HYDROLOGY / HYDRAULICS STUDY

FOR THE:
Pala Mesa Plaza
3233 Old Highway 395
Fallbrook, CA 92028
APN: 125-050-54-00

PREPARED FOR:
TGRH3 LLC, Rafid Hamika Managing Member
3712 East Owens Ave #101
North Las Vegas, NV 89030

PREPARED BY:
EXCEL ENGINEERING
440 State Place
Escondido, CA 92029
Tel: (760) 745-8118
Project No: 17-047

ORIGINAL REPORT PREPARATION DATE:
June 17, 2020

REVISION DATE(S):

June 7, 2022

June 13, 2023

April 26, 2024 – Via Belmonte Addition

Post Development Mitigation Drainage Map

Attachment 3 – Modified Rational Method Runoff Calculations
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ATTACHMENT 6

6a. Project Description

In addition to any prior project description, this project also proposes to make improvements to half of the section of Via Belmonte between Via de Todos Santos and Old Highway 395, including new paving, curb, gutter, and DG trail along the street.

6b. DESCRIPTION OF WATERSHED

Pre-Development Topography and Drainage Patterns

Via Belmonte drains easterly towards Old Highway 395, where there is a sump condition on the corner of the existing project site. Water sheets across the empty lot to the north of Via Belmonte and towards this sump condition. Via Belmonte has an approximate slope of 6.5%. The soil type is consistent with the rest of the project site; the western 25% is composed of Soils Type A and the remainder of the street is Soils Type C. Via Belmonte is paved with rough asphalt, and the empty lot to the north is full of grass and weeds, as well as a few trees and bushes.

A pre-developed drainage map can be found as Attachment 6f in this report.

Post-Development Topography and Drainage Patterns

The project proposes to expand Via Belmonte and repave the southerly half of the existing street, add curb, gutter, and DG trail. It also proposes to add street trees along the DG trail.

Water will sheet flow across the empty lot to the north of Via Belmonte and easterly down Via Belmonte, and then into a reverse D-25 where it will travel through pipes to a cleanout box in Basin 103. Water will also infiltrate through the street trees and into a perforated pipe to the cleanout box in Basin 103. This perforated pipe is only meant to collect overflow water to help prevent erosion of the slope along Via Belmonte. In Basin 103, there will be a cleanout and a 30" diameter, 30 foot long detention pipe. The flow of water out of this detention pipe will be controlled by a weir plate. Water leaving this detention pipe will flow into the storm drain system and into POC 109.

A post-developed drainage map can be found as Attachment 6G in this report.

6b. 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 Table of Drainage Discharges from the Project							
	Node Number	Q100 (cfs)	Area* (Acres)	Tc (Min)	V100 (ft/s)	C**	I** (in/hr)
PRE	POC Node 309	**36.398**	11.915	9.077	14.89	0.45	6.32
POST	POC Node 107	37.500	11.929	9.152	15.17	0.46	6.28
POST MITIGATED	POC Node 107	**35.615**	11.929	9.155	14.88	0.45	6.28

Table 1: Q100 Analysis Results

Note: the comparison of our analysis is made about the same discharge points for the project. Drainage discharging from the project to the existing 18 inches pipe.

*Note: Areas (acres) of Predeveloped and Post-developed can potentially differ because of rounding errors.

**Note: Average rainfall intensity is calculated based on $I = 7.44*P_6T_c^{-0.645}$. Average runoff coefficient "C" is calculated based on Q = CIA.

Per Table 1 (see above) The Post development flow of 37.5 cfs is higher than the Pre-Development flow of 36.398 cfs. Therefore, mitigation is to be used. Upon analysis of the Post Mitigated flow, the Mitigated flow is 35.615 cfs lower than the Predevelopment flow of 36.398 cfs showing compliance.

CivilD data and output files can be found in Attachment 3 of this report.

By observation of the results in the summary table, the proposed redevelopment of the site will have an overall decrease in the 100-year peak flow discharge from the site.

CONCLUSION

Based on the results of this report, the project does not increase the 100-year peak flow rate of the mitigated stormwater discharge from the site as flows are lower than those of the Pre-development. The project meets the County of San Diego standards for peak flow control and therefore can concluded that this project will not impact the existing downstream storm drainage facilities.
This project does not sit within a 100-year flood hazard zone as mapped on the federal Flood Insurance Rate maps for this area.

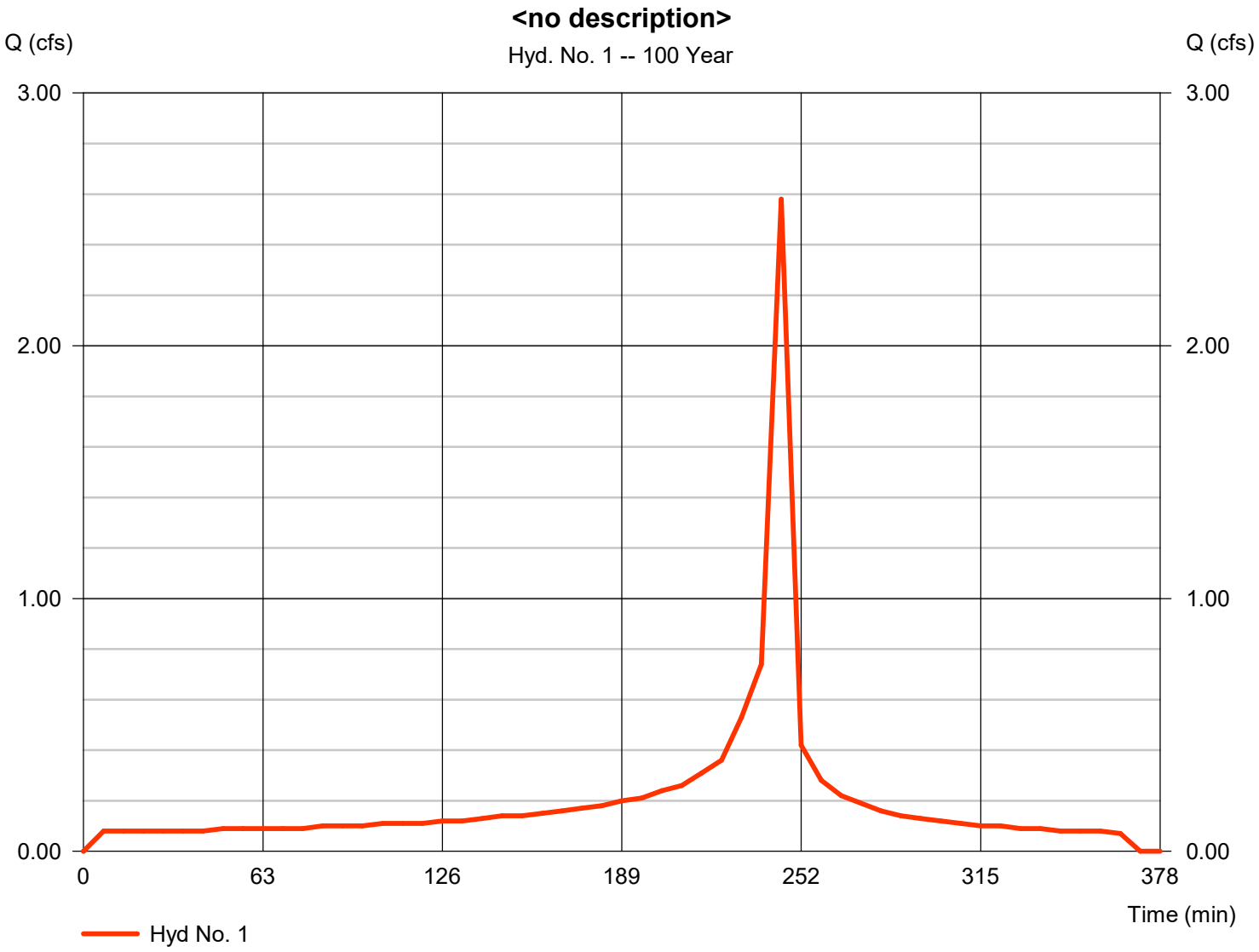
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Friday, 04 / 26 / 2024

Hyd. No. 1

<no description>

Hydrograph type	= Manual	Peak discharge	= 2.580 cfs
Storm frequency	= 100 yrs	Time to peak	= 245 min
Time interval	= 7 min	Hyd. volume	= 4,519 cuft



Hydrograph Report

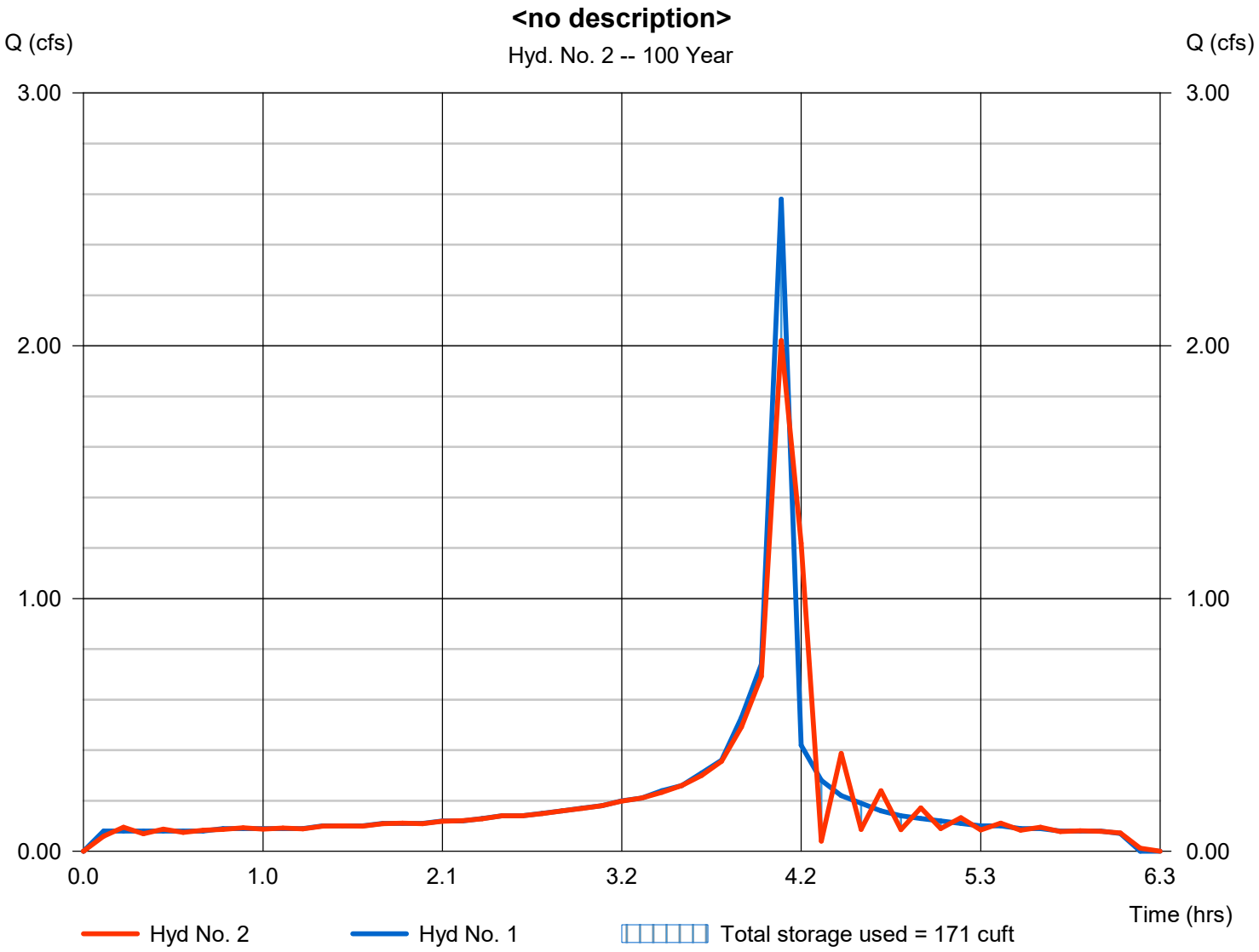
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Friday, 04 / 26 / 2024

Hyd. No. 2

<no description>

Hydrograph type	=	Reservoir	Peak discharge	=	2.020 cfs
Storm frequency	=	100 yrs	Time to peak	=	4.08 hrs
Time interval	=	7 min	Hyd. volume	=	4,520 cuft
Inflow hyd. No.	=	1 - <no description>	Max. Elevation	=	305.48 ft
Reservoir name	=	Pond 3003	Max. Storage	=	171 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond 3003

Pond Data

UG Chambers -Invert elev. = 303.00 ft, Rise x Span = 2.50 x 2.50 ft, Barrel Len = 35.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	303.00	n/a	0	0
0.25	303.25	n/a	9	9
0.50	303.50	n/a	16	24
0.75	303.75	n/a	19	43
1.00	304.00	n/a	21	64
1.25	304.25	n/a	22	86
1.50	304.50	n/a	22	108
1.75	304.75	n/a	21	128
2.00	305.00	n/a	19	147
2.25	305.25	n/a	16	163
2.50	305.50	n/a	9	172

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	Inactive	3.00	0.00
Span (in)	= 12.00	5.00	12.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 303.00	305.08	303.00	0.00
Length (ft)	= 42.90	0.04	0.04	0.00
Slope (%)	= 0.50	0.01	0.01	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	2.00	0.00	0.00
Crest El. (ft)	= 309.00	305.25	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= 1	Broad	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	303.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.03	1	303.02	0.00 ic	0.00	0.00 ic	---	0.00	0.00	---	---	---	---	0.003
0.05	2	303.05	0.01 ic	0.00	0.01 ic	---	0.00	0.00	---	---	---	---	0.011
0.08	3	303.07	0.02 ic	0.00	0.02 ic	---	0.00	0.00	---	---	---	---	0.023
0.10	4	303.10	0.04 ic	0.00	0.04 ic	---	0.00	0.00	---	---	---	---	0.040
0.13	4	303.12	0.06 ic	0.00	0.06 ic	---	0.00	0.00	---	---	---	---	0.061
0.15	5	303.15	0.08 ic	0.00	0.08 ic	---	0.00	0.00	---	---	---	---	0.085
0.18	6	303.17	0.11 ic	0.00	0.11 ic	---	0.00	0.00	---	---	---	---	0.110
0.20	7	303.20	0.14 ic	0.00	0.14 ic	---	0.00	0.00	---	---	---	---	0.140
0.23	8	303.22	0.18 ic	0.00	0.17 ic	---	0.00	0.00	---	---	---	---	0.172
0.25	9	303.25	0.21 ic	0.00	0.21 ic	---	0.00	0.00	---	---	---	---	0.211
0.28	10	303.27	0.24 ic	0.00	0.24 ic	---	0.00	0.00	---	---	---	---	0.238
0.30	12	303.30	0.27 ic	0.00	0.27 ic	---	0.00	0.00	---	---	---	---	0.265
0.33	14	303.32	0.29 ic	0.00	0.29 ic	---	0.00	0.00	---	---	---	---	0.294
0.35	15	303.35	0.32 ic	0.00	0.32 ic	---	0.00	0.00	---	---	---	---	0.323
0.38	17	303.37	0.35 ic	0.00	0.35 ic	---	0.00	0.00	---	---	---	---	0.353
0.40	18	303.40	0.39 ic	0.00	0.38 ic	---	0.00	0.00	---	---	---	---	0.378
0.43	20	303.42	0.40 ic	0.00	0.40 ic	---	0.00	0.00	---	---	---	---	0.405
0.45	21	303.45	0.44 ic	0.00	0.43 ic	---	0.00	0.00	---	---	---	---	0.428
0.48	23	303.47	0.46 ic	0.00	0.46 ic	---	0.00	0.00	---	---	---	---	0.457
0.50	24	303.50	0.48 ic	0.00	0.48 ic	---	0.00	0.00	---	---	---	---	0.479
0.52	26	303.52	0.50 ic	0.00	0.50 ic	---	0.00	0.00	---	---	---	---	0.500
0.55	28	303.55	0.54 ic	0.00	0.52 ic	---	0.00	0.00	---	---	---	---	0.524
0.57	30	303.57	0.56 oc	0.00	0.55 ic	---	0.00	0.00	---	---	---	---	0.547
0.60	32	303.60	0.58 oc	0.00	0.57 ic	---	0.00	0.00	---	---	---	---	0.570
0.62	34	303.62	0.59 oc	0.00	0.59 ic	---	0.00	0.00	---	---	---	---	0.592
0.65	36	303.65	0.61 oc	0.00	0.61 ic	---	0.00	0.00	---	---	---	---	0.613
0.67	38	303.67	0.63 oc	0.00	0.63 ic	---	0.00	0.00	---	---	---	---	0.632
0.70	40	303.70	0.65 oc	0.00	0.65 ic	---	0.00	0.00	---	---	---	---	0.651
0.72	41	303.72	0.67 oc	0.00	0.67 ic	---	0.00	0.00	---	---	---	---	0.670
0.75	43	303.75	0.69 oc	0.00	0.69 ic	---	0.00	0.00	---	---	---	---	0.689
0.77	45	303.77	0.71 oc	0.00	0.71 ic	---	0.00	0.00	---	---	---	---	0.707

Continues on next page...

Pond 3003

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.80	48	303.80	0.73 oc	0.00	0.72 ic	---	0.00	0.00	---	---	---	---	0.725
0.82	50	303.82	0.75 oc	0.00	0.74 ic	---	0.00	0.00	---	---	---	---	0.742
0.85	52	303.85	0.77 oc	0.00	0.76 ic	---	0.00	0.00	---	---	---	---	0.758
0.87	54	303.87	0.79 oc	0.00	0.77 ic	---	0.00	0.00	---	---	---	---	0.775
0.90	56	303.90	0.81 oc	0.00	0.79 ic	---	0.00	0.00	---	---	---	---	0.791
0.92	58	303.92	0.81 oc	0.00	0.81 ic	---	0.00	0.00	---	---	---	---	0.808
0.95	60	303.95	0.83 oc	0.00	0.83 ic	---	0.00	0.00	---	---	---	---	0.828
0.97	62	303.97	0.85 oc	0.00	0.84 ic	---	0.00	0.00	---	---	---	---	0.843
1.00	64	304.00	0.87 oc	0.00	0.86 ic	---	0.00	0.00	---	---	---	---	0.858
1.02	66	304.02	0.89 oc	0.00	0.87 ic	---	0.00	0.00	---	---	---	---	0.872
1.05	69	304.05	0.89 oc	0.00	0.89 ic	---	0.00	0.00	---	---	---	---	0.888
1.07	71	304.07	0.91 oc	0.00	0.91 ic	---	0.00	0.00	---	---	---	---	0.906
1.10	73	304.10	0.93 oc	0.00	0.92 ic	---	0.00	0.00	---	---	---	---	0.920
1.12	75	304.12	0.95 oc	0.00	0.93 ic	---	0.00	0.00	---	---	---	---	0.933
1.15	77	304.15	0.95 oc	0.00	0.95 ic	---	0.00	0.00	---	---	---	---	0.948
1.17	79	304.17	0.97 oc	0.00	0.97 ic	---	0.00	0.00	---	---	---	---	0.966
1.20	82	304.20	0.99 oc	0.00	0.98 ic	---	0.00	0.00	---	---	---	---	0.978
1.22	84	304.22	1.01 oc	0.00	0.99 ic	---	0.00	0.00	---	---	---	---	0.991
1.25	86	304.25	1.01 oc	0.00	1.01 ic	---	0.00	0.00	---	---	---	---	1.008
1.27	88	304.27	1.03 oc	0.00	1.02 ic	---	0.00	0.00	---	---	---	---	1.021
1.30	90	304.30	1.05 oc	0.00	1.03 ic	---	0.00	0.00	---	---	---	---	1.034
1.32	92	304.32	1.05 oc	0.00	1.05 ic	---	0.00	0.00	---	---	---	---	1.048
1.35	95	304.35	1.07 oc	0.00	1.06 ic	---	0.00	0.00	---	---	---	---	1.063
1.37	97	304.37	1.09 oc	0.00	1.07 ic	---	0.00	0.00	---	---	---	---	1.074
1.40	99	304.40	1.09 oc	0.00	1.09 ic	---	0.00	0.00	---	---	---	---	1.087
1.42	101	304.42	1.11 oc	0.00	1.10 ic	---	0.00	0.00	---	---	---	---	1.103
1.45	103	304.45	1.13 oc	0.00	1.11 ic	---	0.00	0.00	---	---	---	---	1.114
1.47	106	304.47	1.13 oc	0.00	1.13 ic	---	0.00	0.00	---	---	---	---	1.126
1.50	108	304.50	1.14 oc	0.00	1.14 ic	---	0.00	0.00	---	---	---	---	1.141
1.52	110	304.52	1.16 oc	0.00	1.15 ic	---	0.00	0.00	---	---	---	---	1.152
1.55	112	304.55	1.16 oc	0.00	1.16 ic	---	0.00	0.00	---	---	---	---	1.164
1.57	114	304.57	1.18 oc	0.00	1.18 ic	---	0.00	0.00	---	---	---	---	1.178
1.60	116	304.60	1.20 oc	0.00	1.19 ic	---	0.00	0.00	---	---	---	---	1.189
1.62	118	304.62	1.20 oc	0.00	1.20 ic	---	0.00	0.00	---	---	---	---	1.201
1.65	120	304.65	1.22 oc	0.00	1.21 ic	---	0.00	0.00	---	---	---	---	1.215
1.67	122	304.67	1.24 oc	0.00	1.22 ic	---	0.00	0.00	---	---	---	---	1.225
1.70	124	304.70	1.24 oc	0.00	1.24 ic	---	0.00	0.00	---	---	---	---	1.238
1.72	126	304.72	1.26 oc	0.00	1.25 ic	---	0.00	0.00	---	---	---	---	1.250
1.75	128	304.75	1.27 oc	0.00	1.26 ic	---	0.00	0.00	---	---	---	---	1.260
1.77	130	304.77	1.27 oc	0.00	1.27 ic	---	0.00	0.00	---	---	---	---	1.274
1.80	132	304.80	1.29 oc	0.00	1.28 ic	---	0.00	0.00	---	---	---	---	1.284
1.82	134	304.82	1.31 oc	0.00	1.29 ic	---	0.00	0.00	---	---	---	---	1.294
1.85	136	304.85	1.31 oc	0.00	1.31 ic	---	0.00	0.00	---	---	---	---	1.308
1.87	138	304.87	1.33 oc	0.00	1.32 ic	---	0.00	0.00	---	---	---	---	1.318
1.90	140	304.90	1.34 oc	0.00	1.33 ic	---	0.00	0.00	---	---	---	---	1.327
1.92	142	304.92	1.34 oc	0.00	1.34 ic	---	0.00	0.00	---	---	---	---	1.341
1.95	144	304.95	1.36 oc	0.00	1.35 ic	---	0.00	0.00	---	---	---	---	1.350
1.97	145	304.97	1.36 oc	0.00	1.36 ic	---	0.00	0.00	---	---	---	---	1.361
2.00	147	305.00	1.38 oc	0.00	1.37 ic	---	0.00	0.00	---	---	---	---	1.373
2.03	149	305.02	1.39 oc	0.00	1.38 ic	---	0.00	0.00	---	---	---	---	1.383
2.05	150	305.05	1.39 oc	0.00	1.39 ic	---	0.00	0.00	---	---	---	---	1.393
2.08	152	305.07	1.41 oc	0.00	1.40 ic	---	0.00	0.00	---	---	---	---	1.405
2.10	154	305.10	1.42 oc	0.00	1.41 ic	---	0.00	0.00	---	---	---	---	1.414
2.13	155	305.12	1.42 oc	0.00	1.42 ic	---	0.00	0.00	---	---	---	---	1.425
2.15	157	305.15	1.44 oc	0.00	1.44 ic	---	0.00	0.00	---	---	---	---	1.436
2.18	158	305.17	1.46 oc	0.00	1.44 ic	---	0.00	0.00	---	---	---	---	1.445
2.20	160	305.20	1.46 oc	0.00	1.46 ic	---	0.00	0.00	---	---	---	---	1.455
2.23	161	305.22	1.47 oc	0.00	1.47 ic	---	0.00	0.00	---	---	---	---	1.466
2.25	163	305.25	1.48 oc	0.00	1.48 ic	---	0.00	0.00	---	---	---	---	1.475
2.28	164	305.27	1.51 oc	0.00	1.48 ic	---	0.00	0.02	---	---	---	---	1.502
2.30	165	305.30	1.55 oc	0.00	1.48 ic	---	0.00	0.06	---	---	---	---	1.542
2.33	166	305.32	1.60 oc	0.00	1.48 ic	---	0.00	0.11	---	---	---	---	1.590
2.35	166	305.35	1.65 oc	0.00	1.48 ic	---	0.00	0.16	---	---	---	---	1.645
2.38	167	305.37	1.71 oc	0.00	1.47 ic	---	0.00	0.23	---	---	---	---	1.704
2.40	168	305.40	1.76 oc	0.00	1.46 ic	---	0.00	0.30	---	---	---	---	1.762
2.43	169	305.42	1.81 oc	0.00	1.43 ic	---	0.00	0.38	---	---	---	---	1.808
2.45	170	305.45	1.89 oc	0.00	1.43 ic	---	0.00	0.46	---	---	---	---	1.894
2.48	171	305.47	1.98 oc	0.00	1.43 ic	---	0.00	0.55	---	---	---	---	1.984
2.50	172	305.50	2.08 oc	0.00	1.43 ic	---	0.00	0.65	---	---	---	---	2.078

...End

CALCULATION AFTER THE DETENTION STRUCTURE

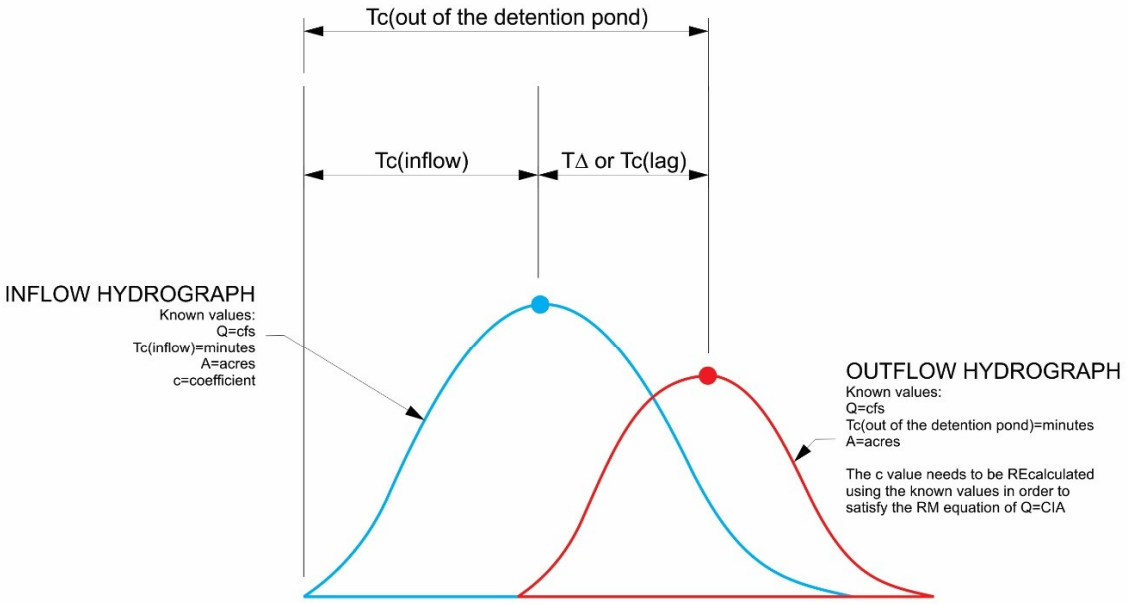
The purpose of the detention structure is to alter the peak flow and or time to peak of a given storm so it will not have a negative impact on the downstream facilities. There are different methods on how to use the resulting values of the outflow hydrograph.

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 Nodes 802 to 802; BMP-802			
LINE	**ITEM**	**AT THE OUTFLOW OF NODE 802**	**REMARKS**
1	P6 inch	3.5	KNOWN VALUE
2	TC (inflow) mins	14.06	KNOWN VALUE
3	TC (lag) mins	0	FROM THE OUTFLOW HYDROGRAPH
4	TC (ouflow) mins	14.06	LINE 2+3
5	I inches/hour	4.734	FROM THE INTENSITY FORMULA
6	Q(outflow)	1.801	KNOWN VALUE
7	A (inflow=outflow)	0.97	KNOWN VALUE
8	c(inflow)	0.582	KNOWN VALUE FROM THE CONTRIBUTING BASIN(S)
9	c(outflow)	0.392	CALCULATED FROM C=Q/IA

CALCULATIONS For Nodes 3003 to 103; BMP-103			
LINE	**ITEM**	**AT THE OUTFLOW OF NODE 802**	**REMARKS**
1	P6 inch	3.5	KNOWN VALUE
2	TC (inflow) mins	7.36	KNOWN VALUE
3	TC (lag) mins	0	FROM THE OUTFLOW HYDROGRAPH
4	TC (ouflow) mins	7.36	LINE 2+3
5	I inches/hour	7.186	FROM THE INTENSITY FORMULA
6	Q(outflow)	2.02	KNOWN VALUE
7	A (inflow=outflow)	0.78	KNOWN VALUE
8	c(inflow)	0.461	KNOWN VALUE FROM THE CONTRIBUTING BASIN(S)
9	c(outflow)	0.360	CALCULATED FROM C=Q/IA

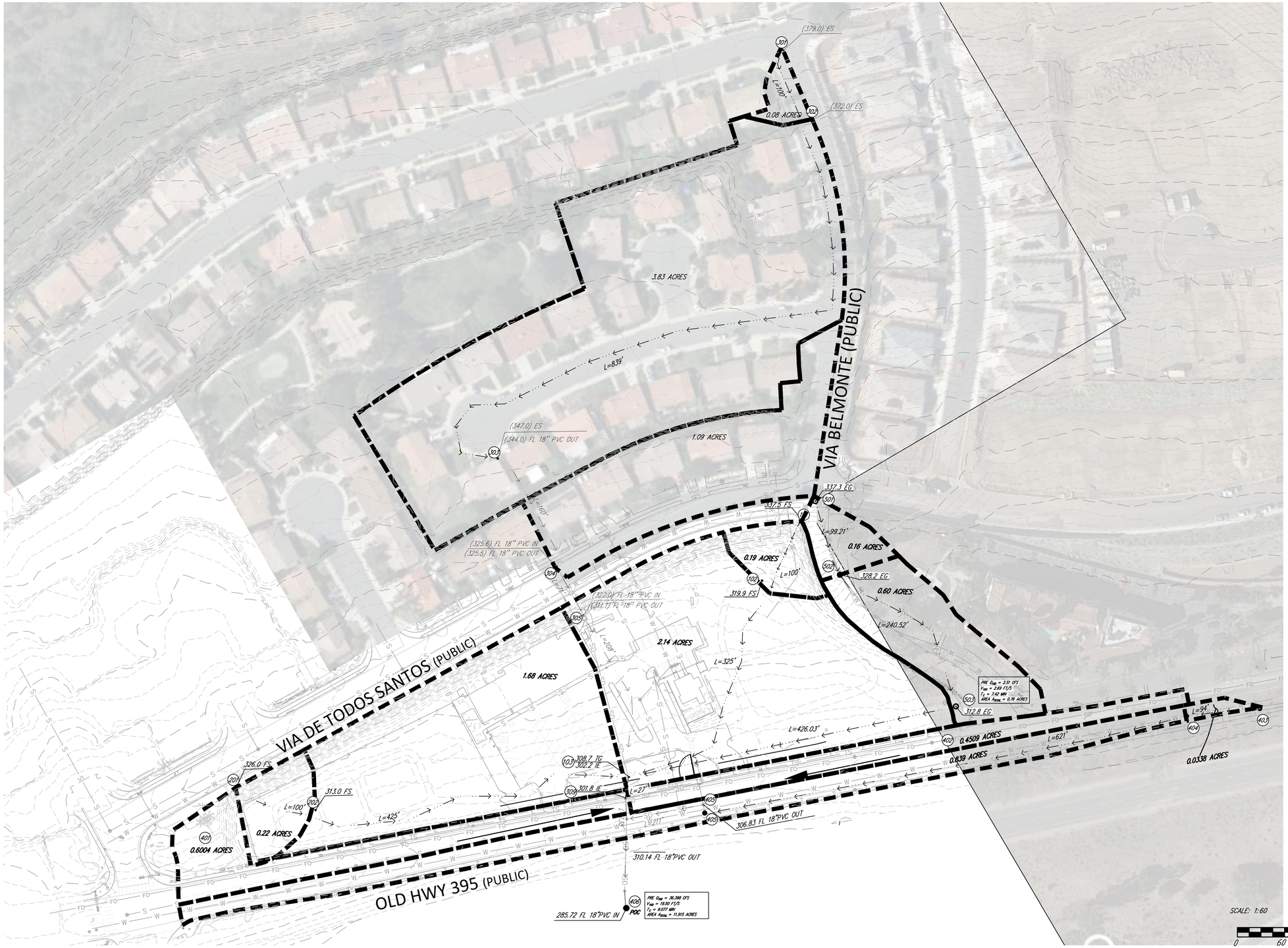
The preceding highlighted data are then used to continue the calculations downstream of the detention structure.

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.



LEGEND

- HYD BASIN BOUNDARY
- NODE NUMBER (101)
- SURFACE FLOW
- PIPE FLOW
- STREET FLOW

HYDROLOGIC SOIL GROUP

THE HYROLOGICAL SOIL GROUPS FOR THIS SITE ARE TYPE (A & C)

NOTE:
APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 20'

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

PALA MESA PLAZA
HYDROLOGY PRE DEVELOPMENT EXHIBIT

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

LEGEND

- HYD BASIN BOUNDARY
- NODE NUMBER (100)
- SURFACE FLOW
- PIPE FLOW
- STREET FLOW

SCALE 1:60

0 60 120 180 240

HYDROLOGIC SOIL GROUP

THE HYDROLOGICAL SOIL GROUPS FOR THIS SITE ARE TYPE (A & C)

NOTE:
APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 20'

PALA MESA PLAZA
HYDROLOGY POST DEVELOPMENT EXHIBIT

6h. CivilD Pre-Development Via Belmonte Calculations

```
        San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
    Rational Hydrology Study        Date: 04/22/24
--------------------------------------------------------------------------
19025 Pre Dev
100 yr study - Belmonte Addition
19025belmonte

--------------------------------------------------------------------------
 *********   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) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** INITIAL AREA EVALUATION ****
___________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.410
Initial subarea total flow distance  =   99.210(Ft.)
Highest elevation =  337.300(Ft.)
Lowest elevation =  328.200(Ft.)
Elevation difference =    9.100(Ft.) Slope =  9.172 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   9.17 %, in a development type of
 4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.93 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(   9.172^(1/3)]=   5.93
Rainfall intensity (I) =      8.258(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =      0.542(CFS)
Total initial stream area =        0.160(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 =     1.557(CFS)
      Depth of flow =   0.143(Ft.), Average velocity =   2.690(Ft/s)
          ******* Irregular Channel Data **********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
          1              0.00              0.50
          2             26.00              0.00
          3             27.00              0.20
      Manning's 'N' friction factor =   0.024
      ------------------------------------------------------------------
      Sub-Channel flow  =     1.557(CFS)
        '     '    flow top width =     8.125(Ft.)
        '     '    velocity=    2.690(Ft/s)
        '     '    area =      0.579(Sq.Ft)
        '     '    Froude number =     1.776

      Upstream point elevation =   328.200(Ft.)
      Downstream point elevation =   312.800(Ft.)
      Flow length =   240.520(Ft.)
      Travel time  =    1.49 min.
      Time of concentration =    7.42 min.
      Depth of flow =   0.143(Ft.)
      Average velocity =   2.690(Ft/s)
      Total irregular channel flow =     1.557(CFS)
      Irregular channel normal depth above invert elev. =   0.143(Ft.)
      Average velocity of channel(s) =   2.690(Ft/s)
       Adding area flow to channel
      Rainfall intensity (I) =     7.146(In/Hr) for a   100.0 year storm
      Decimal fraction soil group A = 0.050
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.950
      Decimal fraction soil group D = 0.000
      [MEDIUM DENSITY RESIDENTIAL                 ]
      (4.3 DU/A or Less       )
      Impervious value, Ai = 0.300
      Sub-Area C Value = 0.476
      Rainfall intensity =     7.146(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.462  CA =      0.351
      Subarea runoff =      1.970(CFS) for      0.600(Ac.)
      Total runoff =      2.512(CFS)  Total area =       0.760(Ac.)
      Depth of flow =   0.171(Ft.), Average velocity =   3.031(Ft/s)
      End of computations, total study area =          0.760 (Ac.)
```

6i. CivilD Pre-Development Onsite Calculations

```
1
2
3                San Diego County Rational Hydrology Program
4
5       CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0
6
7       Rational method hydrology  program based on
8       San Diego County Flood Control Division 2003 hydrology manual
9           Rational Hydrology Study        Date: 04/24/24
10      --------------------------------------------------------------------------
11      19025 Pre Dev
12      100 Year Study Onsite
13      19025Pre100Onsite
14      offsite ud to onsite
15      --------------------------------------------------------------------------
16       *********   Hydrology Study Control Information **********
17
18      --------------------------------------------------------------------------
19
20
21      Program License Serial Number 6332
22
23      --------------------------------------------------------------------------
24      Rational hydrology study storm event year is   100.0
25      English (in-lb) input data Units used
26
27      Map data precipitation entered:
28      6 hour,  precipitation(inches) =  3.500
29      24 hour precipitation(inches) =  6.000
30      P6/P24 =    58.3%
31      San Diego hydrology manual 'C' values used
32
33
34      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
35      Process from Point/Station      101.000 to Point/Station      102.000
36      **** INITIAL AREA EVALUATION ****
37      ____________________________________________________________________________
38      Decimal fraction soil group A = 0.900
39      Decimal fraction soil group B = 0.000
40      Decimal fraction soil group C = 0.100
41      Decimal fraction soil group D = 0.000
42      [MEDIUM DENSITY RESIDENTIAL                  ]
43      (4.3 DU/A or Less       )
44      Impervious value, Ai = 0.300
45      Sub-Area C Value = 0.417
46      Initial subarea total flow distance  =  100.000(Ft.)
47      Highest elevation =  337.500(Ft.)
48      Lowest elevation =  319.900(Ft.)
49      Elevation difference =   17.600(Ft.) Slope = 17.600 %
50      Top of Initial Area Slope adjusted by User to 30.000 %
51      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
52      The maximum overland flow distance is 100.00 (Ft)
53      for the top area slope value of  30.00 %, in a development type of
54       4.3 DU/A or Less
55      In Accordance With Figure 3-3
56      Initial Area Time of Concentration =   3.96 minutes
57      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
58      TC = [1.8*(1.1-0.4170)*( 100.000^.5)/(  30.000^(1/3)]=   3.96
59      Calculated TC of    3.957 minutes is less than 5 minutes,
60       resetting TC to 5.0 minutes for rainfall intensity calculations
61      Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
62      Effective runoff coefficient used for area (Q=KCIA) is C = 0.417
63      Subarea runoff =      0.731(CFS)
64      Total initial stream area =        0.190(Ac.)
65
66
67      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
68      Process from Point/Station      102.000 to Point/Station      103.000
69      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

```
 ------------------------------------------------------------------------
 Estimated mean flow rate at midpoint of channel =      4.743(CFS)
 Depth of flow =   0.278(Ft.), Average velocity =   2.463(Ft/s)
     ******* Irregular Channel Data ***********
 ------------------------------------------------------------------------
 Information entered for subchannel number 1 :
 Point number      'X' coordinate     'Y' coordinate
     1              0.00              1.00
     2             25.00              0.00
     3             50.00              1.00
 Manning's 'N' friction factor =   0.030
 ------------------------------------------------------------------------
 Sub-Channel flow  =      4.743(CFS)
   '     '    flow top width =     13.876(Ft.)
   '     '    velocity=    2.463(Ft/s)
   '     '    area =      1.925(Sq.Ft)
   '     '    Froude number =     1.165

 Upstream point elevation =   319.900(Ft.)
 Downstream point elevation =   308.700(Ft.)
 Flow length =   325.000(Ft.)
 Travel time  =    2.20 min.
 Time of concentration =    6.16 min.
 Depth of flow =   0.278(Ft.)
 Average velocity =   2.463(Ft/s)
 Total irregular channel flow =     4.743(CFS)
 Irregular channel normal depth above invert elev. =   0.278(Ft.)
 Average velocity of channel(s) =   2.463(Ft/s)
  Adding area flow to channel
 Rainfall intensity (I) =      8.064(In/Hr) for a   100.0 year storm
 Decimal fraction soil group A = 0.200
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.800
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL                 ]
 (4.3 DU/A or Less       )
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.466
 Rainfall intensity =      8.064(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.462  CA =      1.076
 Subarea runoff =      7.950(CFS) for      2.140(Ac.)
 Total runoff =      8.681(CFS)  Total area =       2.330(Ac.)
 Depth of flow =   0.348(Ft.), Average velocity =   2.865(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 =      2.330(Ac.)
 Runoff from this stream =      8.681(CFS)
 Time of concentration =    6.16 min.
 Rainfall intensity =     8.064(In/Hr)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station      201.000 to Point/Station      202.000
 **** INITIAL AREA EVALUATION ****

 ------------------------------------------------------------------------
 Decimal fraction soil group A = 0.550
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.450
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL                 ]
 (4.3 DU/A or Less       )
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.442
```

```
 Initial subarea total flow distance  =  100.000(Ft.)
 Highest elevation =  326.000(Ft.)
 Lowest elevation =  313.000(Ft.)
 Elevation difference =   13.000(Ft.) Slope = 13.000 %
 Top of Initial Area Slope adjusted by User to 30.000 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 100.00 (Ft)
 for the top area slope value of  30.00 %, in a development type of
  4.3 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration =   3.81 minutes
 TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
 TC = [1.8*(1.1-0.4415)*( 100.000^.5)/(  30.000^(1/3)]=   3.81
 Calculated TC of    3.815 minutes is less than 5 minutes,
  resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.442
 Subarea runoff =      0.896(CFS)
 Total initial stream area =        0.220(Ac.)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station      202.000 to Point/Station      103.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

 ________________________________________________________________________
 Estimated mean flow rate at midpoint of channel =      3.310(CFS)
 Depth of flow =   0.305(Ft.), Average velocity =   1.422(Ft/s)
     ******* Irregular Channel Data ***********
 ------------------------------------------------------------------
 Information entered for subchannel number 1 :
 Point number      'X' coordinate     'Y' coordinate
     1              0.00              1.00
     2             25.00              0.00
     3             50.00              1.00
 Manning's 'N' friction factor =   0.030
 ------------------------------------------------------------------
 Sub-Channel flow  =      3.310(CFS)
   '     '    flow top width =     15.257(Ft.)
   '     '    velocity=    1.422(Ft/s)
   '     '    area =      2.328(Sq.Ft)
   '     '    Froude number =     0.641

 Upstream point elevation =   313.000(Ft.)
 Downstream point elevation =   308.700(Ft.)
 Flow length =   425.000(Ft.)
 Travel time  =    4.98 min.
 Time of concentration =    8.80 min.
 Depth of flow =   0.305(Ft.)
 Average velocity =   1.422(Ft/s)
 Total irregular channel flow =     3.310(CFS)
 Irregular channel normal depth above invert elev. =   0.305(Ft.)
 Average velocity of channel(s) =   1.422(Ft/s)
  Adding area flow to channel
 Rainfall intensity (I) =      6.406(In/Hr) for a   100.0 year storm
 Decimal fraction soil group A = 0.200
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.800
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL                  ]
 (4.3 DU/A or Less       )
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.466
 Rainfall intensity =      6.406(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.463  CA =      0.880
 Subarea runoff =      4.741(CFS) for      1.680(Ac.)
 Total runoff =      5.637(CFS)  Total area =       1.900(Ac.)
 Depth of flow =   0.373(Ft.), Average velocity =   1.624(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 2
Stream flow area =      1.900(Ac.)
Runoff from this stream =      5.637(CFS)
Time of concentration =    8.80 min.
Rainfall intensity =     6.406(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      305.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
____________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Rainfall intensity (I) =      6.428(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   8.75 min.  Rain intensity =       6.43(In/Hr)
Total area =        5.000(Ac.)  Total runoff =    13.794(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
____________________________________________________________________________
Upstream point/station elevation =   311.100(Ft.)
Downstream point/station elevation =   302.200(Ft.)
Pipe length  =   208.00(Ft.) Slope =   0.0428  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.794(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    29.453(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     31.169(Ft.)
 Minor friction loss =      7.185(Ft.)  K-factor =   1.50
Pipe flow velocity =     17.56(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     8.95 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 3
Stream flow area =      5.000(Ac.)
Runoff from this stream =     13.794(CFS)
Time of concentration =    8.95 min.
Rainfall intensity =     6.336(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      103.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
____________________________________________________________________________
Decimal fraction soil group A = 0.270
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
```

```
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.461
Rainfall intensity (I) =      7.149(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.42 min.  Rain intensity =       7.15(In/Hr)
Total area =        0.760(Ac.)  Total runoff =     2.512(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 4
Stream flow area =      0.760(Ac.)
Runoff from this stream =      2.512(CFS)
Time of concentration =    7.42 min.
Rainfall intensity =     7.149(In/Hr)
Summary of stream data:

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


1        8.681      6.16             8.064
2        5.637      8.80             6.406
3       13.794      8.95             6.336
4        2.512      7.42             7.149
Qmax(1) =
       1.000 *    1.000 *     8.681) +
       1.000 *    0.700 *     5.637) +
       1.000 *    0.688 *    13.794) +
       1.000 *    0.830 *     2.512) + =      24.199
Qmax(2) =
       0.794 *    1.000 *     8.681) +
       1.000 *    1.000 *     5.637) +
       1.000 *    0.983 *    13.794) +
       0.896 *    1.000 *     2.512) + =      28.345
Qmax(3) =
       0.786 *    1.000 *     8.681) +
       0.989 *    1.000 *     5.637) +
       1.000 *    1.000 *    13.794) +
       0.886 *    1.000 *     2.512) + =      28.416
Qmax(4) =
       0.886 *    1.000 *     8.681) +
       1.000 *    0.844 *     5.637) +
       1.000 *    0.829 *    13.794) +
       1.000 *    1.000 *     2.512) + =      26.402

Total of 4 streams to confluence:
Flow rates before confluence point:
       8.681       5.637      13.794       2.512
Maximum flow rates at confluence using above data:
       24.199       28.345       28.416       26.402
Area of streams before confluence:
        2.330        1.900        5.000        0.760
Results of confluence:
Total flow rate =     28.416(CFS)
Time of concentration =     8.947 min.
Effective stream area after confluence =      9.990(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      309.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   302.200(Ft.)
Downstream point/station elevation =   301.800(Ft.)
Pipe length  =    27.00(Ft.) Slope =   0.0148  Manning's N = 0.013
```

```
No. of pipes = 1  Required pipe flow  =    28.416(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     7.598(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      1.975(Ft.)
 Minor friction loss =      6.023(Ft.)  K-factor =   1.50
Pipe flow velocity =     16.08(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     8.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      406.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------
Upstream point/station elevation =   301.800(Ft.)
Downstream point/station elevation =   285.720(Ft.)
Pipe length  =   137.00(Ft.) Slope =   0.1174  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.416(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    28.416(CFS)
Normal flow depth in pipe =   12.07(In.)
Flow top width inside pipe =   16.92(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.57(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     9.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      406.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      9.990(Ac.)
Runoff from this stream =     28.416(CFS)
Time of concentration =    9.08 min.
Rainfall intensity =     6.277(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      404.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------
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
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.810
Initial subarea total flow distance  =   94.000(Ft.)
Highest elevation =  318.000(Ft.)
Lowest elevation =  316.300(Ft.)
Elevation difference =    1.700(Ft.) Slope =  1.809 %
Top of Initial Area Slope adjusted by User to  1.400 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.40 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.61 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8100)*(  60.000^.5)/(   1.400^(1/3)]=   3.61
Calculated TC of    3.614 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =     9.222(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
Subarea runoff =      0.254(CFS)
Total initial stream area =        0.034(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      405.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.197(CFS)
Depth of flow =   0.242(Ft.), Average velocity =   1.791(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.31
    2             26.00              0.13
    3             27.50              0.00
    4             27.50              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      2.197(CFS)
  '     '    flow top width =     17.814(Ft.)
  '     '    velocity=    1.791(Ft/s)
  '     '    area =      1.227(Sq.Ft)
  '     '    Froude number =     1.203

Upstream point elevation =   316.300(Ft.)
Downstream point elevation =   310.800(Ft.)
Flow length =   621.000(Ft.)
Travel time  =    5.78 min.
Time of concentration =    9.39 min.
Depth of flow =   0.242(Ft.)
Average velocity =   1.791(Ft/s)
Total irregular channel flow =     2.197(CFS)
Irregular channel normal depth above invert elev. =   0.242(Ft.)
Average velocity of channel(s) =   1.791(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.140(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.762 given for subarea
Rainfall intensity =      6.140(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.764  CA =      0.665
Subarea runoff =      3.831(CFS) for      0.837(Ac.)
Total runoff =      4.085(CFS)  Total area =       0.871(Ac.)
Depth of flow =   0.279(Ft.), Average velocity =   2.078(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      406.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Rainfall intensity (I) =      6.140(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(14.5 DU/A or Less      )
Impervious value, Ai = 0.500
Sub-Area C Value = 0.595
Time of concentration =     9.39 min.
Rainfall intensity =      6.140(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.695  CA =      1.022
Subarea runoff =      2.192(CFS) for      0.600(Ac.)
Total runoff =      6.277(CFS)  Total area =       1.471(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      406.000
**** SUBAREA FLOW ADDITION ****

------------------------------------------------------------------------
Rainfall intensity (I) =      6.140(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
[COMMERCIAL area type                          ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Time of concentration =     9.39 min.
Rainfall intensity =      6.140(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.715  CA =      1.374
Subarea runoff =      2.160(CFS) for      0.451(Ac.)
Total runoff =      8.437(CFS)  Total area =       1.922(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      405.000 to Point/Station      406.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------
Upstream point/station elevation =   306.830(Ft.)
Downstream point/station elevation =   285.720(Ft.)
Pipe length  =   211.00(Ft.) Slope =   0.1000  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.437(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     8.437(CFS)
Normal flow depth in pipe =    6.19(In.)
Flow top width inside pipe =   17.10(In.)
Critical Depth =   13.50(In.)
Pipe flow velocity =     15.70(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     9.62 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      406.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.922(Ac.)
Runoff from this stream =      8.437(CFS)
Time of concentration =    9.62 min.
Rainfall intensity =     6.047(In/Hr)
Summary of stream data:

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


1       28.416      9.08             6.277
2        8.437      9.62             6.047
Qmax(1) =
       1.000 *    1.000 *    28.416) +
       1.000 *    0.944 *     8.437) + =      36.378
Qmax(2) =
       0.963 *    1.000 *    28.416) +
       1.000 *    1.000 *     8.437) + =      35.811

Total of 2 streams to confluence:
Flow rates before confluence point:
      28.416       8.437
Maximum flow rates at confluence using above data:
       36.378       35.811
Area of streams before confluence:
```

```
              9.990        1.922
      Results of confluence:
      Total flow rate =     36.378(CFS)
      Time of concentration =     9.077 min.
      Effective stream area after confluence =     11.912(Ac.)
      End of computations, total study area =          11.912 (Ac.)
```

```
            San Diego County Rational Hydrology Program

 CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

 Rational method hydrology  program based on
 San Diego County Flood Control Division 2003 hydrology manual
     Rational Hydrology Study        Date: 04/24/24
 ------------------------------------------------------------------------
 19025 Post Dev
 100 yr study - Belmonte Addition
 19025belmontepost

 ------------------------------------------------------------------------
  *********   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) =  3.500
 24 hour precipitation(inches) =  6.000
 P6/P24 =    58.3%
 San Diego hydrology manual 'C' values used


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station     3001.000 to Point/Station     3002.000
 **** INITIAL AREA EVALUATION ****

 ________________________________________________________________________
 Decimal fraction soil group A = 1.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL                  ]
 (4.3 DU/A or Less       )
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.410
 Initial subarea total flow distance  =   99.210(Ft.)
 Highest elevation =  337.300(Ft.)
 Lowest elevation =  328.200(Ft.)
 Elevation difference =    9.100(Ft.) Slope =  9.172 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 100.00 (Ft)
 for the top area slope value of   9.17 %, in a development type of
  4.3 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration =   5.93 minutes
 TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
 TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(   9.172^(1/3)]=   5.93
 Rainfall intensity (I) =      8.258(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
 Subarea runoff =      0.599(CFS)
 Total initial stream area =        0.177(Ac.)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station     3002.000 to Point/Station     3003.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

 ________________________________________________________________________
 Estimated mean flow rate at midpoint of channel =      1.615(CFS)
 Depth of flow =   0.142(Ft.), Average velocity =   2.802(Ft/s)
     ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.50
    2             26.00              0.00
    3             27.00              0.20
Manning's 'N' friction factor =   0.023
------------------------------------------------------------------
Sub-Channel flow  =      1.615(CFS)
  '     '    flow top width =      8.106(Ft.)
  '     '    velocity=    2.802(Ft/s)
  '     '    area =      0.576(Sq.Ft)
  '     '    Froude number =     1.852

Upstream point elevation =   328.200(Ft.)
Downstream point elevation =   312.800(Ft.)
Flow length =   240.520(Ft.)
Travel time  =    1.43 min.
Time of concentration =    7.36 min.
Depth of flow =   0.142(Ft.)
Average velocity =   2.802(Ft/s)
Total irregular channel flow =     1.615(CFS)
Irregular channel normal depth above invert elev. =   0.142(Ft.)
Average velocity of channel(s) =   2.802(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      7.184(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.050
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.476
Rainfall intensity =      7.184(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.461  CA =      0.358
Subarea runoff =      1.976(CFS) for      0.600(Ac.)
Total runoff =      2.575(CFS)  Total area =       0.777(Ac.)
Depth of flow =   0.169(Ft.), Average velocity =   3.149(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3003.000 to Point/Station     3003.000
**** 6 HOUR HYDROGRAPH ****

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


Time of Concentration =   7.36
Basin Area =     0.78 Acres
6 Hour Rainfall =  3.500 Inches
Runoff Coefficient =  0.461
Peak Discharge =     2.58 CFS
     Time (Min)     Discharge (CFS)
       0               0.000
       7               0.075
       14              0.076
       21              0.078
       28              0.079
       35              0.082
       42              0.083
       49              0.085
       56              0.087
       63              0.090
       70              0.091
       77              0.094
       84              0.096
```

91	0.100
98	0.102
105	0.106
112	0.109
119	0.114
126	0.117
133	0.123
140	0.127
147	0.135
154	0.139
161	0.149
168	0.155
175	0.168
182	0.176
189	0.196
196	0.207
203	0.238
210	0.258
217	0.315
224	0.359
231	0.527
238	0.742
245	2.575
252	0.423
259	0.283
266	0.221
273	0.185
280	0.161
287	0.144
294	0.131
301	0.120
308	0.111
315	0.104
322	0.098
329	0.093
336	0.088
343	0.084
350	0.081
357	0.077
364	0.074

++

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

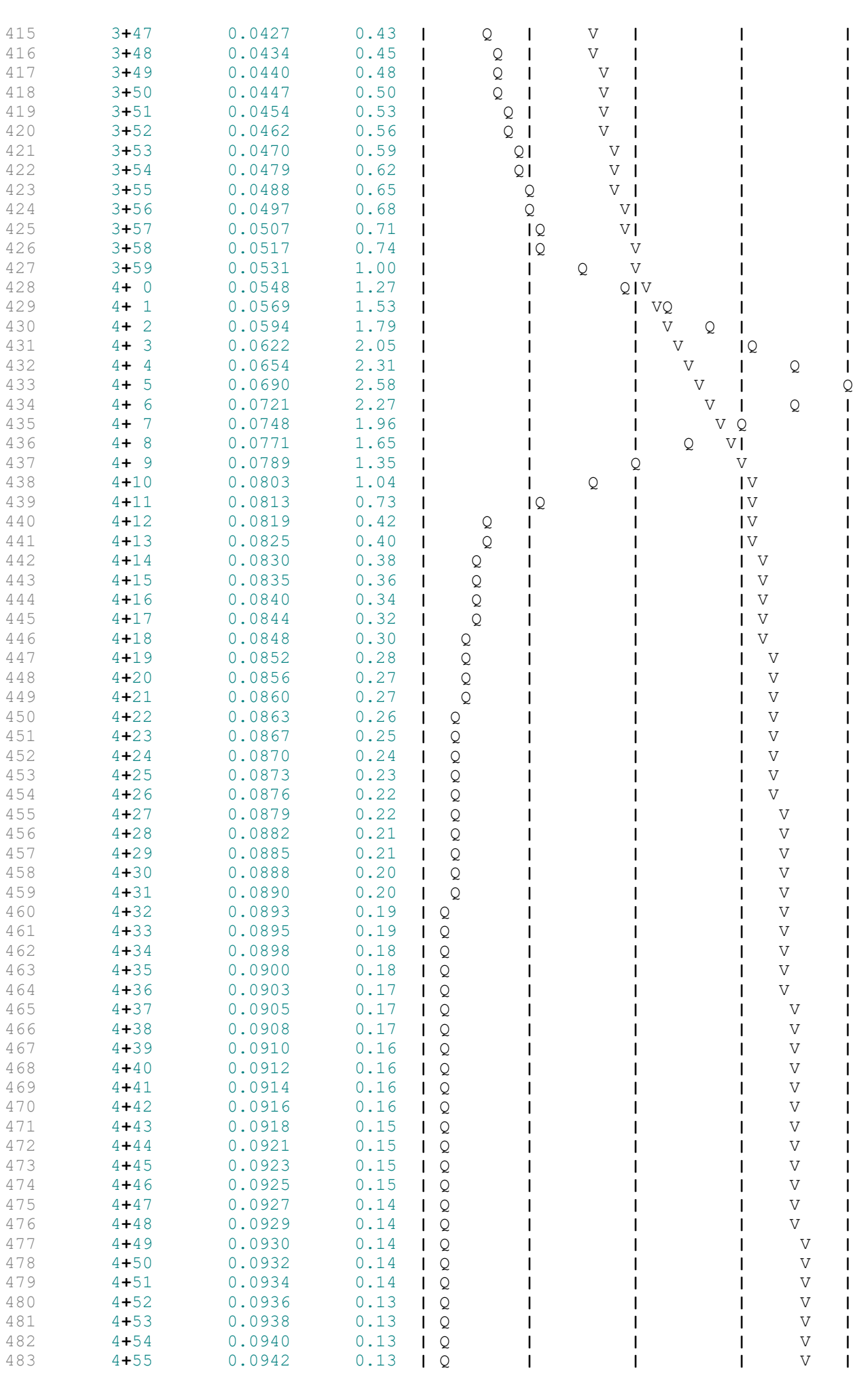
Hydrograph in 1 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	0.6	1.3	1.9	2.6
0+ 0	0.0000	0.00	Q	|	|	|	|
0+ 1	0.0000	0.01	Q	|	|	|	|
0+ 2	0.0000	0.02	Q	|	|	|	|
0+ 3	0.0001	0.03	Q	|	|	|	|
0+ 4	0.0001	0.04	Q	|	|	|	|
0+ 5	0.0002	0.05	Q	|	|	|	|
0+ 6	0.0003	0.06	VQ	|	|	|	|
0+ 7	0.0004	0.08	VQ	|	|	|	|
0+ 8	0.0005	0.08	VQ	|	|	|	|
0+ 9	0.0006	0.08	VQ	|	|	|	|
0+10	0.0007	0.08	VQ	|	|	|	|
0+11	0.0008	0.08	VQ	|	|	|	|
0+12	0.0009	0.08	VQ	|	|	|	|
0+13	0.0010	0.08	VQ	|	|	|	|
0+14	0.0011	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	|	|	|	|

208	0+20	0.0018	0.08	VQ	|	|	|	|
209	0+21	0.0019	0.08	VQ	|	|	|	|
210	0+22	0.0020	0.08	VQ	|	|	|	|
211	0+23	0.0021	0.08	VQ	|	|	|	|
212	0+24	0.0022	0.08	VQ	|	|	|	|
213	0+25	0.0023	0.08	VQ	|	|	|	|
214	0+26	0.0024	0.08	VQ	|	|	|	|
215	0+27	0.0025	0.08	VQ	|	|	|	|
216	0+28	0.0027	0.08	|Q	|	|	|	|
217	0+29	0.0028	0.08	|Q	|	|	|	|
218	0+30	0.0029	0.08	|Q	|	|	|	|
219	0+31	0.0030	0.08	|Q	|	|	|	|
220	0+32	0.0031	0.08	|Q	|	|	|	|
221	0+33	0.0032	0.08	|Q	|	|	|	|
222	0+34	0.0033	0.08	|Q	|	|	|	|
223	0+35	0.0034	0.08	|Q	|	|	|	|
224	0+36	0.0035	0.08	|Q	|	|	|	|
225	0+37	0.0037	0.08	|Q	|	|	|	|
226	0+38	0.0038	0.08	|Q	|	|	|	|
227	0+39	0.0039	0.08	|Q	|	|	|	|
228	0+40	0.0040	0.08	|Q	|	|	|	|
229	0+41	0.0041	0.08	|Q	|	|	|	|
230	0+42	0.0042	0.08	|Q	|	|	|	|
231	0+43	0.0043	0.08	|Q	|	|	|	|
232	0+44	0.0045	0.08	|Q	|	|	|	|
233	0+45	0.0046	0.08	|Q	|	|	|	|
234	0+46	0.0047	0.08	|Q	|	|	|	|
235	0+47	0.0048	0.08	|Q	|	|	|	|
236	0+48	0.0049	0.09	|Q	|	|	|	|
237	0+49	0.0050	0.09	|Q	|	|	|	|
238	0+50	0.0052	0.09	|Q	|	|	|	|
239	0+51	0.0053	0.09	|QV	|	|	|	|
240	0+52	0.0054	0.09	|QV	|	|	|	|
241	0+53	0.0055	0.09	|QV	|	|	|	|
242	0+54	0.0056	0.09	|QV	|	|	|	|
243	0+55	0.0058	0.09	|QV	|	|	|	|
244	0+56	0.0059	0.09	|QV	|	|	|	|
245	0+57	0.0060	0.09	|QV	|	|	|	|
246	0+58	0.0061	0.09	|QV	|	|	|	|
247	0+59	0.0062	0.09	|QV	|	|	|	|
248	1+ 0	0.0064	0.09	|QV	|	|	|	|
249	1+ 1	0.0065	0.09	|QV	|	|	|	|
250	1+ 2	0.0066	0.09	|QV	|	|	|	|
251	1+ 3	0.0067	0.09	|QV	|	|	|	|
252	1+ 4	0.0068	0.09	|QV	|	|	|	|
253	1+ 5	0.0070	0.09	|QV	|	|	|	|
254	1+ 6	0.0071	0.09	|QV	|	|	|	|
255	1+ 7	0.0072	0.09	|QV	|	|	|	|
256	1+ 8	0.0073	0.09	|QV	|	|	|	|
257	1+ 9	0.0075	0.09	|QV	|	|	|	|
258	1+10	0.0076	0.09	|QV	|	|	|	|
259	1+11	0.0077	0.09	|QV	|	|	|	|
260	1+12	0.0078	0.09	|Q V	|	|	|	|
261	1+13	0.0080	0.09	|Q V	|	|	|	|
262	1+14	0.0081	0.09	|Q V	|	|	|	|
263	1+15	0.0082	0.09	|Q V	|	|	|	|
264	1+16	0.0084	0.09	|Q V	|	|	|	|
265	1+17	0.0085	0.09	|Q V	|	|	|	|
266	1+18	0.0086	0.09	|Q V	|	|	|	|
267	1+19	0.0088	0.09	|Q V	|	|	|	|
268	1+20	0.0089	0.10	|Q V	|	|	|	|
269	1+21	0.0090	0.10	|Q V	|	|	|	|
270	1+22	0.0091	0.10	|Q V	|	|	|	|
271	1+23	0.0093	0.10	|Q V	|	|	|	|
272	1+24	0.0094	0.10	|Q V	|	|	|	|
273	1+25	0.0095	0.10	|Q V	|	|	|	|
274	1+26	0.0097	0.10	|Q V	|	|	|	|
275	1+27	0.0098	0.10	|Q V	|	|	|	|
276	1+28	0.0100	0.10	|Q V	|	|	|	|

277	1+29	0.0101	0.10	|Q V |	|	|	|
278	1+30	0.0102	0.10	|Q V |	|	|	|
279	1+31	0.0104	0.10	|Q V |	|	|	|
280	1+32	0.0105	0.10	|Q V |	|	|	|
281	1+33	0.0106	0.10	|Q V |	|	|	|
282	1+34	0.0108	0.10	|Q V |	|	|	|
283	1+35	0.0109	0.10	|Q V |	|	|	|
284	1+36	0.0111	0.10	|Q V |	|	|	|
285	1+37	0.0112	0.10	|Q V |	|	|	|
286	1+38	0.0113	0.10	|Q V |	|	|	|
287	1+39	0.0115	0.10	|Q V |	|	|	|
288	1+40	0.0116	0.10	|Q V |	|	|	|
289	1+41	0.0118	0.10	|Q V |	|	|	|
290	1+42	0.0119	0.10	|Q V |	|	|	|
291	1+43	0.0121	0.11	|Q V |	|	|	|
292	1+44	0.0122	0.11	|Q V |	|	|	|
293	1+45	0.0123	0.11	|Q V |	|	|	|
294	1+46	0.0125	0.11	|Q V |	|	|	|
295	1+47	0.0126	0.11	|Q V |	|	|	|
296	1+48	0.0128	0.11	|Q V |	|	|	|
297	1+49	0.0129	0.11	|Q V |	|	|	|
298	1+50	0.0131	0.11	|Q V |	|	|	|
299	1+51	0.0132	0.11	|Q V |	|	|	|
300	1+52	0.0134	0.11	|Q V |	|	|	|
301	1+53	0.0135	0.11	|Q V |	|	|	|
302	1+54	0.0137	0.11	|Q V |	|	|	|
303	1+55	0.0138	0.11	|Q V |	|	|	|
304	1+56	0.0140	0.11	|Q V |	|	|	|
305	1+57	0.0142	0.11	|Q V |	|	|	|
306	1+58	0.0143	0.11	|Q V |	|	|	|
307	1+59	0.0145	0.11	|Q V |	|	|	|
308	2+ 0	0.0146	0.11	|Q V |	|	|	|
309	2+ 1	0.0148	0.11	|Q V |	|	|	|
310	2+ 2	0.0149	0.12	|Q V |	|	|	|
311	2+ 3	0.0151	0.12	|Q V |	|	|	|
312	2+ 4	0.0153	0.12	|Q V |	|	|	|
313	2+ 5	0.0154	0.12	|Q V |	|	|	|
314	2+ 6	0.0156	0.12	|Q V |	|	|	|
315	2+ 7	0.0157	0.12	|Q V |	|	|	|
316	2+ 8	0.0159	0.12	|Q V |	|	|	|
317	2+ 9	0.0161	0.12	|Q V |	|	|	|
318	2+10	0.0162	0.12	|Q V |	|	|	|
319	2+11	0.0164	0.12	|Q V |	|	|	|
320	2+12	0.0166	0.12	|Q V |	|	|	|
321	2+13	0.0167	0.12	|Q V |	|	|	|
322	2+14	0.0169	0.12	|Q V |	|	|	|
323	2+15	0.0171	0.12	|Q V |	|	|	|
324	2+16	0.0173	0.12	|Q V |	|	|	|
325	2+17	0.0174	0.13	|Q V |	|	|	|
326	2+18	0.0176	0.13	|Q V |	|	|	|
327	2+19	0.0178	0.13	|Q V |	|	|	|
328	2+20	0.0180	0.13	|Q V |	|	|	|
329	2+21	0.0181	0.13	|Q V |	|	|	|
330	2+22	0.0183	0.13	| Q V |	|	|	|
331	2+23	0.0185	0.13	| Q V |	|	|	|
332	2+24	0.0187	0.13	| Q V |	|	|	|
333	2+25	0.0188	0.13	| Q V |	|	|	|
334	2+26	0.0190	0.13	| Q V |	|	|	|
335	2+27	0.0192	0.13	| Q V |	|	|	|
336	2+28	0.0194	0.14	| Q V |	|	|	|
337	2+29	0.0196	0.14	| Q V |	|	|	|
338	2+30	0.0198	0.14	| Q V |	|	|	|
339	2+31	0.0200	0.14	| Q V |	|	|	|
340	2+32	0.0202	0.14	| Q V |	|	|	|
341	2+33	0.0203	0.14	| Q V |	|	|	|
342	2+34	0.0205	0.14	| Q V |	|	|	|
343	2+35	0.0207	0.14	| Q V |	|	|	|
344	2+36	0.0209	0.14	| Q V |	|	|	|
345	2+37	0.0211	0.14	| Q V |	|	|	|

346	2+38	0.0213	0.14	Q	V			
347	2+39	0.0215	0.15	Q	V			
348	2+40	0.0217	0.15	Q	V			
349	2+41	0.0219	0.15	Q	V			
350	2+42	0.0221	0.15	Q	V			
351	2+43	0.0223	0.15	Q	V			
352	2+44	0.0226	0.15	Q	V			
353	2+45	0.0228	0.15	Q	V			
354	2+46	0.0230	0.15	Q	V			
355	2+47	0.0232	0.15	Q	V			
356	2+48	0.0234	0.15	Q	V			
357	2+49	0.0236	0.16	Q	V			
358	2+50	0.0238	0.16	Q	V			
359	2+51	0.0241	0.16	Q	V			
360	2+52	0.0243	0.16	Q	V			
361	2+53	0.0245	0.16	Q	V			
362	2+54	0.0247	0.17	Q	V			
363	2+55	0.0250	0.17	Q	V			
364	2+56	0.0252	0.17	Q	V			
365	2+57	0.0254	0.17	Q	V			
366	2+58	0.0257	0.17	Q	V			
367	2+59	0.0259	0.17	Q	V			
368	3+ 0	0.0262	0.17	Q	V			
369	3+ 1	0.0264	0.18	Q	V			
370	3+ 2	0.0266	0.18	Q	V			
371	3+ 3	0.0269	0.18	Q	V			
372	3+ 4	0.0271	0.18	Q	V			
373	3+ 5	0.0274	0.18	Q	V			
374	3+ 6	0.0276	0.19	Q	V			
375	3+ 7	0.0279	0.19	Q	V			
376	3+ 8	0.0282	0.19	Q	V			
377	3+ 9	0.0284	0.20	Q	V			
378	3+10	0.0287	0.20	Q	V			
379	3+11	0.0290	0.20	Q	V			
380	3+12	0.0293	0.20	Q	V			
381	3+13	0.0295	0.20	Q	V			
382	3+14	0.0298	0.20	Q	V			
383	3+15	0.0301	0.21	Q	V			
384	3+16	0.0304	0.21	Q	V			
385	3+17	0.0307	0.21	Q	V			
386	3+18	0.0310	0.22	Q	V			
387	3+19	0.0313	0.22	Q	V			
388	3+20	0.0316	0.22	Q	V			
389	3+21	0.0319	0.23	Q	V			
390	3+22	0.0322	0.23	Q	V			
391	3+23	0.0326	0.24	Q	V			
392	3+24	0.0329	0.24	Q	V			
393	3+25	0.0332	0.24	Q	V			
394	3+26	0.0336	0.25	Q	V			
395	3+27	0.0339	0.25	Q	V			
396	3+28	0.0343	0.25	Q	V			
397	3+29	0.0346	0.25	Q	V			
398	3+30	0.0350	0.26	Q	V			
399	3+31	0.0353	0.27	Q	V			
400	3+32	0.0357	0.27	Q	V			
401	3+33	0.0361	0.28	Q	V			
402	3+34	0.0365	0.29	Q	V			
403	3+35	0.0369	0.30	Q	V			
404	3+36	0.0373	0.31	Q	V			
405	3+37	0.0378	0.32	Q	V			
406	3+38	0.0382	0.32	Q	V			
407	3+39	0.0387	0.33	Q	V			
408	3+40	0.0391	0.33	Q	V			
409	3+41	0.0396	0.34	Q	V			
410	3+42	0.0401	0.35	Q	V			
411	3+43	0.0406	0.35	Q	V			
412	3+44	0.0410	0.36	Q	V			
413	3+45	0.0416	0.38	Q	V			
414	3+46	0.0421	0.41	Q	V			



484	4+56	0.0943	0.13	Q				V
485	4+57	0.0945	0.13	Q				V
486	4+58	0.0947	0.12	Q				V
487	4+59	0.0948	0.12	Q				V
488	5+ 0	0.0950	0.12	Q				V
489	5+ 1	0.0952	0.12	Q				V
490	5+ 2	0.0953	0.12	Q				V
491	5+ 3	0.0955	0.12	Q				V
492	5+ 4	0.0957	0.12	Q				V
493	5+ 5	0.0958	0.12	Q				V
494	5+ 6	0.0960	0.11	Q				V
495	5+ 7	0.0961	0.11	Q				V
496	5+ 8	0.0963	0.11	Q				V
497	5+ 9	0.0964	0.11	Q				V
498	5+10	0.0966	0.11	Q				V
499	5+11	0.0967	0.11	Q				V
500	5+12	0.0969	0.11	Q				V
501	5+13	0.0970	0.11	Q				V
502	5+14	0.0972	0.11	Q				V
503	5+15	0.0973	0.10	Q				V
504	5+16	0.0975	0.10	Q				V
505	5+17	0.0976	0.10	Q				V
506	5+18	0.0977	0.10	Q				V
507	5+19	0.0979	0.10	Q				V
508	5+20	0.0980	0.10	Q				V
509	5+21	0.0982	0.10	Q				V
510	5+22	0.0983	0.10	Q				V
511	5+23	0.0984	0.10	Q				V
512	5+24	0.0986	0.10	Q				V
513	5+25	0.0987	0.10	Q				V
514	5+26	0.0988	0.10	Q				V
515	5+27	0.0990	0.09	Q				V
516	5+28	0.0991	0.09	Q				V
517	5+29	0.0992	0.09	Q				V
518	5+30	0.0993	0.09	Q				V
519	5+31	0.0995	0.09	Q				V
520	5+32	0.0996	0.09	Q				V
521	5+33	0.0997	0.09	Q				V
522	5+34	0.0998	0.09	Q				V
523	5+35	0.1000	0.09	Q				V
524	5+36	0.1001	0.09	Q				V
525	5+37	0.1002	0.09	Q				V
526	5+38	0.1003	0.09	Q				V
527	5+39	0.1004	0.09	Q				V
528	5+40	0.1006	0.09	Q				V
529	5+41	0.1007	0.09	Q				V
530	5+42	0.1008	0.08	Q				V
531	5+43	0.1009	0.08	Q				V
532	5+44	0.1010	0.08	Q				V
533	5+45	0.1011	0.08	Q				V
534	5+46	0.1012	0.08	Q				V
535	5+47	0.1014	0.08	Q				V
536	5+48	0.1015	0.08	Q				V
537	5+49	0.1016	0.08	Q				V
538	5+50	0.1017	0.08	Q				V
539	5+51	0.1018	0.08	Q				V
540	5+52	0.1019	0.08	Q				V
541	5+53	0.1020	0.08	Q				V
542	5+54	0.1021	0.08	Q				V
543	5+55	0.1022	0.08	Q				V
544	5+56	0.1023	0.08	Q				V
545	5+57	0.1025	0.08	Q				V
546	5+58	0.1026	0.08	Q				V
547	5+59	0.1027	0.08	Q				V
548	6+ 0	0.1028	0.08	Q				V
549	6+ 1	0.1029	0.08	Q				V
550	6+ 2	0.1030	0.08	Q				V
551	6+ 3	0.1031	0.07	Q				V
552	6+ 4	0.1032	0.07	Q				V

```
553   --------------------------------------------------------------------------
554
555
556
557
558       End of computations, total study area =           0.777 (Ac.)
559
560
561
```

6j. CivilD Post Development Via Belmonte Calculations

```
            San Diego County Rational Hydrology Program

 CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

 Rational method hydrology  program based on
 San Diego County Flood Control Division 2003 hydrology manual
     Rational Hydrology Study        Date: 04/24/24
 ------------------------------------------------------------------------
 19025 Post Dev
 100 yr study - Belmonte Addition
 19025belmontepost

 ------------------------------------------------------------------------
  *********   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) =  3.500
 24 hour precipitation(inches) =  6.000
 P6/P24 =    58.3%
 San Diego hydrology manual 'C' values used


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station     3001.000 to Point/Station     3002.000
 **** INITIAL AREA EVALUATION ****

 ________________________________________________________________________
 Decimal fraction soil group A = 1.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL                  ]
 (4.3 DU/A or Less       )
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.410
 Initial subarea total flow distance  =   99.210(Ft.)
 Highest elevation =  337.300(Ft.)
 Lowest elevation =  328.200(Ft.)
 Elevation difference =    9.100(Ft.) Slope =  9.172 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 100.00 (Ft)
 for the top area slope value of   9.17 %, in a development type of
  4.3 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration =   5.93 minutes
 TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
 TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(   9.172^(1/3)]=   5.93
 Rainfall intensity (I) =      8.258(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
 Subarea runoff =      0.599(CFS)
 Total initial stream area =        0.177(Ac.)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station     3002.000 to Point/Station     3003.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

 ________________________________________________________________________
 Estimated mean flow rate at midpoint of channel =      1.615(CFS)
 Depth of flow =   0.142(Ft.), Average velocity =   2.802(Ft/s)
     ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.50
    2             26.00              0.00
    3             27.00              0.20
Manning's 'N' friction factor =   0.023
------------------------------------------------------------------
Sub-Channel flow  =      1.615(CFS)
  '     '    flow top width =      8.106(Ft.)
  '     '    velocity=    2.802(Ft/s)
  '     '    area =      0.576(Sq.Ft)
  '     '    Froude number =     1.852

Upstream point elevation =   328.200(Ft.)
Downstream point elevation =   312.800(Ft.)
Flow length =   240.520(Ft.)
Travel time  =    1.43 min.
Time of concentration =    7.36 min.
Depth of flow =   0.142(Ft.)
Average velocity =   2.802(Ft/s)
Total irregular channel flow =     1.615(CFS)
Irregular channel normal depth above invert elev. =   0.142(Ft.)
Average velocity of channel(s) =   2.802(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      7.184(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.050
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.476
Rainfall intensity =      7.184(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.461  CA =      0.358
Subarea runoff =      1.976(CFS) for      0.600(Ac.)
Total runoff =      2.575(CFS)  Total area =       0.777(Ac.)
Depth of flow =   0.169(Ft.), Average velocity =   3.149(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3003.000 to Point/Station     3003.000
**** 6 HOUR HYDROGRAPH ****

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


Time of Concentration =   7.36
Basin Area =     0.78 Acres
6 Hour Rainfall =  3.500 Inches
Runoff Coefficient =  0.461
Peak Discharge =     2.58 CFS
     Time (Min)     Discharge (CFS)
       0               0.000
       7               0.075
       14              0.076
       21              0.078
       28              0.079
       35              0.082
       42              0.083
       49              0.085
       56              0.087
       63              0.090
       70              0.091
       77              0.094
       84              0.096
```

91	0.100
98	0.102
105	0.106
112	0.109
119	0.114
126	0.117
133	0.123
140	0.127
147	0.135
154	0.139
161	0.149
168	0.155
175	0.168
182	0.176
189	0.196
196	0.207
203	0.238
210	0.258
217	0.315
224	0.359
231	0.527
238	0.742
245	2.575
252	0.423
259	0.283
266	0.221
273	0.185
280	0.161
287	0.144
294	0.131
301	0.120
308	0.111
315	0.104
322	0.098
329	0.093
336	0.088
343	0.084
350	0.081
357	0.077
364	0.074

++

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

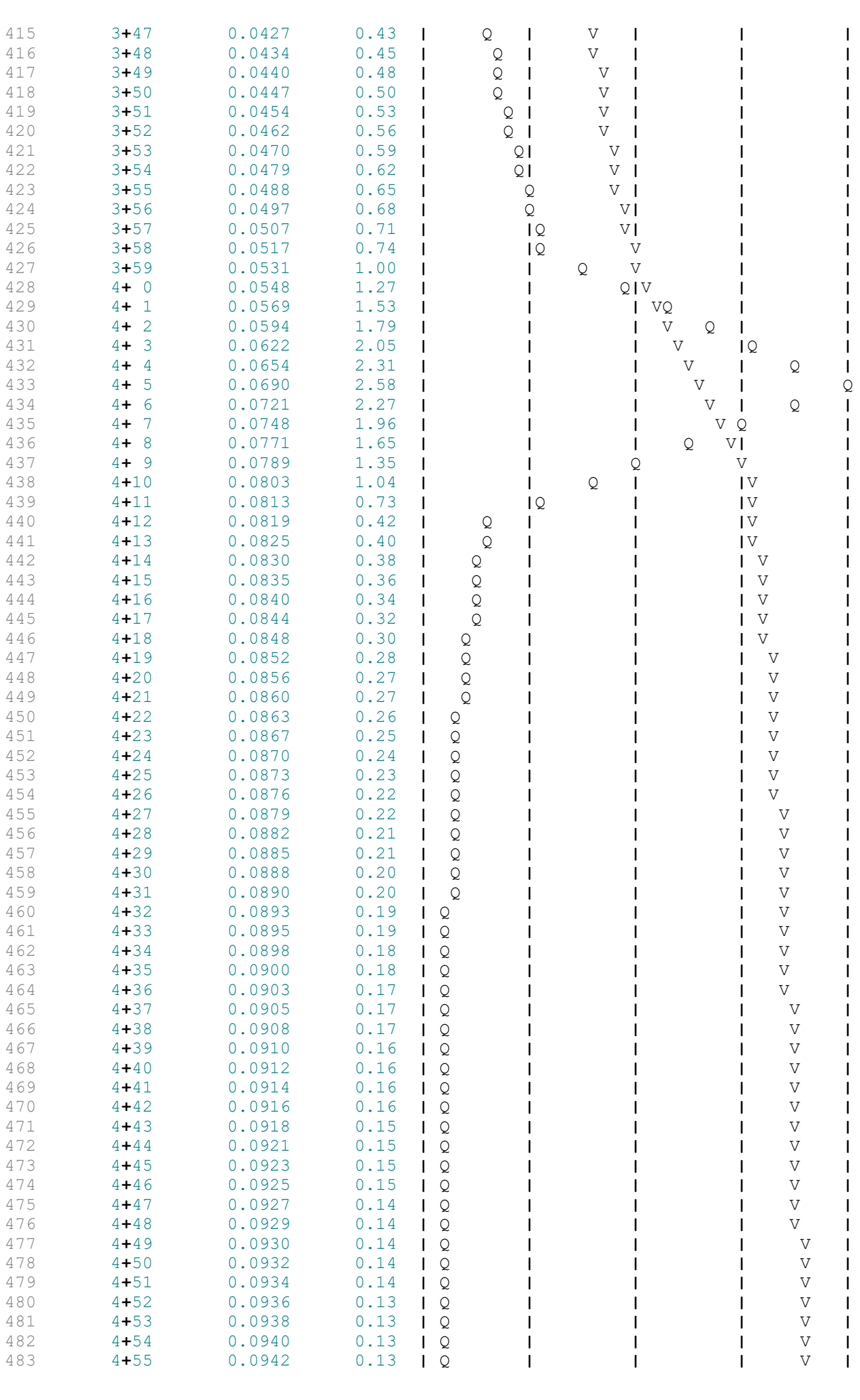
Hydrograph in 1 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	0.6	1.3	1.9	2.6
0+ 0	0.0000	0.00	Q	|	|	|	|
0+ 1	0.0000	0.01	Q	|	|	|	|
0+ 2	0.0000	0.02	Q	|	|	|	|
0+ 3	0.0001	0.03	Q	|	|	|	|
0+ 4	0.0001	0.04	Q	|	|	|	|
0+ 5	0.0002	0.05	Q	|	|	|	|
0+ 6	0.0003	0.06	VQ	|	|	|	|
0+ 7	0.0004	0.08	VQ	|	|	|	|
0+ 8	0.0005	0.08	VQ	|	|	|	|
0+ 9	0.0006	0.08	VQ	|	|	|	|
0+10	0.0007	0.08	VQ	|	|	|	|
0+11	0.0008	0.08	VQ	|	|	|	|
0+12	0.0009	0.08	VQ	|	|	|	|
0+13	0.0010	0.08	VQ	|	|	|	|
0+14	0.0011	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	|	|	|	|

208	0+20	0.0018	0.08	VQ	|	|	|	|
209	0+21	0.0019	0.08	VQ	|	|	|	|
210	0+22	0.0020	0.08	VQ	|	|	|	|
211	0+23	0.0021	0.08	VQ	|	|	|	|
212	0+24	0.0022	0.08	VQ	|	|	|	|
213	0+25	0.0023	0.08	VQ	|	|	|	|
214	0+26	0.0024	0.08	VQ	|	|	|	|
215	0+27	0.0025	0.08	VQ	|	|	|	|
216	0+28	0.0027	0.08	|Q	|	|	|	|
217	0+29	0.0028	0.08	|Q	|	|	|	|
218	0+30	0.0029	0.08	|Q	|	|	|	|
219	0+31	0.0030	0.08	|Q	|	|	|	|
220	0+32	0.0031	0.08	|Q	|	|	|	|
221	0+33	0.0032	0.08	|Q	|	|	|	|
222	0+34	0.0033	0.08	|Q	|	|	|	|
223	0+35	0.0034	0.08	|Q	|	|	|	|
224	0+36	0.0035	0.08	|Q	|	|	|	|
225	0+37	0.0037	0.08	|Q	|	|	|	|
226	0+38	0.0038	0.08	|Q	|	|	|	|
227	0+39	0.0039	0.08	|Q	|	|	|	|
228	0+40	0.0040	0.08	|Q	|	|	|	|
229	0+41	0.0041	0.08	|Q	|	|	|	|
230	0+42	0.0042	0.08	|Q	|	|	|	|
231	0+43	0.0043	0.08	|Q	|	|	|	|
232	0+44	0.0045	0.08	|Q	|	|	|	|
233	0+45	0.0046	0.08	|Q	|	|	|	|
234	0+46	0.0047	0.08	|Q	|	|	|	|
235	0+47	0.0048	0.08	|Q	|	|	|	|
236	0+48	0.0049	0.09	|Q	|	|	|	|
237	0+49	0.0050	0.09	|Q	|	|	|	|
238	0+50	0.0052	0.09	|Q	|	|	|	|
239	0+51	0.0053	0.09	|QV	|	|	|	|
240	0+52	0.0054	0.09	|QV	|	|	|	|
241	0+53	0.0055	0.09	|QV	|	|	|	|
242	0+54	0.0056	0.09	|QV	|	|	|	|
243	0+55	0.0058	0.09	|QV	|	|	|	|
244	0+56	0.0059	0.09	|QV	|	|	|	|
245	0+57	0.0060	0.09	|QV	|	|	|	|
246	0+58	0.0061	0.09	|QV	|	|	|	|
247	0+59	0.0062	0.09	|QV	|	|	|	|
248	1+ 0	0.0064	0.09	|QV	|	|	|	|
249	1+ 1	0.0065	0.09	|QV	|	|	|	|
250	1+ 2	0.0066	0.09	|QV	|	|	|	|
251	1+ 3	0.0067	0.09	|QV	|	|	|	|
252	1+ 4	0.0068	0.09	|QV	|	|	|	|
253	1+ 5	0.0070	0.09	|QV	|	|	|	|
254	1+ 6	0.0071	0.09	|QV	|	|	|	|
255	1+ 7	0.0072	0.09	|QV	|	|	|	|
256	1+ 8	0.0073	0.09	|QV	|	|	|	|
257	1+ 9	0.0075	0.09	|QV	|	|	|	|
258	1+10	0.0076	0.09	|QV	|	|	|	|
259	1+11	0.0077	0.09	|QV	|	|	|	|
260	1+12	0.0078	0.09	|Q V	|	|	|	|
261	1+13	0.0080	0.09	|Q V	|	|	|	|
262	1+14	0.0081	0.09	|Q V	|	|	|	|
263	1+15	0.0082	0.09	|Q V	|	|	|	|
264	1+16	0.0084	0.09	|Q V	|	|	|	|
265	1+17	0.0085	0.09	|Q V	|	|	|	|
266	1+18	0.0086	0.09	|Q V	|	|	|	|
267	1+19	0.0088	0.09	|Q V	|	|	|	|
268	1+20	0.0089	0.10	|Q V	|	|	|	|
269	1+21	0.0090	0.10	|Q V	|	|	|	|
270	1+22	0.0091	0.10	|Q V	|	|	|	|
271	1+23	0.0093	0.10	|Q V	|	|	|	|
272	1+24	0.0094	0.10	|Q V	|	|	|	|
273	1+25	0.0095	0.10	|Q V	|	|	|	|
274	1+26	0.0097	0.10	|Q V	|	|	|	|
275	1+27	0.0098	0.10	|Q V	|	|	|	|
276	1+28	0.0100	0.10	|Q V	|	|	|	|

277	1+29	0.0101	0.10	|Q V |	|	|	|
278	1+30	0.0102	0.10	|Q V |	|	|	|
279	1+31	0.0104	0.10	|Q V |	|	|	|
280	1+32	0.0105	0.10	|Q V |	|	|	|
281	1+33	0.0106	0.10	|Q V |	|	|	|
282	1+34	0.0108	0.10	|Q V |	|	|	|
283	1+35	0.0109	0.10	|Q V |	|	|	|
284	1+36	0.0111	0.10	|Q V |	|	|	|
285	1+37	0.0112	0.10	|Q V |	|	|	|
286	1+38	0.0113	0.10	|Q V |	|	|	|
287	1+39	0.0115	0.10	|Q V |	|	|	|
288	1+40	0.0116	0.10	|Q V |	|	|	|
289	1+41	0.0118	0.10	|Q V |	|	|	|
290	1+42	0.0119	0.10	|Q V |	|	|	|
291	1+43	0.0121	0.11	|Q V |	|	|	|
292	1+44	0.0122	0.11	|Q V |	|	|	|
293	1+45	0.0123	0.11	|Q V |	|	|	|
294	1+46	0.0125	0.11	|Q V |	|	|	|
295	1+47	0.0126	0.11	|Q V |	|	|	|
296	1+48	0.0128	0.11	|Q V |	|	|	|
297	1+49	0.0129	0.11	|Q V |	|	|	|
298	1+50	0.0131	0.11	|Q V |	|	|	|
299	1+51	0.0132	0.11	|Q V |	|	|	|
300	1+52	0.0134	0.11	|Q V |	|	|	|
301	1+53	0.0135	0.11	|Q V |	|	|	|
302	1+54	0.0137	0.11	|Q V |	|	|	|
303	1+55	0.0138	0.11	|Q V |	|	|	|
304	1+56	0.0140	0.11	|Q V |	|	|	|
305	1+57	0.0142	0.11	|Q V |	|	|	|
306	1+58	0.0143	0.11	|Q V |	|	|	|
307	1+59	0.0145	0.11	|Q V |	|	|	|
308	2+ 0	0.0146	0.11	|Q V |	|	|	|
309	2+ 1	0.0148	0.11	|Q V |	|	|	|
310	2+ 2	0.0149	0.12	|Q V |	|	|	|
311	2+ 3	0.0151	0.12	|Q V |	|	|	|
312	2+ 4	0.0153	0.12	|Q V |	|	|	|
313	2+ 5	0.0154	0.12	|Q V |	|	|	|
314	2+ 6	0.0156	0.12	|Q V |	|	|	|
315	2+ 7	0.0157	0.12	|Q V |	|	|	|
316	2+ 8	0.0159	0.12	|Q V |	|	|	|
317	2+ 9	0.0161	0.12	|Q V |	|	|	|
318	2+10	0.0162	0.12	|Q V |	|	|	|
319	2+11	0.0164	0.12	|Q V |	|	|	|
320	2+12	0.0166	0.12	|Q V |	|	|	|
321	2+13	0.0167	0.12	|Q V |	|	|	|
322	2+14	0.0169	0.12	|Q V |	|	|	|
323	2+15	0.0171	0.12	|Q V |	|	|	|
324	2+16	0.0173	0.12	|Q V |	|	|	|
325	2+17	0.0174	0.13	|Q V |	|	|	|
326	2+18	0.0176	0.13	|Q V |	|	|	|
327	2+19	0.0178	0.13	|Q V |	|	|	|
328	2+20	0.0180	0.13	|Q V |	|	|	|
329	2+21	0.0181	0.13	|Q V |	|	|	|
330	2+22	0.0183	0.13	| Q V |	|	|	|
331	2+23	0.0185	0.13	| Q V |	|	|	|
332	2+24	0.0187	0.13	| Q V |	|	|	|
333	2+25	0.0188	0.13	| Q V |	|	|	|
334	2+26	0.0190	0.13	| Q V |	|	|	|
335	2+27	0.0192	0.13	| Q V |	|	|	|
336	2+28	0.0194	0.14	| Q V |	|	|	|
337	2+29	0.0196	0.14	| Q V |	|	|	|
338	2+30	0.0198	0.14	| Q V |	|	|	|
339	2+31	0.0200	0.14	| Q V |	|	|	|
340	2+32	0.0202	0.14	| Q V |	|	|	|
341	2+33	0.0203	0.14	| Q V |	|	|	|
342	2+34	0.0205	0.14	| Q V |	|	|	|
343	2+35	0.0207	0.14	| Q V |	|	|	|
344	2+36	0.0209	0.14	| Q V |	|	|	|
345	2+37	0.0211	0.14	| Q V |	|	|	|

346	2+38	0.0213	0.14	Q	V			
347	2+39	0.0215	0.15	Q	V			
348	2+40	0.0217	0.15	Q	V			
349	2+41	0.0219	0.15	Q	V			
350	2+42	0.0221	0.15	Q	V			
351	2+43	0.0223	0.15	Q	V			
352	2+44	0.0226	0.15	Q	V			
353	2+45	0.0228	0.15	Q	V			
354	2+46	0.0230	0.15	Q	V			
355	2+47	0.0232	0.15	Q	V			
356	2+48	0.0234	0.15	Q	V			
357	2+49	0.0236	0.16	Q	V			
358	2+50	0.0238	0.16	Q	V			
359	2+51	0.0241	0.16	Q	V			
360	2+52	0.0243	0.16	Q	V			
361	2+53	0.0245	0.16	Q	V			
362	2+54	0.0247	0.17	Q	V			
363	2+55	0.0250	0.17	Q	V			
364	2+56	0.0252	0.17	Q	V			
365	2+57	0.0254	0.17	Q	V			
366	2+58	0.0257	0.17	Q	V			
367	2+59	0.0259	0.17	Q	V			
368	3+ 0	0.0262	0.17	Q	V			
369	3+ 1	0.0264	0.18	Q	V			
370	3+ 2	0.0266	0.18	Q	V			
371	3+ 3	0.0269	0.18	Q	V			
372	3+ 4	0.0271	0.18	Q	V			
373	3+ 5	0.0274	0.18	Q	V			
374	3+ 6	0.0276	0.19	Q	V			
375	3+ 7	0.0279	0.19	Q	V			
376	3+ 8	0.0282	0.19	Q	V			
377	3+ 9	0.0284	0.20	Q	V			
378	3+10	0.0287	0.20	Q	V			
379	3+11	0.0290	0.20	Q	V			
380	3+12	0.0293	0.20	Q	V			
381	3+13	0.0295	0.20	Q	V			
382	3+14	0.0298	0.20	Q	V			
383	3+15	0.0301	0.21	Q	V			
384	3+16	0.0304	0.21	Q	V			
385	3+17	0.0307	0.21	Q	V			
386	3+18	0.0310	0.22	Q	V			
387	3+19	0.0313	0.22	Q	V			
388	3+20	0.0316	0.22	Q	V			
389	3+21	0.0319	0.23	Q	V			
390	3+22	0.0322	0.23	Q	V			
391	3+23	0.0326	0.24	Q	V			
392	3+24	0.0329	0.24	Q	V			
393	3+25	0.0332	0.24	Q	V			
394	3+26	0.0336	0.25	Q	V			
395	3+27	0.0339	0.25	Q	V			
396	3+28	0.0343	0.25	Q	V			
397	3+29	0.0346	0.25	Q	V			
398	3+30	0.0350	0.26	Q	V			
399	3+31	0.0353	0.27	Q	V			
400	3+32	0.0357	0.27	Q	V			
401	3+33	0.0361	0.28	Q	V			
402	3+34	0.0365	0.29	Q	V			
403	3+35	0.0369	0.30	Q	V			
404	3+36	0.0373	0.31	Q	V			
405	3+37	0.0378	0.32	Q	V			
406	3+38	0.0382	0.32	Q	V			
407	3+39	0.0387	0.33	Q	V			
408	3+40	0.0391	0.33	Q	V			
409	3+41	0.0396	0.34	Q	V			
410	3+42	0.0401	0.35	Q	V			
411	3+43	0.0406	0.35	Q	V			
412	3+44	0.0410	0.36	Q	V			
413	3+45	0.0416	0.38	Q	V			
414	3+46	0.0421	0.41	Q	V			



484	4+56	0.0943	0.13	Q				V
485	4+57	0.0945	0.13	Q				V
486	4+58	0.0947	0.12	Q				V
487	4+59	0.0948	0.12	Q				V
488	5+ 0	0.0950	0.12	Q				V
489	5+ 1	0.0952	0.12	Q				V
490	5+ 2	0.0953	0.12	Q				V
491	5+ 3	0.0955	0.12	Q				V
492	5+ 4	0.0957	0.12	Q				V
493	5+ 5	0.0958	0.12	Q				V
494	5+ 6	0.0960	0.11	Q				V
495	5+ 7	0.0961	0.11	Q				V
496	5+ 8	0.0963	0.11	Q				V
497	5+ 9	0.0964	0.11	Q				V
498	5+10	0.0966	0.11	Q				V
499	5+11	0.0967	0.11	Q				V
500	5+12	0.0969	0.11	Q				V
501	5+13	0.0970	0.11	Q				V
502	5+14	0.0972	0.11	Q				V
503	5+15	0.0973	0.10	Q				V
504	5+16	0.0975	0.10	Q				V
505	5+17	0.0976	0.10	Q				V
506	5+18	0.0977	0.10	Q				V
507	5+19	0.0979	0.10	Q				V
508	5+20	0.0980	0.10	Q				V
509	5+21	0.0982	0.10	Q				V
510	5+22	0.0983	0.10	Q				V
511	5+23	0.0984	0.10	Q				V
512	5+24	0.0986	0.10	Q				V
513	5+25	0.0987	0.10	Q				V
514	5+26	0.0988	0.10	Q				V
515	5+27	0.0990	0.09	Q				V
516	5+28	0.0991	0.09	Q				V
517	5+29	0.0992	0.09	Q				V
518	5+30	0.0993	0.09	Q				V
519	5+31	0.0995	0.09	Q				V
520	5+32	0.0996	0.09	Q				V
521	5+33	0.0997	0.09	Q				V
522	5+34	0.0998	0.09	Q				V
523	5+35	0.1000	0.09	Q				V
524	5+36	0.1001	0.09	Q				V
525	5+37	0.1002	0.09	Q				V
526	5+38	0.1003	0.09	Q				V
527	5+39	0.1004	0.09	Q				V
528	5+40	0.1006	0.09	Q				V
529	5+41	0.1007	0.09	Q				V
530	5+42	0.1008	0.08	Q				V
531	5+43	0.1009	0.08	Q				V
532	5+44	0.1010	0.08	Q				V
533	5+45	0.1011	0.08	Q				V
534	5+46	0.1012	0.08	Q				V
535	5+47	0.1014	0.08	Q				V
536	5+48	0.1015	0.08	Q				V
537	5+49	0.1016	0.08	Q				V
538	5+50	0.1017	0.08	Q				V
539	5+51	0.1018	0.08	Q				V
540	5+52	0.1019	0.08	Q				V
541	5+53	0.1020	0.08	Q				V
542	5+54	0.1021	0.08	Q				V
543	5+55	0.1022	0.08	Q				V
544	5+56	0.1023	0.08	Q				V
545	5+57	0.1025	0.08	Q				V
546	5+58	0.1026	0.08	Q				V
547	5+59	0.1027	0.08	Q				V
548	6+ 0	0.1028	0.08	Q				V
549	6+ 1	0.1029	0.08	Q				V
550	6+ 2	0.1030	0.08	Q				V
551	6+ 3	0.1031	0.07	Q				V
552	6+ 4	0.1032	0.07	Q				V

```
553   --------------------------------------------------------------------------
554
555
556
557
558       End of computations, total study area =           0.777 (Ac.)
559
560
561
```

6k. CivilD Post Development Onsite Reach 1 Calculations

```
1
2                San Diego County Rational Hydrology Program
3
4       CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0
5
6       Rational method hydrology  program based on
7       San Diego County Flood Control Division 2003 hydrology manual
8           Rational Hydrology Study        Date: 04/26/24
9       ------------------------------------------------------------------------
10      19025 Post Dev
11      100 Year Study Reach 1
12      PostDev100R1.rd3
13      offiste ud to onsite w/main confulence
14      ------------------------------------------------------------------------
15       *********   Hydrology Study Control Information **********
16
17      ------------------------------------------------------------------------
18
19
20      Program License Serial Number 6332
21
22      ------------------------------------------------------------------------
23      Rational hydrology study storm event year is   100.0
24      English (in-lb) input data Units used
25
26      Map data precipitation entered:
27      6 hour,  precipitation(inches) =  3.500
28      24 hour precipitation(inches) =  6.000
29      P6/P24 =    58.3%
30      San Diego hydrology manual 'C' values used
31
32
33      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
34      Process from Point/Station      100.000 to Point/Station      101.000
35      **** INITIAL AREA EVALUATION ****
36
37      Decimal fraction soil group A = 1.000
38      Decimal fraction soil group B = 0.000
39      Decimal fraction soil group C = 0.000
40      Decimal fraction soil group D = 0.000
41      [MEDIUM DENSITY RESIDENTIAL                  ]
42      (7.3 DU/A or Less       )
43      Impervious value, Ai = 0.400
44      Sub-Area C Value = 0.480
45      Initial subarea total flow distance  =   53.000(Ft.)
46      Highest elevation =  316.800(Ft.)
47      Lowest elevation =  316.700(Ft.)
48      Elevation difference =    0.100(Ft.) Slope =  0.189 %
49      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
50      The maximum overland flow distance is 50.00 (Ft)
51      for the top area slope value of   0.19 %, in a development type of
52       7.3 DU/A or Less
53      In Accordance With Figure 3-3
54      Initial Area Time of Concentration =  13.75 minutes
55      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
56      TC = [1.8*(1.1-0.4800)*(  50.000^.5)/(   0.189^(1/3)]=  13.75
57      The initial area total distance of   53.00 (Ft.) entered leaves a
58      remaining distance of    3.00 (Ft.)
59      Using Figure 3-4, the travel time for this distance is   0.20 minutes
60      for a distance of   3.00 (Ft.) and a slope of  0.19 %
61      with an elevation difference of   0.01(Ft.) from the end of the top area
62      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
63       =    0.203 Minutes
64      Tt=[(11.9*0.0006^3)/(  0.01)]^.385=  0.20
65      Total initial area Ti =  13.75 minutes from Figure 3-3 formula plus
66        0.20 minutes from the Figure 3-4 formula =  13.95 minutes
67      Rainfall intensity (I) =      4.757(In/Hr) for a   100.0 year storm
68      Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
69      Subarea runoff =      0.068(CFS)
```

```
Total initial stream area =        0.030(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.228(CFS)
Depth of flow =   0.095(Ft.), Average velocity =   0.591(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.33
    2             23.00              0.00
    3             28.50              0.33
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      0.228(CFS)
  '     '    flow top width =      8.130(Ft.)
  '     '    velocity=    0.591(Ft/s)
  '     '    area =      0.386(Sq.Ft)
  '     '    Froude number =     0.478

Upstream point elevation =   316.700(Ft.)
Downstream point elevation =   316.300(Ft.)
Flow length =   193.000(Ft.)
Travel time  =    5.44 min.
Time of concentration =   19.39 min.
Depth of flow =   0.095(Ft.)
Average velocity =   0.591(Ft/s)
Total irregular channel flow =     0.228(CFS)
Irregular channel normal depth above invert elev. =   0.095(Ft.)
Average velocity of channel(s) =   0.591(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      3.847(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Rainfall intensity =      3.847(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.480  CA =      0.082
Subarea runoff =      0.245(CFS) for      0.140(Ac.)
Total runoff =      0.314(CFS)  Total area =      0.170(Ac.)
Depth of flow =   0.107(Ft.), Average velocity =   0.640(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________________________
Rainfall intensity (I) =      3.847(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Time of concentration =    19.39 min.
Rainfall intensity =      3.847(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.393  CA =      0.114
```

```
Subarea runoff =      0.125(CFS) for      0.120(Ac.)
Total runoff =      0.439(CFS)  Total area =       0.290(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   310.200(Ft.)
Downstream point/station elevation =   309.000(Ft.)
Pipe length  =   250.00(Ft.) Slope =   0.0048  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.439(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     0.439(CFS)
Normal flow depth in pipe =    3.42(In.)
Flow top width inside pipe =   10.84(In.)
Critical Depth =    3.28(In.)
Pipe flow velocity =      2.37(Ft/s)
Travel time through pipe =    1.76 min.
Time of concentration (TC) =    21.15 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 1
Stream flow area =      0.290(Ac.)
Runoff from this stream =      0.439(CFS)
Time of concentration =   21.15 min.
Rainfall intensity =     3.637(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1100.000 to Point/Station     1101.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance  =   59.000(Ft.)
Highest elevation =  336.700(Ft.)
Lowest elevation =  321.600(Ft.)
Elevation difference =   15.100(Ft.) Slope = 25.593 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  25.59 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.07 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2700)*( 100.000^.5)/(  25.593^(1/3)]=   5.07
Rainfall intensity (I) =      9.140(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff =      0.173(CFS)
Total initial stream area =       0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1101.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.544(CFS)
Depth of flow =   0.128(Ft.), Average velocity =   3.658(Ft/s)
```

```
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.60
    2             16.00              0.00
    3             46.00              1.20
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.544(CFS)
  '     '    flow top width =      6.605(Ft.)
  '     '    velocity=    3.658(Ft/s)
  '     '    area =      0.422(Sq.Ft)
  '     '    Froude number =     2.549

Upstream point elevation =   321.600(Ft.)
Downstream point elevation =   309.000(Ft.)
Flow length =   236.000(Ft.)
Travel time  =    1.08 min.
Time of concentration =    6.15 min.
Depth of flow =   0.128(Ft.)
Average velocity =   3.658(Ft/s)
Total irregular channel flow =     1.544(CFS)
Irregular channel normal depth above invert elev. =   0.128(Ft.)
Average velocity of channel(s) =   3.658(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.073(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.534
Rainfall intensity =      8.073(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.509  CA =      0.371
Subarea runoff =      2.825(CFS) for      0.660(Ac.)
Total runoff =      2.998(CFS)  Total area =       0.730(Ac.)
Depth of flow =   0.164(Ft.), Average velocity =   4.317(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 2
Stream flow area =      0.730(Ac.)
Runoff from this stream =      2.998(CFS)
Time of concentration =    6.15 min.
Rainfall intensity =     8.073(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3003.000 to Point/Station      103.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

____________________________________________________________________________
Decimal fraction soil group A = 0.270
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.461
Rainfall intensity (I) =      7.186(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.36 min.  Rain intensity =       7.19(In/Hr)
```

```
Total area =        0.777(Ac.)  Total runoff =     2.575(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.777(Ac.)
Runoff from this stream =      2.575(CFS)
Time of concentration =    7.36 min.
Rainfall intensity =     7.186(In/Hr)
Summary of stream data:

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


1        0.439     21.15             3.637
2        2.998      6.15             8.073
3        2.575      7.36             7.186
Qmax(1) =
       1.000 *    1.000 *     0.439) +
       0.451 *    1.000 *     2.998) +
       0.506 *    1.000 *     2.575) + =       3.093
Qmax(2) =
       1.000 *    0.291 *     0.439) +
       1.000 *    1.000 *     2.998) +
       1.000 *    0.835 *     2.575) + =       5.275
Qmax(3) =
       1.000 *    0.348 *     0.439) +
       0.890 *    1.000 *     2.998) +
       1.000 *    1.000 *     2.575) + =       5.396

Total of 3 streams to confluence:
Flow rates before confluence point:
       0.439       2.998       2.575
Maximum flow rates at confluence using above data:
        3.093       5.275       5.396
Area of streams before confluence:
        0.290       0.730       0.777
Results of confluence:
Total flow rate =      5.396(CFS)
Time of concentration =     7.360 min.
Effective stream area after confluence =      1.797(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   304.200(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =   189.00(Ft.) Slope =   0.0048  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.396(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     5.396(CFS)
Normal flow depth in pipe =   11.58(In.)
Flow top width inside pipe =   17.25(In.)
Critical Depth =   10.74(In.)
Pipe flow velocity =      4.50(Ft/s)
Travel time through pipe =    0.70 min.
Time of concentration (TC) =     8.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
```

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.797(Ac.)
Runoff from this stream =      5.396(CFS)
Time of concentration =    8.06 min.
Rainfall intensity =     6.777(In/Hr)


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

------------------------------------------------------------------------
Decimal fraction soil group A = 0.050
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                         ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.839
Initial subarea total flow distance  =   50.000(Ft.)
Highest elevation =  316.800(Ft.)
Lowest elevation =  316.200(Ft.)
Elevation difference =    0.600(Ft.) Slope =  1.200 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.20 %, in a development type of
 Office Professional
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.42 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8395)*(  60.000^.5)/(   1.200^(1/3)]=   3.42
Calculated TC of    3.418 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.839
Subarea runoff =      0.310(CFS)
Total initial stream area =        0.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      2.245(CFS)
Depth of flow =   0.209(Ft.), Average velocity =   2.102(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.30
    2              1.50              0.00
    3             45.50              1.00
    4             61.50              1.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      2.245(CFS)
  '     '    flow top width =     10.230(Ft.)
  '     '    velocity=    2.102(Ft/s)
  '     '    area =      1.068(Sq.Ft)
  '     '    Froude number =     1.147

Upstream point elevation =   316.200(Ft.)
Downstream point elevation =   314.500(Ft.)
Flow length =   185.000(Ft.)
Travel time  =    1.47 min.
Time of concentration =    4.88 min.
Depth of flow =   0.209(Ft.)
Average velocity =   2.102(Ft/s)
Total irregular channel flow =     2.245(CFS)
```

```
Irregular channel normal depth above invert elev. =   0.209(Ft.)
Average velocity of channel(s) =   2.102(Ft/s)
 Adding area flow to channel
Calculated TC of    4.885 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(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
[COMMERCIAL area type                          ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.840
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.840  CA =      0.454
Subarea runoff =      3.873(CFS) for      0.500(Ac.)
Total runoff =      4.183(CFS)  Total area =       0.540(Ac.)
Depth of flow =   0.264(Ft.), Average velocity =   2.456(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------------
Upstream point/station elevation =   308.500(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =    48.00(Ft.) Slope =   0.1083  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.183(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     4.183(CFS)
Normal flow depth in pipe =    4.95(In.)
Flow top width inside pipe =   11.82(In.)
Critical Depth =   10.36(In.)
Pipe flow velocity =     13.68(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     4.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.540(Ac.)
Runoff from this stream =      4.183(CFS)
Time of concentration =    4.94 min.
Rainfall intensity =     9.222(In/Hr)


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

------------------------------------------------------------------------------
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
[COMMERCIAL area type                          ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Initial subarea total flow distance  =   42.000(Ft.)
Highest elevation =  316.000(Ft.)
Lowest elevation =  314.700(Ft.)
Elevation difference =    1.300(Ft.) Slope =  3.095 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
```

```
for the top area slope value of   3.10 %, in a development type of
 Neighborhod Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.64 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7800)*(  85.000^.5)/(   3.095^(1/3)]=   3.64
Calculated TC of    3.644 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
Subarea runoff =      0.288(CFS)
Total initial stream area =        0.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.259(CFS)
Depth of flow =   0.087(Ft.), Average velocity =   2.583(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             64.00              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.259(CFS)
  '     '    flow top width =     11.169(Ft.)
  '     '    velocity=    2.583(Ft/s)
  '     '    area =      0.487(Sq.Ft)
  '     '    Froude number =     2.180

Upstream point elevation =   314.700(Ft.)
Downstream point elevation =   313.000(Ft.)
Flow length =    38.000(Ft.)
Travel time  =    0.25 min.
Time of concentration =    3.89 min.
Depth of flow =   0.087(Ft.)
Average velocity =   2.583(Ft/s)
Total irregular channel flow =     1.259(CFS)
Irregular channel normal depth above invert elev. =   0.087(Ft.)
Average velocity of channel(s) =   2.583(Ft/s)
 Adding area flow to channel
Calculated TC of    3.889 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(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
[COMMERCIAL area type                        ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.780  CA =      0.242
Subarea runoff =      1.942(CFS) for      0.270(Ac.)
Total runoff =      2.230(CFS)  Total area =       0.310(Ac.)
Depth of flow =   0.108(Ft.), Average velocity =   2.980(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

________________________________________________________________________
```

```
Upstream point/station elevation =   306.000(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =    30.00(Ft.) Slope =   0.0900  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.230(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     2.230(CFS)
Normal flow depth in pipe =    3.72(In.)
Flow top width inside pipe =   11.10(In.)
Critical Depth =    7.66(In.)
Pipe flow velocity =     10.75(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     3.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****

____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.310(Ac.)
Runoff from this stream =      2.230(CFS)
Time of concentration =    3.94 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

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


1        5.396      8.06             6.777
2        4.183      4.94             9.222
3        2.230      3.94             9.222
Qmax(1) =
       1.000 *    1.000 *     5.396) +
       0.735 *    1.000 *     4.183) +
       0.735 *    1.000 *     2.230) + =      10.109
Qmax(2) =
       1.000 *    0.613 *     5.396) +
       1.000 *    1.000 *     4.183) +
       1.000 *    1.000 *     2.230) + =       9.722
Qmax(3) =
       1.000 *    0.488 *     5.396) +
       1.000 *    0.796 *     4.183) +
       1.000 *    1.000 *     2.230) + =       8.195

Total of 3 streams to confluence:
Flow rates before confluence point:
       5.396       4.183       2.230
Maximum flow rates at confluence using above data:
       10.109        9.722        8.195
Area of streams before confluence:
        1.797        0.540        0.310
Results of confluence:
Total flow rate =     10.109(CFS)
Time of concentration =     8.061 min.
Effective stream area after confluence =      2.647(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

____________________________________________________________________________
Upstream point/station elevation =   303.300(Ft.)
Downstream point/station elevation =   303.000(Ft.)
Pipe length  =    71.00(Ft.) Slope =   0.0042  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.109(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
```

```
     1.119(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      0.657(Ft.)
 Minor friction loss =      0.762(Ft.)  K-factor =   1.50
Pipe flow velocity =      5.72(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =     8.27 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 1
Stream flow area =      2.647(Ac.)
Runoff from this stream =     10.109(CFS)
Time of concentration =    8.27 min.
Rainfall intensity =     6.667(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
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
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  316.100(Ft.)
Lowest elevation =  312.600(Ft.)
Elevation difference =    3.500(Ft.) Slope =  3.500 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   3.50 %, in a development type of
 43.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.50 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7800)*(  85.000^.5)/(   3.500^(1/3)]=   3.50
The initial area total distance of  100.00 (Ft.) entered leaves a
remaining distance of   15.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   0.23 minutes
for a distance of  15.00 (Ft.) and a slope of  3.50 %
with an elevation difference of   0.53(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    0.228 Minutes
Tt=[(11.9*0.0028^3)/(  0.53)]^.385=  0.23
Total initial area Ti =   3.50 minutes from Figure 3-3 formula plus
  0.23 minutes from the Figure 3-4 formula =   3.73 minutes
Calculated TC of    3.726 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
Subarea runoff =      0.791(CFS)
Total initial stream area =        0.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      1.043(CFS)
Depth of flow =   0.351(Ft.), Average velocity =   4.504(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
```

```
 Information entered for subchannel number 1 :
 Point number      'X' coordinate     'Y' coordinate
     1              0.00              1.10
     2             34.00              0.40
     3             35.50              0.00
     4             35.50              0.50
 Manning's 'N' friction factor =   0.015
-----------------------------------------------------------------
 Sub-Channel flow  =      1.043(CFS)
   '     '    flow top width =      1.318(Ft.)
   '     '    velocity=    4.504(Ft/s)
   '     '    area =      0.232(Sq.Ft)
   '     '    Froude number =     1.894

 Upstream point elevation =   312.600(Ft.)
 Downstream point elevation =   310.600(Ft.)
 Flow length =    67.000(Ft.)
 Travel time  =    0.25 min.
 Time of concentration =    3.97 min.
 Depth of flow =   0.351(Ft.)
 Average velocity =   4.504(Ft/s)
 Total irregular channel flow =     1.043(CFS)
 Irregular channel normal depth above invert elev. =   0.351(Ft.)
 Average velocity of channel(s) =   4.504(Ft/s)
  Adding area flow to channel
 Calculated TC of    3.974 minutes is less than 5 minutes,
  resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) =      9.222(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
 [HIGH DENSITY RESIDENTIAL                    ]
 (43.0 DU/A or Less      )
 Impervious value, Ai = 0.800
 Sub-Area C Value = 0.780
 Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.780  CA =      0.140
 Subarea runoff =      0.503(CFS) for      0.070(Ac.)
 Total runoff =      1.295(CFS)  Total area =       0.180(Ac.)
 Depth of flow =   0.381(Ft.), Average velocity =   4.754(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 2
 Stream flow area =      0.180(Ac.)
 Runoff from this stream =      1.295(CFS)
 Time of concentration =    3.97 min.
 Rainfall intensity =     9.222(In/Hr)
 Summary of stream data:

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


 1       10.109      8.27             6.667
 2        1.295      3.97             9.222
 Qmax(1) =
        1.000 *    1.000 *    10.109) +
        0.723 *    1.000 *     1.295) + =      11.045
 Qmax(2) =
        1.000 *    0.481 *    10.109) +
        1.000 *    1.000 *     1.295) + =       6.154

 Total of 2 streams to confluence:
```

```
Flow rates before confluence point:
      10.109       1.295
Maximum flow rates at confluence using above data:
       11.045        6.154
Area of streams before confluence:
        2.647        0.180
Results of confluence:
Total flow rate =     11.045(CFS)
Time of concentration =     8.268 min.
Effective stream area after confluence =      2.827(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------
Upstream point/station elevation =   303.000(Ft.)
Downstream point/station elevation =   302.500(Ft.)
Pipe length  =    77.00(Ft.) Slope =   0.0065  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.045(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    11.503(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      7.397(Ft.)
 Minor friction loss =      4.606(Ft.)  K-factor =   1.50
Pipe flow velocity =     14.06(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     8.36 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****

------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.827(Ac.)
Runoff from this stream =     11.045(CFS)
Time of concentration =    8.36 min.
Rainfall intensity =     6.620(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      106.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

------------------------------------------------------------------------
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
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity (I) =      5.826(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  10.19 min.  Rain intensity =       5.83(In/Hr)
Total area =       2.170(Ac.)  Total runoff =     6.593(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****

------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.170(Ac.)
```

```
Runoff from this stream =      6.593(CFS)
Time of concentration =   10.19 min.
Rainfall intensity =     5.826(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1004.000 to Point/Station     1005.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance  =   30.000(Ft.)
Highest elevation =  334.800(Ft.)
Lowest elevation =  327.500(Ft.)
Elevation difference =    7.300(Ft.) Slope = 24.333 %
Top of Initial Area Slope adjusted by User to  0.189 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of   0.19 %, in a development type of
 1.0 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =  12.20 minutes
 (for slope value of   0.50 %)
Rainfall intensity (I) =      5.187(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff =      0.014(CFS)
Total initial stream area =        0.010(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1005.000 to Point/Station     1003.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.042(CFS)
Depth of flow =   0.111(Ft.), Average velocity =   3.401(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 =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      0.042(CFS)
  '     '    flow top width =      0.222(Ft.)
  '     '    velocity=    3.401(Ft/s)
  '     '    area =      0.012(Sq.Ft)
  '     '    Froude number =     2.543

Upstream point elevation =   327.500(Ft.)
Downstream point elevation =   324.500(Ft.)
Flow length =    34.000(Ft.)
Travel time  =    0.17 min.
Time of concentration =   12.37 min.
Depth of flow =   0.111(Ft.)
Average velocity =   3.401(Ft/s)
Total irregular channel flow =     0.042(CFS)
Irregular channel normal depth above invert elev. =   0.111(Ft.)
Average velocity of channel(s) =   3.401(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.142(In/Hr) for a   100.0 year storm
```

```
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Rainfall intensity =      5.142(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.270  CA =      0.014
Subarea runoff =      0.055(CFS) for      0.040(Ac.)
Total runoff =      0.069(CFS)  Total area =       0.050(Ac.)
Depth of flow =   0.134(Ft.), Average velocity =   3.856(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      0.050(Ac.)
Runoff from this stream =      0.069(CFS)
Time of concentration =   12.37 min.
Rainfall intensity =     5.142(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Rainfall intensity (I) =      6.428(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   8.75 min.  Rain intensity =       6.43(In/Hr)
Total area =       5.000(Ac.)  Total runoff =    13.794(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      5.000(Ac.)
Runoff from this stream =     13.794(CFS)
Time of concentration =    8.75 min.
Rainfall intensity =     6.428(In/Hr)
Summary of stream data:

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


1        0.069     12.37             5.142
2       13.794      8.75             6.428
Qmax(1) =
       1.000 *    1.000 *     0.069) +
       0.800 *    1.000 *    13.794) + =      11.105
Qmax(2) =
       1.000 *    0.708 *     0.069) +
       1.000 *    1.000 *    13.794) + =      13.843
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
       0.069      13.794
Maximum flow rates at confluence using above data:
       11.105       13.843
Area of streams before confluence:
        0.050        5.000
Results of confluence:
Total flow rate =     13.843(CFS)
Time of concentration =     8.750 min.
Effective stream area after confluence =      5.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   311.100(Ft.)
Downstream point/station elevation =   302.600(Ft.)
Pipe length  =   209.00(Ft.) Slope =   0.0407  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.843(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    13.843(CFS)
Normal flow depth in pipe =   10.61(In.)
Flow top width inside pipe =   17.71(In.)
Critical Depth =   16.52(In.)
Pipe flow velocity =     12.78(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     9.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      5.050(Ac.)
Runoff from this stream =     13.843(CFS)
Time of concentration =    9.02 min.
Rainfall intensity =     6.302(In/Hr)
Summary of stream data:

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


1       11.045      8.36             6.620
2        6.593     10.19             5.826
3       13.843      9.02             6.302
Qmax(1) =
       1.000 *    1.000 *    11.045) +
       1.000 *    0.820 *     6.593) +
       1.000 *    0.926 *    13.843) + =      29.277
Qmax(2) =
       0.880 *    1.000 *    11.045) +
       1.000 *    1.000 *     6.593) +
       0.925 *    1.000 *    13.843) + =      29.111
Qmax(3) =
       0.952 *    1.000 *    11.045) +
       1.000 *    0.885 *     6.593) +
       1.000 *    1.000 *    13.843) + =      30.194

Total of 3 main streams to confluence:
Flow rates before confluence point:
      11.045       6.593      13.843
Maximum flow rates at confluence using above data:
       29.277       29.111       30.194
Area of streams before confluence:
```

```
            2.827       2.170       5.050


 Results of confluence:
 Total flow rate =     30.194(CFS)
 Time of concentration =     9.023 min.
 Effective stream area after confluence  =     10.047(Ac.)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station      106.000 to Point/Station      107.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****
 ________________________________________________________________________
 Upstream point/station elevation =   302.500(Ft.)
 Downstream point/station elevation =   302.100(Ft.)
 Pipe length  =    31.00(Ft.) Slope =   0.0129  Manning's N = 0.013
 No. of pipes = 1  Required pipe flow  =    30.194(CFS)
 Given pipe size =     18.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
      8.961(Ft.)  at the headworks or inlet of the pipe(s)
  Pipe friction loss =      2.561(Ft.)
  Minor friction loss =      6.800(Ft.)  K-factor =   1.50
 Pipe flow velocity =     17.09(Ft/s)
 Travel time through pipe =    0.03 min.
 Time of concentration (TC) =     9.05 min.


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station      107.000 to Point/Station      109.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****
 ________________________________________________________________________
 Upstream point/station elevation =   302.100(Ft.)
 Downstream point/station elevation =   285.720(Ft.)
 Pipe length  =   137.00(Ft.) Slope =   0.1196  Manning's N = 0.013
 No. of pipes = 1  Required pipe flow  =    30.194(CFS)
 Given pipe size =     18.00(In.)
 Calculated individual pipe flow  =    30.194(CFS)
 Normal flow depth in pipe =   12.54(In.)
 Flow top width inside pipe =   16.55(In.)
 Critical depth could not be calculated.
 Pipe flow velocity =     22.99(Ft/s)
 Travel time through pipe =    0.10 min.
 Time of concentration (TC) =     9.15 min.


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station      109.000 to Point/Station      109.000
 **** CONFLUENCE OF MINOR STREAMS ****
 ________________________________________________________________________
 Along Main Stream number: 1 in normal stream number 1
 Stream flow area =     10.047(Ac.)
 Runoff from this stream =     30.194(CFS)
 Time of concentration =    9.15 min.
 Rainfall intensity =     6.244(In/Hr)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station     2002.000 to Point/Station     2003.000
 **** INITIAL AREA EVALUATION ****
 ________________________________________________________________________
 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
 [COMMERCIAL area type                        ]
 (General Commercial    )
 Impervious value, Ai = 0.850
 Sub-Area C Value = 0.810
```

```
Initial subarea total flow distance  =   93.000(Ft.)
Highest elevation =  318.000(Ft.)
Lowest elevation =  316.300(Ft.)
Elevation difference =    1.700(Ft.) Slope =  1.828 %
Top of Initial Area Slope adjusted by User to  1.400 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.40 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.61 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8100)*(  60.000^.5)/(   1.400^(1/3)]=   3.61
Calculated TC of    3.614 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
Subarea runoff =      0.254(CFS)
Total initial stream area =        0.034(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2003.000 to Point/Station     2004.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.206(CFS)
Depth of flow =   0.250(Ft.), Average velocity =   1.603(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.31
    2             26.00              0.13
    3             27.50              0.00
    4             27.50              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      2.206(CFS)
  '     '    flow top width =     18.940(Ft.)
  '     '    velocity=    1.603(Ft/s)
  '     '    area =      1.376(Sq.Ft)
  '     '    Froude number =     1.048

Upstream point elevation =   316.300(Ft.)
Downstream point elevation =   310.800(Ft.)
Flow length =   625.000(Ft.)
Travel time  =    6.50 min.
Time of concentration =   10.11 min.
Depth of flow =   0.250(Ft.)
Average velocity =   1.603(Ft/s)
Total irregular channel flow =     2.206(CFS)
Irregular channel normal depth above invert elev. =   0.250(Ft.)
Average velocity of channel(s) =   1.603(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.855(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.804 given for subarea
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.804  CA =      0.700
Subarea runoff =      3.848(CFS) for      0.837(Ac.)
Total runoff =      4.102(CFS)  Total area =       0.871(Ac.)
Depth of flow =   0.289(Ft.), Average velocity =   1.862(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2000.000 to Point/Station      109.000
**** SUBAREA FLOW ADDITION ****

________________________________________________________________________
Rainfall intensity (I) =      5.855(In/Hr) for a   100.0 year storm
```

```
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                ]
(14.5 DU/A or Less      )
Impervious value, Ai = 0.500
Sub-Area C Value = 0.595
Time of concentration =    10.11 min.
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.719  CA =      1.057
Subarea runoff =      2.090(CFS) for      0.600(Ac.)
Total runoff =      6.192(CFS)  Total area =       1.471(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2001.000 to Point/Station      109.000
**** SUBAREA FLOW ADDITION ****

____________________________________________________________________________
Rainfall intensity (I) =      5.855(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
[COMMERCIAL area type                      ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Time of concentration =    10.11 min.
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.733  CA =      1.409
Subarea runoff =      2.060(CFS) for      0.451(Ac.)
Total runoff =      8.252(CFS)  Total area =       1.922(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2004.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

____________________________________________________________________________
Upstream point/station elevation =   306.830(Ft.)
Downstream point/station elevation =   285.720(Ft.)
Pipe length  =   211.00(Ft.) Slope =   0.1000  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.252(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     8.252(CFS)
Normal flow depth in pipe =    6.11(In.)
Flow top width inside pipe =   17.05(In.)
Critical Depth =   13.35(In.)
Pipe flow velocity =     15.60(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    10.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      109.000
**** CONFLUENCE OF MINOR STREAMS ****

____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.922(Ac.)
Runoff from this stream =      8.252(CFS)
Time of concentration =   10.34 min.
Rainfall intensity =     5.773(In/Hr)
Summary of stream data:

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

```

```
1243
1244        1       30.194       9.15             6.244
1245        2        8.252      10.34             5.773
1246        Qmax(1) =
1247               1.000 *    1.000 *    30.194) +
1248               1.000 *    0.885 *     8.252) + =      37.500
1249        Qmax(2) =
1250               0.925 *    1.000 *    30.194) +
1251               1.000 *    1.000 *     8.252) + =      36.167
1252
1253        Total of 2 streams to confluence:
1254        Flow rates before confluence point:
1255              30.194       8.252
1256        Maximum flow rates at confluence using above data:
1257               37.500       36.167
1258        Area of streams before confluence:
1259               10.047        1.922
1260        Results of confluence:
1261        Total flow rate =     37.500(CFS)
1262        Time of concentration =     9.152 min.
1263        Effective stream area after confluence =     11.969(Ac.)
1264        End of computations, total study area =          11.969 (Ac.)
1265
1266
1267
```

6l. CivilD Mitigated Onsite Reach 1 Calculations

```
1
2                San Diego County Rational Hydrology Program
3
4       CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0
5
6       Rational method hydrology  program based on
7       San Diego County Flood Control Division 2003 hydrology manual
8           Rational Hydrology Study        Date: 04/26/24
9       ------------------------------------------------------------------------
10      19025 Post Dev Mitigated
11      100 Year Study Reach 1
12      post100r1mit.rd3
13
14      ------------------------------------------------------------------------
15       *********   Hydrology Study Control Information **********
16
17      ------------------------------------------------------------------------
18
19
20      Program License Serial Number 6332
21
22      ------------------------------------------------------------------------
23      Rational hydrology study storm event year is   100.0
24      English (in-lb) input data Units used
25
26      Map data precipitation entered:
27      6 hour,  precipitation(inches) =  3.500
28      24 hour precipitation(inches) =  6.000
29      P6/P24 =    58.3%
30      San Diego hydrology manual 'C' values used
31
32
33      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
34      Process from Point/Station      100.000 to Point/Station      101.000
35      **** INITIAL AREA EVALUATION ****
36
37      Decimal fraction soil group A = 1.000
38      Decimal fraction soil group B = 0.000
39      Decimal fraction soil group C = 0.000
40      Decimal fraction soil group D = 0.000
41      [MEDIUM DENSITY RESIDENTIAL                  ]
42      (7.3 DU/A or Less       )
43      Impervious value, Ai = 0.400
44      Sub-Area C Value = 0.480
45      Initial subarea total flow distance  =   53.000(Ft.)
46      Highest elevation =  316.800(Ft.)
47      Lowest elevation =  316.700(Ft.)
48      Elevation difference =    0.100(Ft.) Slope =  0.189 %
49      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
50      The maximum overland flow distance is 50.00 (Ft)
51      for the top area slope value of   0.19 %, in a development type of
52       7.3 DU/A or Less
53      In Accordance With Figure 3-3
54      Initial Area Time of Concentration =  13.75 minutes
55      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
56      TC = [1.8*(1.1-0.4800)*(  50.000^.5)/(   0.189^(1/3)]=  13.75
57      The initial area total distance of   53.00 (Ft.) entered leaves a
58      remaining distance of    3.00 (Ft.)
59      Using Figure 3-4, the travel time for this distance is   0.20 minutes
60      for a distance of   3.00 (Ft.) and a slope of  0.19 %
61      with an elevation difference of   0.01(Ft.) from the end of the top area
62      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
63       =    0.203 Minutes
64      Tt=[(11.9*0.0006^3)/(  0.01)]^.385=  0.20
65      Total initial area Ti =  13.75 minutes from Figure 3-3 formula plus
66        0.20 minutes from the Figure 3-4 formula =  13.95 minutes
67      Rainfall intensity (I) =      4.757(In/Hr) for a   100.0 year storm
68      Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
69      Subarea runoff =      0.068(CFS)
```

```
Total initial stream area =        0.030(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.228(CFS)
Depth of flow =   0.095(Ft.), Average velocity =   0.591(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.33
    2             23.00              0.00
    3             28.50              0.33
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      0.228(CFS)
  '     '    flow top width =      8.130(Ft.)
  '     '    velocity=    0.591(Ft/s)
  '     '    area =      0.386(Sq.Ft)
  '     '    Froude number =     0.478

Upstream point elevation =   316.700(Ft.)
Downstream point elevation =   316.300(Ft.)
Flow length =   193.000(Ft.)
Travel time  =    5.44 min.
Time of concentration =   19.39 min.
Depth of flow =   0.095(Ft.)
Average velocity =   0.591(Ft/s)
Total irregular channel flow =     0.228(CFS)
Irregular channel normal depth above invert elev. =   0.095(Ft.)
Average velocity of channel(s) =   0.591(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      3.847(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Rainfall intensity =      3.847(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.480  CA =      0.082
Subarea runoff =      0.245(CFS) for      0.140(Ac.)
Total runoff =      0.314(CFS)  Total area =      0.170(Ac.)
Depth of flow =   0.107(Ft.), Average velocity =   0.640(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________________________
Rainfall intensity (I) =      3.847(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Time of concentration =    19.39 min.
Rainfall intensity =      3.847(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.393  CA =      0.114
```

```
Subarea runoff =      0.125(CFS) for      0.120(Ac.)
Total runoff =      0.439(CFS)  Total area =       0.290(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   310.200(Ft.)
Downstream point/station elevation =   309.000(Ft.)
Pipe length  =   250.00(Ft.) Slope =   0.0048  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.439(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     0.439(CFS)
Normal flow depth in pipe =    3.42(In.)
Flow top width inside pipe =   10.84(In.)
Critical Depth =    3.28(In.)
Pipe flow velocity =      2.37(Ft/s)
Travel time through pipe =    1.76 min.
Time of concentration (TC) =    21.15 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 1
Stream flow area =      0.290(Ac.)
Runoff from this stream =      0.439(CFS)
Time of concentration =   21.15 min.
Rainfall intensity =     3.637(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1100.000 to Point/Station     1101.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance  =   59.000(Ft.)
Highest elevation =  336.700(Ft.)
Lowest elevation =  321.600(Ft.)
Elevation difference =   15.100(Ft.) Slope = 25.593 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  25.59 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.07 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2700)*( 100.000^.5)/(  25.593^(1/3)]=   5.07
Rainfall intensity (I) =      9.140(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff =      0.173(CFS)
Total initial stream area =       0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1101.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.544(CFS)
Depth of flow =   0.128(Ft.), Average velocity =   3.658(Ft/s)
```

```
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.60
    2             16.00              0.00
    3             46.00              1.20
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.544(CFS)
  '     '    flow top width =      6.605(Ft.)
  '     '    velocity=    3.658(Ft/s)
  '     '    area =      0.422(Sq.Ft)
  '     '    Froude number =     2.549

Upstream point elevation =   321.600(Ft.)
Downstream point elevation =   309.000(Ft.)
Flow length =   236.000(Ft.)
Travel time  =    1.08 min.
Time of concentration =    6.15 min.
Depth of flow =   0.128(Ft.)
Average velocity =   3.658(Ft/s)
Total irregular channel flow =     1.544(CFS)
Irregular channel normal depth above invert elev. =   0.128(Ft.)
Average velocity of channel(s) =   3.658(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.073(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.534
Rainfall intensity =      8.073(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.509  CA =      0.371
Subarea runoff =      2.825(CFS) for      0.660(Ac.)
Total runoff =      2.998(CFS)  Total area =       0.730(Ac.)
Depth of flow =   0.164(Ft.), Average velocity =   4.317(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 2
Stream flow area =      0.730(Ac.)
Runoff from this stream =      2.998(CFS)
Time of concentration =    6.15 min.
Rainfall intensity =     8.073(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3003.000 to Point/Station      103.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

__________________________________________________________________________
User specified 'C' value of 0.360 given for subarea
Rainfall intensity (I) =      7.186(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.36 min.  Rain intensity =       7.19(In/Hr)
Total area =       0.777(Ac.)  Total runoff =     2.020(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****

__________________________________________________________________________
```

```
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.777(Ac.)
Runoff from this stream =      2.020(CFS)
Time of concentration =    7.36 min.
Rainfall intensity =     7.186(In/Hr)
Summary of stream data:

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


1        0.439     21.15             3.637
2        2.998      6.15             8.073
3        2.020      7.36             7.186
Qmax(1) =
       1.000 *    1.000 *     0.439) +
       0.451 *    1.000 *     2.998) +
       0.506 *    1.000 *     2.020) + =       2.812
Qmax(2) =
       1.000 *    0.291 *     0.439) +
       1.000 *    1.000 *     2.998) +
       1.000 *    0.835 *     2.020) + =       4.812
Qmax(3) =
       1.000 *    0.348 *     0.439) +
       0.890 *    1.000 *     2.998) +
       1.000 *    1.000 *     2.020) + =       4.841

Total of 3 streams to confluence:
Flow rates before confluence point:
       0.439       2.998       2.020
Maximum flow rates at confluence using above data:
        2.812        4.812        4.841
Area of streams before confluence:
        0.290        0.730        0.777
Results of confluence:
Total flow rate =      4.841(CFS)
Time of concentration =     7.360 min.
Effective stream area after confluence =      1.797(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   304.200(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =   189.00(Ft.) Slope =   0.0048  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.841(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     4.841(CFS)
Normal flow depth in pipe =   10.76(In.)
Flow top width inside pipe =   17.65(In.)
Critical Depth =   10.14(In.)
Pipe flow velocity =      4.39(Ft/s)
Travel time through pipe =    0.72 min.
Time of concentration (TC) =     8.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.797(Ac.)
Runoff from this stream =      4.841(CFS)
Time of concentration =    8.08 min.
Rainfall intensity =     6.768(In/Hr)
```

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

------------------------------------------------------------------------------
Decimal fraction soil group A = 0.050
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                         ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.839
Initial subarea total flow distance  =   50.000(Ft.)
Highest elevation =  316.800(Ft.)
Lowest elevation =  316.200(Ft.)
Elevation difference =    0.600(Ft.) Slope =  1.200 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.20 %, in a development type of
 Office Professional
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.42 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8395)*(  60.000^.5)/(   1.200^(1/3)]=   3.42
Calculated TC of    3.418 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.839
Subarea runoff =      0.310(CFS)
Total initial stream area =        0.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      2.245(CFS)
Depth of flow =   0.209(Ft.), Average velocity =   2.102(Ft/s)
    ******* Irregular Channel Data ***********
-------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.30
    2              1.50              0.00
    3             45.50              1.00
    4             61.50              1.50
Manning's 'N' friction factor =   0.015
-------------------------------------------------------------
Sub-Channel flow  =      2.245(CFS)
  '     '    flow top width =     10.230(Ft.)
  '     '    velocity=    2.102(Ft/s)
  '     '    area =      1.068(Sq.Ft)
  '     '    Froude number =     1.147

Upstream point elevation =   316.200(Ft.)
Downstream point elevation =   314.500(Ft.)
Flow length =   185.000(Ft.)
Travel time  =    1.47 min.
Time of concentration =    4.88 min.
Depth of flow =   0.209(Ft.)
Average velocity =   2.102(Ft/s)
Total irregular channel flow =     2.245(CFS)
Irregular channel normal depth above invert elev. =   0.209(Ft.)
Average velocity of channel(s) =   2.102(Ft/s)
 Adding area flow to channel
Calculated TC of    4.885 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(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
[COMMERCIAL area type                        ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.840
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.840  CA =      0.454
Subarea runoff =      3.873(CFS) for      0.500(Ac.)
Total runoff =      4.183(CFS)  Total area =      0.540(Ac.)
Depth of flow =   0.264(Ft.), Average velocity =   2.456(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

____________________________________________________________________________
Upstream point/station elevation =   308.500(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =    48.00(Ft.) Slope =   0.1083  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.183(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     4.183(CFS)
Normal flow depth in pipe =    4.95(In.)
Flow top width inside pipe =   11.82(In.)
Critical Depth =   10.36(In.)
Pipe flow velocity =     13.68(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     4.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****

____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.540(Ac.)
Runoff from this stream =      4.183(CFS)
Time of concentration =    4.94 min.
Rainfall intensity =     9.222(In/Hr)


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

____________________________________________________________________________
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
[COMMERCIAL area type                        ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Initial subarea total flow distance  =   42.000(Ft.)
Highest elevation =  316.000(Ft.)
Lowest elevation =  314.700(Ft.)
Elevation difference =    1.300(Ft.) Slope =  3.095 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   3.10 %, in a development type of
 Neighborhod Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.64 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7800)*(  85.000^.5)/(   3.095^(1/3)]=   3.64
Calculated TC of    3.644 minutes is less than 5 minutes,
```

```
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
Subarea runoff =      0.288(CFS)
Total initial stream area =        0.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.259(CFS)
Depth of flow =   0.087(Ft.), Average velocity =   2.583(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             64.00              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.259(CFS)
  '     '    flow top width =     11.169(Ft.)
  '     '    velocity=    2.583(Ft/s)
  '     '    area =      0.487(Sq.Ft)
  '     '    Froude number =     2.180

Upstream point elevation =   314.700(Ft.)
Downstream point elevation =   313.000(Ft.)
Flow length =    38.000(Ft.)
Travel time  =    0.25 min.
Time of concentration =    3.89 min.
Depth of flow =   0.087(Ft.)
Average velocity =   2.583(Ft/s)
Total irregular channel flow =     1.259(CFS)
Irregular channel normal depth above invert elev. =   0.087(Ft.)
Average velocity of channel(s) =   2.583(Ft/s)
 Adding area flow to channel
Calculated TC of    3.889 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(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
[COMMERCIAL area type                         ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.780  CA =      0.242
Subarea runoff =      1.942(CFS) for      0.270(Ac.)
Total runoff =      2.230(CFS)  Total area =       0.310(Ac.)
Depth of flow =   0.108(Ft.), Average velocity =   2.980(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

________________________________________________________________________
Upstream point/station elevation =   306.000(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =    30.00(Ft.) Slope =   0.0900  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.230(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     2.230(CFS)
Normal flow depth in pipe =    3.72(In.)
```

```
Flow top width inside pipe =   11.10(In.)
Critical Depth =    7.66(In.)
Pipe flow velocity =     10.75(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     3.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.310(Ac.)
Runoff from this stream =      2.230(CFS)
Time of concentration =    3.94 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

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


1        4.841      8.08             6.768
2        4.183      4.94             9.222
3        2.230      3.94             9.222
Qmax(1) =
       1.000 *    1.000 *     4.841) +
       0.734 *    1.000 *     4.183) +
       0.734 *    1.000 *     2.230) + =       9.548
Qmax(2) =
       1.000 *    0.612 *     4.841) +
       1.000 *    1.000 *     4.183) +
       1.000 *    1.000 *     2.230) + =       9.375
Qmax(3) =
       1.000 *    0.487 *     4.841) +
       1.000 *    0.796 *     4.183) +
       1.000 *    1.000 *     2.230) + =       7.919

Total of 3 streams to confluence:
Flow rates before confluence point:
       4.841       4.183       2.230
Maximum flow rates at confluence using above data:
        9.548        9.375        7.919
Area of streams before confluence:
        1.797        0.540        0.310
Results of confluence:
Total flow rate =      9.548(CFS)
Time of concentration =     8.077 min.
Effective stream area after confluence =      2.647(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   303.300(Ft.)
Downstream point/station elevation =   303.000(Ft.)
Pipe length  =    71.00(Ft.) Slope =   0.0042  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.548(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     0.966(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      0.586(Ft.)
 Minor friction loss =      0.680(Ft.)  K-factor =   1.50
Pipe flow velocity =      5.40(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     8.30 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 1
Stream flow area =      2.647(Ac.)
Runoff from this stream =      9.548(CFS)
Time of concentration =    8.30 min.
Rainfall intensity =     6.652(In/Hr)


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

____________________________________________________________________________
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
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  316.100(Ft.)
Lowest elevation =  312.600(Ft.)
Elevation difference =    3.500(Ft.) Slope =  3.500 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   3.50 %, in a development type of
 43.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.50 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7800)*(  85.000^.5)/(   3.500^(1/3)]=   3.50
The initial area total distance of  100.00 (Ft.) entered leaves a
remaining distance of   15.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   0.23 minutes
for a distance of  15.00 (Ft.) and a slope of  3.50 %
with an elevation difference of   0.53(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    0.228 Minutes
Tt=[(11.9*0.0028^3)/(  0.53)]^.385=  0.23
Total initial area Ti =   3.50 minutes from Figure 3-3 formula plus
  0.23 minutes from the Figure 3-4 formula =   3.73 minutes
Calculated TC of    3.726 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
Subarea runoff =      0.791(CFS)
Total initial stream area =        0.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

____________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.043(CFS)
Depth of flow =   0.351(Ft.), Average velocity =   4.504(Ft/s)
    ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.10
    2             34.00              0.40
    3             35.50              0.00
    4             35.50              0.50
Manning's 'N' friction factor =   0.015
```

```
------------------------------------------------------------------
Sub-Channel flow  =      1.043(CFS)
  '     '    flow top width =      1.318(Ft.)
  '     '    velocity=    4.504(Ft/s)
  '     '    area =      0.232(Sq.Ft)
  '     '    Froude number =     1.894

Upstream point elevation =   312.600(Ft.)
Downstream point elevation =   310.600(Ft.)
Flow length =    67.000(Ft.)
Travel time  =    0.25 min.
Time of concentration =    3.97 min.
Depth of flow =   0.351(Ft.)
Average velocity =   4.504(Ft/s)
Total irregular channel flow =     1.043(CFS)
Irregular channel normal depth above invert elev. =   0.351(Ft.)
Average velocity of channel(s) =   4.504(Ft/s)
 Adding area flow to channel
Calculated TC of    3.974 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(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
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.780  CA =      0.140
Subarea runoff =      0.503(CFS) for      0.070(Ac.)
Total runoff =      1.295(CFS)  Total area =       0.180(Ac.)
Depth of flow =   0.381(Ft.), Average velocity =   4.754(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 2
Stream flow area =      0.180(Ac.)
Runoff from this stream =      1.295(CFS)
Time of concentration =    3.97 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

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


1        9.548      8.30             6.652
2        1.295      3.97             9.222
Qmax(1) =
       1.000 *    1.000 *     9.548) +
       0.721 *    1.000 *     1.295) + =      10.482
Qmax(2) =
       1.000 *    0.479 *     9.548) +
       1.000 *    1.000 *     1.295) + =       5.868

Total of 2 streams to confluence:
Flow rates before confluence point:
       9.548       1.295
Maximum flow rates at confluence using above data:
      10.482        5.868
Area of streams before confluence:
       2.647        0.180
Results of confluence:
```

```
Total flow rate =     10.482(CFS)
Time of concentration =     8.296 min.
Effective stream area after confluence =      2.827(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   303.000(Ft.)
Downstream point/station elevation =   302.500(Ft.)
Pipe length  =    77.00(Ft.) Slope =   0.0065  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.482(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    10.310(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      6.662(Ft.)
 Minor friction loss =      4.148(Ft.)  K-factor =   1.50
Pipe flow velocity =     13.35(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     8.39 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.827(Ac.)
Runoff from this stream =     10.482(CFS)
Time of concentration =    8.39 min.
Rainfall intensity =     6.603(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      106.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
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
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity (I) =      5.819(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  10.21 min.  Rain intensity =       5.82(In/Hr)
Total area =       2.170(Ac.)  Total runoff =     5.047(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.170(Ac.)
Runoff from this stream =      5.047(CFS)
Time of concentration =   10.21 min.
Rainfall intensity =     5.819(In/Hr)
Program is now starting with Main Stream No. 3


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

```
Process from Point/Station     1004.000 to Point/Station     1005.000
**** INITIAL AREA EVALUATION ****

----------------------------------------------------------------------
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance  =   30.000(Ft.)
Highest elevation =  334.800(Ft.)
Lowest elevation =  327.500(Ft.)
Elevation difference =    7.300(Ft.) Slope = 24.333 %
Top of Initial Area Slope adjusted by User to  0.189 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of   0.19 %, in a development type of
 1.0 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =  12.20 minutes
 (for slope value of   0.50 %)
Rainfall intensity (I) =      5.187(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff =      0.014(CFS)
Total initial stream area =        0.010(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1005.000 to Point/Station     1003.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      0.042(CFS)
Depth of flow =   0.111(Ft.), Average velocity =   3.401(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 =   0.015
---------------------------------------------------------------
Sub-Channel flow  =      0.042(CFS)
  '     '    flow top width =      0.222(Ft.)
  '     '    velocity=    3.401(Ft/s)
  '     '    area =      0.012(Sq.Ft)
  '     '    Froude number =     2.543

Upstream point elevation =   327.500(Ft.)
Downstream point elevation =   324.500(Ft.)
Flow length =    34.000(Ft.)
Travel time  =    0.17 min.
Time of concentration =   12.37 min.
Depth of flow =   0.111(Ft.)
Average velocity =   3.401(Ft/s)
Total irregular channel flow =     0.042(CFS)
Irregular channel normal depth above invert elev. =   0.111(Ft.)
Average velocity of channel(s) =   3.401(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.142(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
```

```
Sub-Area C Value = 0.270
Rainfall intensity =      5.142(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.270  CA =      0.014
Subarea runoff =      0.055(CFS) for      0.040(Ac.)
Total runoff =      0.069(CFS)  Total area =       0.050(Ac.)
Depth of flow =   0.134(Ft.), Average velocity =   3.856(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      0.050(Ac.)
Runoff from this stream =      0.069(CFS)
Time of concentration =   12.37 min.
Rainfall intensity =     5.142(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Rainfall intensity (I) =      6.428(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   8.75 min.  Rain intensity =       6.43(In/Hr)
Total area =       5.000(Ac.)  Total runoff =    13.794(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      5.000(Ac.)
Runoff from this stream =     13.794(CFS)
Time of concentration =    8.75 min.
Rainfall intensity =     6.428(In/Hr)
Summary of stream data:

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


1        0.069     12.37             5.142
2       13.794      8.75             6.428
Qmax(1) =
       1.000 *    1.000 *     0.069) +
       0.800 *    1.000 *    13.794) + =      11.105
Qmax(2) =
       1.000 *    0.708 *     0.069) +
       1.000 *    1.000 *    13.794) + =      13.843

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.069      13.794
Maximum flow rates at confluence using above data:
       11.105       13.843
Area of streams before confluence:
        0.050        5.000
```

```
Results of confluence:
Total flow rate =     13.843(CFS)
Time of concentration =     8.750 min.
Effective stream area after confluence =      5.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   311.100(Ft.)
Downstream point/station elevation =   302.600(Ft.)
Pipe length  =   209.00(Ft.) Slope =   0.0407  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.843(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    13.843(CFS)
Normal flow depth in pipe =   10.61(In.)
Flow top width inside pipe =   17.71(In.)
Critical Depth =   16.52(In.)
Pipe flow velocity =     12.78(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     9.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      5.050(Ac.)
Runoff from this stream =     13.843(CFS)
Time of concentration =    9.02 min.
Rainfall intensity =     6.302(In/Hr)
Summary of stream data:

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


1       10.482      8.39             6.603
2        5.047     10.21             5.819
3       13.843      9.02             6.302
Qmax(1) =
       1.000 *    1.000 *    10.482) +
       1.000 *    0.822 *     5.047) +
       1.000 *    0.930 *    13.843) + =      27.506
Qmax(2) =
       0.881 *    1.000 *    10.482) +
       1.000 *    1.000 *     5.047) +
       0.923 *    1.000 *    13.843) + =      27.065
Qmax(3) =
       0.954 *    1.000 *    10.482) +
       1.000 *    0.884 *     5.047) +
       1.000 *    1.000 *    13.843) + =      28.306

Total of 3 main streams to confluence:
Flow rates before confluence point:
      10.482       5.047      13.843
Maximum flow rates at confluence using above data:
       27.506       27.065       28.306
Area of streams before confluence:
        2.827        2.170        5.050


Results of confluence:
Total flow rate =     28.306(CFS)
Time of concentration =     9.023 min.
Effective stream area after confluence  =     10.047(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   302.500(Ft.)
Downstream point/station elevation =   302.100(Ft.)
Pipe length  =    31.00(Ft.) Slope =   0.0129  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.306(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     7.827(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      2.250(Ft.)
 Minor friction loss =      5.976(Ft.)  K-factor =   1.50
Pipe flow velocity =     16.02(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     9.05 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   302.100(Ft.)
Downstream point/station elevation =   285.720(Ft.)
Pipe length  =   137.00(Ft.) Slope =   0.1196  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.306(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    28.306(CFS)
Normal flow depth in pipe =   11.95(In.)
Flow top width inside pipe =   17.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.73(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     9.16 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      109.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     10.047(Ac.)
Runoff from this stream =     28.306(CFS)
Time of concentration =    9.16 min.
Rainfall intensity =     6.243(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2002.000 to Point/Station     2003.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
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
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.810
Initial subarea total flow distance  =   93.000(Ft.)
Highest elevation =  318.000(Ft.)
Lowest elevation =  316.300(Ft.)
Elevation difference =    1.700(Ft.) Slope =  1.828 %
Top of Initial Area Slope adjusted by User to  1.400 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
```

```
for the top area slope value of   1.40 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.61 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8100)*(  60.000^.5)/(   1.400^(1/3)]=   3.61
Calculated TC of    3.614 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
Subarea runoff =      0.254(CFS)
Total initial stream area =        0.034(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2003.000 to Point/Station     2004.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.206(CFS)
Depth of flow =   0.250(Ft.), Average velocity =   1.603(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.31
    2             26.00              0.13
    3             27.50              0.00
    4             27.50              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      2.206(CFS)
  '     '    flow top width =     18.940(Ft.)
  '     '    velocity=    1.603(Ft/s)
  '     '    area =      1.376(Sq.Ft)
  '     '    Froude number =     1.048

Upstream point elevation =   316.300(Ft.)
Downstream point elevation =   310.800(Ft.)
Flow length =   625.000(Ft.)
Travel time  =    6.50 min.
Time of concentration =   10.11 min.
Depth of flow =   0.250(Ft.)
Average velocity =   1.603(Ft/s)
Total irregular channel flow =     2.206(CFS)
Irregular channel normal depth above invert elev. =   0.250(Ft.)
Average velocity of channel(s) =   1.603(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.855(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.804 given for subarea
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.804  CA =      0.700
Subarea runoff =      3.848(CFS) for      0.837(Ac.)
Total runoff =      4.102(CFS)  Total area =       0.871(Ac.)
Depth of flow =   0.289(Ft.), Average velocity =   1.862(Ft/s)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Process from Point/Station     2000.000 to Point/Station      109.000
**** SUBAREA FLOW ADDITION ****

________________________________________________________________________
Rainfall intensity (I) =      5.855(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(14.5 DU/A or Less      )
Impervious value, Ai = 0.500
```

```
Sub-Area C Value = 0.595
Time of concentration =    10.11 min.
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.719  CA =      1.057
Subarea runoff =      2.090(CFS) for      0.600(Ac.)
Total runoff =      6.192(CFS)  Total area =       1.471(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2001.000 to Point/Station      109.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Rainfall intensity (I) =      5.855(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
[COMMERCIAL area type                          ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Time of concentration =    10.11 min.
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.733  CA =      1.409
Subarea runoff =      2.060(CFS) for      0.451(Ac.)
Total runoff =      8.252(CFS)  Total area =       1.922(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2004.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   306.830(Ft.)
Downstream point/station elevation =   285.720(Ft.)
Pipe length  =   211.00(Ft.) Slope =   0.1000  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.252(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     8.252(CFS)
Normal flow depth in pipe =    6.11(In.)
Flow top width inside pipe =   17.05(In.)
Critical Depth =   13.35(In.)
Pipe flow velocity =     15.60(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    10.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      109.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.922(Ac.)
Runoff from this stream =      8.252(CFS)
Time of concentration =   10.34 min.
Rainfall intensity =     5.773(In/Hr)
Summary of stream data:

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


1       28.306      9.16             6.243
2        8.252     10.34             5.773
Qmax(1) =
       1.000 *    1.000 *    28.306) +
       1.000 *    0.886 *     8.252) + =      35.615
Qmax(2) =
```

```
            0.925 *    1.000 *    28.306) +
            1.000 *    1.000 *     8.252) + =      34.427

      Total of 2 streams to confluence:
      Flow rates before confluence point:
            28.306       8.252
      Maximum flow rates at confluence using above data:
            35.615       34.427
      Area of streams before confluence:
            10.047        1.922
      Results of confluence:
      Total flow rate =     35.615(CFS)
      Time of concentration =     9.155 min.
      Effective stream area after confluence =     11.969(Ac.)
      End of computations, total study area =          11.969 (Ac.)
```