	| V	|
1182	4+51	0.5561	0.85	| Q	|	|	| V	|
1183	4+52	0.5572	0.84	| Q	|	|	| V	|
1184	4+53	0.5584	0.83	| Q	|	|	| V	|
1185	4+54	0.5595	0.82	| Q	|	|	| V	|
1186	4+55	0.5606	0.81	| Q	|	|	| V	|
1187	4+56	0.5617	0.79	| Q	|	|	| V	|
1188	4+57	0.5628	0.79	| Q	|	|	| V	|
1189	4+58	0.5639	0.78	| Q	|	|	| V	|
1190	4+59	0.5649	0.77	| Q	|	|	| V	|
1191	5+ 0	0.5660	0.76	| Q	|	|	| V	|
1192	5+ 1	0.5670	0.75	| Q	|	|	| V	|
1193	5+ 2	0.5680	0.74	| Q	|	|	| V	|
1194	5+ 3	0.5690	0.73	| Q	|	|	| V	|
1195	5+ 4	0.5700	0.72	| Q	|	|	| V	|
1196	5+ 5	0.5710	0.71	| Q	|	|	| V	|
1197	5+ 6	0.5720	0.71	| Q	|	|	| V	|
1198	5+ 7	0.5729	0.70	| Q	|	|	| V	|
1199	5+ 8	0.5739	0.69	| Q	|	|	| V	|
1200	5+ 9	0.5748	0.68	|Q	|	|	| V	|
1201	5+10	0.5758	0.68	|Q	|	|	| V	|
1202	5+11	0.5767	0.67	|Q	|	|	| V	|
1203	5+12	0.5776	0.66	|Q	|	|	| V	|
1204	5+13	0.5785	0.66	|Q	|	|	| V	|
1205	5+14	0.5794	0.65	|Q	|	|	| V	|
1206	5+15	0.5803	0.65	|Q	|	|	| V	|
1207	5+16	0.5812	0.64	|Q	|	|	| V	|
1208	5+17	0.5820	0.63	|Q	|	|	| V	|
1209	5+18	0.5829	0.63	|Q	|	|	| V	|
1210	5+19	0.5838	0.62	|Q	|	|	| V	|
1211	5+20	0.5846	0.62	|Q	|	|	| V	|
1212	5+21	0.5854	0.61	|Q	|	|	| V	|
1213	5+22	0.5863	0.61	|Q	|	|	| V	|
1214	5+23	0.5871	0.60	|Q	|	|	| V	|
1215	5+24	0.5879	0.60	|Q	|	|	| V	|
1216	5+25	0.5887	0.59	|Q	|	|	| V	|
1217	5+26	0.5895	0.59	|Q	|	|	| V	|
1218	5+27	0.5903	0.58	|Q	|	|	| V	|
1219	5+28	0.5911	0.58	|Q	|	|	| V	|
1220	5+29	0.5919	0.57	|Q	|	|	| V	|
1221	5+30	0.5927	0.57	|Q	|	|	| V	|
1222	5+31	0.5935	0.56	|Q	|	|	| V	|
1223	5+32	0.5943	0.56	|Q	|	|	| V	|
1224	5+33	0.5950	0.55	|Q	|	|	| V	|
1225	5+34	0.5958	0.55	|Q	|	|	| V	|
1226	5+35	0.5965	0.55	|Q	|	|	| V	|
1227	5+36	0.5973	0.54	|Q	|	|	| V	|
1228	5+37	0.5980	0.54	|Q	|	|	| V	|
1229	5+38	0.5988	0.53	|Q	|	|	| V	|
1230	5+39	0.5995	0.53	|Q	|	|	| V	|
1231	5+40	0.6002	0.53	|Q	|	|	| V	|
1232	5+41	0.6009	0.52	|Q	|	|	| V	|
1233	5+42	0.6016	0.52	|Q	|	|	| V	|
1234	5+43	0.6024	0.52	|Q	|	|	| V	|
1235	5+44	0.6031	0.51	|Q	|	|	| V	|
1236	5+45	0.6038	0.51	|Q	|	|	| V	|
1237	5+46	0.6045	0.51	|Q	|	|	| V	|
1238	5+47	0.6052	0.50	|Q	|	|	| V	|
1239	5+48	0.6058	0.50	|Q	|	|	| V	|
1240	5+49	0.6065	0.50	|Q	|	|	| V	|
1241	5+50	0.6072	0.49	|Q	|	|	| V	|
1242	5+51	0.6079	0.49	|Q	|	|	| V	|

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     5+52       0.6086      0.49  |Q        |         |         |         V|
     5+53       0.6092      0.48  |Q        |         |         |         V|
     5+54       0.6099      0.48  |Q        |         |         |         V|
     5+55       0.6105      0.48  |Q        |         |         |         V|
     5+56       0.6112      0.48  |Q        |         |         |         V|
     5+57       0.6119      0.47  |Q        |         |         |         V|
     5+58       0.6125      0.47  |Q        |         |         |         V|
     5+59       0.6131      0.47  |Q        |         |         |         V|
     6+ 0       0.6138      0.46  |Q        |         |         |         V|
     6+ 1       0.6144      0.46  |Q        |         |         |         V|
     6+ 2       0.6151      0.46  |Q        |         |         |         V|
     6+ 3       0.6157      0.46  |Q        |         |         |         V|
     6+ 4       0.6163      0.45  |Q        |         |         |         V|
     6+ 5       0.6169      0.45  |Q        |         |         |         V|
     6+ 6       0.6176      0.45  |Q        |         |         |         V|
     6+ 7       0.6182      0.45  |Q        |         |         |         V|
     6+ 8       0.6188      0.44  |Q        |         |         |          V
-------------------------------------------------------------------------


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   690.910(Ft.)
Downstream point/station elevation =   684.350(Ft.)
Pipe length  =    63.00(Ft.) Slope =   0.1041  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.820(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    13.820(CFS)
Normal flow depth in pipe =    8.00(In.)
Flow top width inside pipe =   17.89(In.)
Critical Depth =   16.52(In.)
Pipe flow velocity =     18.21(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     8.86 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     14.072(CFS)
Depth of flow =   0.874(Ft.), Average velocity =  18.419(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.016
------------------------------------------------------------------
Sub-Channel flow  =     14.072(CFS)
  '     '    flow top width =      1.748(Ft.)
  '     '    velocity=   18.419(Ft/s)
  '     '    area =      0.764(Sq.Ft)
  '     '    Froude number =     4.910

Upstream point elevation =   684.820(Ft.)
Downstream point elevation =   611.400(Ft.)
Flow length =   390.000(Ft.)
Travel time  =    0.35 min.
Time of concentration =    9.21 min.
Depth of flow =   0.874(Ft.)
```

```
Average velocity =  18.419(Ft/s)
Total irregular channel flow =    14.072(CFS)
Irregular channel normal depth above invert elev. =   0.874(Ft.)
Average velocity of channel(s) =  18.419(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.861(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.050
Decimal fraction soil group D = 0.950
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.347
Rainfall intensity =      5.861(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.749  CA =      2.428
Subarea runoff =      0.408(CFS) for      0.397(Ac.)
Total runoff =     14.228(CFS)  Total area =       3.239(Ac.)
Depth of flow =   0.878(Ft.), Average velocity =  18.470(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     14.430(CFS)
Depth of flow =   0.461(Ft.), Average velocity =   4.222(Ft/s)
    ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.63
    2             25.00              0.13
    3             26.50              0.00
    4             26.50              0.50
    5             31.50              0.60
Manning's 'N' friction factor =   0.015
----------------------------------------------------------------
Sub-Channel flow  =     14.430(CFS)
  '     '    flow top width =     18.293(Ft.)
  '     '    velocity=    4.222(Ft/s)
  '     '    area =      3.418(Sq.Ft)
  '     '    Froude number =     1.721

Upstream point elevation =   611.400(Ft.)
Downstream point elevation =   608.550(Ft.)
Flow length =   162.000(Ft.)
Travel time  =    0.64 min.
Time of concentration =    9.85 min.
Depth of flow =   0.461(Ft.)
Average velocity =   4.222(Ft/s)
Total irregular channel flow =    14.430(CFS)
Irregular channel normal depth above invert elev. =   0.461(Ft.)
Average velocity of channel(s) =   4.222(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.613(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.050
Decimal fraction soil group D = 0.950
[INDUSTRIAL area type                       ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      5.613(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.756  CA =      2.595
Subarea runoff =      0.340(CFS) for      0.193(Ac.)
```

```
Total runoff =     14.568(CFS)  Total area =       3.432(Ac.)
Depth of flow =   0.462(Ft.), Average velocity =   4.232(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      107.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.432(Ac.)
Runoff from this stream =     14.568(CFS)
Time of concentration =    9.85 min.
Rainfall intensity =     5.613(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.790
Initial subarea total flow distance  =   74.000(Ft.)
Highest elevation =  700.090(Ft.)
Lowest elevation =  693.340(Ft.)
Elevation difference =    6.750(Ft.) Slope =  9.122 %
Top of Initial Area Slope adjusted by User to  9.838 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   9.84 %, in a development type of
 43.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.60 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7900)*( 100.000^.5)/(   9.838^(1/3)]=   2.60
Calculated TC of    2.604 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.790
Subarea runoff =      0.323(CFS)
Total initial stream area =        0.047(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      107.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      1.486(CFS)
Depth of flow =   0.020(Ft.), Average velocity =   2.907(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.50
    2              0.00              0.00
    3             25.00              0.00
    4             25.00              0.50
Manning's 'N' friction factor =   0.016
------------------------------------------------------------------
Sub-Channel flow  =      1.486(CFS)
  '     '    flow top width =     25.000(Ft.)
  '     '    velocity=    2.907(Ft/s)
  '     '    area =      0.511(Sq.Ft)
  '     '    Froude number =     3.583
```

```
Upstream point elevation =   693.340(Ft.)
Downstream point elevation =   611.680(Ft.)
Flow length =   465.000(Ft.)
Travel time  =    2.67 min.
Time of concentration =    5.27 min.
Depth of flow =   0.020(Ft.)
Average velocity =   2.907(Ft/s)
Total irregular channel flow =     1.486(CFS)
Irregular channel normal depth above invert elev. =   0.020(Ft.)
Average velocity of channel(s) =   2.907(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.404(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[HIGH DENSITY RESIDENTIAL                    ]
(24.0 DU/A or Less      )
Impervious value, Ai = 0.650
Sub-Area C Value = 0.710
Rainfall intensity =      8.404(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.719  CA =      0.303
Subarea runoff =      2.227(CFS) for      0.375(Ac.)
Total runoff =      2.550(CFS)  Total area =       0.422(Ac.)
Depth of flow =   0.028(Ft.), Average velocity =   3.607(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      107.000
**** CONFLUENCE OF MINOR STREAMS ****

____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.422(Ac.)
Runoff from this stream =      2.550(CFS)
Time of concentration =    5.27 min.
Rainfall intensity =     8.404(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       14.568      9.85             5.613
2        2.550      5.27             8.404
Qmax(1) =
       1.000 *    1.000 *    14.568) +
       0.668 *    1.000 *     2.550) + =      16.271
Qmax(2) =
       1.000 *    0.535 *    14.568) +
       1.000 *    1.000 *     2.550) + =      10.341

Total of 2 streams to confluence:
Flow rates before confluence point:
      14.568       2.550
Maximum flow rates at confluence using above data:
       16.271       10.341
Area of streams before confluence:
        3.432        0.422
Results of confluence:
Total flow rate =     16.271(CFS)
Time of concentration =     9.854 min.
Effective stream area after confluence =      3.854(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

```
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    16.465(CFS)
Depth of flow =   0.426(Ft.), Average velocity =   6.042(Ft/s)
    ******* Irregular Channel Data **********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.63
    2             25.00              0.13
    3             26.50              0.00
    4             26.50              0.50
    5             31.50              0.60
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------------
Sub-Channel flow  =     16.465(CFS)
  '     '    flow top width =     16.279(Ft.)
  '     '    velocity=    6.042(Ft/s)
  '     '    area =      2.725(Sq.Ft)
  '     '    Froude number =     2.603

Upstream point elevation =   608.550(Ft.)
Downstream point elevation =   601.450(Ft.)
Flow length =   170.000(Ft.)
Travel time  =    0.47 min.
Time of concentration =   10.32 min.
Depth of flow =   0.426(Ft.)
Average velocity =   6.042(Ft/s)
Total irregular channel flow =    16.465(CFS)
Irregular channel normal depth above invert elev. =   0.426(Ft.)
Average velocity of channel(s) =   6.042(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.447(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.050
Decimal fraction soil group D = 0.950
[INDUSTRIAL area type                         ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      5.447(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.757  CA =      3.040
Subarea runoff =      0.287(CFS) for      0.162(Ac.)
Total runoff =     16.558(CFS)  Total area =       4.016(Ac.)
Depth of flow =   0.426(Ft.), Average velocity =   6.051(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      108.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.016(Ac.)
Runoff from this stream =     16.558(CFS)
Time of concentration =   10.32 min.
Rainfall intensity =     5.447(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                  ]
(Permanent Open Space   )
```

```
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  709.280(Ft.)
Lowest elevation =  687.650(Ft.)
Elevation difference =   21.630(Ft.) Slope = 21.630 %
Top of Initial Area Slope adjusted by User to 23.240 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  23.24 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.73 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  23.240^(1/3)]=   4.73
Calculated TC of    4.731 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.207(CFS)
Total initial stream area =        0.068(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      108.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      1.331(CFS)
Depth of flow =   0.497(Ft.), Average velocity =   5.388(Ft/s)
    ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.030
----------------------------------------------------------------
Sub-Channel flow  =      1.331(CFS)
  '     '    flow top width =      0.994(Ft.)
  '     '    velocity=    5.388(Ft/s)
  '     '    area =      0.247(Sq.Ft)
  '     '    Froude number =     1.905

Upstream point elevation =   687.650(Ft.)
Downstream point elevation =   601.450(Ft.)
Flow length =   717.000(Ft.)
Travel time  =    2.22 min.
Time of concentration =    6.95 min.
Depth of flow =   0.497(Ft.)
Average velocity =   5.388(Ft/s)
Total irregular channel flow =     1.331(CFS)
Irregular channel normal depth above invert elev. =   0.497(Ft.)
Average velocity of channel(s) =   5.388(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      7.032(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      7.032(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.338
Subarea runoff =      2.170(CFS) for      0.898(Ac.)
Total runoff =      2.377(CFS)  Total area =       0.966(Ac.)
```

```
Depth of flow =   0.618(Ft.), Average velocity =   6.229(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      108.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.966(Ac.)
Runoff from this stream =      2.377(CFS)
Time of concentration =    6.95 min.
Rainfall intensity =     7.032(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       16.558     10.32             5.447
2        2.377      6.95             7.032
Qmax(1) =
       1.000 *    1.000 *    16.558) +
       0.775 *    1.000 *     2.377) + =      18.400
Qmax(2) =
       1.000 *    0.673 *    16.558) +
       1.000 *    1.000 *     2.377) + =      13.523

Total of 2 streams to confluence:
Flow rates before confluence point:
      16.558       2.377
Maximum flow rates at confluence using above data:
       18.400       13.523
Area of streams before confluence:
        4.016        0.966
Results of confluence:
Total flow rate =     18.400(CFS)
Time of concentration =    10.323 min.
Effective stream area after confluence =      4.982(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     18.549(CFS)
Depth of flow =   0.420(Ft.), Average velocity =   7.056(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.63
    2             25.00              0.13
    3             26.50              0.00
    4             26.50              0.50
    5             31.50              0.60
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =     18.549(CFS)
  '     '    flow top width =     15.980(Ft.)
  '     '    velocity=    7.056(Ft/s)
  '     '    area =      2.629(Sq.Ft)
  '     '    Froude number =     3.066

Upstream point elevation =   601.450(Ft.)
Downstream point elevation =   593.870(Ft.)
Flow length =   130.000(Ft.)
Travel time  =    0.31 min.
Time of concentration =   10.63 min.
Depth of flow =   0.420(Ft.)
```

```
Average velocity =   7.056(Ft/s)
Total irregular channel flow =    18.549(CFS)
Irregular channel normal depth above invert elev. =   0.420(Ft.)
Average velocity of channel(s) =   7.056(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.345(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                         ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      5.345(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.683  CA =      3.487
Subarea runoff =      0.241(CFS) for      0.126(Ac.)
Total runoff =     18.641(CFS)  Total area =       5.108(Ac.)
Depth of flow =   0.420(Ft.), Average velocity =   7.065(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      110.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     18.833(CFS)
Depth of flow =   0.445(Ft.), Average velocity =   6.177(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.63
    2             25.00              0.13
    3             26.50              0.00
    4             26.50              0.50
    5             31.50              0.60
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =     18.833(CFS)
  '     '    flow top width =     17.246(Ft.)
  '     '    velocity=    6.177(Ft/s)
  '     '    area =      3.049(Sq.Ft)
  '     '    Froude number =     2.589

Upstream point elevation =   593.870(Ft.)
Downstream point elevation =   585.800(Ft.)
Flow length =   199.000(Ft.)
Travel time  =    0.54 min.
Time of concentration =   11.17 min.
Depth of flow =   0.445(Ft.)
Average velocity =   6.177(Ft/s)
Total irregular channel flow =    18.833(CFS)
Irregular channel normal depth above invert elev. =   0.445(Ft.)
Average velocity of channel(s) =   6.177(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.178(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                         ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      5.178(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.690  CA =      3.664
Subarea runoff =      0.331(CFS) for      0.203(Ac.)
```

```
Total runoff =     18.973(CFS)  Total area =       5.311(Ac.)
Depth of flow =   0.446(Ft.), Average velocity =   6.188(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      110.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      5.311(Ac.)
Runoff from this stream =     18.973(CFS)
Time of concentration =   11.17 min.
Rainfall intensity =     5.178(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  137.000(Ft.)
Highest elevation =  709.360(Ft.)
Lowest elevation =  685.490(Ft.)
Elevation difference =   23.870(Ft.) Slope = 17.423 %
Top of Initial Area Slope adjusted by User to 19.708 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  19.71 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.00 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  19.708^(1/3)]=   5.00
Calculated TC of    4.998 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.700(CFS)
Total initial stream area =        0.230(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station      503.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      2.157(CFS)
Depth of flow =   0.549(Ft.), Average velocity =   7.164(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      2.157(CFS)
  '     '    flow top width =      1.097(Ft.)
  '     '    velocity=    7.164(Ft/s)
  '     '    area =      0.301(Sq.Ft)
  '     '    Froude number =     2.410
```

```
Upstream point elevation =   685.490(Ft.)
Downstream point elevation =   619.000(Ft.)
Flow length =   357.000(Ft.)
Travel time  =    0.83 min.
Time of concentration =    5.83 min.
Depth of flow =   0.549(Ft.)
Average velocity =   7.164(Ft/s)
Total irregular channel flow =     2.157(CFS)
Irregular channel normal depth above invert elev. =   0.549(Ft.)
Average velocity of channel(s) =   7.164(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      7.876(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      7.876(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.447
Subarea runoff =      2.820(CFS) for      1.047(Ac.)
Total runoff =      3.520(CFS)  Total area =       1.277(Ac.)
Depth of flow =   0.659(Ft.), Average velocity =   8.097(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      504.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------
Upstream point/station elevation =   605.110(Ft.)
Downstream point/station elevation =   582.760(Ft.)
Pipe length  =   230.00(Ft.) Slope =   0.0972  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.520(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     3.520(CFS)
Normal flow depth in pipe =    3.98(In.)
Flow top width inside pipe =   14.95(In.)
Critical Depth =    8.59(In.)
Pipe flow velocity =     12.10(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =     6.15 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      504.000 to Point/Station      110.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------
Upstream point/station elevation =   582.760(Ft.)
Downstream point/station elevation =   582.080(Ft.)
Pipe length  =    15.00(Ft.) Slope =   0.0453  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.520(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     3.520(CFS)
Normal flow depth in pipe =    4.39(In.)
Flow top width inside pipe =   18.56(In.)
Critical Depth =    7.88(In.)
Pipe flow velocity =      8.94(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     6.17 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      110.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
```

```
 Stream flow area =      1.277(Ac.)
 Runoff from this stream =      3.520(CFS)
 Time of concentration =    6.17 min.
 Rainfall intensity =     7.589(In/Hr)
 Summary of stream data:

 Stream   Flow rate      TC            Rainfall Intensity
  No.       (CFS)       (min)                 (In/Hr)


 1       18.973     11.17             5.178
 2        3.520      6.17             7.589
 Qmax(1) =
        1.000 *    1.000 *    18.973) +
        0.682 *    1.000 *     3.520) + =      21.374
 Qmax(2) =
        1.000 *    0.553 *    18.973) +
        1.000 *    1.000 *     3.520) + =      14.008

 Total of 2 streams to confluence:
 Flow rates before confluence point:
       18.973       3.520
 Maximum flow rates at confluence using above data:
        21.374       14.008
 Area of streams before confluence:
         5.311        1.277
 Results of confluence:
 Total flow rate =     21.374(CFS)
 Time of concentration =    11.167 min.
 Effective stream area after confluence =      6.588(Ac.)
 End of computations, total study area =          6.588 (Ac.)
```

```
        San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
    Rational Hydrology Study        Date: 02/06/23
--------------------------------------------------------------------------
22027 POST POC2
UPDATED


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

--------------------------------------------------------------------------


Program License Serial Number 6332

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.300
24 hour precipitation(inches) =  5.600
P6/P24 =    58.9%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      701.000 to Point/Station      702.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  763.850(Ft.)
Lowest elevation =  755.270(Ft.)
Elevation difference =    8.580(Ft.) Slope =  8.580 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   8.58 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.59 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(   8.580^(1/3)]=   6.59
Rainfall intensity (I) =      7.273(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.158(CFS)
Total initial stream area =        0.062(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      702.000 to Point/Station      703.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.306(CFS)
Depth of flow =   0.410(Ft.), Average velocity =   7.774(Ft/s)
    ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      1.306(CFS)
  '     '    flow top width =      0.820(Ft.)
  '     '    velocity=    7.774(Ft/s)
  '     '    area =      0.168(Sq.Ft)
  '     '    Froude number =     3.026

Upstream point elevation =   755.270(Ft.)
Downstream point elevation =   687.000(Ft.)
Flow length =   211.000(Ft.)
Travel time  =    0.45 min.
Time of concentration =    7.05 min.
Depth of flow =   0.410(Ft.)
Average velocity =   7.774(Ft/s)
Total irregular channel flow =     1.306(CFS)
Irregular channel normal depth above invert elev. =   0.410(Ft.)
Average velocity of channel(s) =   7.774(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.968(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      6.968(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.345
Subarea runoff =      2.245(CFS) for      0.923(Ac.)
Total runoff =      2.402(CFS)  Total area =       0.985(Ac.)
Depth of flow =   0.515(Ft.), Average velocity =   9.053(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      703.000 to Point/Station      704.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________
Depth of flow =   0.486(Ft.), Average velocity =  10.168(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      2.402(CFS)
  '     '    flow top width =      0.972(Ft.)
  '     '    velocity=   10.168(Ft/s)
  '     '    area =      0.236(Sq.Ft)
  '     '    Froude number =     3.635

Upstream point elevation =   687.000(Ft.)
Downstream point elevation =   616.000(Ft.)
Flow length =   161.000(Ft.)
Travel time  =    0.26 min.
Time of concentration =    7.31 min.
Depth of flow =   0.486(Ft.)
Average velocity =  10.168(Ft/s)
```

```
Total irregular channel flow =     2.402(CFS)
Irregular channel normal depth above invert elev. =   0.486(Ft.)
Average velocity of channel(s) =  10.168(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      704.000 to Point/Station      704.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.985(Ac.)
Runoff from this stream =      2.402(CFS)
Time of concentration =    7.31 min.
Rainfall intensity =     6.805(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      801.000 to Point/Station      802.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  709.950(Ft.)
Lowest elevation =  699.560(Ft.)
Elevation difference =   10.390(Ft.) Slope = 10.390 %
Top of Initial Area Slope adjusted by User to  7.500 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   7.50 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.90 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(   7.500^(1/3)]=   6.90
Rainfall intensity (I) =      7.066(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.237(CFS)
Total initial stream area =        0.096(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      802.000 to Point/Station      803.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      0.392(CFS)
Depth of flow =   0.441(Ft.), Average velocity =   2.015(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      0.392(CFS)
  '     '    flow top width =      0.882(Ft.)
  '     '    velocity=    2.015(Ft/s)
  '     '    area =      0.195(Sq.Ft)
  '     '    Froude number =     0.756

Upstream point elevation =   699.560(Ft.)
```

```
Downstream point elevation =   697.470(Ft.)
Flow length =   106.000(Ft.)
Travel time  =    0.88 min.
Time of concentration =    7.77 min.
Depth of flow =   0.441(Ft.)
Average velocity =   2.015(Ft/s)
Total irregular channel flow =     0.392(CFS)
Irregular channel normal depth above invert elev. =   0.441(Ft.)
Average velocity of channel(s) =   2.015(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.541(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      6.541(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.077
Subarea runoff =      0.269(CFS) for      0.125(Ac.)
Total runoff =      0.506(CFS)  Total area =      0.221(Ac.)
Depth of flow =   0.485(Ft.), Average velocity =   2.148(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      803.000 to Point/Station      804.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   697.470(Ft.)
Downstream point/station elevation =   665.270(Ft.)
Pipe length  =    39.00(Ft.) Slope =   0.8256  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.506(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     0.506(CFS)
Normal flow depth in pipe =    0.88(In.)
Flow top width inside pipe =    9.01(In.)
Critical Depth =    2.91(In.)
Pipe flow velocity =     13.70(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     7.82 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      704.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      1.047(CFS)
Depth of flow =   0.412(Ft.), Average velocity =   6.164(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      1.047(CFS)
  '     '    flow top width =      0.824(Ft.)
  '     '    velocity=    6.164(Ft/s)
  '     '    area =      0.170(Sq.Ft)
  '     '    Froude number =     2.393

Upstream point elevation =   665.270(Ft.)
Downstream point elevation =   616.000(Ft.)
Flow length =   244.000(Ft.)
```

```
Travel time  =    0.66 min.
Time of concentration =    8.48 min.
Depth of flow =   0.412(Ft.)
Average velocity =   6.164(Ft/s)
Total irregular channel flow =     1.047(CFS)
Irregular channel normal depth above invert elev. =   0.412(Ft.)
Average velocity of channel(s) =   6.164(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.184(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      6.184(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.243
Subarea runoff =      0.996(CFS) for      0.473(Ac.)
Total runoff =      1.502(CFS)  Total area =       0.694(Ac.)
Depth of flow =   0.472(Ft.), Average velocity =   6.746(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      704.000 to Point/Station      704.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.694(Ac.)
Runoff from this stream =      1.502(CFS)
Time of concentration =    8.48 min.
Rainfall intensity =     6.184(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        2.402      7.31             6.805
2        1.502      8.48             6.184
Qmax(1) =
       1.000 *    1.000 *     2.402) +
       1.000 *    0.862 *     1.502) + =       3.697
Qmax(2) =
       0.909 *    1.000 *     2.402) +
       1.000 *    1.000 *     1.502) + =       3.685

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.402       1.502
Maximum flow rates at confluence using above data:
        3.697        3.685
Area of streams before confluence:
        0.985        0.694
Results of confluence:
Total flow rate =      3.697(CFS)
Time of concentration =     7.311 min.
Effective stream area after confluence =      1.679(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      704.000 to Point/Station      705.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   601.580(Ft.)
Downstream point/station elevation =   600.300(Ft.)
Pipe length  =    18.00(Ft.) Slope =   0.0711  Manning's N = 0.013
```

```
No. of pipes = 1  Required pipe flow  =     3.697(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     3.697(CFS)
Normal flow depth in pipe =    4.42(In.)
Flow top width inside pipe =   15.49(In.)
Critical Depth =    8.82(In.)
Pipe flow velocity =     10.99(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     7.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      705.000 to Point/Station      705.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.679(Ac.)
Runoff from this stream =      3.697(CFS)
Time of concentration =    7.34 min.
Rainfall intensity =     6.789(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      901.000 to Point/Station      902.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =   97.000(Ft.)
Highest elevation =  699.820(Ft.)
Lowest elevation =  697.610(Ft.)
Elevation difference =    2.210(Ft.) Slope =  2.278 %
Top of Initial Area Slope adjusted by User to  3.619 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   3.62 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   8.79 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(   3.619^(1/3)]=   8.79
Rainfall intensity (I) =      6.041(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.258(CFS)
Total initial stream area =        0.122(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      902.000 to Point/Station      903.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   697.610(Ft.)
Downstream point/station elevation =   673.150(Ft.)
Pipe length  =    43.00(Ft.) Slope =   0.5688  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.258(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     0.258(CFS)
Normal flow depth in pipe =    0.70(In.)
Flow top width inside pipe =    8.07(In.)
Critical Depth =    2.06(In.)
Pipe flow velocity =      9.80(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     8.87 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      903.000 to Point/Station      904.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      0.827(CFS)
Depth of flow =   0.351(Ft.), Average velocity =   6.710(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      0.827(CFS)
  '     '    flow top width =      0.702(Ft.)
  '     '    velocity=    6.710(Ft/s)
  '     '    area =      0.123(Sq.Ft)
  '     '    Froude number =     2.823

Upstream point elevation =   673.150(Ft.)
Downstream point elevation =   626.610(Ft.)
Flow length =   157.000(Ft.)
Travel time  =    0.39 min.
Time of concentration =    9.26 min.
Depth of flow =   0.351(Ft.)
Average velocity =   6.710(Ft/s)
Total irregular channel flow =     0.827(CFS)
Irregular channel normal depth above invert elev. =   0.351(Ft.)
Average velocity of channel(s) =   6.710(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.844(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      5.844(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.231
Subarea runoff =      1.092(CFS) for      0.538(Ac.)
Total runoff =      1.350(CFS)  Total area =      0.660(Ac.)
Depth of flow =   0.422(Ft.), Average velocity =   7.585(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      904.000 to Point/Station      705.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   626.610(Ft.)
Downstream point/station elevation =   600.300(Ft.)
Pipe length  =   306.00(Ft.) Slope =   0.0860  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.350(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     1.350(CFS)
Normal flow depth in pipe =    2.57(In.)
Flow top width inside pipe =   12.59(In.)
Critical Depth =    5.22(In.)
Pipe flow velocity =      8.73(Ft/s)
Travel time through pipe =    0.58 min.
Time of concentration (TC) =     9.84 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      705.000 to Point/Station      705.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.660(Ac.)
Runoff from this stream =      1.350(CFS)
Time of concentration =    9.84 min.
Rainfall intensity =     5.618(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        3.697      7.34             6.789
2        1.350      9.84             5.618
Qmax(1) =
       1.000 *    1.000 *     3.697) +
       1.000 *    0.746 *     1.350) + =       4.704
Qmax(2) =
       0.828 *    1.000 *     3.697) +
       1.000 *    1.000 *     1.350) + =       4.410

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.697       1.350
Maximum flow rates at confluence using above data:
        4.704        4.410
Area of streams before confluence:
        1.679        0.660
Results of confluence:
Total flow rate =      4.704(CFS)
Time of concentration =     7.338 min.
Effective stream area after confluence =      2.339(Ac.)
End of computations, total study area =          2.339 (Ac.)
```

```
        San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
    Rational Hydrology Study        Date: 02/06/23
--------------------------------------------------------------------------

22027 POST POC3
UPDATED

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

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Program License Serial Number 6332

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.300
24 hour precipitation(inches) =  5.600
P6/P24 =    58.9%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1001.000 to Point/Station     1002.000
**** INITIAL AREA EVALUATION ****
___________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  165.000(Ft.)
Highest elevation =  763.850(Ft.)
Lowest elevation =  749.000(Ft.)
Elevation difference =   14.850(Ft.) Slope =  9.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   9.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.49 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(   9.000^(1/3)]=   6.49
Rainfall intensity (I) =      7.348(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.293(CFS)
Total initial stream area =        0.114(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1002.000 to Point/Station     1003.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
___________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.616(CFS)
Depth of flow =   0.326(Ft.), Average velocity =   5.792(Ft/s)
    ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.023
------------------------------------------------------------------
Sub-Channel flow  =      0.616(CFS)
  '     '    flow top width =      0.652(Ft.)
  '     '    velocity=    5.792(Ft/s)
  '     '    area =      0.106(Sq.Ft)
  '     '    Froude number =     2.528

Upstream point elevation =   749.000(Ft.)
Downstream point elevation =   700.170(Ft.)
Flow length =   341.000(Ft.)
Travel time  =    0.98 min.
Time of concentration =    7.47 min.
Depth of flow =   0.326(Ft.)
Average velocity =   5.792(Ft/s)
Total irregular channel flow =     0.616(CFS)
Irregular channel normal depth above invert elev. =   0.326(Ft.)
Average velocity of channel(s) =   5.792(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.710(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      6.710(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.128
Subarea runoff =      0.564(CFS) for      0.251(Ac.)
Total runoff =      0.857(CFS)  Total area =       0.365(Ac.)
Depth of flow =   0.369(Ft.), Average velocity =   6.291(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.365(Ac.)
Runoff from this stream =      0.857(CFS)
Time of concentration =    7.47 min.
Rainfall intensity =     6.710(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1101.000 to Point/Station     1102.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  738.850(Ft.)
Lowest elevation =  714.230(Ft.)
Elevation difference =   24.620(Ft.) Slope = 24.620 %
```

```
Top of Initial Area Slope adjusted by User to 24.160 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  24.16 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.67 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  24.160^(1/3)]=   4.67
Calculated TC of    4.670 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.289(CFS)
Total initial stream area =        0.095(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1102.000 to Point/Station     1103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.585(CFS)
Depth of flow =   0.647(Ft.), Average velocity =   3.784(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.019
------------------------------------------------------------------
Sub-Channel flow  =      1.585(CFS)
  '     '    flow top width =      1.295(Ft.)
  '     '    velocity=    3.784(Ft/s)
  '     '    area =      0.419(Sq.Ft)
  '     '    Froude number =     1.172

Upstream point elevation =   714.230(Ft.)
Downstream point elevation =   707.250(Ft.)
Flow length =   417.291(Ft.)
Travel time  =    1.84 min.
Time of concentration =    6.51 min.
Depth of flow =   0.647(Ft.)
Average velocity =   3.784(Ft/s)
Total irregular channel flow =     1.585(CFS)
Irregular channel normal depth above invert elev. =   0.647(Ft.)
Average velocity of channel(s) =   3.784(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      7.336(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      7.336(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.383
Subarea runoff =      2.522(CFS) for      1.000(Ac.)
Total runoff =      2.811(CFS)  Total area =       1.095(Ac.)
Depth of flow =   0.802(Ft.), Average velocity =   4.367(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1103.000 to Point/Station     1103.000
**** 6 HOUR HYDROGRAPH ****
```

Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003

Time of Concentration = 6.51
Basin Area = 1.46 Acres
6 Hour Rainfall = 3.300 Inches
Runoff Coefficient = 0.263
Peak Discharge = 2.81 CFS

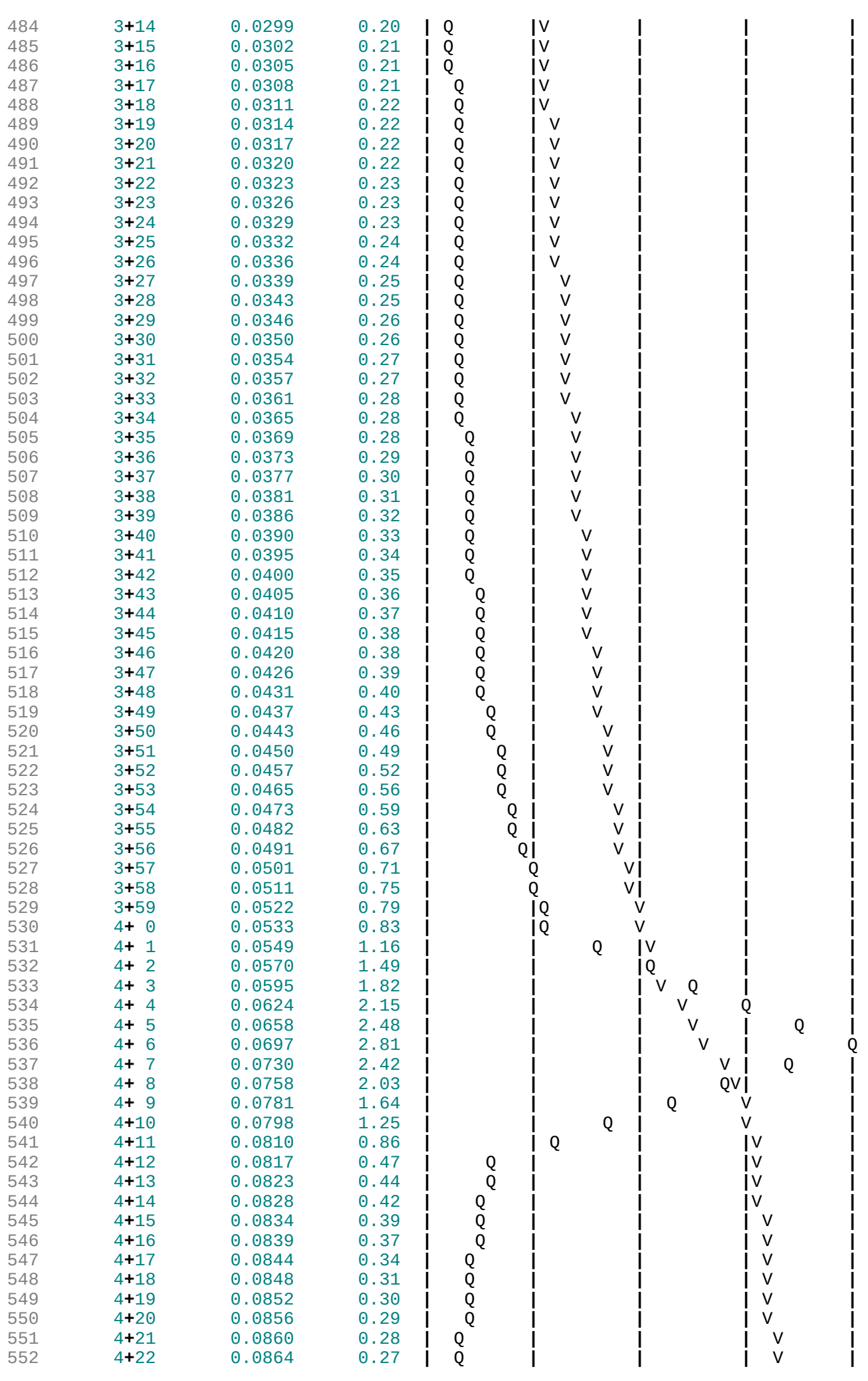
Time (Min)	Discharge (CFS)
0	0.000
6	0.075
12	0.076
18	0.078
24	0.079
30	0.081
36	0.082
42	0.084
48	0.085
54	0.087
60	0.088
66	0.091
72	0.092
78	0.095
84	0.097
90	0.100
96	0.102
102	0.105
108	0.107
114	0.111
120	0.114
126	0.119
132	0.121
138	0.127
144	0.130
150	0.137
156	0.141
162	0.150
168	0.155
174	0.166
180	0.172
186	0.187
192	0.196
198	0.218
204	0.231
210	0.265
216	0.287
222	0.351
228	0.400
234	0.587
240	0.827
246	2.811
252	0.470
258	0.315
264	0.246
270	0.206
276	0.180
282	0.160
288	0.145
294	0.134
300	0.124
306	0.116
312	0.109
318	0.103
324	0.098
330	0.094
336	0.090
342	0.086

```
            348               0.083
            354               0.080
            360               0.077
            366               0.075
  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        6 - 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
  ----------------------------------------------------------------------
                Hydrograph in   1   Minute intervals ((CFS))

  ----------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        0.7       1.4       2.1       2.8
----------------------------------------------------------------------------
  0+ 0       0.0000      0.00  Q          |         |         |         |
  0+ 1       0.0000      0.01  Q          |         |         |         |
  0+ 2       0.0001      0.03  Q          |         |         |         |
  0+ 3       0.0001      0.04  Q          |         |         |         |
  0+ 4       0.0002      0.05  Q          |         |         |         |
  0+ 5       0.0003      0.06  Q          |         |         |         |
  0+ 6       0.0004      0.08  VQ         |         |         |         |
  0+ 7       0.0005      0.08  VQ         |         |         |         |
  0+ 8       0.0006      0.08  VQ         |         |         |         |
  0+ 9       0.0007      0.08  VQ         |         |         |         |
  0+10       0.0008      0.08  VQ         |         |         |         |
  0+11       0.0009      0.08  VQ         |         |         |         |
  0+12       0.0010      0.08  VQ         |         |         |         |
  0+13       0.0011      0.08  VQ         |         |         |         |
  0+14       0.0012      0.08  VQ         |         |         |         |
  0+15       0.0013      0.08  VQ         |         |         |         |
  0+16       0.0014      0.08  VQ         |         |         |         |
  0+17       0.0015      0.08  VQ         |         |         |         |
  0+18       0.0016      0.08  VQ         |         |         |         |
  0+19       0.0017      0.08  VQ         |         |         |         |
  0+20       0.0018      0.08  VQ         |         |         |         |
  0+21       0.0020      0.08  VQ         |         |         |         |
  0+22       0.0021      0.08  VQ         |         |         |         |
  0+23       0.0022      0.08  VQ         |         |         |         |
  0+24       0.0023      0.08  VQ         |         |         |         |
  0+25       0.0024      0.08  VQ         |         |         |         |
  0+26       0.0025      0.08  VQ         |         |         |         |
  0+27       0.0026      0.08  |Q         |         |         |         |
  0+28       0.0027      0.08  |Q         |         |         |         |
  0+29       0.0028      0.08  |Q         |         |         |         |
  0+30       0.0029      0.08  |Q         |         |         |         |
  0+31       0.0030      0.08  |Q         |         |         |         |
  0+32       0.0032      0.08  |Q         |         |         |         |
  0+33       0.0033      0.08  |Q         |         |         |         |
  0+34       0.0034      0.08  |Q         |         |         |         |
  0+35       0.0035      0.08  |Q         |         |         |         |
  0+36       0.0036      0.08  |Q         |         |         |         |
  0+37       0.0037      0.08  |Q         |         |         |         |
  0+38       0.0038      0.08  |Q         |         |         |         |
  0+39       0.0040      0.08  |Q         |         |         |         |
  0+40       0.0041      0.08  |Q         |         |         |         |
  0+41       0.0042      0.08  |Q         |         |         |         |
  0+42       0.0043      0.08  |Q         |         |         |         |
  0+43       0.0044      0.08  |Q         |         |         |         |
  0+44       0.0045      0.08  |Q         |         |         |         |
  0+45       0.0046      0.08  |Q         |         |         |         |
  0+46       0.0048      0.08  |Q         |         |         |         |
  0+47       0.0049      0.08  |Q         |         |         |         |
  0+48       0.0050      0.08  |Q         |         |         |         |
  0+49       0.0051      0.09  |Q         |         |         |         |
  0+50       0.0052      0.09  |QV        |         |         |         |
  0+51       0.0053      0.09  |QV        |         |         |         |
  0+52       0.0055      0.09  |QV        |         |         |         |
  0+53       0.0056      0.09  |QV        |         |         |         |
  0+54       0.0057      0.09  |QV        |         |         |         |
  0+55       0.0058      0.09  |QV        |         |         |         |
```

346	0+56	0.0059	0.09	|QV	|	|	|
347	0+57	0.0061	0.09	|QV	|	|	|
348	0+58	0.0062	0.09	|QV	|	|	|
349	0+59	0.0063	0.09	|QV	|	|	|
350	1+ 0	0.0064	0.09	|QV	|	|	|
351	1+ 1	0.0066	0.09	|QV	|	|	|
352	1+ 2	0.0067	0.09	|QV	|	|	|
353	1+ 3	0.0068	0.09	|QV	|	|	|
354	1+ 4	0.0069	0.09	|QV	|	|	|
355	1+ 5	0.0071	0.09	|QV	|	|	|
356	1+ 6	0.0072	0.09	|QV	|	|	|
357	1+ 7	0.0073	0.09	|QV	|	|	|
358	1+ 8	0.0074	0.09	|QV	|	|	|
359	1+ 9	0.0076	0.09	|QV	|	|	|
360	1+10	0.0077	0.09	|QV	|	|	|
361	1+11	0.0078	0.09	|Q V	|	|	|
362	1+12	0.0079	0.09	|Q V	|	|	|
363	1+13	0.0081	0.09	|Q V	|	|	|
364	1+14	0.0082	0.09	|Q V	|	|	|
365	1+15	0.0083	0.09	|Q V	|	|	|
366	1+16	0.0084	0.09	|Q V	|	|	|
367	1+17	0.0086	0.09	|Q V	|	|	|
368	1+18	0.0087	0.10	|Q V	|	|	|
369	1+19	0.0088	0.10	|Q V	|	|	|
370	1+20	0.0090	0.10	|Q V	|	|	|
371	1+21	0.0091	0.10	|Q V	|	|	|
372	1+22	0.0092	0.10	|Q V	|	|	|
373	1+23	0.0094	0.10	|Q V	|	|	|
374	1+24	0.0095	0.10	|Q V	|	|	|
375	1+25	0.0096	0.10	|Q V	|	|	|
376	1+26	0.0098	0.10	|Q V	|	|	|
377	1+27	0.0099	0.10	|Q V	|	|	|
378	1+28	0.0100	0.10	|Q V	|	|	|
379	1+29	0.0102	0.10	|Q V	|	|	|
380	1+30	0.0103	0.10	|Q V	|	|	|
381	1+31	0.0105	0.10	|Q V	|	|	|
382	1+32	0.0106	0.10	|Q V	|	|	|
383	1+33	0.0107	0.10	|Q V	|	|	|
384	1+34	0.0109	0.10	|Q V	|	|	|
385	1+35	0.0110	0.10	|Q V	|	|	|
386	1+36	0.0112	0.10	|Q V	|	|	|
387	1+37	0.0113	0.10	|Q V	|	|	|
388	1+38	0.0114	0.10	|Q V	|	|	|
389	1+39	0.0116	0.10	|Q V	|	|	|
390	1+40	0.0117	0.10	|Q V	|	|	|
391	1+41	0.0119	0.10	|Q V	|	|	|
392	1+42	0.0120	0.11	|Q V	|	|	|
393	1+43	0.0122	0.11	|Q V	|	|	|
394	1+44	0.0123	0.11	|Q V	|	|	|
395	1+45	0.0124	0.11	|Q V	|	|	|
396	1+46	0.0126	0.11	|Q V	|	|	|
397	1+47	0.0127	0.11	|Q V	|	|	|
398	1+48	0.0129	0.11	|Q V	|	|	|
399	1+49	0.0130	0.11	|Q V	|	|	|
400	1+50	0.0132	0.11	|Q V	|	|	|
401	1+51	0.0133	0.11	|Q V	|	|	|
402	1+52	0.0135	0.11	|Q V	|	|	|
403	1+53	0.0136	0.11	|Q V	|	|	|
404	1+54	0.0138	0.11	|Q V	|	|	|
405	1+55	0.0139	0.11	|Q V	|	|	|
406	1+56	0.0141	0.11	|Q V	|	|	|
407	1+57	0.0143	0.11	|Q V	|	|	|
408	1+58	0.0144	0.11	|Q V	|	|	|
409	1+59	0.0146	0.11	|Q V	|	|	|
410	2+ 0	0.0147	0.11	|Q V	|	|	|
411	2+ 1	0.0149	0.11	|Q V	|	|	|
412	2+ 2	0.0150	0.12	|Q V	|	|	|
413	2+ 3	0.0152	0.12	|Q V	|	|	|
414	2+ 4	0.0154	0.12	|Q V	|	|	|

415	2+ 5	0.0155	0.12	|Q V |	|	|	|
416	2+ 6	0.0157	0.12	|Q V |	|	|	|
417	2+ 7	0.0158	0.12	|Q V |	|	|	|
418	2+ 8	0.0160	0.12	|Q V |	|	|	|
419	2+ 9	0.0162	0.12	|Q V |	|	|	|
420	2+10	0.0163	0.12	|Q V |	|	|	|
421	2+11	0.0165	0.12	|Q V |	|	|	|
422	2+12	0.0167	0.12	|Q V |	|	|	|
423	2+13	0.0168	0.12	|Q V |	|	|	|
424	2+14	0.0170	0.12	|Q V |	|	|	|
425	2+15	0.0172	0.12	|Q V |	|	|	|
426	2+16	0.0174	0.13	|Q V |	|	|	|
427	2+17	0.0175	0.13	|Q V |	|	|	|
428	2+18	0.0177	0.13	|Q V |	|	|	|
429	2+19	0.0179	0.13	|Q V |	|	|	|
430	2+20	0.0181	0.13	|Q V |	|	|	|
431	2+21	0.0182	0.13	|Q V |	|	|	|
432	2+22	0.0184	0.13	|Q V |	|	|	|
433	2+23	0.0186	0.13	|Q V |	|	|	|
434	2+24	0.0188	0.13	|Q V |	|	|	|
435	2+25	0.0190	0.13	|Q V |	|	|	|
436	2+26	0.0191	0.13	|Q V |	|	|	|
437	2+27	0.0193	0.13	|Q V |	|	|	|
438	2+28	0.0195	0.13	|Q V |	|	|	|
439	2+29	0.0197	0.14	|Q V |	|	|	|
440	2+30	0.0199	0.14	|Q V |	|	|	|
441	2+31	0.0201	0.14	|Q V |	|	|	|
442	2+32	0.0203	0.14	|Q V |	|	|	|
443	2+33	0.0205	0.14	|Q V |	|	|	|
444	2+34	0.0206	0.14	|Q V |	|	|	|
445	2+35	0.0208	0.14	|Q V |	|	|	|
446	2+36	0.0210	0.14	| Q V |	|	|	|
447	2+37	0.0212	0.14	| Q V |	|	|	|
448	2+38	0.0214	0.14	| Q V |	|	|	|
449	2+39	0.0216	0.15	| Q V |	|	|	|
450	2+40	0.0218	0.15	| Q V |	|	|	|
451	2+41	0.0220	0.15	| Q V |	|	|	|
452	2+42	0.0222	0.15	| Q V |	|	|	|
453	2+43	0.0225	0.15	| Q V |	|	|	|
454	2+44	0.0227	0.15	| Q V |	|	|	|
455	2+45	0.0229	0.15	| Q V |	|	|	|
456	2+46	0.0231	0.15	| Q V |	|	|	|
457	2+47	0.0233	0.15	| Q V |	|	|	|
458	2+48	0.0235	0.15	| Q V|	|	|	|
459	2+49	0.0237	0.16	| Q V|	|	|	|
460	2+50	0.0239	0.16	| Q V|	|	|	|
461	2+51	0.0242	0.16	| Q V|	|	|	|
462	2+52	0.0244	0.16	| Q V|	|	|	|
463	2+53	0.0246	0.16	| Q V|	|	|	|
464	2+54	0.0248	0.17	| Q V|	|	|	|
465	2+55	0.0251	0.17	| Q V|	|	|	|
466	2+56	0.0253	0.17	| Q V|	|	|	|
467	2+57	0.0255	0.17	| Q V|	|	|	|
468	2+58	0.0258	0.17	| Q V|	|	|	|
469	2+59	0.0260	0.17	| Q V	|	|	|
470	3+ 0	0.0262	0.17	| Q V	|	|	|
471	3+ 1	0.0265	0.17	| Q V	|	|	|
472	3+ 2	0.0267	0.18	| Q V	|	|	|
473	3+ 3	0.0270	0.18	| Q V	|	|	|
474	3+ 4	0.0272	0.18	| Q V	|	|	|
475	3+ 5	0.0275	0.18	| Q V	|	|	|
476	3+ 6	0.0277	0.19	| Q V	|	|	|
477	3+ 7	0.0280	0.19	| Q V	|	|	|
478	3+ 8	0.0283	0.19	| Q V	|	|	|
479	3+ 9	0.0285	0.19	| Q V	|	|	|
480	3+10	0.0288	0.19	| Q |V	|	|	|
481	3+11	0.0291	0.19	| Q |V	|	|	|
482	3+12	0.0293	0.20	| Q |V	|	|	|
483	3+13	0.0296	0.20	| Q |V	|	|	|



553	4+23	0.0867	0.26	| Q	|	|	| V	|
554	4+24	0.0871	0.25	| Q	|	|	| V	|
555	4+25	0.0874	0.24	| Q	|	|	| V	|
556	4+26	0.0877	0.23	| Q	|	|	| V	|
557	4+27	0.0880	0.23	| Q	|	|	| V	|
558	4+28	0.0883	0.22	| Q	|	|	| V	|
559	4+29	0.0886	0.21	| Q	|	|	| V	|
560	4+30	0.0889	0.21	| Q	|	|	| V	|
561	4+31	0.0892	0.20	| Q	|	|	| V	|
562	4+32	0.0895	0.20	| Q	|	|	| V	|
563	4+33	0.0897	0.19	| Q	|	|	| V	|
564	4+34	0.0900	0.19	| Q	|	|	| V	|
565	4+35	0.0902	0.18	| Q	|	|	| V	|
566	4+36	0.0905	0.18	| Q	|	|	| V	|
567	4+37	0.0907	0.18	| Q	|	|	| V	|
568	4+38	0.0910	0.17	| Q	|	|	| V	|
569	4+39	0.0912	0.17	| Q	|	|	| V	|
570	4+40	0.0914	0.17	| Q	|	|	| V	|
571	4+41	0.0917	0.16	| Q	|	|	| V	|
572	4+42	0.0919	0.16	| Q	|	|	| V	|
573	4+43	0.0921	0.16	| Q	|	|	| V	|
574	4+44	0.0923	0.16	| Q	|	|	| V	|
575	4+45	0.0925	0.15	| Q	|	|	| V	|
576	4+46	0.0927	0.15	| Q	|	|	| V	|
577	4+47	0.0929	0.15	| Q	|	|	| V	|
578	4+48	0.0931	0.15	| Q	|	|	| V	|
579	4+49	0.0933	0.14	| Q	|	|	| V	|
580	4+50	0.0935	0.14	| Q	|	|	| V	|
581	4+51	0.0937	0.14	|Q	|	|	| V	|
582	4+52	0.0939	0.14	|Q	|	|	| V	|
583	4+53	0.0941	0.14	|Q	|	|	| V	|
584	4+54	0.0943	0.13	|Q	|	|	| V	|
585	4+55	0.0945	0.13	|Q	|	|	| V	|
586	4+56	0.0946	0.13	|Q	|	|	| V	|
587	4+57	0.0948	0.13	|Q	|	|	| V	|
588	4+58	0.0950	0.13	|Q	|	|	| V	|
589	4+59	0.0952	0.13	|Q	|	|	| V	|
590	5+ 0	0.0953	0.12	|Q	|	|	| V	|
591	5+ 1	0.0955	0.12	|Q	|	|	| V	|
592	5+ 2	0.0957	0.12	|Q	|	|	| V	|
593	5+ 3	0.0958	0.12	|Q	|	|	| V	|
594	5+ 4	0.0960	0.12	|Q	|	|	| V	|
595	5+ 5	0.0962	0.12	|Q	|	|	| V	|
596	5+ 6	0.0963	0.12	|Q	|	|	| V	|
597	5+ 7	0.0965	0.11	|Q	|	|	| V	|
598	5+ 8	0.0966	0.11	|Q	|	|	| V	|
599	5+ 9	0.0968	0.11	|Q	|	|	| V	|
600	5+10	0.0969	0.11	|Q	|	|	| V	|
601	5+11	0.0971	0.11	|Q	|	|	| V	|
602	5+12	0.0972	0.11	|Q	|	|	| V	|
603	5+13	0.0974	0.11	|Q	|	|	| V	|
604	5+14	0.0975	0.11	|Q	|	|	| V	|
605	5+15	0.0977	0.11	|Q	|	|	| V	|
606	5+16	0.0978	0.11	|Q	|	|	| V	|
607	5+17	0.0980	0.10	|Q	|	|	| V	|
608	5+18	0.0981	0.10	|Q	|	|	| V	|
609	5+19	0.0983	0.10	|Q	|	|	| V	|
610	5+20	0.0984	0.10	|Q	|	|	| V	|
611	5+21	0.0985	0.10	|Q	|	|	| V	|
612	5+22	0.0987	0.10	|Q	|	|	| V	|
613	5+23	0.0988	0.10	|Q	|	|	| V	|
614	5+24	0.0989	0.10	|Q	|	|	| V	|
615	5+25	0.0991	0.10	|Q	|	|	| V	|
616	5+26	0.0992	0.10	|Q	|	|	| V	|
617	5+27	0.0993	0.10	|Q	|	|	| V	|
618	5+28	0.0995	0.10	|Q	|	|	| V	|
619	5+29	0.0996	0.09	|Q	|	|	| V	|
620	5+30	0.0997	0.09	|Q	|	|	| V	|
621	5+31	0.0999	0.09	|Q	|	|	| V	|

```
      5+32       0.1000      0.09  |Q        |         |         |        V |
      5+33       0.1001      0.09  |Q        |         |         |        V |
      5+34       0.1002      0.09  |Q        |         |         |        V |
      5+35       0.1004      0.09  |Q        |         |         |        V |
      5+36       0.1005      0.09  |Q        |         |         |        V |
      5+37       0.1006      0.09  |Q        |         |         |        V |
      5+38       0.1007      0.09  |Q        |         |         |        V |
      5+39       0.1009      0.09  |Q        |         |         |        V |
      5+40       0.1010      0.09  |Q        |         |         |        V |
      5+41       0.1011      0.09  |Q        |         |         |        V |
      5+42       0.1012      0.09  |Q        |         |         |        V |
      5+43       0.1013      0.09  |Q        |         |         |         V|
      5+44       0.1015      0.08  |Q        |         |         |         V|
      5+45       0.1016      0.08  |Q        |         |         |         V|
      5+46       0.1017      0.08  |Q        |         |         |         V|
      5+47       0.1018      0.08  |Q        |         |         |         V|
      5+48       0.1019      0.08  |Q        |         |         |         V|
      5+49       0.1020      0.08  |Q        |         |         |         V|
      5+50       0.1021      0.08  |Q        |         |         |         V|
      5+51       0.1022      0.08  |Q        |         |         |         V|
      5+52       0.1024      0.08  |Q        |         |         |         V|
      5+53       0.1025      0.08  |Q        |         |         |         V|
      5+54       0.1026      0.08  |Q        |         |         |         V|
      5+55       0.1027      0.08  |Q        |         |         |         V|
      5+56       0.1028      0.08  |Q        |         |         |         V|
      5+57       0.1029      0.08  |Q        |         |         |         V|
      5+58       0.1030      0.08  |Q        |         |         |         V|
      5+59       0.1031      0.08  |Q        |         |         |         V|
      6+ 0       0.1032      0.08  |Q        |         |         |         V|
      6+ 1       0.1033      0.08  |Q        |         |         |         V|
      6+ 2       0.1034      0.08  |Q        |         |         |         V|
      6+ 3       0.1035      0.08  |Q        |         |         |         V|
      6+ 4       0.1036      0.08  |Q        |         |         |         V|
      6+ 5       0.1037      0.08  |Q        |         |         |         V|
      6+ 6       0.1039      0.07  |Q        |         |         |          V
    ------------------------------------------------------------------------


    ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
    Process from Point/Station     1103.000 to Point/Station     1003.000
    **** PIPEFLOW TRAVEL TIME (User specified size) ****
    ----------------------------------------------------------------------
    Upstream point/station elevation =   707.250(Ft.)
    Downstream point/station elevation =   700.170(Ft.)
    Pipe length  =   212.00(Ft.) Slope =   0.0334  Manning's N = 0.013
    No. of pipes = 1  Required pipe flow  =     2.811(CFS)
    Given pipe size =     18.00(In.)
    Calculated individual pipe flow  =     2.811(CFS)
    Normal flow depth in pipe =    4.65(In.)
    Flow top width inside pipe =   15.76(In.)
    Critical Depth =    7.64(In.)
    Pipe flow velocity =      7.76(Ft/s)
    Travel time through pipe =    0.46 min.
    Time of concentration (TC) =     6.96 min.


    ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
    Process from Point/Station     1003.000 to Point/Station     1003.000
    **** CONFLUENCE OF MINOR STREAMS ****
    ----------------------------------------------------------------------
    Along Main Stream number: 1 in normal stream number 2
    Stream flow area =      1.095(Ac.)
    Runoff from this stream =      2.811(CFS)
    Time of concentration =    6.96 min.
    Rainfall intensity =     7.022(In/Hr)
```

```
 Summary of stream data:

 Stream   Flow rate      TC            Rainfall Intensity
  No.       (CFS)       (min)                (In/Hr)


 1        0.857      7.47             6.710
 2        2.811      6.96             7.022
 Qmax(1) =
        1.000 *    1.000 *     0.857) +
        0.956 *    1.000 *     2.811) + =       3.544
 Qmax(2) =
        1.000 *    0.932 *     0.857) +
        1.000 *    1.000 *     2.811) + =       3.610

 Total of 2 streams to confluence:
 Flow rates before confluence point:
        0.857       2.811
 Maximum flow rates at confluence using above data:
         3.544        3.610
 Area of streams before confluence:
         0.365        1.095
 Results of confluence:
 Total flow rate =      3.610(CFS)
 Time of concentration =     6.963 min.
 Effective stream area after confluence =      1.460(Ac.)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station     1003.000 to Point/Station     1004.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
 ________________________________________________________________________
 Depth of flow =   0.605(Ft.), Average velocity =   9.870(Ft/s)
     ******* Irregular Channel Data ***********
 ------------------------------------------------------------------
 Information entered for subchannel number 1 :
 Point number      'X' coordinate     'Y' coordinate
     1              0.00              1.00
     2              1.00              0.00
     3              2.00              1.00
 Manning's 'N' friction factor =   0.030
 ------------------------------------------------------------------
 Sub-Channel flow  =      3.610(CFS)
   '     '    flow top width =      1.210(Ft.)
   '     '    velocity=    9.870(Ft/s)
   '     '    area =      0.366(Sq.Ft)
   '     '    Froude number =     3.163

 Upstream point elevation =   696.870(Ft.)
 Downstream point elevation =   651.540(Ft.)
 Flow length =   146.000(Ft.)
 Travel time  =    0.25 min.
 Time of concentration =    7.21 min.
 Depth of flow =   0.605(Ft.)
 Average velocity =   9.870(Ft/s)
 Total irregular channel flow =     3.610(CFS)
 Irregular channel normal depth above invert elev. =   0.605(Ft.)
 Average velocity of channel(s) =   9.870(Ft/s)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station     1005.000 to Point/Station     1006.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
 ________________________________________________________________________
 Depth of flow =   0.590(Ft.), Average velocity =  10.366(Ft/s)
     ******* Irregular Channel Data ***********
 ------------------------------------------------------------------
 Information entered for subchannel number 1 :
 Point number      'X' coordinate     'Y' coordinate
```

```
        1              0.00              1.00
        2              1.00              0.00
        3              2.00              1.00
    Manning's 'N' friction factor =   0.030
    -----------------------------------------------------------------
    Sub-Channel flow  =      3.610(CFS)
      '      '    flow top width =      1.180(Ft.)
      '      '    velocity=   10.366(Ft/s)
      '      '    area =      0.348(Sq.Ft)
      '      '    Froude number =     3.363

    Upstream point elevation =   680.820(Ft.)
    Downstream point elevation =   600.490(Ft.)
    Flow length =   227.000(Ft.)
    Travel time  =    0.36 min.
    Time of concentration =    7.57 min.
    Depth of flow =   0.590(Ft.)
    Average velocity =  10.366(Ft/s)
    Total irregular channel flow =     3.610(CFS)
    Irregular channel normal depth above invert elev. =   0.590(Ft.)
    Average velocity of channel(s) =  10.366(Ft/s)
    End of computations, total study area =           1.460 (Ac.)
```

6c. CivilD Mitigated Post-Development Calculations

```
        San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
    Rational Hydrology Study        Date: 02/07/23
--------------------------------------------------------------------------
22027 POST POC1
MITIGATION PART 1


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

--------------------------------------------------------------------------


Program License Serial Number 6332

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.300
24 hour precipitation(inches) =  5.600
P6/P24 =    58.9%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      103.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
____________________________________________________________________________
User specified 'C' value of 0.789 given for subarea
Rainfall intensity (I) =      5.708(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   9.60 min.  Rain intensity =       5.71(In/Hr)
Total area =        2.300(Ac.)  Total runoff =    10.357(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Rainfall intensity (I) =      5.708(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Time of concentration =     9.60 min.
Rainfall intensity =      5.708(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.744  CA =      1.906
Subarea runoff =      0.522(CFS) for      0.260(Ac.)
Total runoff =     10.879(CFS)  Total area =       2.560(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Rainfall intensity (I) =      5.708(In/Hr) for a   100.0 year storm
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.790
Time of concentration =     9.60 min.
Rainfall intensity =      5.708(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.749  CA =      2.130
Subarea runoff =      1.281(CFS) for      0.284(Ac.)
Total runoff =     12.159(CFS)  Total area =       2.844(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** 6 HOUR HYDROGRAPH ****
________________________________________________________________________
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003

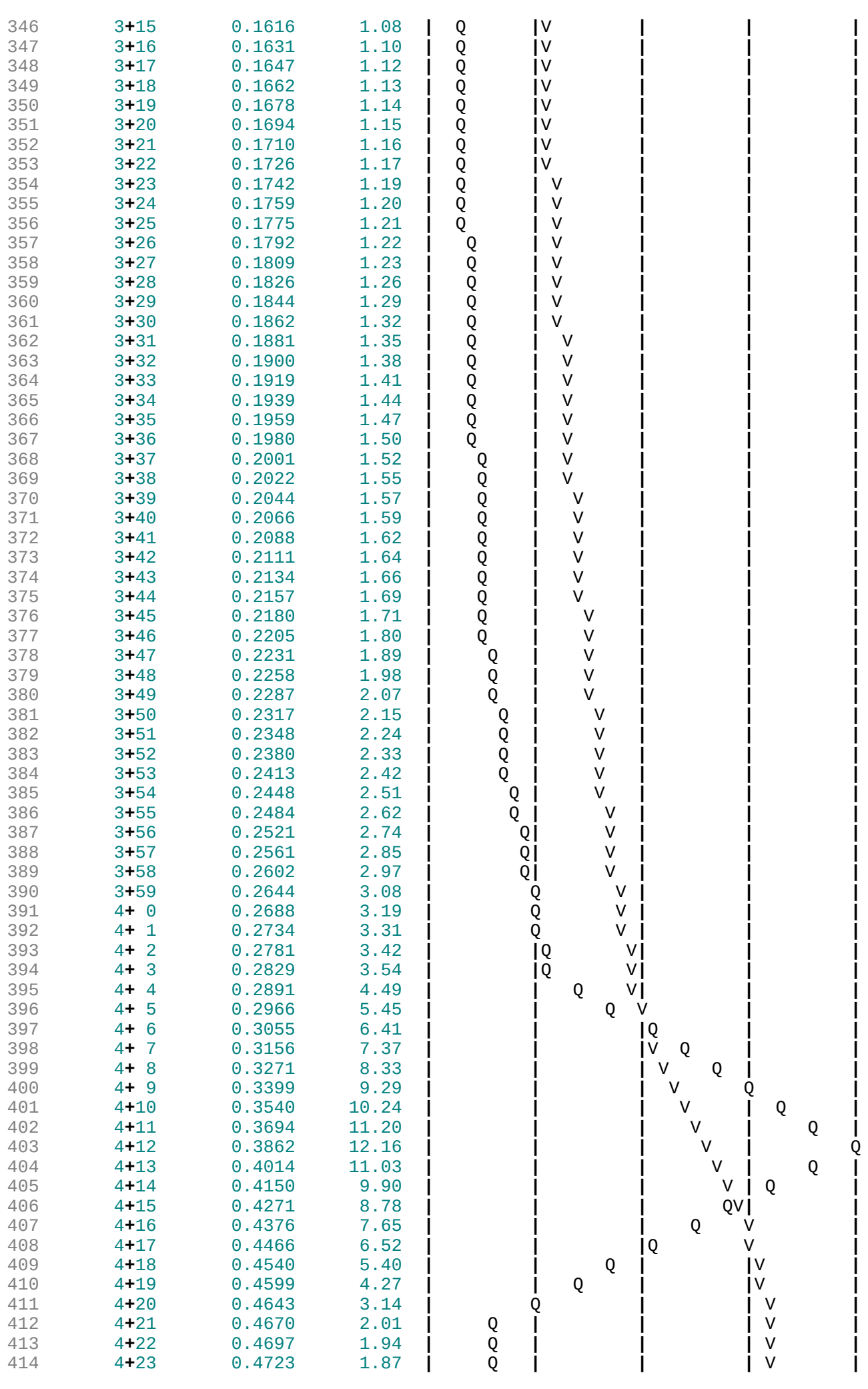

Time of Concentration =   9.60
Basin Area =     2.84 Acres
6 Hour Rainfall =  3.300 Inches
Runoff Coefficient =  0.749
Peak Discharge =    12.16 CFS
     Time (Min)     Discharge (CFS)
       0               0.000
       9               0.413
       18               0.427
       27               0.434
       36               0.450
       45               0.459
       54               0.477
       63               0.486
       72               0.507
       81               0.519
       90               0.544
       99               0.557
       108               0.587
       117               0.604
       126               0.641
       135               0.663
       144               0.710
       153               0.738
       162               0.802
       171               0.840
       180               0.932
       189               0.988
       198               1.132
       207               1.228
       216               1.501
       225               1.709
       234               2.510
       243               3.537
       252              12.159
       261               2.013
       270               1.347
       279               1.054
       288               0.883
       297               0.768
       306               0.685
       315               0.622
       324               0.572
       333               0.531
       342               0.496
```

```
            351               0.467
            360               0.442
            369               0.420
  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        6 - 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
  ------------------------------------------------------------------------
                Hydrograph in   1   Minute intervals ((CFS))

  ------------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        3.0       6.1       9.1      12.2
------------------------------------------------------------------------
    0+ 0       0.0000      0.00  Q         |         |         |         |
    0+ 1       0.0001      0.05  Q         |         |         |         |
    0+ 2       0.0002      0.09  Q         |         |         |         |
    0+ 3       0.0004      0.14  Q         |         |         |         |
    0+ 4       0.0006      0.18  Q         |         |         |         |
    0+ 5       0.0009      0.23  Q         |         |         |         |
    0+ 6       0.0013      0.28  Q         |         |         |         |
    0+ 7       0.0018      0.32  VQ        |         |         |         |
    0+ 8       0.0023      0.37  VQ        |         |         |         |
    0+ 9       0.0028      0.41  VQ        |         |         |         |
    0+10       0.0034      0.41  VQ        |         |         |         |
    0+11       0.0040      0.42  VQ        |         |         |         |
    0+12       0.0046      0.42  VQ        |         |         |         |
    0+13       0.0051      0.42  VQ        |         |         |         |
    0+14       0.0057      0.42  VQ        |         |         |         |
    0+15       0.0063      0.42  VQ        |         |         |         |
    0+16       0.0069      0.42  VQ        |         |         |         |
    0+17       0.0075      0.43  VQ        |         |         |         |
    0+18       0.0081      0.43  VQ        |         |         |         |
    0+19       0.0087      0.43  VQ        |         |         |         |
    0+20       0.0092      0.43  VQ        |         |         |         |
    0+21       0.0098      0.43  VQ        |         |         |         |
    0+22       0.0104      0.43  VQ        |         |         |         |
    0+23       0.0110      0.43  VQ        |         |         |         |
    0+24       0.0116      0.43  VQ        |         |         |         |
    0+25       0.0122      0.43  VQ        |         |         |         |
    0+26       0.0128      0.43  VQ        |         |         |         |
    0+27       0.0134      0.43  VQ        |         |         |         |
    0+28       0.0140      0.44  VQ        |         |         |         |
    0+29       0.0146      0.44  |Q        |         |         |         |
    0+30       0.0152      0.44  |Q        |         |         |         |
    0+31       0.0158      0.44  |Q        |         |         |         |
    0+32       0.0164      0.44  |Q        |         |         |         |
    0+33       0.0171      0.44  |Q        |         |         |         |
    0+34       0.0177      0.45  |Q        |         |         |         |
    0+35       0.0183      0.45  |Q        |         |         |         |
    0+36       0.0189      0.45  |Q        |         |         |         |
    0+37       0.0195      0.45  |Q        |         |         |         |
    0+38       0.0202      0.45  |Q        |         |         |         |
    0+39       0.0208      0.45  |Q        |         |         |         |
    0+40       0.0214      0.45  |Q        |         |         |         |
    0+41       0.0220      0.45  |Q        |         |         |         |
    0+42       0.0227      0.46  |Q        |         |         |         |
    0+43       0.0233      0.46  |Q        |         |         |         |
    0+44       0.0239      0.46  |Q        |         |         |         |
    0+45       0.0245      0.46  |Q        |         |         |         |
    0+46       0.0252      0.46  |Q        |         |         |         |
    0+47       0.0258      0.46  |Q        |         |         |         |
    0+48       0.0265      0.46  |Q        |         |         |         |
    0+49       0.0271      0.47  |Q        |         |         |         |
    0+50       0.0277      0.47  |Q        |         |         |         |
    0+51       0.0284      0.47  |Q        |         |         |         |
    0+52       0.0290      0.47  |QV       |         |         |         |
    0+53       0.0297      0.47  |QV       |         |         |         |
    0+54       0.0304      0.48  |QV       |         |         |         |
    0+55       0.0310      0.48  |QV       |         |         |         |
    0+56       0.0317      0.48  |QV       |         |         |         |
```

208	0+57	0.0323	0.48	|QV	|	|	|
209	0+58	0.0330	0.48	|QV	|	|	|
210	0+59	0.0337	0.48	|QV	|	|	|
211	1+ 0	0.0343	0.48	|QV	|	|	|
212	1+ 1	0.0350	0.48	|QV	|	|	|
213	1+ 2	0.0357	0.49	|QV	|	|	|
214	1+ 3	0.0363	0.49	|QV	|	|	|
215	1+ 4	0.0370	0.49	|QV	|	|	|
216	1+ 5	0.0377	0.49	|QV	|	|	|
217	1+ 6	0.0384	0.49	|QV	|	|	|
218	1+ 7	0.0390	0.50	|QV	|	|	|
219	1+ 8	0.0397	0.50	|QV	|	|	|
220	1+ 9	0.0404	0.50	|QV	|	|	|
221	1+10	0.0411	0.50	|QV	|	|	|
222	1+11	0.0418	0.50	|QV	|	|	|
223	1+12	0.0425	0.51	|QV	|	|	|
224	1+13	0.0432	0.51	|QV	|	|	|
225	1+14	0.0439	0.51	|Q V	|	|	|
226	1+15	0.0446	0.51	|Q V	|	|	|
227	1+16	0.0453	0.51	|Q V	|	|	|
228	1+17	0.0460	0.51	|Q V	|	|	|
229	1+18	0.0467	0.51	|Q V	|	|	|
230	1+19	0.0474	0.52	|Q V	|	|	|
231	1+20	0.0482	0.52	|Q V	|	|	|
232	1+21	0.0489	0.52	|Q V	|	|	|
233	1+22	0.0496	0.52	|Q V	|	|	|
234	1+23	0.0503	0.52	|Q V	|	|	|
235	1+24	0.0510	0.53	|Q V	|	|	|
236	1+25	0.0518	0.53	|Q V	|	|	|
237	1+26	0.0525	0.53	|Q V	|	|	|
238	1+27	0.0532	0.54	|Q V	|	|	|
239	1+28	0.0540	0.54	|Q V	|	|	|
240	1+29	0.0547	0.54	|Q V	|	|	|
241	1+30	0.0555	0.54	|Q V	|	|	|
242	1+31	0.0562	0.55	|Q V	|	|	|
243	1+32	0.0570	0.55	|Q V	|	|	|
244	1+33	0.0577	0.55	|Q V	|	|	|
245	1+34	0.0585	0.55	|Q V	|	|	|
246	1+35	0.0592	0.55	|Q V	|	|	|
247	1+36	0.0600	0.55	|Q V	|	|	|
248	1+37	0.0608	0.55	|Q V	|	|	|
249	1+38	0.0615	0.56	|Q V	|	|	|
250	1+39	0.0623	0.56	|Q V	|	|	|
251	1+40	0.0631	0.56	|Q V	|	|	|
252	1+41	0.0638	0.56	|Q V	|	|	|
253	1+42	0.0646	0.57	|Q V	|	|	|
254	1+43	0.0654	0.57	|Q V	|	|	|
255	1+44	0.0662	0.57	|Q V	|	|	|
256	1+45	0.0670	0.58	|Q V	|	|	|
257	1+46	0.0678	0.58	|Q V	|	|	|
258	1+47	0.0686	0.58	|Q V	|	|	|
259	1+48	0.0694	0.59	|Q V	|	|	|
260	1+49	0.0702	0.59	|Q V	|	|	|
261	1+50	0.0710	0.59	|Q V	|	|	|
262	1+51	0.0719	0.59	|Q V	|	|	|
263	1+52	0.0727	0.59	|Q V	|	|	|
264	1+53	0.0735	0.60	|Q V	|	|	|
265	1+54	0.0743	0.60	|Q V	|	|	|
266	1+55	0.0752	0.60	|Q V	|	|	|
267	1+56	0.0760	0.60	|Q V	|	|	|
268	1+57	0.0768	0.60	|Q V	|	|	|
269	1+58	0.0776	0.61	| Q V	|	|	|
270	1+59	0.0785	0.61	| Q V	|	|	|
271	2+ 0	0.0793	0.62	| Q V	|	|	|
272	2+ 1	0.0802	0.62	| Q V	|	|	|
273	2+ 2	0.0811	0.62	| Q V	|	|	|
274	2+ 3	0.0819	0.63	| Q V	|	|	|
275	2+ 4	0.0828	0.63	| Q V	|	|	|
276	2+ 5	0.0837	0.64	| Q V	|	|	|

277	2+ 6	0.0846	0.64	Q V				
278	2+ 7	0.0854	0.64	Q V				
279	2+ 8	0.0863	0.65	Q V				
280	2+ 9	0.0872	0.65	Q V				
281	2+10	0.0881	0.65	Q V				
282	2+11	0.0890	0.65	Q V				
283	2+12	0.0899	0.66	Q V				
284	2+13	0.0908	0.66	Q V				
285	2+14	0.0917	0.66	Q V				
286	2+15	0.0927	0.66	Q V				
287	2+16	0.0936	0.67	Q V				
288	2+17	0.0945	0.67	Q V				
289	2+18	0.0954	0.68	Q V				
290	2+19	0.0964	0.68	Q V				
291	2+20	0.0973	0.69	Q V				
292	2+21	0.0983	0.69	Q V				
293	2+22	0.0992	0.70	Q V				
294	2+23	0.1002	0.71	Q V				
295	2+24	0.1012	0.71	Q V				
296	2+25	0.1022	0.71	Q V				
297	2+26	0.1032	0.72	Q V				
298	2+27	0.1042	0.72	Q V				
299	2+28	0.1052	0.72	Q V				
300	2+29	0.1062	0.73	Q V				
301	2+30	0.1072	0.73	Q V				
302	2+31	0.1082	0.73	Q V				
303	2+32	0.1092	0.73	Q V				
304	2+33	0.1102	0.74	Q V				
305	2+34	0.1112	0.75	Q V				
306	2+35	0.1123	0.75	Q V				
307	2+36	0.1133	0.76	Q V				
308	2+37	0.1144	0.77	Q V				
309	2+38	0.1154	0.77	Q V				
310	2+39	0.1165	0.78	Q V				
311	2+40	0.1176	0.79	Q V				
312	2+41	0.1187	0.79	Q V				
313	2+42	0.1198	0.80	Q V				
314	2+43	0.1209	0.81	Q V				
315	2+44	0.1220	0.81	Q V				
316	2+45	0.1231	0.81	Q V				
317	2+46	0.1243	0.82	Q V				
318	2+47	0.1254	0.82	Q V				
319	2+48	0.1265	0.83	Q V				
320	2+49	0.1277	0.83	Q V				
321	2+50	0.1288	0.84	Q V				
322	2+51	0.1300	0.84	Q V				
323	2+52	0.1312	0.85	Q V				
324	2+53	0.1323	0.86	Q V				
325	2+54	0.1335	0.87	Q V				
326	2+55	0.1348	0.88	Q V				
327	2+56	0.1360	0.89	Q V				
328	2+57	0.1372	0.90	Q V				
329	2+58	0.1385	0.91	Q V				
330	2+59	0.1397	0.92	Q V				
331	3+ 0	0.1410	0.93	Q V				
332	3+ 1	0.1423	0.94	Q V				
333	3+ 2	0.1436	0.94	Q V				
334	3+ 3	0.1449	0.95	Q V				
335	3+ 4	0.1463	0.96	Q V				
336	3+ 5	0.1476	0.96	Q V				
337	3+ 6	0.1489	0.97	Q V				
338	3+ 7	0.1503	0.98	Q V				
339	3+ 8	0.1516	0.98	Q V				
340	3+ 9	0.1530	0.99	Q V				
341	3+10	0.1544	1.00	Q V				
342	3+11	0.1558	1.02	Q V				
343	3+12	0.1572	1.04	Q V				
344	3+13	0.1586	1.05	Q V				
345	3+14	0.1601	1.07	Q V				



415	4+24	0.4747	1.79	| Q |	|	|	| V |
416	4+25	0.4771	1.72	| Q |	|	|	| V |
417	4+26	0.4794	1.64	| Q |	|	|	| V |
418	4+27	0.4815	1.57	| Q |	|	|	| V |
419	4+28	0.4836	1.49	| Q |	|	|	| V |
420	4+29	0.4855	1.42	| Q |	|	|	| V |
421	4+30	0.4874	1.35	| Q |	|	|	| V |
422	4+31	0.4892	1.31	| Q |	|	|	| V |
423	4+32	0.4910	1.28	| Q |	|	|	| V |
424	4+33	0.4927	1.25	| Q |	|	|	| V |
425	4+34	0.4944	1.22	| Q |	|	|	| V |
426	4+35	0.4960	1.18	| Q |	|	|	| V |
427	4+36	0.4976	1.15	| Q |	|	|	| V |
428	4+37	0.4991	1.12	| Q |	|	|	| V |
429	4+38	0.5006	1.09	| Q |	|	|	| V |
430	4+39	0.5021	1.05	| Q |	|	|	| V |
431	4+40	0.5035	1.03	| Q |	|	|	| V |
432	4+41	0.5049	1.02	| Q |	|	|	| V |
433	4+42	0.5063	1.00	| Q |	|	|	| V |
434	4+43	0.5076	0.98	| Q |	|	|	| V |
435	4+44	0.5089	0.96	| Q |	|	|	| V |
436	4+45	0.5102	0.94	| Q |	|	|	| V |
437	4+46	0.5115	0.92	| Q |	|	|	| V |
438	4+47	0.5127	0.90	| Q |	|	|	| V |
439	4+48	0.5140	0.88	| Q |	|	|	| V |
440	4+49	0.5152	0.87	| Q |	|	|	| V |
441	4+50	0.5163	0.86	| Q |	|	|	| V |
442	4+51	0.5175	0.84	| Q |	|	|	| V |
443	4+52	0.5186	0.83	| Q |	|	|	| V |
444	4+53	0.5198	0.82	| Q |	|	|	| V |
445	4+54	0.5209	0.81	| Q |	|	|	| V |
446	4+55	0.5220	0.79	| Q |	|	|	| V |
447	4+56	0.5231	0.78	| Q |	|	|	| V |
448	4+57	0.5241	0.77	| Q |	|	|	| V |
449	4+58	0.5252	0.76	| Q |	|	|	| V |
450	4+59	0.5262	0.75	| Q |	|	|	| V |
451	5+ 0	0.5272	0.74	| Q |	|	|	| V |
452	5+ 1	0.5282	0.73	| Q |	|	|	| V |
453	5+ 2	0.5292	0.72	| Q |	|	|	| V |
454	5+ 3	0.5302	0.71	| Q |	|	|	| V |
455	5+ 4	0.5312	0.70	| Q |	|	|	| V |
456	5+ 5	0.5321	0.69	| Q |	|	|	| V |
457	5+ 6	0.5331	0.69	| Q |	|	|	| V |
458	5+ 7	0.5340	0.68	| Q |	|	|	| V |
459	5+ 8	0.5349	0.67	| Q |	|	|	| V |
460	5+ 9	0.5358	0.66	| Q |	|	|	| V |
461	5+10	0.5367	0.66	| Q |	|	|	| V |
462	5+11	0.5376	0.65	| Q |	|	|	| V |
463	5+12	0.5385	0.64	| Q |	|	|	| V |
464	5+13	0.5394	0.64	| Q |	|	|	| V |
465	5+14	0.5403	0.63	| Q |	|	|	| V |
466	5+15	0.5411	0.62	| Q |	|	|	| V |
467	5+16	0.5420	0.62	| Q |	|	|	| V |
468	5+17	0.5428	0.61	| Q |	|	|	| V |
469	5+18	0.5437	0.61	|Q |	|	|	| V |
470	5+19	0.5445	0.60	|Q |	|	|	| V |
471	5+20	0.5453	0.59	|Q |	|	|	| V |
472	5+21	0.5461	0.59	|Q |	|	|	| V |
473	5+22	0.5469	0.58	|Q |	|	|	| V |
474	5+23	0.5477	0.58	|Q |	|	|	| V |
475	5+24	0.5485	0.57	|Q |	|	|	| V |
476	5+25	0.5493	0.57	|Q |	|	|	| V |
477	5+26	0.5501	0.56	|Q |	|	|	| V |
478	5+27	0.5508	0.56	|Q |	|	|	| V |
479	5+28	0.5516	0.55	|Q |	|	|	| V |
480	5+29	0.5523	0.55	|Q |	|	|	| V |
481	5+30	0.5531	0.54	|Q |	|	|	| V |
482	5+31	0.5538	0.54	|Q |	|	|	| V |
483	5+32	0.5546	0.54	|Q |	|	|	| V |

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      5+33       0.5553      0.53  |Q        |         |         |        V |
      5+34       0.5560      0.53  |Q        |         |         |        V |
      5+35       0.5567      0.52  |Q        |         |         |        V |
      5+36       0.5575      0.52  |Q        |         |         |        V |
      5+37       0.5582      0.52  |Q        |         |         |        V |
      5+38       0.5589      0.51  |Q        |         |         |        V |
      5+39       0.5596      0.51  |Q        |         |         |        V |
      5+40       0.5603      0.50  |Q        |         |         |        V |
      5+41       0.5610      0.50  |Q        |         |         |        V |
      5+42       0.5616      0.50  |Q        |         |         |        V |
      5+43       0.5623      0.49  |Q        |         |         |        V |
      5+44       0.5630      0.49  |Q        |         |         |        V |
      5+45       0.5637      0.49  |Q        |         |         |        V |
      5+46       0.5643      0.48  |Q        |         |         |         V|
      5+47       0.5650      0.48  |Q        |         |         |         V|
      5+48       0.5657      0.48  |Q        |         |         |         V|
      5+49       0.5663      0.47  |Q        |         |         |         V|
      5+50       0.5670      0.47  |Q        |         |         |         V|
      5+51       0.5676      0.47  |Q        |         |         |         V|
      5+52       0.5682      0.46  |Q        |         |         |         V|
      5+53       0.5689      0.46  |Q        |         |         |         V|
      5+54       0.5695      0.46  |Q        |         |         |         V|
      5+55       0.5701      0.46  |Q        |         |         |         V|
      5+56       0.5708      0.45  |Q        |         |         |         V|
      5+57       0.5714      0.45  |Q        |         |         |         V|
      5+58       0.5720      0.45  |Q        |         |         |         V|
      5+59       0.5726      0.44  |Q        |         |         |         V|
      6+ 0       0.5732      0.44  |Q        |         |         |         V|
      6+ 1       0.5738      0.44  |Q        |         |         |         V|
      6+ 2       0.5744      0.44  |Q        |         |         |         V|
      6+ 3       0.5750      0.43  |Q        |         |         |         V|
      6+ 4       0.5756      0.43  |Q        |         |         |         V|
      6+ 5       0.5762      0.43  |Q        |         |         |         V|
      6+ 6       0.5768      0.43  |Q        |         |         |         V|
      6+ 7       0.5774      0.43  |Q        |         |         |         V|
      6+ 8       0.5780      0.42  |Q        |         |         |         V|
      6+ 9       0.5785      0.42  |Q        |         |         |          V
-------------------------------------------------------------------------


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   690.910(Ft.)
Downstream point/station elevation =   685.810(Ft.)
Pipe length  =    63.00(Ft.) Slope =   0.0810  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.159(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    12.159(CFS)
Normal flow depth in pipe =    7.99(In.)
Flow top width inside pipe =   17.89(In.)
Critical Depth =   15.85(In.)
Pipe flow velocity =     16.04(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     9.67 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     12.414(CFS)
Depth of flow =   0.832(Ft.), Average velocity =  17.941(Ft/s)
    ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.016
------------------------------------------------------------------
Sub-Channel flow  =     12.414(CFS)
  '     '    flow top width =      1.664(Ft.)
  '     '    velocity=   17.941(Ft/s)
  '     '    area =      0.692(Sq.Ft)
  '     '    Froude number =     4.902

Upstream point elevation =   685.810(Ft.)
Downstream point elevation =   611.400(Ft.)
Flow length =   390.000(Ft.)
Travel time  =    0.36 min.
Time of concentration =   10.03 min.
Depth of flow =   0.832(Ft.)
Average velocity =  17.941(Ft/s)
Total irregular channel flow =    12.414(CFS)
Irregular channel normal depth above invert elev. =   0.832(Ft.)
Average velocity of channel(s) =  17.941(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.550(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.050
Decimal fraction soil group D = 0.950
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.347
Rainfall intensity =      5.550(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.700  CA =      2.268
Subarea runoff =      0.429(CFS) for      0.397(Ac.)
Total runoff =     12.588(CFS)  Total area =       3.241(Ac.)
Depth of flow =   0.836(Ft.), Average velocity =  18.003(Ft/s)


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Process from Point/Station      106.000 to Point/Station      107.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________
Estimated mean flow rate at midpoint of channel =     12.828(CFS)
Depth of flow =   0.445(Ft.), Average velocity =   4.101(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.63
    2             25.00              0.13
    3             26.50              0.00
    4             26.50              0.50
    5             31.50              0.60
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =     12.828(CFS)
  '     '    flow top width =     17.483(Ft.)
  '     '    velocity=    4.101(Ft/s)
  '     '    area =      3.128(Sq.Ft)
  '     '    Froude number =     1.709

Upstream point elevation =   611.400(Ft.)
Downstream point elevation =   608.550(Ft.)
Flow length =   162.000(Ft.)
Travel time  =    0.66 min.
```

```
Time of concentration =   10.69 min.
Depth of flow =   0.445(Ft.)
Average velocity =   4.101(Ft/s)
Total irregular channel flow =    12.828(CFS)
Irregular channel normal depth above invert elev. =   0.445(Ft.)
Average velocity of channel(s) =   4.101(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.327(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.050
Decimal fraction soil group D = 0.950
[INDUSTRIAL area type                         ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      5.327(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.709  CA =      2.436
Subarea runoff =      0.389(CFS) for      0.193(Ac.)
Total runoff =     12.977(CFS)  Total area =       3.434(Ac.)
Depth of flow =   0.446(Ft.), Average velocity =   4.113(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      107.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.434(Ac.)
Runoff from this stream =     12.977(CFS)
Time of concentration =   10.69 min.
Rainfall intensity =     5.327(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[HIGH DENSITY RESIDENTIAL                     ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.790
Initial subarea total flow distance  =   74.000(Ft.)
Highest elevation =  699.890(Ft.)
Lowest elevation =  693.340(Ft.)
Elevation difference =    6.550(Ft.) Slope =  8.851 %
Top of Initial Area Slope adjusted by User to  9.838 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   9.84 %, in a development type of
 43.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.60 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7900)*( 100.000^.5)/(   9.838^(1/3)]=   2.60
Calculated TC of    2.604 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.790
Subarea runoff =      0.323(CFS)
Total initial stream area =        0.047(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
      Process from Point/Station      302.000 to Point/Station      107.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

      ____________________________________________________________________
      Estimated mean flow rate at midpoint of channel =      1.486(CFS)
      Depth of flow =   0.020(Ft.), Average velocity =   2.907(Ft/s)
          ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
          1              0.00              0.50
          2              0.00              0.00
          3             25.00              0.00
          4             25.00              0.50
      Manning's 'N' friction factor =   0.016
      ------------------------------------------------------------------
      Sub-Channel flow  =      1.486(CFS)
        '     '    flow top width =     25.000(Ft.)
        '     '    velocity=    2.907(Ft/s)
        '     '    area =      0.511(Sq.Ft)
        '     '    Froude number =     3.583

      Upstream point elevation =   693.340(Ft.)
      Downstream point elevation =   611.680(Ft.)
      Flow length =   465.000(Ft.)
      Travel time  =    2.67 min.
      Time of concentration =    5.27 min.
      Depth of flow =   0.020(Ft.)
      Average velocity =   2.907(Ft/s)
      Total irregular channel flow =     1.486(CFS)
      Irregular channel normal depth above invert elev. =   0.020(Ft.)
      Average velocity of channel(s) =   2.907(Ft/s)
       Adding area flow to channel
      Rainfall intensity (I) =      8.404(In/Hr) for a   100.0 year storm
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (24.0 DU/A or Less      )
      Impervious value, Ai = 0.650
      Sub-Area C Value = 0.710
      Rainfall intensity =      8.404(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.719  CA =      0.303
      Subarea runoff =      2.227(CFS) for      0.375(Ac.)
      Total runoff =      2.550(CFS)  Total area =       0.422(Ac.)
      Depth of flow =   0.028(Ft.), Average velocity =   3.607(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      107.000 to Point/Station      107.000
      **** CONFLUENCE OF MINOR STREAMS ****

      ____________________________________________________________________
      Along Main Stream number: 1 in normal stream number 2
      Stream flow area =      0.422(Ac.)
      Runoff from this stream =      2.550(CFS)
      Time of concentration =    5.27 min.
      Rainfall intensity =     8.404(In/Hr)
      Summary of stream data:

      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                (In/Hr)


      1       12.977     10.69             5.327
      2        2.550      5.27             8.404
      Qmax(1) =
            1.000 *    1.000 *    12.977) +
            0.634 *    1.000 *     2.550) + =      14.593
```

```
      Qmax(2) =
            1.000 *    0.493 *    12.977) +
            1.000 *    1.000 *     2.550) + =       8.950

      Total of 2 streams to confluence:
      Flow rates before confluence point:
           12.977       2.550
      Maximum flow rates at confluence using above data:
            14.593        8.950
      Area of streams before confluence:
             3.434        0.422
      Results of confluence:
      Total flow rate =     14.593(CFS)
      Time of concentration =    10.686 min.
      Effective stream area after confluence =      3.856(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      107.000 to Point/Station      108.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ________________________________________________________________________
      Estimated mean flow rate at midpoint of channel =     14.790(CFS)
      Depth of flow =   0.412(Ft.), Average velocity =   5.885(Ft/s)
          ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
          1              0.00              0.63
          2             25.00              0.13
          3             26.50              0.00
          4             26.50              0.50
          5             31.50              0.60
      Manning's 'N' friction factor =   0.015
      ------------------------------------------------------------------
      Sub-Channel flow  =     14.790(CFS)
        '     '    flow top width =     15.615(Ft.)
        '     '    velocity=    5.885(Ft/s)
        '     '    area =      2.513(Sq.Ft)
        '     '    Froude number =     2.585

      Upstream point elevation =   608.550(Ft.)
      Downstream point elevation =   601.450(Ft.)
      Flow length =   170.000(Ft.)
      Travel time  =    0.48 min.
      Time of concentration =   11.17 min.
      Depth of flow =   0.412(Ft.)
      Average velocity =   5.885(Ft/s)
      Total irregular channel flow =    14.790(CFS)
      Irregular channel normal depth above invert elev. =   0.412(Ft.)
      Average velocity of channel(s) =   5.885(Ft/s)
       Adding area flow to channel
      Rainfall intensity (I) =      5.178(In/Hr) for a   100.0 year storm
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.050
      Decimal fraction soil group D = 0.950
      [INDUSTRIAL area type                        ]
      (General Industrial       )
      Impervious value, Ai = 0.950
      Sub-Area C Value = 0.870
      Rainfall intensity =      5.178(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.717  CA =      2.880
      Subarea runoff =      0.321(CFS) for      0.162(Ac.)
      Total runoff =     14.914(CFS)  Total area =       4.018(Ac.)
      Depth of flow =   0.413(Ft.), Average velocity =   5.897(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
      Process from Point/Station      108.000 to Point/Station      108.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ----------------------------------------------------------------------
      Along Main Stream number: 1 in normal stream number 1
      Stream flow area =      4.018(Ac.)
      Runoff from this stream =     14.914(CFS)
      Time of concentration =   11.17 min.
      Rainfall intensity =     5.178(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      401.000 to Point/Station      402.000
      **** INITIAL AREA EVALUATION ****
      ----------------------------------------------------------------------
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.350
      Initial subarea total flow distance  =  100.000(Ft.)
      Highest elevation =  709.280(Ft.)
      Lowest elevation =  687.650(Ft.)
      Elevation difference =   21.630(Ft.) Slope = 21.630 %
      Top of Initial Area Slope adjusted by User to 23.240 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  23.24 %, in a development type of
       Permanent Open Space
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   4.73 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  23.240^(1/3)]=   4.73
      Calculated TC of    4.731 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
      Subarea runoff =      0.207(CFS)
      Total initial stream area =        0.068(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      402.000 to Point/Station      108.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ----------------------------------------------------------------------
      Estimated mean flow rate at midpoint of channel =      1.331(CFS)
      Depth of flow =   0.497(Ft.), Average velocity =   5.388(Ft/s)
          ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
          1              0.00              1.00
          2              1.00              0.00
          3              2.00              1.00
      Manning's 'N' friction factor =   0.030
      ------------------------------------------------------------------
      Sub-Channel flow  =      1.331(CFS)
        '     '    flow top width =      0.994(Ft.)
        '     '    velocity=    5.388(Ft/s)
        '     '    area =      0.247(Sq.Ft)
        '     '    Froude number =     1.905

      Upstream point elevation =   687.650(Ft.)
      Downstream point elevation =   601.450(Ft.)
      Flow length =   717.000(Ft.)
      Travel time  =    2.22 min.
      Time of concentration =    6.95 min.
```

```
Depth of flow =   0.497(Ft.)
Average velocity =   5.388(Ft/s)
Total irregular channel flow =     1.331(CFS)
Irregular channel normal depth above invert elev. =   0.497(Ft.)
Average velocity of channel(s) =   5.388(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      7.032(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      7.032(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.338
Subarea runoff =      2.170(CFS) for      0.898(Ac.)
Total runoff =      2.377(CFS)  Total area =       0.966(Ac.)
Depth of flow =   0.618(Ft.), Average velocity =   6.229(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      108.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.966(Ac.)
Runoff from this stream =      2.377(CFS)
Time of concentration =    6.95 min.
Rainfall intensity =     7.032(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       14.914     11.17             5.178
2        2.377      6.95             7.032
Qmax(1) =
       1.000 *    1.000 *    14.914) +
       0.736 *    1.000 *     2.377) + =      16.664
Qmax(2) =
       1.000 *    0.622 *    14.914) +
       1.000 *    1.000 *     2.377) + =      11.657

Total of 2 streams to confluence:
Flow rates before confluence point:
      14.914       2.377
Maximum flow rates at confluence using above data:
       16.664       11.657
Area of streams before confluence:
        4.018        0.966
Results of confluence:
Total flow rate =     16.664(CFS)
Time of concentration =    11.168 min.
Effective stream area after confluence =      4.984(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     16.835(CFS)
Depth of flow =   0.408(Ft.), Average velocity =   6.890(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------
Information entered for subchannel number 1 :
```

```
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.63
    2             25.00              0.13
    3             26.50              0.00
    4             26.50              0.50
    5             31.50              0.60
Manning's 'N' friction factor =   0.015
-----------------------------------------------------------------
Sub-Channel flow  =     16.835(CFS)
  '     '    flow top width =     15.389(Ft.)
  '     '    velocity=    6.890(Ft/s)
  '     '    area =      2.443(Sq.Ft)
  '     '    Froude number =     3.047

Upstream point elevation =   601.450(Ft.)
Downstream point elevation =   593.870(Ft.)
Flow length =   130.000(Ft.)
Travel time  =    0.31 min.
Time of concentration =   11.48 min.
Depth of flow =   0.408(Ft.)
Average velocity =   6.890(Ft/s)
Total irregular channel flow =    16.835(CFS)
Irregular channel normal depth above invert elev. =   0.408(Ft.)
Average velocity of channel(s) =   6.890(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.086(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                         ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      5.086(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.651  CA =      3.328
Subarea runoff =      0.262(CFS) for      0.126(Ac.)
Total runoff =     16.926(CFS)  Total area =       5.110(Ac.)
Depth of flow =   0.408(Ft.), Average velocity =   6.899(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      110.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____________________________________________________________________
Estimated mean flow rate at midpoint of channel =     17.149(CFS)
Depth of flow =   0.433(Ft.), Average velocity =   6.036(Ft/s)
    ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.63
    2             25.00              0.13
    3             26.50              0.00
    4             26.50              0.50
    5             31.50              0.60
Manning's 'N' friction factor =   0.015
-----------------------------------------------------------------
Sub-Channel flow  =     17.149(CFS)
  '     '    flow top width =     16.632(Ft.)
  '     '    velocity=    6.036(Ft/s)
  '     '    area =      2.841(Sq.Ft)
  '     '    Froude number =     2.573

Upstream point elevation =   593.870(Ft.)
Downstream point elevation =   585.800(Ft.)
Flow length =   199.000(Ft.)
Travel time  =    0.55 min.
```

```
Time of concentration =   12.03 min.
Depth of flow =   0.433(Ft.)
Average velocity =   6.036(Ft/s)
Total irregular channel flow =    17.149(CFS)
Irregular channel normal depth above invert elev. =   0.433(Ft.)
Average velocity of channel(s) =   6.036(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.935(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                         ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      4.935(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.660  CA =      3.505
Subarea runoff =      0.369(CFS) for      0.203(Ac.)
Total runoff =     17.295(CFS)  Total area =       5.313(Ac.)
Depth of flow =   0.434(Ft.), Average velocity =   6.048(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      110.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      5.313(Ac.)
Runoff from this stream =     17.295(CFS)
Time of concentration =   12.03 min.
Rainfall intensity =     4.935(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                  ]
(Permanent Open Space    )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  137.000(Ft.)
Highest elevation =  709.360(Ft.)
Lowest elevation =  685.490(Ft.)
Elevation difference =   23.870(Ft.) Slope = 17.423 %
Top of Initial Area Slope adjusted by User to 19.708 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  19.71 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.00 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  19.708^(1/3)]=   5.00
Calculated TC of    4.998 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.700(CFS)
Total initial stream area =        0.230(Ac.)


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 Process from Point/Station      502.000 to Point/Station      503.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

 ------------------------------------------------------------------------
 Estimated mean flow rate at midpoint of channel =      2.157(CFS)
 Depth of flow =   0.549(Ft.), Average velocity =   7.164(Ft/s)
     ******* Irregular Channel Data **********
 ------------------------------------------------------------------------
 Information entered for subchannel number 1 :
 Point number      'X' coordinate     'Y' coordinate
     1              0.00              1.00
     2              1.00              0.00
     3              2.00              1.00
 Manning's 'N' friction factor =   0.030
 ------------------------------------------------------------------------
 Sub-Channel flow  =      2.157(CFS)
   '     '    flow top width =      1.097(Ft.)
   '     '    velocity=    7.164(Ft/s)
   '     '    area =      0.301(Sq.Ft)
   '     '    Froude number =     2.410

 Upstream point elevation =   685.490(Ft.)
 Downstream point elevation =   619.000(Ft.)
 Flow length =   357.000(Ft.)
 Travel time  =    0.83 min.
 Time of concentration =    5.83 min.
 Depth of flow =   0.549(Ft.)
 Average velocity =   7.164(Ft/s)
 Total irregular channel flow =     2.157(CFS)
 Irregular channel normal depth above invert elev. =   0.549(Ft.)
 Average velocity of channel(s) =   7.164(Ft/s)
  Adding area flow to channel
 Rainfall intensity (I) =      7.876(In/Hr) for a   100.0 year storm
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [UNDISTURBED NATURAL TERRAIN                ]
 (Permanent Open Space   )
 Impervious value, Ai = 0.000
 Sub-Area C Value = 0.350
 Rainfall intensity =      7.876(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.350  CA =      0.447
 Subarea runoff =      2.820(CFS) for      1.047(Ac.)
 Total runoff =      3.520(CFS)  Total area =       1.277(Ac.)
 Depth of flow =   0.659(Ft.), Average velocity =   8.097(Ft/s)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station      503.000 to Point/Station      504.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

 ------------------------------------------------------------------------
 Upstream point/station elevation =   605.110(Ft.)
 Downstream point/station elevation =   582.760(Ft.)
 Pipe length  =   230.00(Ft.) Slope =   0.0972  Manning's N = 0.013
 No. of pipes = 1  Required pipe flow  =     3.520(CFS)
 Given pipe size =     18.00(In.)
 Calculated individual pipe flow  =     3.520(CFS)
 Normal flow depth in pipe =    3.98(In.)
 Flow top width inside pipe =   14.95(In.)
 Critical Depth =    8.59(In.)
 Pipe flow velocity =     12.10(Ft/s)
 Travel time through pipe =    0.32 min.
 Time of concentration (TC) =     6.15 min.


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station      504.000 to Point/Station      110.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****
```

```
_____________________________________________________________________________
Upstream point/station elevation =   582.760(Ft.)
Downstream point/station elevation =   582.080(Ft.)
Pipe length  =    15.00(Ft.) Slope =   0.0453  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.520(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     3.520(CFS)
Normal flow depth in pipe =    4.39(In.)
Flow top width inside pipe =   18.56(In.)
Critical Depth =    7.88(In.)
Pipe flow velocity =      8.94(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     6.17 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      110.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.277(Ac.)
Runoff from this stream =      3.520(CFS)
Time of concentration =    6.17 min.
Rainfall intensity =     7.589(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       17.295     12.03             4.935
2        3.520      6.17             7.589
Qmax(1) =
       1.000 *    1.000 *    17.295) +
       0.650 *    1.000 *     3.520) + =      19.584
Qmax(2) =
       1.000 *    0.513 *    17.295) +
       1.000 *    1.000 *     3.520) + =      12.394

Total of 2 streams to confluence:
Flow rates before confluence point:
      17.295       3.520
Maximum flow rates at confluence using above data:
       19.584       12.394
Area of streams before confluence:
        5.313        1.277
Results of confluence:
Total flow rate =     19.584(CFS)
Time of concentration =    12.031 min.
Effective stream area after confluence =      6.590(Ac.)
End of computations, total study area =          6.590 (Ac.)
```

```
        San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
    Rational Hydrology Study        Date: 06/14/23
--------------------------------------------------------------------------
22027 POST POC1



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

--------------------------------------------------------------------------


Program License Serial Number 6332

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.300
24 hour precipitation(inches) =  5.600
P6/P24 =    58.9%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
User specified 'C' value of 0.502 given for subarea
Rainfall intensity (I) =      4.356(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  14.60 min.  Rain intensity =       4.36(In/Hr)
Total area =        2.840(Ac.)  Total runoff =     6.206(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   691.990(Ft.)
Downstream point/station elevation =   684.820(Ft.)
Pipe length  =    63.00(Ft.) Slope =   0.1138  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.206(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     6.206(CFS)
Normal flow depth in pipe =    5.10(In.)
Flow top width inside pipe =   16.22(In.)
Critical Depth =   11.55(In.)
Pipe flow velocity =     15.08(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    14.67 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      6.461(CFS)
Depth of flow =   0.653(Ft.), Average velocity =  15.162(Ft/s)
    ******* Irregular Channel Data ***********
--------------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.016
-----------------------------------------------------------------
Sub-Channel flow  =      6.461(CFS)
   '     '    flow top width =      1.306(Ft.)
   '     '    velocity=   15.162(Ft/s)
   '     '    area =      0.426(Sq.Ft)
   '     '    Froude number =     4.677

Upstream point elevation =   684.820(Ft.)
Downstream point elevation =   611.400(Ft.)
Flow length =   390.000(Ft.)
Travel time  =    0.43 min.
Time of concentration =   15.10 min.
Depth of flow =   0.653(Ft.)
Average velocity =  15.162(Ft/s)
Total irregular channel flow =     6.461(CFS)
Irregular channel normal depth above invert elev. =   0.653(Ft.)
Average velocity of channel(s) =  15.162(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.263(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.050
Decimal fraction soil group D = 0.950
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.347
Rainfall intensity =      4.263(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.483  CA =      1.564
Subarea runoff =      0.459(CFS) for      0.397(Ac.)
Total runoff =      6.665(CFS)  Total area =      3.237(Ac.)
Depth of flow =   0.660(Ft.), Average velocity =  15.280(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      6.864(CFS)
Depth of flow =   0.369(Ft.), Average velocity =   3.518(Ft/s)
    ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.63
    2             25.00              0.13
    3             26.50              0.00
    4             26.50              0.50
    5             31.50              0.60
Manning's 'N' friction factor =   0.015
-----------------------------------------------------------------
Sub-Channel flow  =      6.864(CFS)
   '     '    flow top width =     13.712(Ft.)
   '     '    velocity=    3.518(Ft/s)
   '     '    area =      1.951(Sq.Ft)
   '     '    Froude number =     1.643

Upstream point elevation =   611.400(Ft.)
Downstream point elevation =   608.550(Ft.)
Flow length =   162.000(Ft.)
Travel time  =    0.77 min.
Time of concentration =   15.87 min.
```

```
Depth of flow =   0.369(Ft.)
Average velocity =   3.518(Ft/s)
Total irregular channel flow =     6.864(CFS)
Irregular channel normal depth above invert elev. =   0.369(Ft.)
Average velocity of channel(s) =   3.518(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.128(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.050
Decimal fraction soil group D = 0.950
[INDUSTRIAL area type                         ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      4.128(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.505  CA =      1.732
Subarea runoff =      0.483(CFS) for      0.193(Ac.)
Total runoff =      7.149(CFS)  Total area =      3.430(Ac.)
Depth of flow =   0.374(Ft.), Average velocity =   3.553(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      107.000
**** CONFLUENCE OF MINOR STREAMS ****

____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.430(Ac.)
Runoff from this stream =      7.149(CFS)
Time of concentration =   15.87 min.
Rainfall intensity =     4.128(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****

____________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[HIGH DENSITY RESIDENTIAL                     ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.790
Initial subarea total flow distance  =   74.000(Ft.)
Highest elevation =  700.090(Ft.)
Lowest elevation =  693.340(Ft.)
Elevation difference =    6.750(Ft.) Slope =  9.122 %
Top of Initial Area Slope adjusted by User to  9.838 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   9.84 %, in a development type of
 43.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.60 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7900)*( 100.000^.5)/(   9.838^(1/3)]=   2.60
Calculated TC of    2.604 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.790
Subarea runoff =      0.323(CFS)
Total initial stream area =        0.047(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      107.000
```

```
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

____________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.488(CFS)
Depth of flow =   0.020(Ft.), Average velocity =   2.923(Ft/s)
    ******* Irregular Channel Data **********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.50
    2              0.00              0.00
    3             25.00              0.00
    4             25.00              0.50
Manning's 'N' friction factor =   0.016
------------------------------------------------------------------
Sub-Channel flow  =      1.488(CFS)
  '     '    flow top width =     25.000(Ft.)
  '     '    velocity=    2.923(Ft/s)
  '     '    area =      0.509(Sq.Ft)
  '     '    Froude number =     3.611

Upstream point elevation =   693.340(Ft.)
Downstream point elevation =   610.470(Ft.)
Flow length =   464.000(Ft.)
Travel time  =    2.65 min.
Time of concentration =    5.25 min.
Depth of flow =   0.020(Ft.)
Average velocity =   2.923(Ft/s)
Total irregular channel flow =     1.488(CFS)
Irregular channel normal depth above invert elev. =   0.020(Ft.)
Average velocity of channel(s) =   2.923(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.426(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[HIGH DENSITY RESIDENTIAL                    ]
(24.0 DU/A or Less      )
Impervious value, Ai = 0.650
Sub-Area C Value = 0.710
Rainfall intensity =      8.426(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.719  CA =      0.303
Subarea runoff =      2.233(CFS) for      0.375(Ac.)
Total runoff =      2.556(CFS)  Total area =       0.422(Ac.)
Depth of flow =   0.028(Ft.), Average velocity =   3.629(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      107.000
**** CONFLUENCE OF MINOR STREAMS ****

____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.422(Ac.)
Runoff from this stream =      2.556(CFS)
Time of concentration =    5.25 min.
Rainfall intensity =     8.426(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        7.149     15.87             4.128
2        2.556      5.25             8.426
Qmax(1) =
       1.000 *    1.000 *     7.149) +
       0.490 *    1.000 *     2.556) + =       8.401
Qmax(2) =
```

```
            1.000 *    0.331 *     7.149) +
            1.000 *    1.000 *     2.556) + =       4.921

      Total of 2 streams to confluence:
      Flow rates before confluence point:
            7.149       2.556
      Maximum flow rates at confluence using above data:
            8.401       4.921
      Area of streams before confluence:
            3.430       0.422
      Results of confluence:
      Total flow rate =      8.401(CFS)
      Time of concentration =    15.866 min.
      Effective stream area after confluence =      3.852(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      107.000 to Point/Station      108.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ------------------------------------------------------------------------
      Estimated mean flow rate at midpoint of channel =      8.479(CFS)
      Depth of flow =   0.312(Ft.), Average velocity =   6.764(Ft/s)
          ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
          1              0.00              0.63
          2             25.00              0.13
          3             26.50              0.00
          4             26.50              0.50
          5             31.50              0.60
      Manning's 'N' friction factor =   0.015
      ------------------------------------------------------------------
      Sub-Channel flow  =      8.479(CFS)
        '     '    flow top width =     10.873(Ft.)
        '     '    velocity=    6.764(Ft/s)
        '     '    area =      1.254(Sq.Ft)
        '     '    Froude number =     3.511

      Upstream point elevation =   608.550(Ft.)
      Downstream point elevation =   593.870(Ft.)
      Flow length =   170.000(Ft.)
      Travel time  =    0.42 min.
      Time of concentration =   16.28 min.
      Depth of flow =   0.312(Ft.)
      Average velocity =   6.764(Ft/s)
      Total irregular channel flow =     8.479(CFS)
      Irregular channel normal depth above invert elev. =   0.312(Ft.)
      Average velocity of channel(s) =   6.764(Ft/s)
       Adding area flow to channel
      Rainfall intensity (I) =      4.060(In/Hr) for a   100.0 year storm
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.050
      Decimal fraction soil group D = 0.950
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.347
      Rainfall intensity =      4.060(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.521  CA =      2.091
      Subarea runoff =      0.089(CFS) for      0.162(Ac.)
      Total runoff =      8.490(CFS)  Total area =       4.014(Ac.)
      Depth of flow =   0.313(Ft.), Average velocity =   6.766(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      108.000 to Point/Station      108.000
```

```
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.014(Ac.)
Runoff from this stream =      8.490(CFS)
Time of concentration =   16.28 min.
Rainfall intensity =     4.060(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  709.280(Ft.)
Lowest elevation =  686.650(Ft.)
Elevation difference =   22.630(Ft.) Slope = 22.630 %
Top of Initial Area Slope adjusted by User to 23.240 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  23.24 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.73 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  23.240^(1/3)]=   4.73
Calculated TC of    4.731 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.207(CFS)
Total initial stream area =        0.068(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      108.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      1.444(CFS)
Depth of flow =   0.405(Ft.), Average velocity =   8.815(Ft/s)
    ******* Irregular Channel Data ***********
-------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.016
-------------------------------------------------------------
Sub-Channel flow  =      1.444(CFS)
  '     '    flow top width =      0.809(Ft.)
  '     '    velocity=    8.815(Ft/s)
  '     '    area =      0.164(Sq.Ft)
  '     '    Froude number =     3.454

Upstream point elevation =   687.650(Ft.)
Downstream point elevation =   601.330(Ft.)
Flow length =   717.000(Ft.)
Travel time  =    1.36 min.
Time of concentration =    6.09 min.
Depth of flow =   0.405(Ft.)
```

```
Average velocity =   8.815(Ft/s)
Total irregular channel flow =     1.444(CFS)
Irregular channel normal depth above invert elev. =   0.405(Ft.)
Average velocity of channel(s) =   8.815(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      7.659(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      7.659(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.338
Subarea runoff =      2.383(CFS) for      0.898(Ac.)
Total runoff =      2.590(CFS)  Total area =       0.966(Ac.)
Depth of flow =   0.504(Ft.), Average velocity =  10.202(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      108.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.966(Ac.)
Runoff from this stream =      2.590(CFS)
Time of concentration =    6.09 min.
Rainfall intensity =     7.659(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        8.490     16.28             4.060
2        2.590      6.09             7.659
Qmax(1) =
       1.000 *    1.000 *     8.490) +
       0.530 *    1.000 *     2.590) + =       9.862
Qmax(2) =
       1.000 *    0.374 *     8.490) +
       1.000 *    1.000 *     2.590) + =       5.762

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.490       2.590
Maximum flow rates at confluence using above data:
        9.862        5.762
Area of streams before confluence:
        4.014        0.966
Results of confluence:
Total flow rate =      9.862(CFS)
Time of concentration =    16.285 min.
Effective stream area after confluence =      4.980(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      9.908(CFS)
Depth of flow =   0.346(Ft.), Average velocity =   6.015(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
```

```
    1              0.00              0.63
    2             25.00              0.13
    3             26.50              0.00
    4             26.50              0.50
    5             31.50              0.60
Manning's 'N' friction factor =   0.015
-----------------------------------------------------------------
Sub-Channel flow  =      9.908(CFS)
  '     '    flow top width =     12.553(Ft.)
  '     '    velocity=    6.015(Ft/s)
  '     '    area =      1.647(Sq.Ft)
  '     '    Froude number =     2.927

Upstream point elevation =   601.330(Ft.)
Downstream point elevation =   593.870(Ft.)
Flow length =   130.000(Ft.)
Travel time  =    0.36 min.
Time of concentration =   16.65 min.
Depth of flow =   0.346(Ft.)
Average velocity =   6.015(Ft/s)
Total irregular channel flow =     9.908(CFS)
Irregular channel normal depth above invert elev. =   0.346(Ft.)
Average velocity of channel(s) =   6.015(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.003(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      4.003(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.484  CA =      2.473
Subarea runoff =      0.038(CFS) for      0.126(Ac.)
Total runoff =      9.900(CFS)  Total area =      5.106(Ac.)
Depth of flow =   0.346(Ft.), Average velocity =   6.014(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      110.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      9.966(CFS)
Depth of flow =   0.364(Ft.), Average velocity =   5.283(Ft/s)
    ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.63
    2             25.00              0.13
    3             26.50              0.00
    4             26.50              0.50
    5             31.50              0.60
Manning's 'N' friction factor =   0.015
-----------------------------------------------------------------
Sub-Channel flow  =      9.966(CFS)
  '     '    flow top width =     13.474(Ft.)
  '     '    velocity=    5.283(Ft/s)
  '     '    area =      1.887(Sq.Ft)
  '     '    Froude number =     2.488

Upstream point elevation =   593.870(Ft.)
Downstream point elevation =   585.800(Ft.)
Flow length =   199.000(Ft.)
Travel time  =    0.63 min.
Time of concentration =   17.27 min.
```

```
Depth of flow =   0.364(Ft.)
Average velocity =   5.283(Ft/s)
Total irregular channel flow =     9.966(CFS)
Irregular channel normal depth above invert elev. =   0.364(Ft.)
Average velocity of channel(s) =   5.283(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      3.908(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      3.908(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.479  CA =      2.544
Subarea runoff =      0.044(CFS) for      0.203(Ac.)
Total runoff =      9.945(CFS)  Total area =       5.309(Ac.)
Depth of flow =   0.364(Ft.), Average velocity =   5.280(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      110.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      5.309(Ac.)
Runoff from this stream =      9.945(CFS)
Time of concentration =   17.27 min.
Rainfall intensity =     3.908(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  137.000(Ft.)
Highest elevation =  709.360(Ft.)
Lowest elevation =  685.500(Ft.)
Elevation difference =   23.860(Ft.) Slope = 17.416 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  17.42 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.21 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  17.420^(1/3)]=   5.21
Rainfall intensity (I) =      8.469(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.682(CFS)
Total initial stream area =        0.230(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station      503.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      2.105(CFS)
```

```
Depth of flow =   0.544(Ft.), Average velocity =   7.120(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      2.105(CFS)
  '     '    flow top width =      1.087(Ft.)
  '     '    velocity=    7.120(Ft/s)
  '     '    area =      0.296(Sq.Ft)
  '     '    Froude number =     2.407

Upstream point elevation =   685.500(Ft.)
Downstream point elevation =   619.000(Ft.)
Flow length =   357.000(Ft.)
Travel time  =    0.84 min.
Time of concentration =    6.04 min.
Depth of flow =   0.544(Ft.)
Average velocity =   7.120(Ft/s)
Total irregular channel flow =     2.105(CFS)
Irregular channel normal depth above invert elev. =   0.544(Ft.)
Average velocity of channel(s) =   7.120(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      7.694(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      7.694(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.447
Subarea runoff =      2.757(CFS) for      1.047(Ac.)
Total runoff =      3.439(CFS)  Total area =       1.277(Ac.)
Depth of flow =   0.654(Ft.), Average velocity =   8.050(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      504.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   605.110(Ft.)
Downstream point/station elevation =   582.760(Ft.)
Pipe length  =   230.00(Ft.) Slope =   0.0972  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.439(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     3.439(CFS)
Normal flow depth in pipe =    3.94(In.)
Flow top width inside pipe =   14.88(In.)
Critical Depth =    8.48(In.)
Pipe flow velocity =     12.02(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =     6.36 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      504.000 to Point/Station      110.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   582.760(Ft.)
Downstream point/station elevation =   582.080(Ft.)
Pipe length  =    15.00(Ft.) Slope =   0.0453  Manning's N = 0.013
```

```
No. of pipes = 1  Required pipe flow  =     3.439(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     3.439(CFS)
Normal flow depth in pipe =    4.34(In.)
Flow top width inside pipe =   18.48(In.)
Critical Depth =    7.78(In.)
Pipe flow velocity =      8.88(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     6.39 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      110.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.277(Ac.)
Runoff from this stream =      3.439(CFS)
Time of concentration =    6.39 min.
Rainfall intensity =     7.422(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        9.945     17.27             3.908
2        3.439      6.39             7.422
Qmax(1) =
       1.000 *    1.000 *     9.945) +
       0.527 *    1.000 *     3.439) + =      11.755
Qmax(2) =
       1.000 *    0.370 *     9.945) +
       1.000 *    1.000 *     3.439) + =       7.118

Total of 2 streams to confluence:
Flow rates before confluence point:
       9.945       3.439
Maximum flow rates at confluence using above data:
       11.755        7.118
Area of streams before confluence:
        5.309        1.277
Results of confluence:
Total flow rate =     11.755(CFS)
Time of concentration =    17.273 min.
Effective stream area after confluence =      6.586(Ac.)
End of computations, total study area =          6.586 (Ac.)
```

```
        San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
    Rational Hydrology Study        Date: 02/10/23
--------------------------------------------------------------------------
22027 post poc 3 mit



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

--------------------------------------------------------------------------


Program License Serial Number 6332

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.300
24 hour precipitation(inches) =  5.600
P6/P24 =    58.9%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1001.000 to Point/Station     1002.000
**** INITIAL AREA EVALUATION ****
___________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  165.000(Ft.)
Highest elevation =  763.850(Ft.)
Lowest elevation =  749.000(Ft.)
Elevation difference =   14.850(Ft.) Slope =  9.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   9.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.49 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(   9.000^(1/3)]=   6.49
Rainfall intensity (I) =      7.348(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.293(CFS)
Total initial stream area =        0.114(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1002.000 to Point/Station     1003.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
___________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.616(CFS)
Depth of flow =   0.285(Ft.), Average velocity =   7.604(Ft/s)
    ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.016
------------------------------------------------------------------
Sub-Channel flow  =      0.616(CFS)
  '      '    flow top width =      0.569(Ft.)
  '      '    velocity=    7.604(Ft/s)
  '      '    area =      0.081(Sq.Ft)
  '      '    Froude number =     3.552

Upstream point elevation =   749.000(Ft.)
Downstream point elevation =   700.170(Ft.)
Flow length =   341.000(Ft.)
Travel time  =    0.75 min.
Time of concentration =    7.24 min.
Depth of flow =   0.285(Ft.)
Average velocity =   7.604(Ft/s)
Total irregular channel flow =     0.616(CFS)
Irregular channel normal depth above invert elev. =   0.285(Ft.)
Average velocity of channel(s) =   7.604(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.849(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      6.849(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.128
Subarea runoff =      0.582(CFS) for      0.251(Ac.)
Total runoff =      0.875(CFS)  Total area =       0.365(Ac.)
Depth of flow =   0.325(Ft.), Average velocity =   8.301(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.365(Ac.)
Runoff from this stream =      0.875(CFS)
Time of concentration =    7.24 min.
Rainfall intensity =     6.849(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1101.000 to Point/Station     1103.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
User specified 'C' value of 0.234 given for subarea
Rainfall intensity (I) =      5.385(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  10.51 min.  Rain intensity =       5.38(In/Hr)
Total area =       1.095(Ac.)  Total runoff =     1.387(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1103.000 to Point/Station     1003.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   709.270(Ft.)
```

```
Downstream point/station elevation =   700.170(Ft.)
Pipe length  =   212.00(Ft.) Slope =   0.0429  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.387(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     1.387(CFS)
Normal flow depth in pipe =    3.08(In.)
Flow top width inside pipe =   13.56(In.)
Critical Depth =    5.29(In.)
Pipe flow velocity =      6.90(Ft/s)
Travel time through pipe =    0.51 min.
Time of concentration (TC) =    11.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.095(Ac.)
Runoff from this stream =      1.387(CFS)
Time of concentration =   11.02 min.
Rainfall intensity =     5.222(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        0.875      7.24             6.849
2        1.387     11.02             5.222
Qmax(1) =
       1.000 *    1.000 *     0.875) +
       1.000 *    0.657 *     1.387) + =       1.786
Qmax(2) =
       0.762 *    1.000 *     0.875) +
       1.000 *    1.000 *     1.387) + =       2.054

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.875       1.387
Maximum flow rates at confluence using above data:
        1.786        2.054
Area of streams before confluence:
        0.365        1.095
Results of confluence:
Total flow rate =      2.054(CFS)
Time of concentration =    11.022 min.
Effective stream area after confluence =      1.460(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1004.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.490(Ft.), Average velocity =   8.572(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      2.054(CFS)
  '     '    flow top width =      0.979(Ft.)
  '     '    velocity=    8.572(Ft/s)
  '     '    area =      0.240(Sq.Ft)
  '     '    Froude number =     3.053
```

```
 Upstream point elevation =   696.870(Ft.)
 Downstream point elevation =   651.540(Ft.)
 Flow length =   146.000(Ft.)
 Travel time  =    0.28 min.
 Time of concentration =   11.31 min.
 Depth of flow =   0.490(Ft.)
 Average velocity =   8.572(Ft/s)
 Total irregular channel flow =     2.054(CFS)
 Irregular channel normal depth above invert elev. =   0.490(Ft.)
 Average velocity of channel(s) =   8.572(Ft/s)

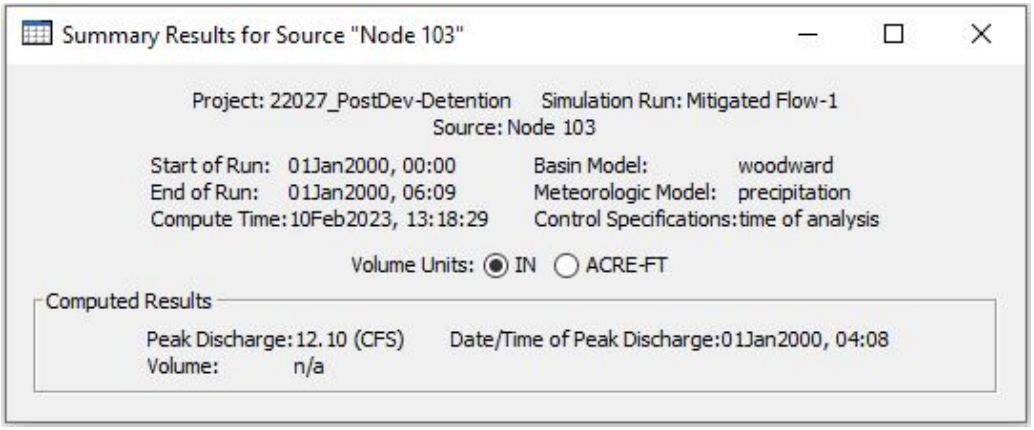

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station     1005.000 to Point/Station     1006.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
 ______________________________________________________________________
 Depth of flow =   0.478(Ft.), Average velocity =   9.003(Ft/s)
     ******* Irregular Channel Data ***********
 ----------------------------------------------------------------
 Information entered for subchannel number 1 :
 Point number      'X' coordinate     'Y' coordinate
     1              0.00              1.00
     2              1.00              0.00
     3              2.00              1.00
 Manning's 'N' friction factor =   0.030
 ----------------------------------------------------------------
 Sub-Channel flow  =      2.054(CFS)
   '     '    flow top width =      0.955(Ft.)
   '     '    velocity=    9.003(Ft/s)
   '     '    area =      0.228(Sq.Ft)
   '     '    Froude number =     3.246

 Upstream point elevation =   680.820(Ft.)
 Downstream point elevation =   600.490(Ft.)
 Flow length =   227.000(Ft.)
 Travel time  =    0.42 min.
 Time of concentration =   11.73 min.
 Depth of flow =   0.478(Ft.)
 Average velocity =   9.003(Ft/s)
 Total irregular channel flow =     2.054(CFS)
 Irregular channel normal depth above invert elev. =   0.478(Ft.)
 Average velocity of channel(s) =   9.003(Ft/s)
 End of computations, total study area =          1.460 (Ac.)
```

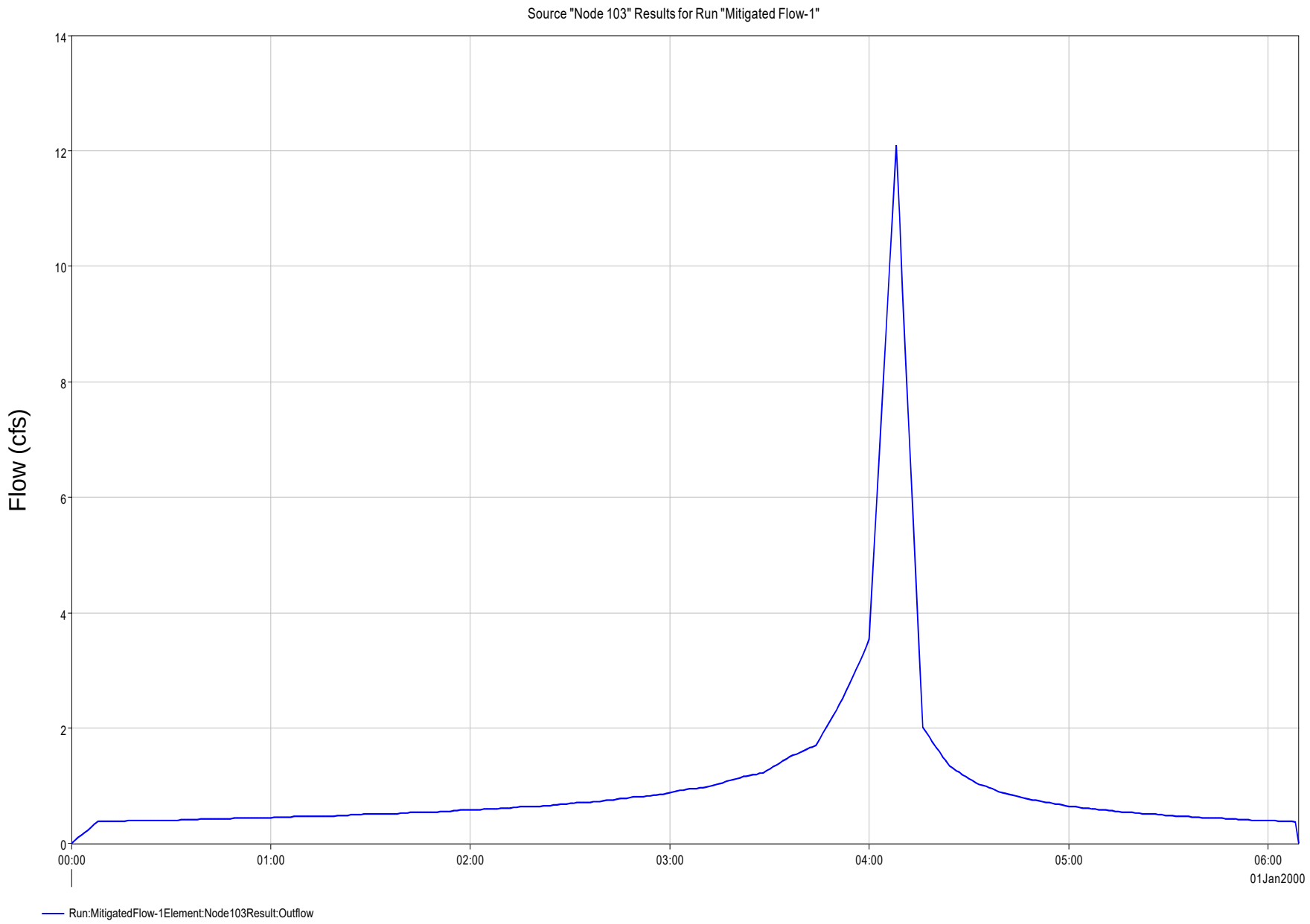
ATTACHMENT 7
HYDROGRAPH

7a. HEC-HMS Simulations Results

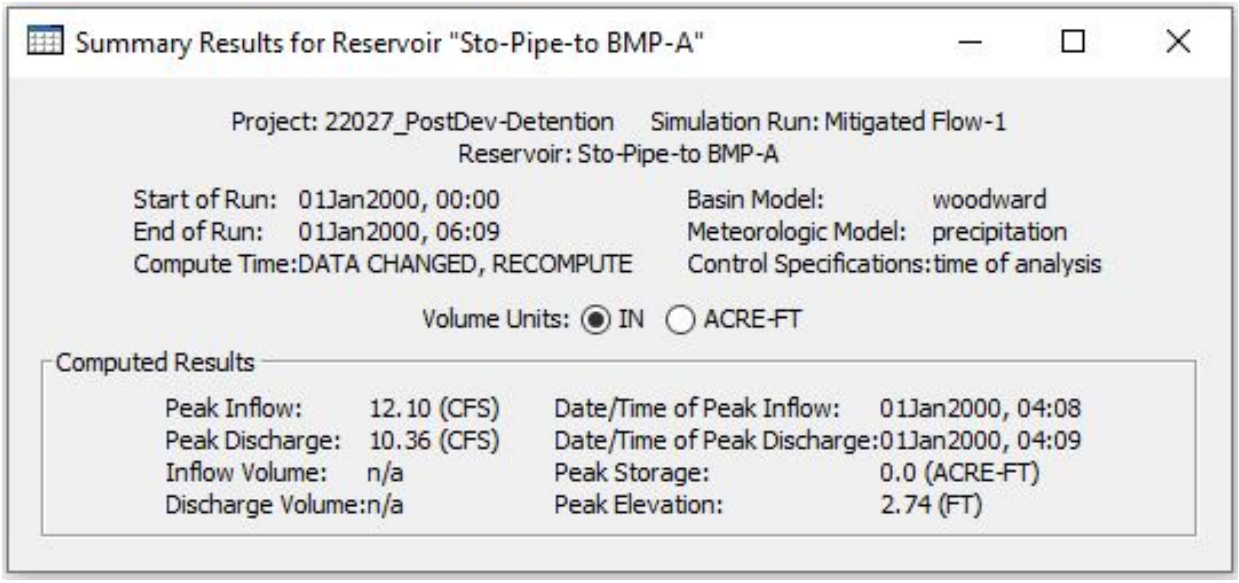
POC-1 PART 1 MITIGATION INFLOW HYDROGRAPH



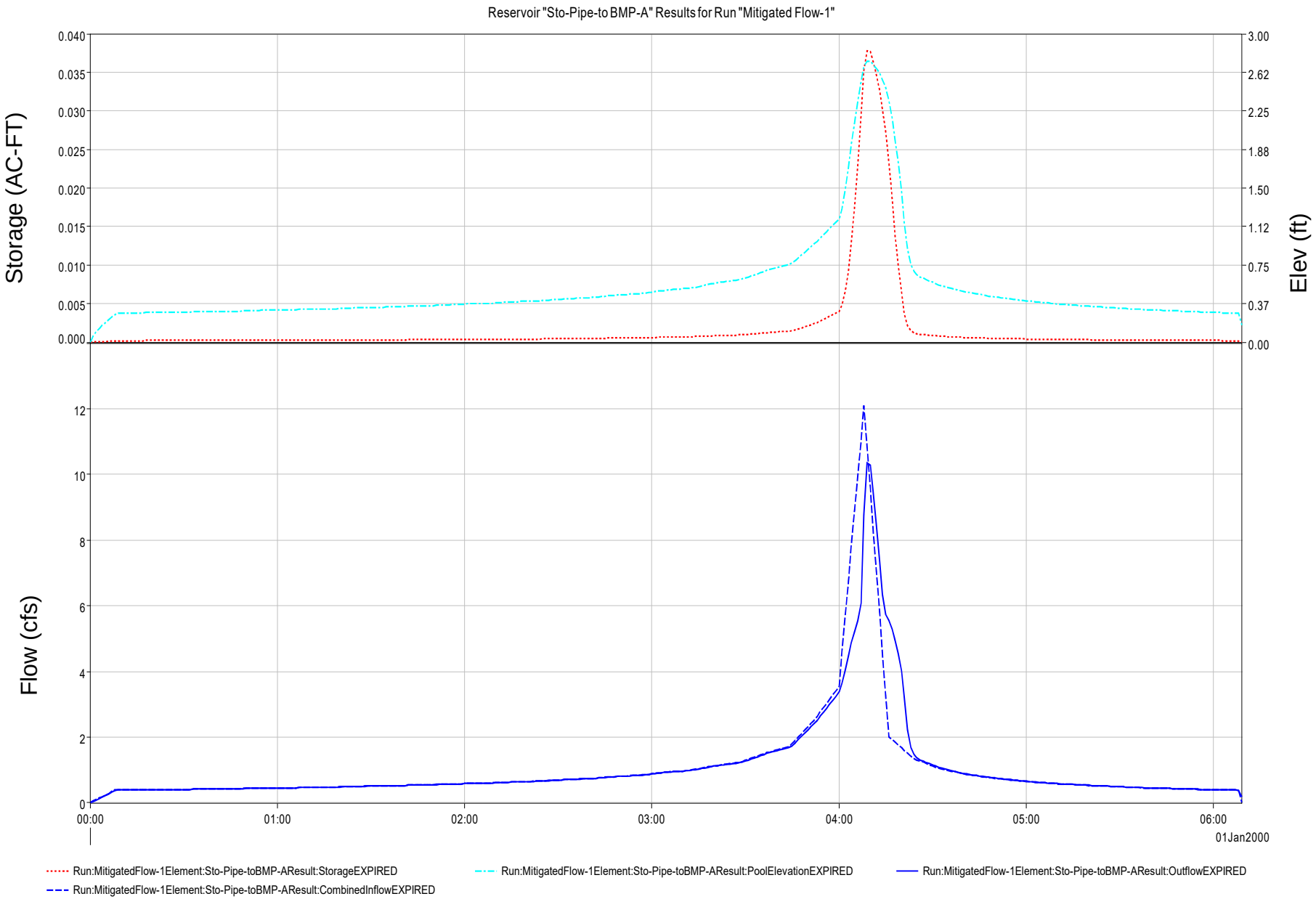
POC-1 PART 1 MITIGATION INFLOW HYDROGRAPH



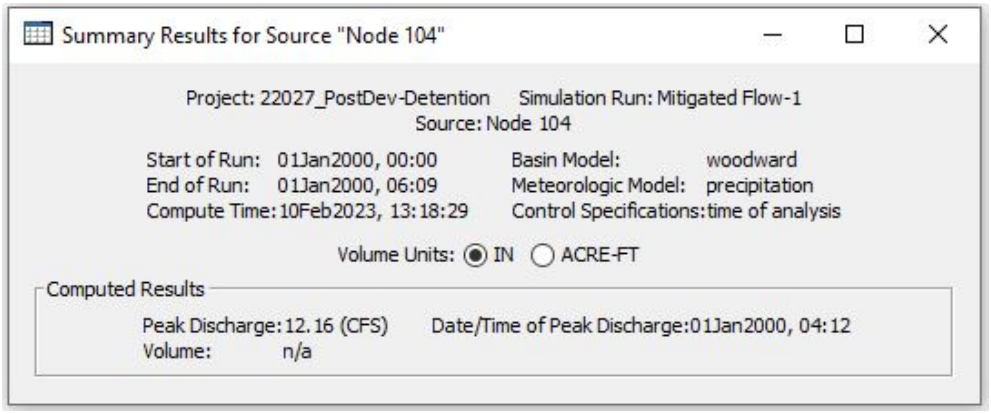
POC-1 PART 1 MITIGATED OUTFLOW SUMMARY TABLE



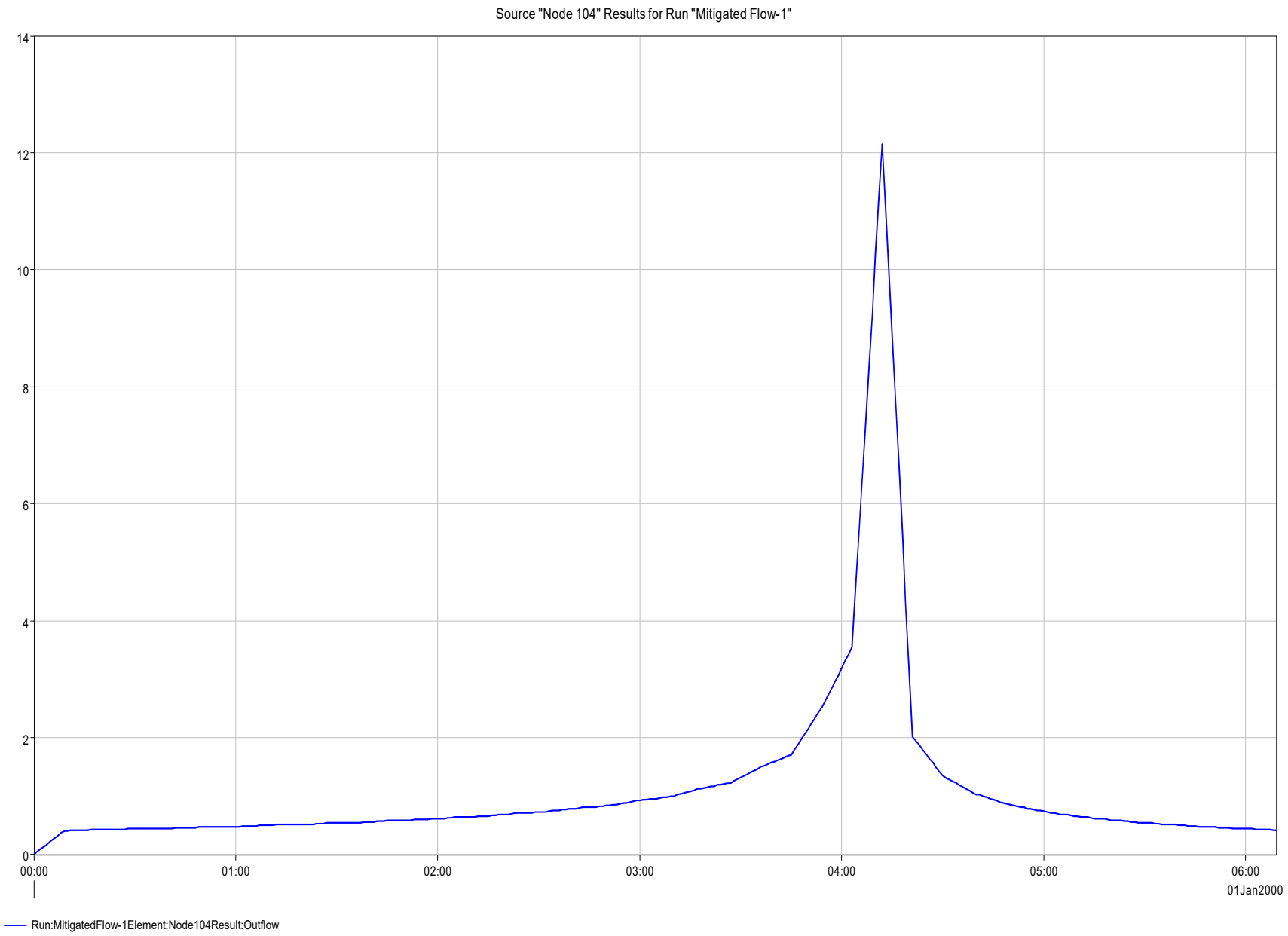
POC-1 PART 1 MITIGATED OUTFLOW HYDROGRAPH



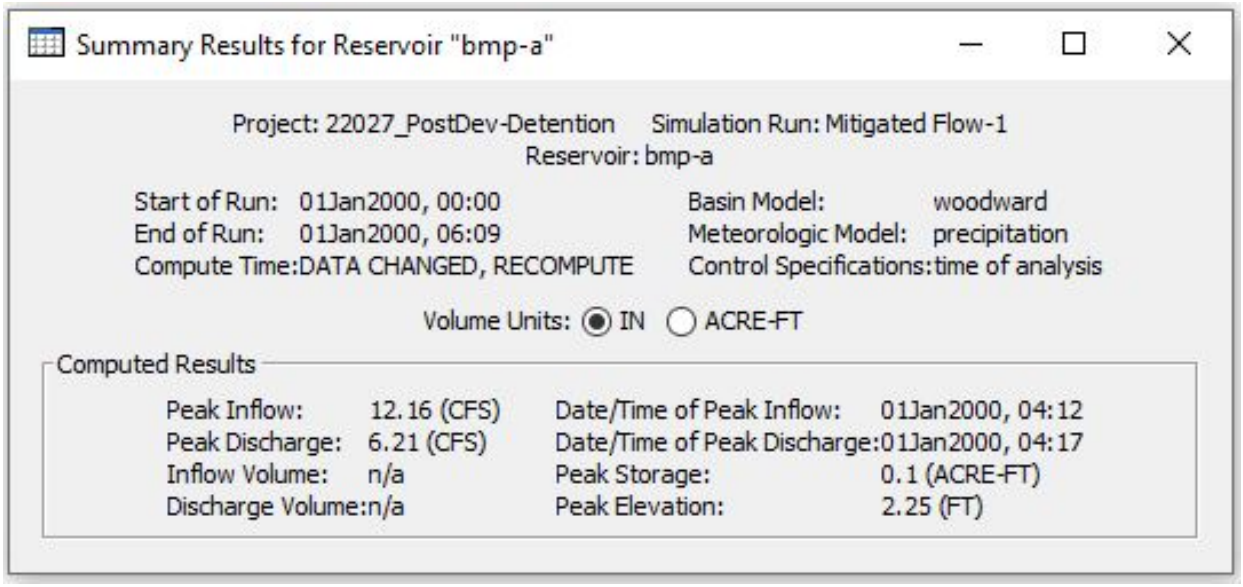
POC-1 PART 2 MITIGATION INFLOW HYDROGRAPH



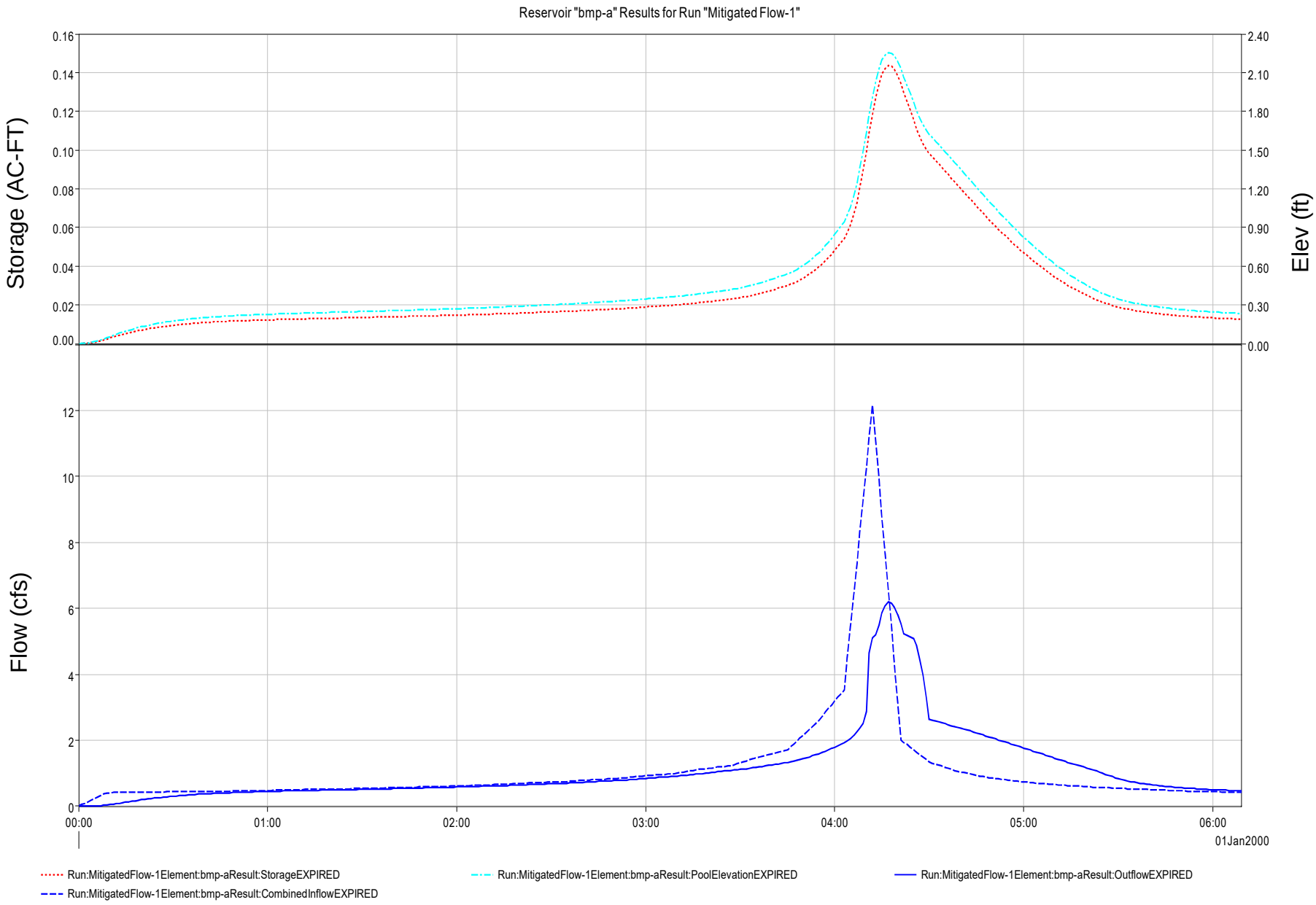
POC-1 PART 2 MITIGATION INFLOW HYDROGRAPH



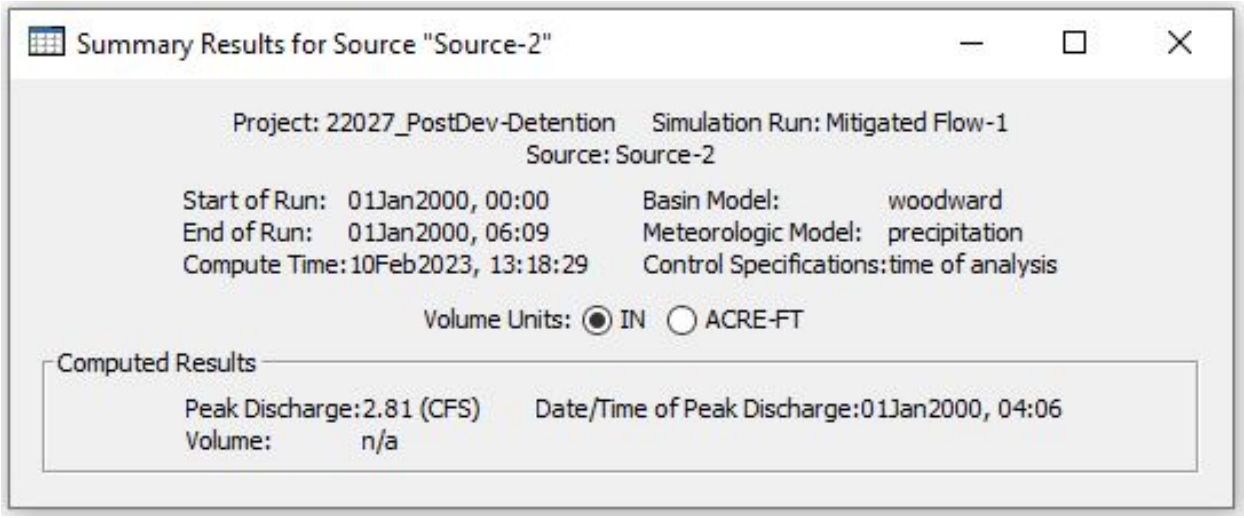
POC-1 PART 2 MITIGATED OUTFLOW SUMMARY TABLE



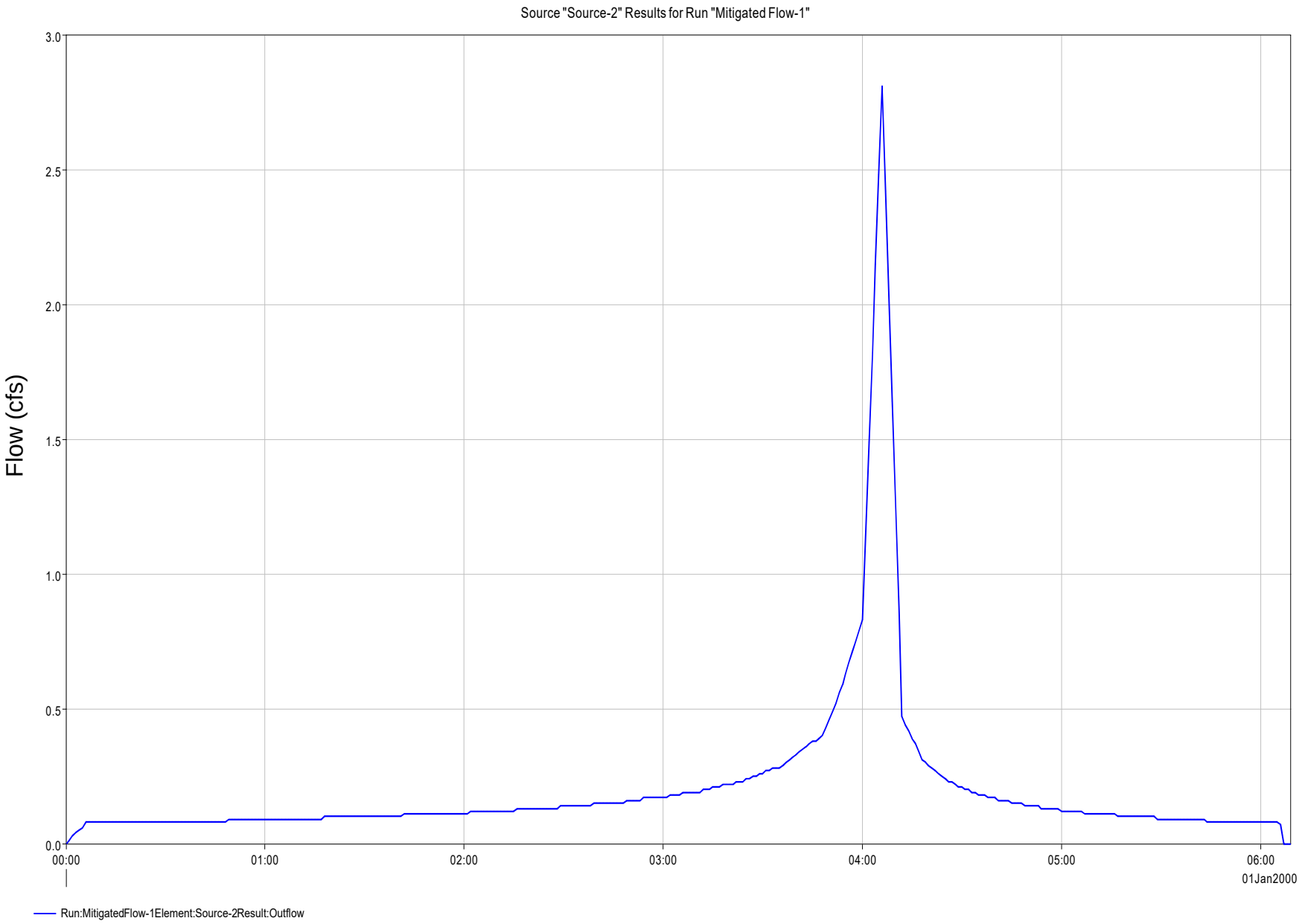
POC-1 PART 2 MITIGATED OUTFLOW HYDROGRAPH



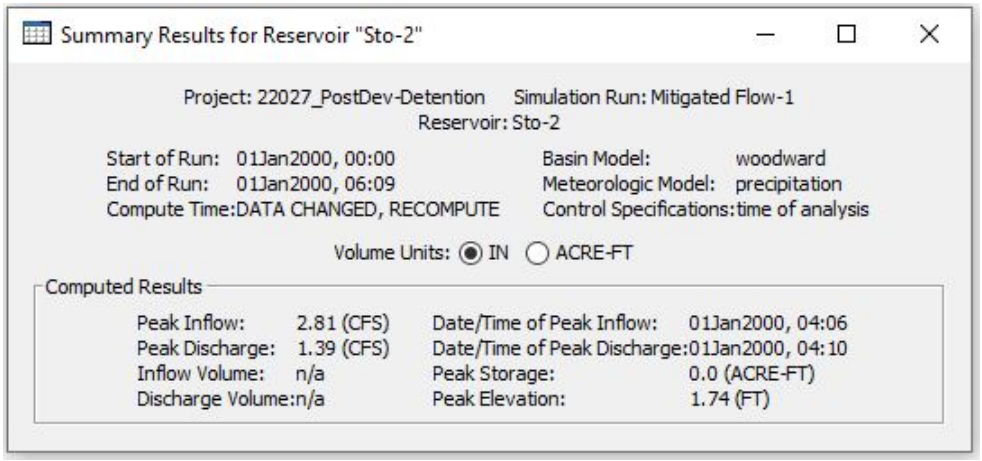
POC-3 MITIGATION INFLOW SUMMARY TBALE



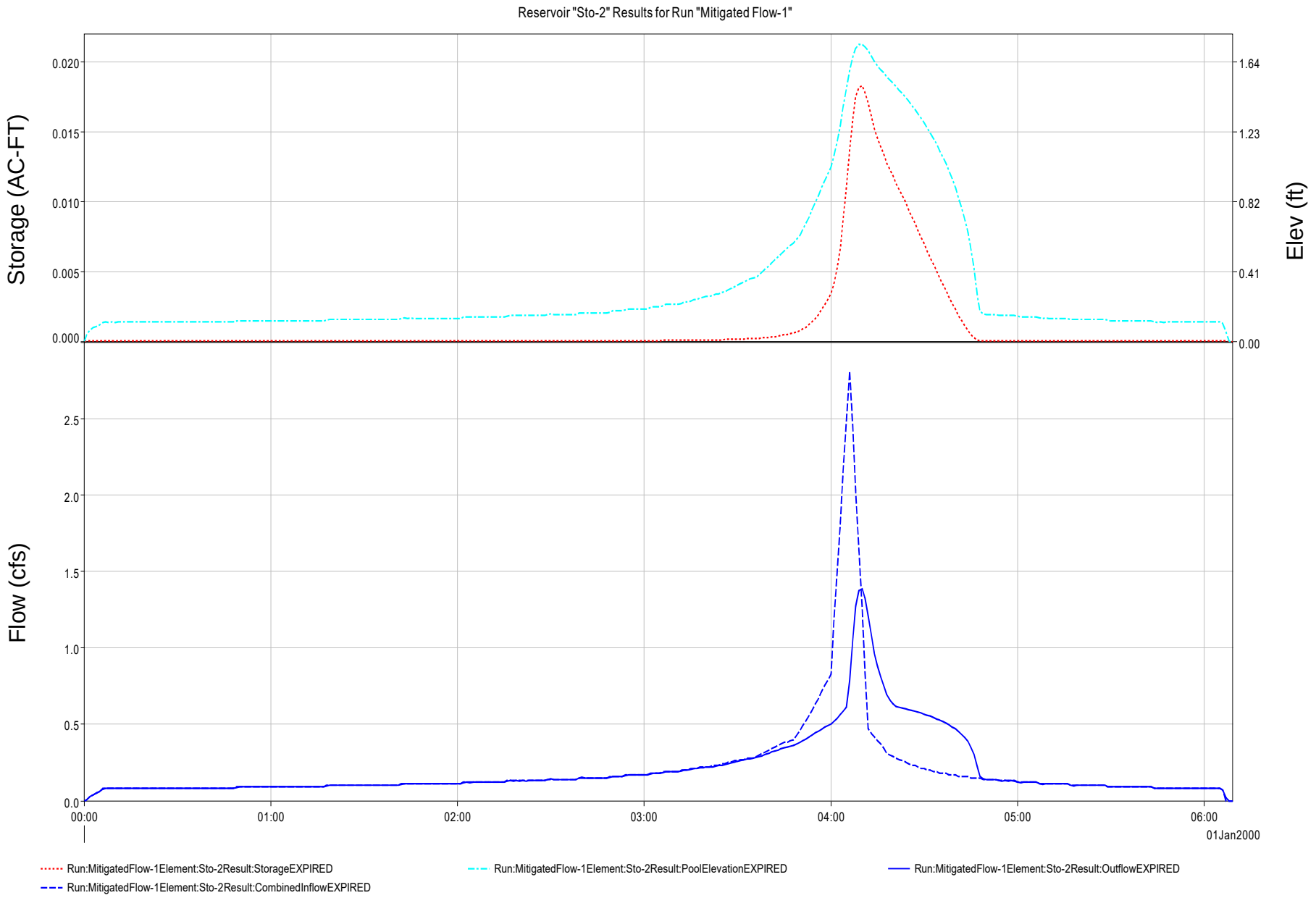
POC-3 MITIGATION INFLOW HYDROGRAPH



POC-3 MITIGATED OUTFLOW SUMMARY TABLE



POC-3 MITIGATED OUTFLOW HYDROGRAPH



7b. Runoff Coefficient C After Detention Structure

CALCULATION AFTER THE DETENTION STRUCTURE

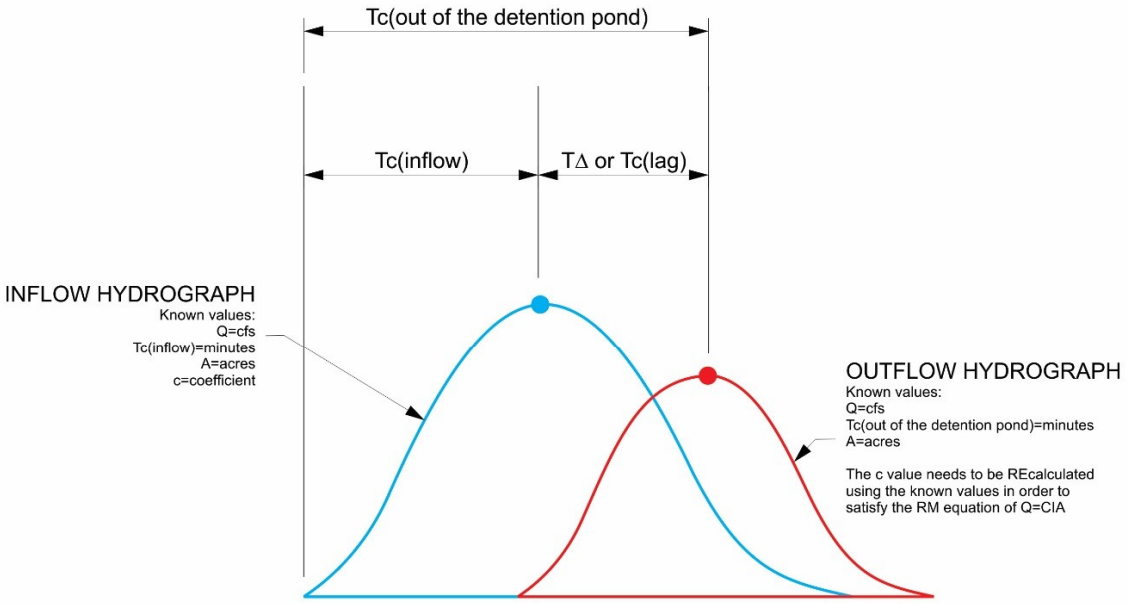
The purpose of the detention structure is to alter the peak flow and or time to peak of a given storm so it will not have a negative impact on the downstream facilities. There are different methods on how to use the resulting values of the outflow hydrograph.

For the purposes of this example there will be an association of the following values:

Q_{in} = Is equal to the inflow value that will enter the basin before storage
Q_{out} = Is equal to the outflow value that will exit the basin after storage
Tc_{in} = Is equal to the Time of Concentration flowing into the basin before detention
Tc_{out} = Is equal to the Time of Concentration exiting the basin after detention
A = Area of the tributary area being examined; (This value does not change)
c_{inflow} = The runoff coefficient going into the basin for detention
c_{out} = The runoff coefficient recalculated taking into account water stored in pond for detention

One method is to keep the value of c(inflow) and solve for the I=intensity & Tc(outflow). In this interpretation, we will get a Tc that will not match the value of the $Tc_{(\text{out of the detention structure})}$ of the outflow hydrograph that was calculated using the detention pond. The Tc Using this method shows a disruption on the oneness & continuity of the outflow hydrograph & the formula Q=cIA.

The second method; that is the method we are using is to recalculate the c=coefficient based on the fix values of the outflow hydrograph to achieve a c_{out} . This value uses the c_{inflow} from the flow into the detention basin and then is recalculated by the output of the hydrograph software using Q=cIA; translated as c=Q/IA. This method preserves the formula Q=cIA & does not alter the $Tc_{(\text{out of the detention structure})}$. This method shows that in order to maintain mathematical integrity of the rational equation (Q=CIA), the detention structure alters the runoff coefficient which is the only unknown in the equation. It is noted that the designer feels it is important to hold the value of Tc and the Q values that are calculated from the hydrograph.



GRAPHICAL DIAGRAM OF THE HYDROGRAPH COMING OUT OF THE DETENTION POND

The routing of the runoff through the detention structure gives us the $Q_{(\text{out of the detention structure})}$ and TΔ time lag between $Q_{(\text{inflow})}$ & $Q_{(\text{out of the detention structure})}$.

The known fix values coming out of the detention structure are:

- Q = cfs
- $Tc_{(\text{out of the detention structure})}$ = minutes
- A = acres
- *Please note that c=coefficient is not given directly from the resulting hydrograph coming out of the detention pond.*

In order to satisfy the rational equation of Q=CIA (see Section 3 of the 2003 San Diego County Hydrology Manual) coming out of the detention structure, we will calculate the only unknown value of the equation which is the outlet runoff coefficient, $C_{(\text{outlet})}$. By using the $Tc_{(\text{out of the detention structure})}$ we can solve for the intensity, I. With the intensity (I) value calculated, we can solve for the outlet runoff coefficient, $C_{(\text{outlet})}$.

The following equations are used in this stage: $Q = CIA$ $I = 7.44P_6D^{-0.645}$

Where:

$Q_{(\text{out of the detention structure})}$ = runoff (cfs), known value

$Tc_{(\text{inflow})}$ = detention structure inflow time of concentration (D) (minutes)

TΔ = time lag between $Q_{(\text{inflow})}$ & $Q_{(\text{out of the detention structure})}$

(minutes) $Tc_{(\text{out of the detention structure})} = Tc_{(\text{inflow})} + T\Delta$ (minutes)

P_6 = 6 hour precipitation (inches), known value.

I = intensity (inches/hour), calculated based on the value of $Tc_{(\text{out of the detention structure})}$

A = tributary area of the detention structure (acres),

known value $C_{(\text{outflow})}$ = runoff coefficient (unitless),

value to be solved

CALCULATIONS For STO-1			
LINE	**ITEM**	**AT THE OUTFLOW OF STO-1**	**REMARKS**
1	P6 inch	3.3	KNOWN VALUE
2	TC (inflow) mins	8.6	KNOWN VALUE
3	TC (lag) mins	1	FROM THE OUTFLOW HYDROGRAPH
4	TC (ouflow) mins	9.6	LINE 2+3
5	I inches/hour	5.708	FROM THE INTENSITY FORMULA
6	Q(outflow)	10.35706	KNOWN VALUE
7	A (inflow=outflow)	2.3	KNOWN VALUE
8	c(inflow)	0.859	KNOWN VALUE FROM THE CONTRIBUTING BASIN(S)
9	c(outflow)	0.789	CALCULATED FROM C=Q/IA

CALCULATIONS For BMP-A			
LINE	**ITEM**	**AT THE OUTFLOW OF STO-1**	**REMARKS**
1	P6 inch	3.3	KNOWN VALUE
2	TC (inflow) mins	9.6	KNOWN VALUE
3	TC (lag) mins	5	FROM THE OUTFLOW HYDROGRAPH
4	TC (ouflow) mins	14.6	LINE 2+3
5	I inches/hour	4.356	FROM THE INTENSITY FORMULA
6	Q(outflow)	6.20628	KNOWN VALUE
7	A (inflow=outflow)	2.84	KNOWN VALUE
8	c(inflow)	0.749	KNOWN VALUE FROM THE CONTRIBUTING BASIN(S)
9	c(outflow)	0.502	CALCULATED FROM C=Q/IA

CALCULATIONS For STO-2			
LINE	ITEM	AT THE OUTFLOW OF STO-2	REMARKS
1	P6 inch	3.3	KNOWN VALUE
2	TC (inflow) mins	6.51	KNOWN VALUE
3	TC (lag) mins	4	FROM THE OUTFLOW HYDROGRAPH
4	TC (ouflow) mins	10.51	LINE 2+3
5	I inches/hour	5.385	FROM THE INTENSITY FORMULA
6	Q(outflow)	1.38743	KNOWN VALUE
7	A (inflow=outflow)	1.1	KNOWN VALUE
8	c(inflow)	0.35	KNOWN VALUE FROM THE CONTRIBUTING BASIN(S)
9	c(outflow)	0.234	CALCULATED FROM C=Q/IA

The preceding highlighted data are then used to continue the calculations downstream of the detention structure.

In summary these are the steps of the calculations presented here:

1. Hydrologic methods of calculation as laid out in the 2003 San Diego Hydrology Manual was used upstream of the detention structure. These includes the methods of determining c, Tc and confluence of a junction. The c values used in the proposed conditions range from “undisturbed natural terrain” to “low & high density residential” whichever is appropriate for the contributing basin.
2. At the outflow of the detention structure, the c value was recalculated using the resulting values of the outflow hydrograph. This method preserves the values of $Tc_{(\text{out of the detention structure})}$, A & $Q_{(\text{outflow})}$. Methods and software satisfy the formula Q=cIA & the 2003 San Diego Hydrology Manual. This step shows that in order to maintain mathematical integrity of the rational equation (Q=CIA), the detention structure alters the runoff coefficient which is the only unknown in the equation.
3. The values determined in step 2 were used in the continuation of the calculations using the Hydrologic methods of calculation as laid out in the 2003 San Diego Hydrology Manual downstream of the detention structure. These includes the methods of determining c, Tc and confluence of a junction. The c values used in the proposed conditions range from “undisturbed natural terrain” to “low & high density residential” whichever is appropriate for the contributing basin.