DRAINAGE STUDY

For

GREENHILLS RANCH – PHASE 2

9385 ADLAI ROAD
LAKESDIE, CA 92040

Prepared for**:**

Dan Jill Goodman
Trustees of the Goodman Irrevocable Trust
Dated December 11,1992

Prepared by:

REC Consultants, Inc.
2442 Second Avenue
San Diego, CA 92101
Telephone: 619-232-9200

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CHAPTER 1 - EXECUTIVE SUMMARY

1.1 - Introduction

The Greenhills Ranch project site is located east of Lake Jennings Park Road and south of Julian Avenue within the County of San Diego, California.

The project site drains to four (4) Points of Compliance (POC): POC-1 is located to the south near the intersection of Audubon Rd and Adlai Road; POC-2 is located to the northwestern portion of the project site; and POC-3 is located to the north of the project site slightly east of POC-2. POC-4 is located at the north property line, however, since there will be a slight reduction in drainage area (runoff from the development will instead flow to a biofiltration basin) and no proposed impervious area, this POC was not analyzed since there will be a lower post-developed 100-year peak flow rate. Please see attached exhibits.

This study analyzes existing and developed condition 100-year peak flowrates from the development to the individual POCs from the project site.

The project site lies outside any FEMA 100-year floodplain zones. Therefore, no Letters of Map Revision will be required.

Treatment of storm water runoff from the site has been addressed in a separate report - the “Storm Water Quality Management Plan for Green Hills Ranch – Phase 2” prepared by REC Consultants, Inc. and dated July 2019. Hydromodification (HMP) analysis has been presented within the “Technical Memorandum: SWMM Modeling for Green Hills Ranch – Phase 2”, prepared by REC Consultants, Inc. and dated July 2019.

Per County of San Diego drainage criteria, the Modified Rational Method should be used to determine peak design flowrates when the contributing drainage area is less than 1.0 square mile. Since the total watershed area discharging from the site is less than 1.0 square mile, the AES computer software was used to model the pre & post developed condition runoff response per the Modified Rational Method.

Methodology used for the computation of design rainfall events, runoff coefficients, and rainfall intensity values are consistent with criteria set forth in the “County of San Diego Drainage Design Manual” dated 2003. A more detailed explanation of methodology used for this analysis is listed in Chapter 2 of this report.

Hydraulic Modified-Puls detention basin routing of the aforementioned AES rational method hydrology was performed using the Army Corps of Engineers HEC-HMS 4.0 software.

1.2 – Summary of Existing Conditions

In existing conditions, the Green Hills Ranch – Phase 2 project site is a vegetated hilltop-site containing four (4) residences. Type C and D hydrologic soil groups were located on the project site via the USGS web soil survey data for the project site (see Chapter 2).

Runoff from the existing site flows to one (1) of ten (10) POCs. POC 1 is a catch basin located near the intersection of Adlai Road and Adlai Terrace. POCs 2 through 10 are natural flow paths. Note that POCs 2 through 10 receive offsite runoff from the adjacent hill. The project site ultimately drains to the receiving San Diego River located approximately 2.5 miles west of the project site.

Per County of San Diego criteria: 0.36 and 0.41 were the assumed runoff coefficients used for the weighted coefficient, 0.37, for the tributary area to POC 1. Tributary areas to POC 2 and 3 also contain C and D-type soils, therefore, a weighted runoff coefficient of 0.34 was assumed. A coefficient value of 0.35 was used for the tributary areas to POC 4-10. Per County of San Diego rainfall isopluvial maps, the design 100-year rainfall depth for the project site is 2.86 inches.

Table 1 below summarizes the existing condition design 100-year peak flow from the project site. The complete analysis can be found in Chapter 3 of this report.

TABLE 1 – Summary of Existing Condition Flows

Discharge Location	Drainage Area (Ac)	Imp %	C coeff	Tc (min)	Intensity (in/hr)	100-Year Peak Flow (cfs)	Peak Velocity (fps)
POC-1	11.45	10%	0.37	16.25	3.52	14.9	2.22
POC-2	1.03	0%	0.34	8.51	5.35	1.8	1.93
POC-3	1.68	0%	0.34	8.52	5.34	2.7	1.45
POC-4	7.02	0%	0.35	-	-	-	-
POC-5	1.6	0%	0.35	-	-	-	-
POC-6	2.0	0%	0.34	-	-	-	-
POC-7	1.6	0%	0.34	-	-	-	-
POC-8	2.7	0%	0.34	-	-	-	-
POC-9	1.2	0%	0.34	-	-	-	-
POC-10	1.6	0%	0.34	-	-	-	-
TOTAL	31.88	-	-	-	-	19.4	-

1.3 – Summary of Developed Conditions

The Greenhills Ranch – Phase 2 project proposes the construction of 64 single family residences and access roads. Three (3) out of the four (4) existing residences will remain undisturbed.

Tributary areas draining to POC 1 will be treated by two (2) multiple purpose onsite biofiltration best management practice (BMP) detention facilities. These basins serve to meet water quality, hydromodification and peak flow reduction requirements for the project site. Undeveloped areas that drain to POC 1 will bypass BMP treatment.

Developed site runoff from tributary areas to POC 2 and POC 3 will be intercepted by one (1) multiple purpose onsite BMP detention facility, and will be discharged to both POCs through the use of two (2) outlet structures, one per BMP. Undeveloped areas that drain to POC 2 and POC 3 will bypass BMP treatment.

Tributary areas to POCs 4 through 10 will remain the same as in existing conditions (i.e. undeveloped) therefore; runoff will remain the same and will not be treated.

Forty eight (48) residential homes are located within the developed portion (11.4 ac) of the tributary area to POC 1. Per County of San Diego criteria, runoff coefficients of 0.48 and 0.52 were used in the determination of weighted coefficient value, 0.48. Sixteen (16) residential homes are located within the developed portion (3.2 ac) of the tributary areas to POC 2 and 3. Runoff coefficients of 0.54 and 0.57 were used in the determination of weighted coefficient value, 0.54. Values of 0.30 and 0.35 were used for the tributary areas to POC 4-10. Per County of San Diego rainfall isopluvial maps, the design 100-year rainfall depth for the project site is 2.86 inches.

Table 2 summarizes the developed, unmitigated condition design 100-year peak flow from the project site. The complete analysis can be found in Chapter 4 of this report. Table 3 summaries the developed, mitigated condition design 100-year peak flow from the project site. The complete analysis can be found in Chapter 5 of this report.

TABLE 2 – Summary of Developed Condition Flows – Unmitigated

Discharge Location	Drainage Area (Ac)	Imp %	C coeff	Tc (min)	Intensity (in/hr)	100-Year Peak Flow (cfs)	Peak Velocity (fps)
POC-1	11.49	54%	0.48	11.58	4.38	25.43	8.51
POC-2	1.08	53%	0.54	13.89	3.93	6.01	8.50
POC-3	1.75	28%	0.54	14.12	3.86	6.01	21.39
POC-4	6.86	0%	0.35	-	-	-	-
POC-5	1.6	0%	0.35	-	-	-	-
POC-6	2.0	0%	0.34	-	-	-	-
POC-7	1.6	0%	0.34	-	-	-	-
POC-8	2.7	0%	0.34	-	-	-	-
POC-9	1.2	0%	0.34	-	-	-	-
POC-10	1.6	0%	0.34	-	-	-	-
TOTAL	31.88	-	-	-	-	37.45	-

TABLE 3 – Summary of Developed Condition Flows - Mitigated

Discharge Location	Drainage Area (Ac)	Imp %	C coeff	Tc (min)	Intensity (in/hr)	100-Year Peak Flow (cfs)	Peak Velocity (fps)
POC-1	11.49	54%	0.48	23.48	2.78	8.2	6.42
POC-2	1.08	53%	0.54	13.89	3.42	1.7	8.50
POC-3	1.75	28%	0.54	17.0	3.42	2.4	15.65
POC-4	6.86	0%	0.35	-	-	-	-
POC-5	1.6	0%	0.35	-	-	-	-
POC-6	2.0	0%	0.34	-	-	-	-
POC-7	1.6	0%	0.34	-	-	-	-
POC-8	2.7	0%	0.34	-	-	-	-
POC-9	1.2	0%	0.34	-	-	-	-
POC-10	1.6	0%	0.34	-	-	-	-
TOTAL	31.88	-	-	-	-	12.3	-

Please note flows outletting to the POCs shall pass over an energy dissipator (rip rap) in order to prevent scouring and erosion.

Prior to discharging from the site, first flush runoff will be treated via the biofiltration based BMP in accordance with standards set forth by the Regional Water Quality Control Board and the County of San Diego's BMP Design Manual (see "Storm Water Quality Management Plan for Green Hills Ranch – Phase 2").

Three (3) LID biofiltration basins are located within the project site and are responsible for handling hydromodification requirements for the project. In developed conditions, the basins will have surface ponding and riser spillway structures (see dimensions in Tables 4 and 5). Flows will then discharge from the basin via the outlet structures or infiltrate through the bio-filtration layer of the facilities to the low flow orifices. The riser structure will act as a spillway such that peak flows can be safely discharged to the receiving storm drain systems.

Beneath the basins' invert lies the proposed LID biofiltration portion of the drainage facility. This portion of the basin is comprised of a 3-inch layer of mulch, an 18-inch layer of amended soil (a highly sandy, organic rich composite with an infiltration capacity of at least 5 inches/hr) and a layer of gravel.

TABLE 4 – SUMMARY OF BMP BASIN DIMENSIONS

BMP	Tributary Area (Ac)[7]	DIMENSIONS					
		BMP Area[1] (ft^2)	Gravel Depth[2] (in)	Lower Orif. D (in)[3]	Elev. Weir (ft)[4]	Weir Perimeter Length[5] (ft)	Total Surface Depth[6] (ft)
1	10.880	13,066	18	1-2.25"	3.50	12	4.5
2	2.584	3,642	18	2 - $^{7}/_{8}$" [8]	2.50	16[9]	3.0
3	0.495	626	18	1-0.5"	2.50	8	3.0

Notes:
(1): Area of amended soil equal to area of gravel
(2): Gravel depth needed to comply with hydromodification purposes. Includes 6" of filter material.
(3): Diameter of orifice in gravel layer with invert at bottom of layer; tied with hydromod min threshold ($0.1 \cdot Q_2$).
(4): Depth of ponding beneath riser structure's surface spillway.
(5): Overflow length, the internal perimeter of the riser is 8 ft (2 ft x 2 ft internal dimensions).
(6): Total surface depth of BMP from top of amended soil to crest elevation.
(7): Tributary area to basin not including area of BMP.
(8): BMP 2 has two riser structures 2-2 and 2-3 which drain to POC-2 and POC-3 respectively. Each one has one LID low orifice, measuring 0.875".
(9): Structure 2-2 and 2-3 each has an 8 foot perimeter weir.

TABLE 5 – SUMMARY OF OUTLET DETAILS:

BASIN	Low Surface Orifices		Lower Slot		Emergency Weir	
	# - dia (in)	Elev. (ft) [1]	W (in) x H (in)	Elev. (ft)[1]	L (ft)	Elev. (ft)[1]
1	4 - 1"	1.25	72 x 3 (4 slots 18 x 3)	2.50	12	3.50
2 [2]	2- ¾"	1.25	36 x 3 (2 slots, 18 x 3 each)	2.00	8	2.50
2 [3]	n/a	n/a	36 x 3 (2 slots, 18 x 3 each)	2.00	8	2.50
3	1- 1"	1.25	n/a	n/a	8	2.50

Notes:
(1): All elevations measured from the top of the amended soil (amended soil/mulch interphase)
(2): This is structure 2-2, which drains to POC-2
(3): This is the outlet structure of BMP-2 that drains to POC-3 (identical than the other but with no low surface orifices)

The developed condition peak flows calculated using the modified rational method were then routed through the detention facilities on the project site in HEC-HMS. The HMS Modified-Puls results are summarized in Table 6.

TABLE 6 – SUMMARY OF DETENTION BASIN ROUTING

Detention Basin	100-Year Peak Inflow (cfs)	100-Year Peak Outflow (cfs)	Peak Water Surface Elevation (ft)[(1)]
BMP-1	24.05	7.19	5.32
BMP-2	6.01	4.11	4.18
BMP-3	2.36	2.09	4.92

(1) : Biofiltraion layer included as part of basin depth – volume reduced by voids accordingly

It should be noted that as a conservative design approach, it has been assumed that the 85th percentile water quality event volume was stored in the detention facilities prior to the routing of the 100-year event storm. 85th percentile volumes are provided in Chapter 6 of this report. The volumes are a conservative hydraulic design methodology only. For water quality discussion and BMP sizing analysis, please refer to the site specific SWMP.

Additionally, as the detention facilities are multiple purpose water quality and hydromodfication BMPs, there is available storage provided in the biofiltration layers of the basins; namely the engineered fill soil layer and the underlying gravel base layer. As HEC-HMS uses an elevation-storage-discharge function to model the basin volume (stage-storage) and basin discharge (stage-discharge) relationships, the available storage volume provided by these aforementioned sub-layers is accounted for by reducing the total sub-basin volume by the corresponding void ratio for each layer (0.4 for gravel and 0.3 for soil respectively).

Rational method hydrographs, stage-storage, stage-discharge relationships and HEC-HMS model output is provided in Chapter 6 of this report.

1.4 - Summary of Results

Table 7 summarizes existing and developed (mitigated) condition drainage areas and resultant 100-year peak flow rates at the POC discharge locations from the Greenhills Ranch – Phase 2 site. Per County of San Diego rainfall isolpluvial maps, the design 100-year rainfall depth for the site area is 2.86 inches.

TABLE 7 – SUMMARY OF PEAK FLOWS

Discharge Location	Area (ac)			100 Year Peak Flow (cfs)		
	Existing	Developed	Difference	Existing	Developed	Difference
POC-1	11.45	11.49	0.04	14.9	8.2	-6.7
POC-2	1.03	1.08	0.05	1.8	1.7	-0.1
POC-3	1.68	1.75	0.07	2.7	2.4	-0.3
POC-4	7.02	6.86	-0.16	-	-	-
POC-5	1.6	1.6	-	-	-	-
POC-6	2.0	2.0	-	-	-	-
POC-7	1.6	1.6	-	-	-	-
POC-8	2.7	2.7	-	-	-	-
POC-9	1.2	1.2	-	-	-	-
POC-10	1.6	1.6	-	-	-	-
Total	31.88	31.88	0.0	19.4	12.3	-7.1

As shown in the above table, the proposed Greenhills Ranch – Phase 2 project site will result in a net decrease of peak flow discharged from the project site by approximately 7.1 cfs.

All developed runoff will receive water quality treatment in accordance with the site specific SWQMP. Additionally, the POC is HMP compliant as analyzed in the Hydromodification Technical Memo.

Final design details will be provided at the final engineering phase of the development.

1.5 - References

"*County of San Diego Hydrology Manual*", June 2003.

"*Q100 Routing Analysis for Greenhills Ranch – Phase 2*", prepared by REC Consultants, Inc., January 2016.

"*Storm Water Quality Management Plan for Greenhills Ranch – Phase 2*", prepared by REC Consultants, Inc., April 2018.

"*Technical Memorandum: SWMM Modeling for Greenhills Ranch – Phase 2*", prepared by REC Consultants, Inc., April 2018

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1.6 - Declaration of Responsible Charge

THIS DRAINAGE STUDY HAS BEEN PREPARED UNDER THE DIRECTION OF THE FOLLOWING REGISTERED CIVIL ENGINEER. THE REGISTERED ENGINEER ATTESTS TO THE TECHNICAL INFORMATION CONTAINED HEREIN AND THE ENGINEERING DATA UPON WHICH RECOMMENDATIONS, CONCLUSIONS, AND DECISIONS ARE BASED.

Jonathan Raab Rydeen **R.C.E. 64811**

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CHAPTER 2: METHODOLOGY – RATIONAL METHOD PEAK FLOWRATE DETERMINATION

2.1 – County of San Diego Design Criteria

SECTION 3
RATIONAL METHOD AND MODIFIED RATIONAL METHOD

3.1 THE RATIONAL METHOD

The Rational Method (RM) is a mathematical formula used to determine the maximum runoff rate from a given rainfall. It has particular application in urban storm drainage, where it is used to estimate peak runoff rates from small urban and rural watersheds for the design of storm drains and small drainage structures. The RM is recommended for analyzing the runoff response from drainage areas up to approximately 1 square mile in size. It should not be used in instances where there is a junction of independent drainage systems or for drainage areas greater than approximately 1 square mile in size. In these instances, the Modified Rational Method (MRM) should be used for junctions of independent drainage systems in watersheds up to approximately 1 square mile in size (see Section 3.4); or the NRCS Hydrologic Method should be used for watersheds greater than approximately 1 square mile in size (see Section 4).

The RM can be applied using any design storm frequency (e.g., 100-year, 50-year, 10-year, etc.). The local agency determines the design storm frequency that must be used based on the type of project and specific local requirements. A discussion of design storm frequency is provided in Section 2.3 of this manual. A procedure has been developed that converts the 6-hour and 24-hour precipitation isopluvial map data to an Intensity-Duration curve that can be used for the rainfall intensity in the RM formula as shown in Figure 3-1. The RM is applicable to a 6-hour storm duration because the procedure uses Intensity-Duration Design Charts that are based on a 6-hour storm duration.

3.1.1 Rational Method Formula

The RM formula estimates the peak rate of runoff at any location in a watershed as a function of the drainage area (A), runoff coefficient (C), and rainfall intensity (I) for a duration equal to the time of concentration (T_c), which is the time required for water to

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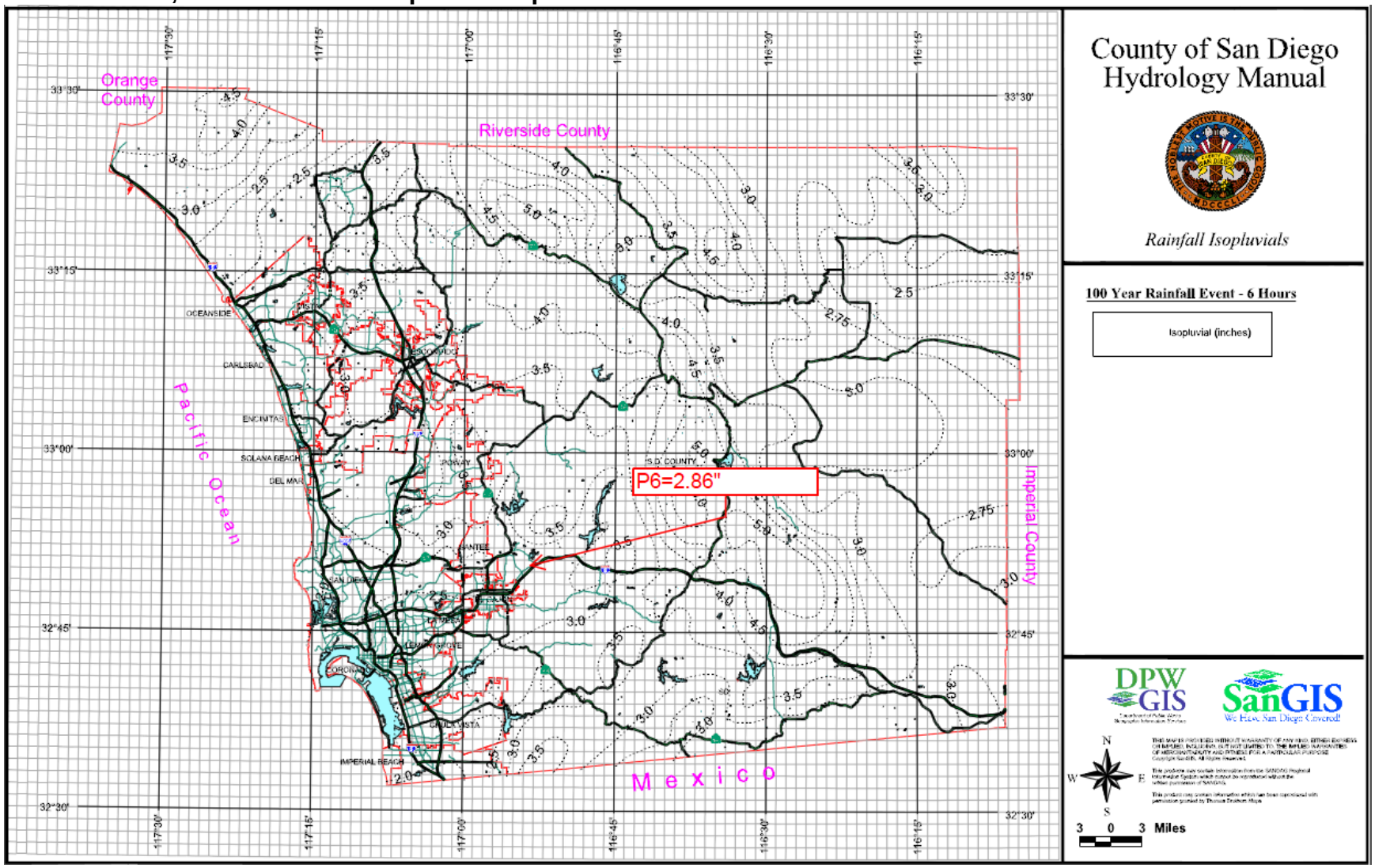
2.2 – Design Rainfall Determination

2.2.1 – 100-Year, 6-Hour Rainfall Isopluvial Map



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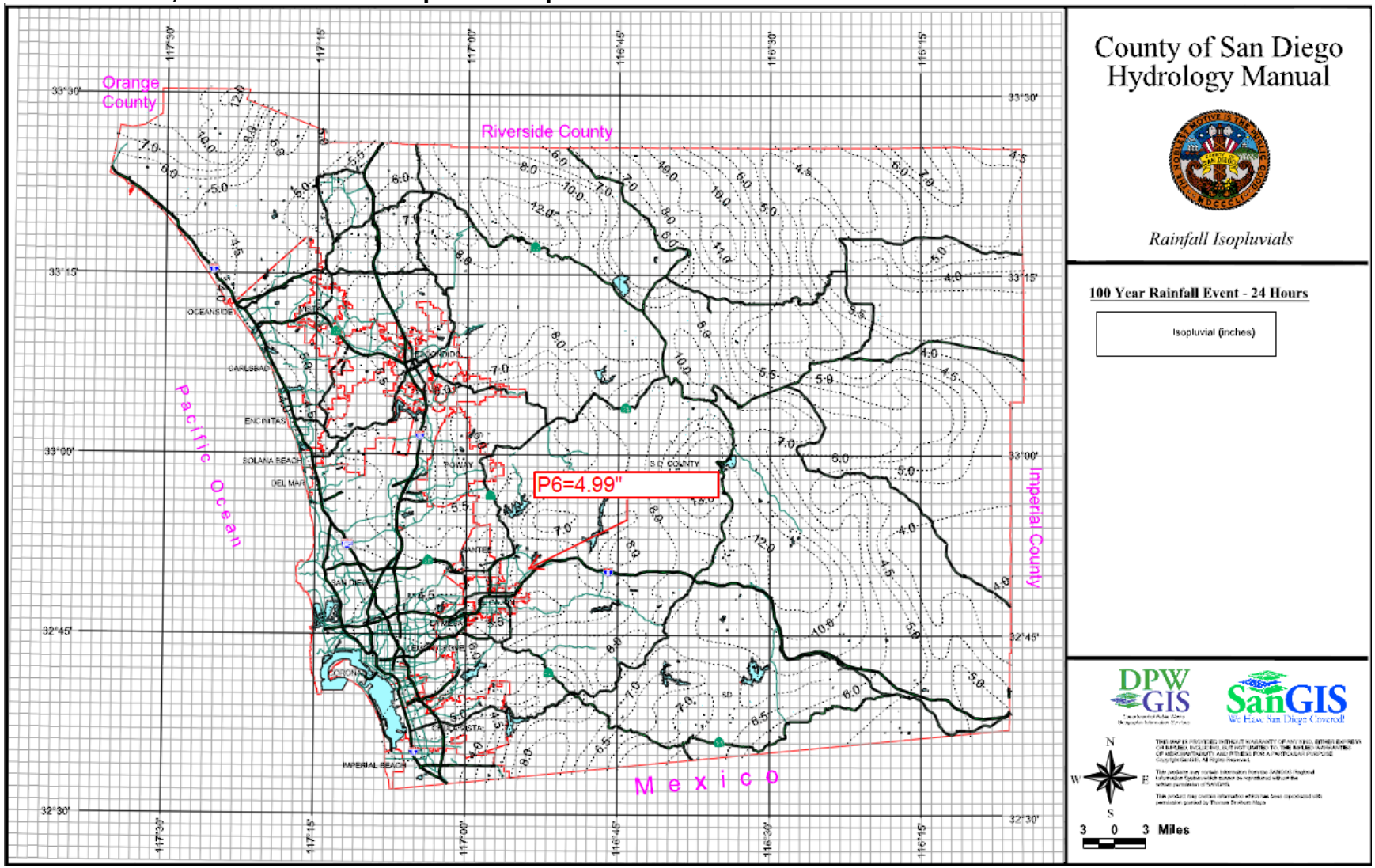
2.2.2 – 100-Year, 24-Hour Rainfall Isopluvial Map



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2.3 – Runoff Coefficient Determination

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

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

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

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PRE DEVELOPED AREAS

	Type C HSG		Type D HSG			
Area	Area (ac)	C	Area (ac)	C	Total Area (ac)	Weighted C
1	22.80	0.36	2.80	0.41	25.6	0.37
2	4.66	0.30	18.10	0.35	22.8	0.34
3	0.81	0.30	6.22	0.35	7.0	0.34
4	0.00	0.30	4.14	0.35	4.1	0.35
5	0.00	0.30	2.12	0.35	2.1	0.35
6	0.00	0.30	1.63	0.35	1.6	0.35
Total	28.3		35.0		63.3	

POST DEVELOPED AREAS

	Type C HSG		Type D HSG			
Area	Area (ac)	C	Area (ac)	C	Total Area (ac)	Weighted C
1	11.73	0.48	0.09	0.52	11.8	0.48
Bypass 1	11.15	0.30	2.71	0.35	13.9	0.31
2	2.55	0.54	0.50	0.57	3.0	0.54
Bypass 2	2.20	0.30	17.65	0.35	19.9	0.34
3	0.68	0.30	6.13	0.35	6.8	0.35
4	0.00	0.30	4.14	0.35	4.1	0.35
5	0.00	0.30	2.12	0.35	2.1	0.35
6	0.00	0.30	1.63	0.35	1.6	0.35
Total	28.3		35.0		63.3	

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2.4 – Urban Watershed Overland Time of flow Nomograph

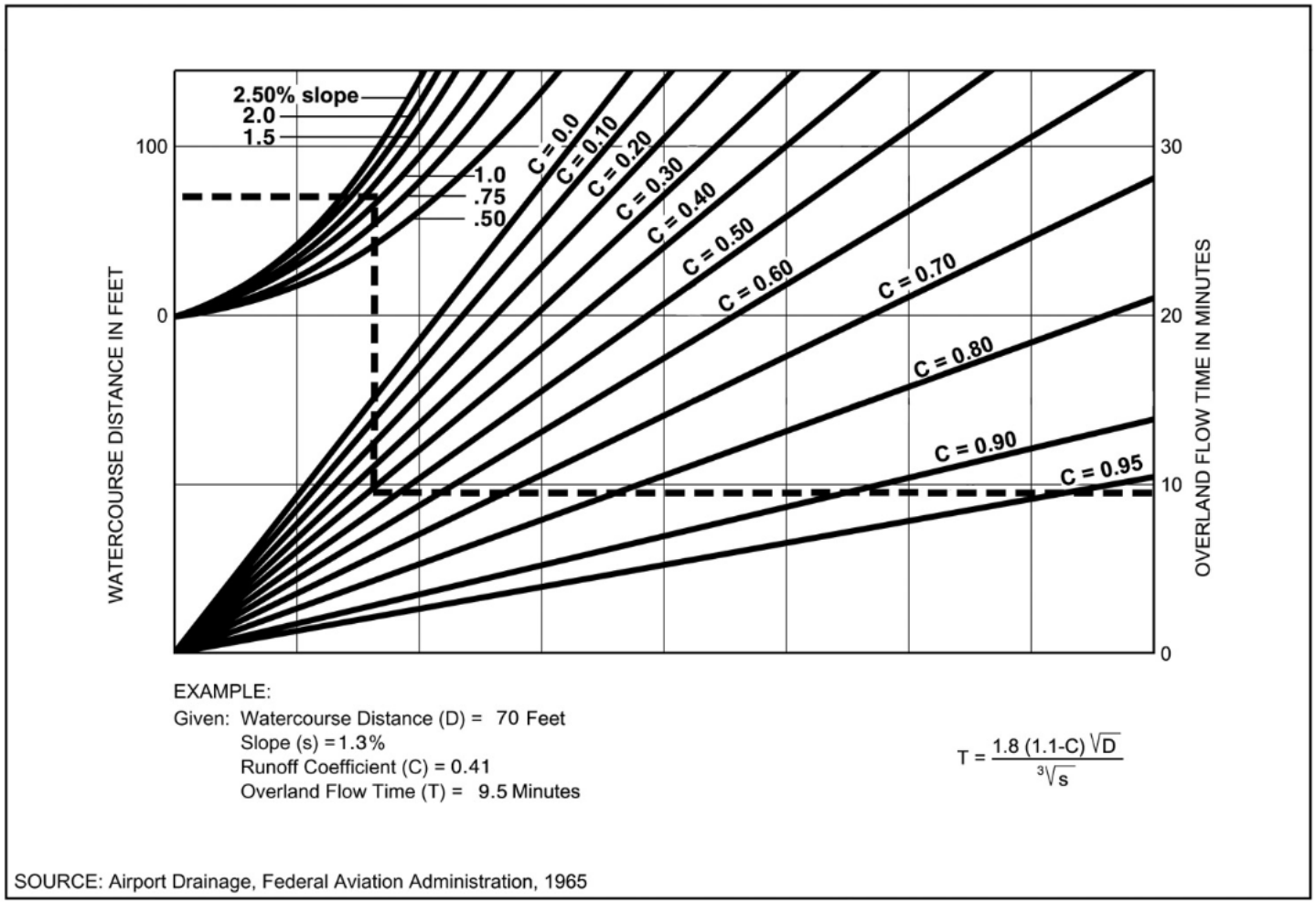

FIGURE 3-3

Rational Formula - Overland Time of Flow Nomograph

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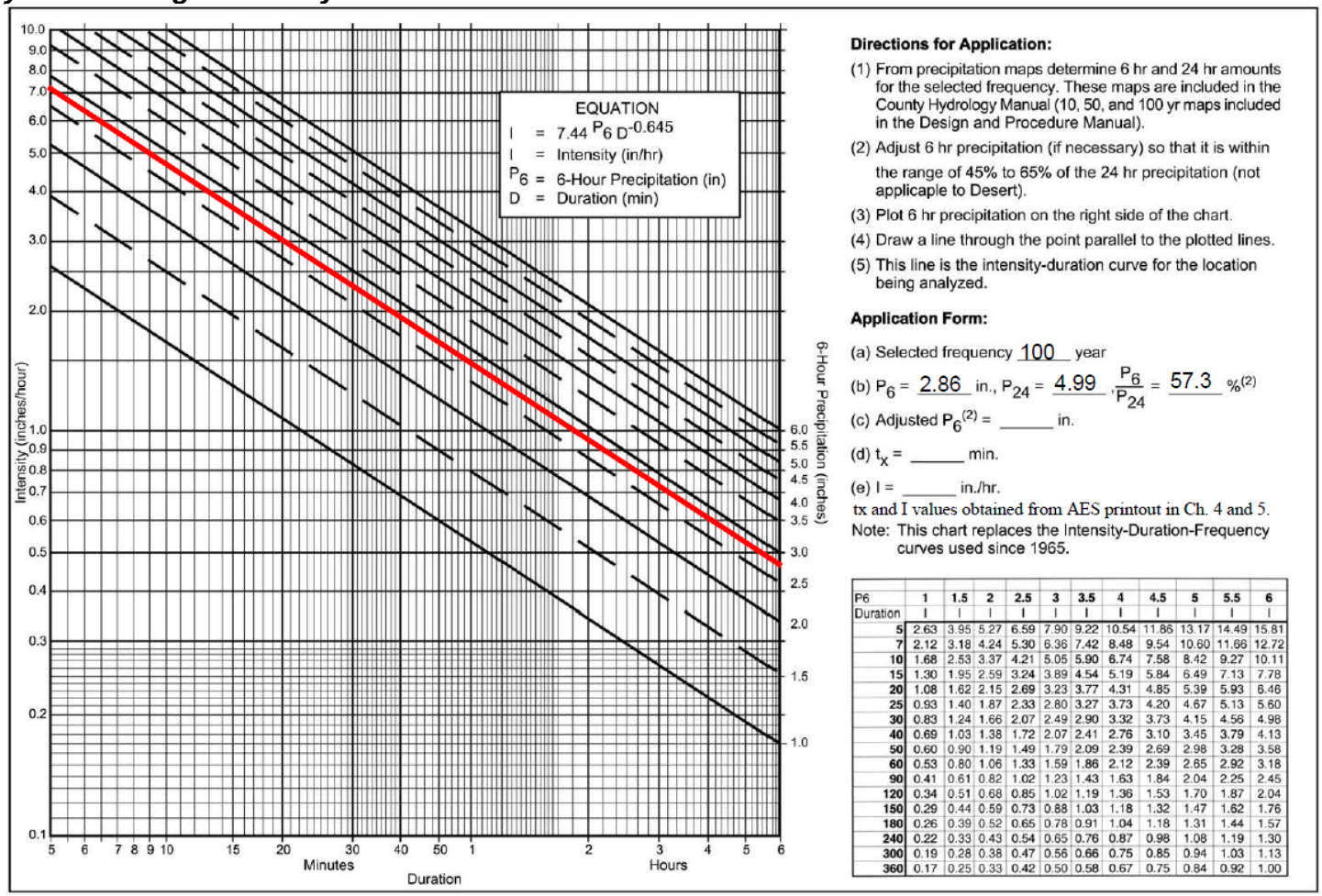
2.5 – County of San Diego Intensity-Duration Curve



Directions for Application:

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

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

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

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

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

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 2.86 in., P_{24} = 4.99, $\frac{P_6}{P_{24}}$ = 57.3 %(2)

(c) Adjusted $P_6^{(2)}$ = _____ in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

tx and I values obtained from AES printout in Ch. 4 and 5.

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

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

Intensity-Duration Design Chart - Template

FIGURE 3-1

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2.6– Model Development Summary (from County of San Diego Hydrology Manual)

3.2 Developing Input Data for the Rational Method

This section describes the development of the necessary data to perform RM calculations. Section 3.3 describes the RM calculation process. Input data for calculating peak flows and T_c's with the RM should be developed as follows:

1. On a topographic base map, outline the overall drainage area boundary, showing adjacent drains, existing and proposed drains, and overland flow paths.

2. Verify the accuracy of the drainage map in the field.

3. Divide the drainage area into subareas by locating significant points of interest. These divisions should be based on topography, soil type, and land use. Ensure that an appropriate first subarea is delineated. For natural areas, the first subarea flow path length should be less than or equal to 4,000 feet plus the overland flow length (Table 3-2). For developed areas, the initial subarea flow path length should be consistent with Table 3-2. The topography and slope within the initial subarea should be generally uniform.

4. Working from upstream to downstream, assign a number representing each subarea in the drainage system to each point of interest. Figure 3-8 provides guidelines for node numbers for geographic information system (GIS)-based studies.

5. Measure each subarea in the drainage area to determine its size in acres (A).

6. Determine the length and effective slope of the flow path in each subarea.

7. Identify the soil type for each subarea.

8. Determine the runoff coefficient (C) for each subarea based on Table 3-1. If the subarea contains more than one type of development classification, use a proportionate average for C. In determining C for the subarea, use future land use taken from the applicable community plan, Multiple Species Conservation Plan, National Forest land use plan, etc.

9. Calculate the CA value for the subarea.

10. Calculate the Σ(CA) value(s) for the subareas upstream of the point(s) of interest.

11. Determine P_6 and P_{24} for the study using the isopluvial maps provided in Appendix B. If necessary, adjust the value for P_6 to be within 45% to 65% of the value for P_{24}.

See Section 3.3 for a description of the RM calculation process.

3.3 Performing Rational Method Calculations

This section describes the RM calculation process. Using the input data, calculation of peak flows and T_c's should be performed as follows:

1. Determine T_i for the first subarea. Use Table 3-2 or Figure 3-3 as discussed in Section 3.1.4. If the watershed is natural, the travel time to the downstream end of the first subarea can be added to T_i to obtain the T_c. Refer to paragraph 3.1.4.2 (a).

2. Determine I for the subarea using Figure 3-1. If T_i was less than 5 minutes, use the 5 minute time to determine intensity for calculating the flow.

3. Calculate the peak discharge flow rate for the subarea, where $Q_p = \Sigma(CA)\, I$.
In case that the downstream flow rate is less than the upstream flow rate, due to the long travel time that is not offset by the additional subarea runoff, use the upstream peak flow for design purposes until downstream flows increase again.

4. Estimate the T_t to the next point of interest.

5. Add the T_t to the previous T_c to obtain a new T_c.

6. Continue with step 2, above, until the final point of interest is reached.

Note: The MRM should be used to calculate the peak discharge when there is a junction from independent subareas into the drainage system.

3.4 MODIFIED RATIONAL METHOD (FOR JUNCTION ANALYSIS)

The purpose of this section is to describe the steps necessary to develop a hydrology report for a small watershed using the MRM. It is necessary to use the MRM if the watershed contains junctions of independent drainage systems. The process is based on the design manuals of the City/County of San Diego. The general process description for using this method, including an example of the application of this method, is described below.

The engineer should only use the MRM for drainage areas up to approximately 1 square mile in size. If the watershed will significantly exceed 1 square mile then the NRCS method described in Section 4 should be used. The engineer may choose to use either the RM or the MRM for calculations for up to an approximately 1-square-mile area and then transition the study to the NRCS method for additional downstream areas that exceed approximately 1 square mile. The transition process is described in Section 4.

3.4.1 Modified Rational Method General Process Description

The general process for the MRM differs from the RM only when a junction of independent drainage systems is reached. The peak Q, T_c, and I for each of the independent drainage systems at the point of the junction are calculated by the RM. The independent drainage systems are then combined using the MRM procedure described below. The peak Q, T_c, and I for each of the independent drainage systems at the point of the junction must be calculated prior to using the MRM procedure to combine the independent drainage systems, as these

values will be used for the MRM calculations. After the independent drainage systems have been combined, RM calculations are continued to the next point of interest.

3.4.2 Procedure for Combining Independent Drainage Systems at a Junction

Calculate the peak Q, T_c, and I for each of the independent drainage systems at the point of the junction. These values will be used for the MRM calculations.

At the junction of two or more independent drainage systems, the respective peak flows are combined to obtain the maximum flow out of the junction at T_c. Based on the approximation that total runoff increases directly in proportion to time, a general equation may be written to determine the maximum Q and its corresponding T_c using the peak Q, T_c, and I for each of the independent drainage systems at the point immediately before the junction. The general equation requires that contributing Q's be numbered in order of increasing T_c.

Let Q_1, T_1, and I_1 correspond to the tributary area with the shortest T_c. Likewise, let Q_2, T_2, and I_2 correspond to the tributary area with the next longer T_c; Q_3, T_3, and I_3 correspond to the tributary area with the next longer T_c; and so on. When only two independent drainage systems are combined, leave Q_3, T_3, and I_3 out of the equation. Combine the independent drainage systems using the junction equation below:

Junction Equation: $T_1 < T_2 < T_3$

$$Q_{T1} = Q_1 + \frac{T_1}{T_2} Q_2 + \frac{T_1}{T_3} Q_3$$

$$Q_{T2} = Q_2 + \frac{I_2}{I_1} Q_1 + \frac{T_2}{T_3} Q_3$$

$$Q_{T3} = Q_3 + \frac{I_3}{I_1} Q_1 + \frac{I_3}{I_2} Q_2$$

Calculate Q_{T1}, Q_{T2}, and Q_{T3}. Select the largest Q and use the T_c associated with that Q for further calculations (see the three Notes for options). If the largest calculated Q's are equal (e.g., $Q_{T1} = Q_{T2} > Q_{T3}$), use the shorter of the T_c's associated with that Q.

This equation may be expanded for a junction of more than three independent drainage systems using the same concept. The concept is that when Q from a selected subarea (e.g., Q_2) is combined with Q from another subarea with a shorter T_c (e.g., Q_1), the Q from the subarea with the shorter T_c is reduced by the ratio of the I's (I_2/I_1); and when Q from a selected subarea (e.g., Q_2) is combined with Q from another subarea with a longer T_c (e.g., Q_3), the Q from the subarea with the longer T_c is reduced by the ratio of the T_c's (T_2/T_3).

Note #1: At a junction of two independent drainage systems that have the same T_c, the tributary flows may be added to obtain the Q_p.

$$Q_p = Q_1 + Q_2 \text{; when } T_1 = T_2 \text{; and } T_c = T_1 = T_2$$

This can be verified by using the junction equation above. Let Q_3, T_3, and $I_3 = 0$. When T_1 and T_2 are the same, I_1 and I_2 are also the same, and T_1/T_2 and $I_2/I_1 = 1$. T_1/T_2 and I_2/I_1 are cancelled from the equations. At this point, $Q_{T1} = Q_{T2} = Q_1 + Q_2$.

Note #2: In the upstream part of a watershed, a conservative computation is acceptable. When the times of concentration (T_c's) are relatively close in magnitude (within 10%), use the shorter T_c for the intensity and the equation $Q = \Sigma(CA)I$.

Note #3: . An optional method of determining the T_c is to use the equation
$T_c = [(\Sigma (CA)7.44\ P_6)/Q]^{1.55}$

This equation is from $Q = \Sigma(CA)I = \Sigma(CA)(7.44\ P_6/T_c^{.645})$ and solving for T_c. The advantage in this option is that the T_c is consistent with the peak flow Q, and avoids inappropriate fluctuation in downstream flows in some cases.

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CHAPTER 3 - 100-Year Hydrologic Analysis for Existing Conditions

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 ****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1643

                            Analysis prepared by:

                               REC Consultants
                               2442 Second St.
                             San Diego, Ca 92101


 ************************** DESCRIPTION OF STUDY **************************
* Existing Condition Hydrology                                             *
* 100 Year Storm                                                          *
* Greenhills Ranch - Phase 2                                              *
 ****************************************************************************

  FILE NAME: 1083PRE.DAT
  TIME/DATE OF STUDY: 16:03 04/10/2018
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.860
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE      1.01 TO NODE      1.02 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3700
  S.C.S. CURVE NUMBER (AMC II) =  98
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    765.59
  DOWNSTREAM ELEVATION(FEET) =    760.00
  ELEVATION DIFFERENCE(FEET) =      5.59
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.404
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.850
  SUBAREA RUNOFF(CFS) =      0.61
  TOTAL AREA(ACRES) =      0.28   TOTAL RUNOFF(CFS) =      0.61

****************************************************************************
```

```
  FLOW PROCESS FROM NODE      1.02 TO NODE      1.03 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    760.00  DOWNSTREAM(FEET) =    657.25
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1178.00   CHANNEL SLOPE =  0.0872
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.524
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3700
  S.C.S. CURVE NUMBER (AMC II) =  98
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.27
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.22
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   8.84
  Tc(MIN.) =   16.25
  SUBAREA AREA(ACRES) =    11.17       SUBAREA RUNOFF(CFS) =   14.56
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.370
  TOTAL AREA(ACRES) =       11.4         PEAK FLOW RATE(CFS) =      14.93

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   2.81
  LONGEST FLOWPATH FROM NODE      1.01 TO NODE      1.03 =    1278.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.02 TO NODE      1.03 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   16.25
  RAINFALL INTENSITY(INCH/HR) =   3.52
  TOTAL STREAM AREA(ACRES) =    11.45
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     14.93

****************************************************************************
  FLOW PROCESS FROM NODE      2.01 TO NODE      2.02 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =  98
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    732.00
  DOWNSTREAM ELEVATION(FEET) =    726.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.925
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.599
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.17

****************************************************************************
  FLOW PROCESS FROM NODE      2.02 TO NODE      2.03 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    726.00  DOWNSTREAM(FEET) =    702.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    54.00   CHANNEL SLOPE =  0.4444
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.349
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3200
  S.C.S. CURVE NUMBER (AMC II) =  98
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.96
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.55
  AVERAGE FLOW DEPTH(FEET) =   0.01   TRAVEL TIME(MIN.) =   0.58
  Tc(MIN.) =    8.51
```

```
  SUBAREA AREA(ACRES) =     0.93       SUBAREA RUNOFF(CFS) =    1.59
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.318
  TOTAL AREA(ACRES) =        1.0         PEAK FLOW RATE(CFS) =       1.75

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.02   FLOW VELOCITY(FEET/SEC.) =   1.93
  LONGEST FLOWPATH FROM NODE      2.01 TO NODE      2.03 =     154.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.02 TO NODE      2.03 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.51
  RAINFALL INTENSITY(INCH/HR) =   5.35
  TOTAL STREAM AREA(ACRES) =     1.03
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.75

****************************************************************************
  FLOW PROCESS FROM NODE      3.01 TO NODE      3.02 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =  98
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    780.00
  DOWNSTREAM ELEVATION(FEET) =    750.00
  ELEVATION DIFFERENCE(FEET) =     30.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.684
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.248
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.19

****************************************************************************
  FLOW PROCESS FROM NODE      3.02 TO NODE      3.03 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    750.00  DOWNSTREAM(FEET) =    720.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   160.00   CHANNEL SLOPE =  0.1875
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.342
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =  98
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.46
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.45
  AVERAGE FLOW DEPTH(FEET) =   0.02   TRAVEL TIME(MIN.) =   1.84
  Tc(MIN.) =    8.52
  SUBAREA AREA(ACRES) =     1.56       SUBAREA RUNOFF(CFS) =    2.50
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.300
  TOTAL AREA(ACRES) =        1.7         PEAK FLOW RATE(CFS) =       2.66

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.03   FLOW VELOCITY(FEET/SEC.) =   1.91
  LONGEST FLOWPATH FROM NODE      3.01 TO NODE      3.03 =     260.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.02 TO NODE      3.03 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.52
```

```
  RAINFALL INTENSITY(INCH/HR) =   5.34
  TOTAL STREAM AREA(ACRES) =     1.66
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.66
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.7  TC(MIN.) =      8.52
  PEAK FLOW RATE(CFS)   =       2.66
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 4 - 100-Year Hydrologic Analysis for Developed Conditions - Unmitigated

```
**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1643

                          Analysis prepared by:

                             REC Consultants
                             2442 Second St.
                            San Diego, Ca 92101


 ************************* DESCRIPTION OF STUDY *************************
* Proposed Conditions Hydrology - Unmitigated                            *
* 100 Year Storm                                                         *
* Greenhills Ranch Phase 2                                               *
 ************************************************************************

  FILE NAME: 1083PSTU.DAT
  TIME/DATE OF STUDY: 08:07 07/19/2019
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.860
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE      1.11 TO NODE      1.12 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    770.00
  DOWNSTREAM ELEVATION(FEET) =    767.08
  ELEVATION DIFFERENCE(FEET) =      2.92
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.562
```

```
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    93.80
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.770
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE      1.12 TO NODE      1.13 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  767.08  DOWNSTREAM ELEVATION(FEET) =  729.22
  STREET LENGTH(FEET) =   480.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.82
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.24
    HALFSTREET FLOOD WIDTH(FEET) =    4.28
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.10
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.22
  STREET FLOW TRAVEL TIME(MIN.) =   1.57   Tc(MIN.) =    9.13
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.109
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  SUBAREA AREA(ACRES) =    1.26      SUBAREA RUNOFF(CFS) =    3.09
  TOTAL AREA(ACRES) =        1.4        PEAK FLOW RATE(CFS) =       3.34

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   6.91
  FLOW VELOCITY(FEET/SEC.) =  5.38   DEPTH*VELOCITY(FT*FT/SEC.) =   1.54
  LONGEST FLOWPATH FROM NODE      1.11 TO NODE      1.13 =     580.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.13 TO NODE      1.14 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   726.22  DOWNSTREAM(FEET) =   693.47
  FLOW LENGTH(FEET) =   460.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.76
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.34
  PIPE TRAVEL TIME(MIN.) =   0.71    Tc(MIN.) =    9.84
  LONGEST FLOWPATH FROM NODE      1.11 TO NODE      1.14 =    1040.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.13 TO NODE      1.14 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
```

```
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      1.21 TO NODE      1.22 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    731.72
  DOWNSTREAM ELEVATION(FEET) =    729.62
  ELEVATION DIFFERENCE(FEET) =      2.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.296
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.261
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE      1.22 TO NODE      1.23 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  729.62  DOWNSTREAM ELEVATION(FEET) =  698.92
  STREET LENGTH(FEET) =  1180.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.06
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   10.27
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.58
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.24
  STREET FLOW TRAVEL TIME(MIN.) =   5.50   Tc(MIN.) =   10.79
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.587
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  SUBAREA AREA(ACRES) =    3.47      SUBAREA RUNOFF(CFS) =    7.64
  TOTAL AREA(ACRES) =        3.5        PEAK FLOW RATE(CFS) =       7.72

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.41   HALFSTREET FLOOD WIDTH(FEET) =  13.71
  FLOW VELOCITY(FEET/SEC.) =  4.12   DEPTH*VELOCITY(FT*FT/SEC.) =   1.68
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.23 =    1235.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.23 TO NODE      1.24 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   695.92  DOWNSTREAM(FEET) =   694.92
  FLOW LENGTH(FEET) =     6.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.43
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.72
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   10.80
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.24 =    1241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.23 TO NODE      1.24 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.80
  RAINFALL INTENSITY(INCH/HR) =   4.59
  TOTAL STREAM AREA(ACRES) =     3.51
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.72

****************************************************************************
  FLOW PROCESS FROM NODE      1.31 TO NODE      1.32 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    724.18
  DOWNSTREAM ELEVATION(FEET) =    720.59
  ELEVATION DIFFERENCE(FEET) =      3.59
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.984
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.074
  SUBAREA RUNOFF(CFS) =      0.35
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.35

****************************************************************************
  FLOW PROCESS FROM NODE      1.32 TO NODE      1.33 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  720.59  DOWNSTREAM ELEVATION(FEET) =  698.97
  STREET LENGTH(FEET) =   535.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.87
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    5.84
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.76
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.00
  STREET FLOW TRAVEL TIME(MIN.) =   2.37   Tc(MIN.) =    9.36
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.030
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  SUBAREA AREA(ACRES) =    1.26      SUBAREA RUNOFF(CFS) =    3.04
  TOTAL AREA(ACRES) =        1.4        PEAK FLOW RATE(CFS) =       3.33

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   8.34
  FLOW VELOCITY(FEET/SEC.) =  4.09   DEPTH*VELOCITY(FT*FT/SEC.) =   1.27
  LONGEST FLOWPATH FROM NODE      1.31 TO NODE      1.33 =     630.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.33 TO NODE      1.24 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   695.97  DOWNSTREAM(FEET) =   694.92
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.92
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.33
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    9.40
  LONGEST FLOWPATH FROM NODE      1.31 TO NODE      1.24 =     655.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.33 TO NODE      1.24 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.40
  RAINFALL INTENSITY(INCH/HR) =   5.01
  TOTAL STREAM AREA(ACRES) =     1.38
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.33

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        7.72    10.80        4.586          3.51
      2        3.33     9.40        5.014          1.38

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       10.05     9.40       5.014
      2       10.76    10.80       4.586

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.76   Tc(MIN.) =   10.80
  TOTAL AREA(ACRES) =        4.9
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.24 =    1241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.24 TO NODE      1.14 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   694.92  DOWNSTREAM(FEET) =   693.47
  FLOW LENGTH(FEET) =    41.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.2 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.93
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.76
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   10.86
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.14 =    1282.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.21 TO NODE      1.14 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       10.76    10.86       4.569        4.89
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.14 =    1282.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        3.34     9.84       4.868        1.36
  LONGEST FLOWPATH FROM NODE      1.11 TO NODE      1.14 =    1040.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      13.09       9.84        4.868
      2      13.90      10.86        4.569

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      13.90   Tc(MIN.) =   10.86
  TOTAL AREA(ACRES) =        6.2

****************************************************************************
  FLOW PROCESS FROM NODE      1.14 TO NODE      1.15 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   693.47  DOWNSTREAM(FEET) =   688.33
  FLOW LENGTH(FEET) =    65.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.97
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.90
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   10.93
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.15 =    1347.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.14 TO NODE      1.15 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.93
  RAINFALL INTENSITY(INCH/HR) =   4.55
  TOTAL STREAM AREA(ACRES) =     6.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.90

****************************************************************************
  FLOW PROCESS FROM NODE      1.41 TO NODE      1.42 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    770.00
  DOWNSTREAM ELEVATION(FEET) =    769.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.337
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    70.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.037
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.11

****************************************************************************
  FLOW PROCESS FROM NODE      1.42 TO NODE      1.43 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  769.00  DOWNSTREAM ELEVATION(FEET) =  691.67
  STREET LENGTH(FEET) =   790.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.67
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    3.16
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.90
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.29
  STREET FLOW TRAVEL TIME(MIN.) =   2.23   Tc(MIN.) =   11.57
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.387
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  SUBAREA AREA(ACRES) =    1.49      SUBAREA RUNOFF(CFS) =    3.14
  TOTAL AREA(ACRES) =        1.5        PEAK FLOW RATE(CFS) =       3.23

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   6.28
  FLOW VELOCITY(FEET/SEC.) =  5.91   DEPTH*VELOCITY(FT*FT/SEC.) =   1.62
  LONGEST FLOWPATH FROM NODE      1.41 TO NODE      1.43 =     890.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.43 TO NODE      1.15 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   688.67  DOWNSTREAM(FEET) =   688.33
  FLOW LENGTH(FEET) =     8.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   7.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.57
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       3.23
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =   11.58
  LONGEST FLOWPATH FROM NODE      1.41 TO NODE      1.15 =     898.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.43 TO NODE      1.15 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.58
  RAINFALL INTENSITY(INCH/HR) =   4.38
  TOTAL STREAM AREA(ACRES) =     1.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.23

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       13.90    10.93        4.550          6.25
      2        3.23    11.58        4.383          1.53

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       16.94    10.93       4.550
      2       16.61    11.58       4.383

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      16.94   Tc(MIN.) =   10.93
  TOTAL AREA(ACRES) =        7.8
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.15 =    1347.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.15 TO NODE      1.16 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   688.33  DOWNSTREAM(FEET) =   676.92
  FLOW LENGTH(FEET) =   175.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.74
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.94
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =   11.11
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.16 =    1522.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.15 TO NODE      1.16 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      1.51 TO NODE      1.52 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    726.60
  DOWNSTREAM ELEVATION(FEET) =    724.73
  ELEVATION DIFFERENCE(FEET) =      1.87
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.729
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.221
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE      1.52 TO NODE      1.53 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  724.73  DOWNSTREAM ELEVATION(FEET) =  691.37
  STREET LENGTH(FEET) =   492.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.44
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.20
    HALFSTREET FLOOD WIDTH(FEET) =    2.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.65
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.12
  STREET FLOW TRAVEL TIME(MIN.) =   1.45   Tc(MIN.) =    8.18
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.486
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  SUBAREA AREA(ACRES) =    0.22      SUBAREA RUNOFF(CFS) =    0.58
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       0.71

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.20   HALFSTREET FLOOD WIDTH(FEET) =   2.00
  FLOW VELOCITY(FEET/SEC.) =  5.65   DEPTH*VELOCITY(FT*FT/SEC.) =   1.12
  LONGEST FLOWPATH FROM NODE      1.51 TO NODE      1.53 =     562.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.53 TO NODE      1.54 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   688.37  DOWNSTREAM(FEET) =   688.00
  FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   3.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.75
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.71
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    8.21
  LONGEST FLOWPATH FROM NODE      1.51 TO NODE      1.54 =     572.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.53 TO NODE      1.54 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.21
  RAINFALL INTENSITY(INCH/HR) =   5.47
  TOTAL STREAM AREA(ACRES) =     0.27
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.71

****************************************************************************
  FLOW PROCESS FROM NODE      1.61 TO NODE      1.62 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    726.60
  DOWNSTREAM ELEVATION(FEET) =    725.00
  ELEVATION DIFFERENCE(FEET) =      1.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.088
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.016
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE      1.62 TO NODE      1.63 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  725.00  DOWNSTREAM ELEVATION(FEET) =  691.43
  STREET LENGTH(FEET) =   480.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.40
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    3.09
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.02
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.09
  STREET FLOW TRAVEL TIME(MIN.) =   1.59   Tc(MIN.) =    8.68
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.278
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  SUBAREA AREA(ACRES) =    1.02      SUBAREA RUNOFF(CFS) =    2.58
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       2.69

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   6.22
  FLOW VELOCITY(FEET/SEC.) =  4.98   DEPTH*VELOCITY(FT*FT/SEC.) =   1.36
  LONGEST FLOWPATH FROM NODE      1.61 TO NODE      1.63 =     550.00 FEET.

****************************************************************************
```

```
  FLOW PROCESS FROM NODE      1.63 TO NODE      1.54 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   688.43  DOWNSTREAM(FEET) =   688.02
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.52
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.69
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    8.77
  LONGEST FLOWPATH FROM NODE      1.61 TO NODE      1.54 =     580.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.63 TO NODE      1.54 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.77
  RAINFALL INTENSITY(INCH/HR) =   5.24
  TOTAL STREAM AREA(ACRES) =     1.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.69

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.71     8.21        5.473          0.27
      2        2.69     8.77        5.243          1.06

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        3.22     8.21       5.473
      2        3.37     8.77       5.243

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.37   Tc(MIN.) =    8.77
  TOTAL AREA(ACRES) =        1.3
  LONGEST FLOWPATH FROM NODE      1.61 TO NODE      1.54 =     580.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.54 TO NODE      1.16 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   688.02  DOWNSTREAM(FEET) =   676.52
  FLOW LENGTH(FEET) =   135.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.58
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.37
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =    8.97
  LONGEST FLOWPATH FROM NODE      1.61 TO NODE      1.16 =     715.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.54 TO NODE      1.16 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
```

```
==========================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        3.37     8.97       5.170        1.33
  LONGEST FLOWPATH FROM NODE      1.61 TO NODE      1.16 =     715.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       16.94    11.11       4.501        7.78
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.16 =    1522.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      17.04       8.97        5.170
      2      19.87      11.11        4.501

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.87   Tc(MIN.) =   11.11
  TOTAL AREA(ACRES) =        9.1

****************************************************************************
  FLOW PROCESS FROM NODE      1.16 TO NODE      1.17 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   676.52  DOWNSTREAM(FEET) =   668.52
  FLOW LENGTH(FEET) =   110.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.01
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.87
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =   11.22
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.17 =    1632.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.16 TO NODE      1.17 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.22
  RAINFALL INTENSITY(INCH/HR) =   4.47
  TOTAL STREAM AREA(ACRES) =     9.11
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     19.87

****************************************************************************
  FLOW PROCESS FROM NODE      1.71 TO NODE      1.72 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    691.20
  DOWNSTREAM ELEVATION(FEET) =    685.00
  ELEVATION DIFFERENCE(FEET) =      6.20
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.513
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.535
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
```

```
  SUBAREA RUNOFF(CFS) =      0.14
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.14

****************************************************************************
  FLOW PROCESS FROM NODE      1.72 TO NODE      1.73 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  685.00  DOWNSTREAM ELEVATION(FEET) =  671.86
  STREET LENGTH(FEET) =   175.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.61
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.20
    HALFSTREET FLOOD WIDTH(FEET) =    2.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.95
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.18
  STREET FLOW TRAVEL TIME(MIN.) =   0.49   Tc(MIN.) =    5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.532
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  SUBAREA AREA(ACRES) =    0.26      SUBAREA RUNOFF(CFS) =    0.94
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.08

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.20   HALFSTREET FLOOD WIDTH(FEET) =   2.00
  FLOW VELOCITY(FEET/SEC.) =  5.95   DEPTH*VELOCITY(FT*FT/SEC.) =   1.18
  LONGEST FLOWPATH FROM NODE      1.71 TO NODE      1.73 =     245.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.73 TO NODE      1.17 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   668.86  DOWNSTREAM(FEET) =   668.52
  FLOW LENGTH(FEET) =    26.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.35
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.08
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    5.10
  LONGEST FLOWPATH FROM NODE      1.71 TO NODE      1.17 =     271.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.73 TO NODE      1.17 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.10
```

```
  RAINFALL INTENSITY(INCH/HR) =   7.44
  TOTAL STREAM AREA(ACRES) =     0.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.08

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       19.87    11.22        4.473          9.11
      2        1.08     5.10        7.437          0.30

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       10.12     5.10       7.437
      2       20.53    11.22       4.473

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.53   Tc(MIN.) =   11.22
  TOTAL AREA(ACRES) =        9.4
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.17 =    1632.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.17 TO NODE      1.18 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   668.52  DOWNSTREAM(FEET) =   668.00
  FLOW LENGTH(FEET) =     8.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.36
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.53
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   11.23
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.18 =    1640.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.18 TO NODE      1.18 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.23
  RAINFALL INTENSITY(INCH/HR) =   4.47
  TOTAL STREAM AREA(ACRES) =     9.41
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     20.53

****************************************************************************
  FLOW PROCESS FROM NODE      1.81 TO NODE      1.82 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    700.84
  DOWNSTREAM ELEVATION(FEET) =    699.03
  ELEVATION DIFFERENCE(FEET) =      1.81
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.803
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.178
  SUBAREA RUNOFF(CFS) =      0.24
```

```
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.24

 ****************************************************************************
  FLOW PROCESS FROM NODE      1.82 TO NODE      1.18 IS CODE =  62
 ----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ============================================================================
  UPSTREAM ELEVATION(FEET) =  699.03  DOWNSTREAM ELEVATION(FEET) =  671.81
  STREET LENGTH(FEET) =   380.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.31
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    5.53
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.94
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.29
  STREET FLOW TRAVEL TIME(MIN.) =   1.28   Tc(MIN.) =    8.08
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.527
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  SUBAREA AREA(ACRES) =    1.56      SUBAREA RUNOFF(CFS) =    4.14
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       4.35

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   8.22
  FLOW VELOCITY(FEET/SEC.) =  5.46   DEPTH*VELOCITY(FT*FT/SEC.) =   1.69
  LONGEST FLOWPATH FROM NODE      1.81 TO NODE      1.18 =     450.00 FEET.

 ****************************************************************************
  FLOW PROCESS FROM NODE      1.82 TO NODE      1.18 IS CODE =   1
 ----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
 ============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.08
  RAINFALL INTENSITY(INCH/HR) =   5.53
  TOTAL STREAM AREA(ACRES) =     1.64
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.35

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       20.53    11.23        4.471          9.41
      2        4.35     8.08        5.527          1.64

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
```

```
      1       20.96     8.08       5.527
      2       24.05    11.23       4.471

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      24.05   Tc(MIN.) =   11.23
  TOTAL AREA(ACRES) =       11.0
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.18 =    1640.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.18 TO NODE      1.19 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   671.81  DOWNSTREAM(FEET) =   670.00
  FLOW LENGTH(FEET) =    83.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.34
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.05
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   11.35
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.19 =    1723.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.19 TO NODE      1.10 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   667.00  DOWNSTREAM(FEET) =   653.00
  FLOW LENGTH(FEET) =    60.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  27.48
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.05
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =   11.39
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.10 =    1783.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.19 TO NODE      1.10 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.39
  RAINFALL INTENSITY(INCH/HR) =   4.43
  TOTAL STREAM AREA(ACRES) =    11.05
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     24.05

****************************************************************************
  FLOW PROCESS FROM NODE      1.91 TO NODE      1.92 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    671.52
  DOWNSTREAM ELEVATION(FEET) =    667.35
  ELEVATION DIFFERENCE(FEET) =      4.17
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.136
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.535
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.46
```

```
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.46

 ****************************************************************************
  FLOW PROCESS FROM NODE      1.92 TO NODE      1.11 IS CODE =  62
 ----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ============================================================================
  UPSTREAM ELEVATION(FEET) =  667.35  DOWNSTREAM ELEVATION(FEET) =  656.00
  STREET LENGTH(FEET) =   210.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.41
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.20
    HALFSTREET FLOOD WIDTH(FEET) =    2.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.05
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.00
  STREET FLOW TRAVEL TIME(MIN.) =   0.69   Tc(MIN.) =    2.83
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.535
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.29      SUBAREA RUNOFF(CFS) =    1.90
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       2.36

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.21   HALFSTREET FLOOD WIDTH(FEET) =   2.72
  FLOW VELOCITY(FEET/SEC.) =  4.54   DEPTH*VELOCITY(FT*FT/SEC.) =   0.96
  LONGEST FLOWPATH FROM NODE      1.91 TO NODE      1.11 =     290.00 FEET.

 ****************************************************************************
  FLOW PROCESS FROM NODE      1.11 TO NODE      1.11 IS CODE =   1
 ----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
 ============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    2.83
  RAINFALL INTENSITY(INCH/HR) =   7.54
  TOTAL STREAM AREA(ACRES) =     0.36
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.36

  ** CONFLUENCE DATA **
  STREAM     RUNOFF        Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       24.05    11.39        4.431         11.05
      2        2.36     2.83        7.535          0.36

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
```

```
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       16.50     2.83       7.535
      2       25.43    11.39       4.431

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      25.43   Tc(MIN.) =   11.39
  TOTAL AREA(ACRES) =       11.4
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.11 =    1783.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.11 TO NODE      1.12 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   653.00  DOWNSTREAM(FEET) =   652.00
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.51
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      25.43
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =   11.58
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.12 =    1883.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.12 TO NODE      1.12 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.383
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  98
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4949
  SUBAREA AREA(ACRES) =    0.08   SUBAREA RUNOFF(CFS) =    0.31
  TOTAL AREA(ACRES) =       11.5   TOTAL RUNOFF(CFS) =      25.43
  TC(MIN.) =   11.58
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE      1.12 TO NODE      1.12 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.58
  RAINFALL INTENSITY(INCH/HR) =   4.38
  TOTAL STREAM AREA(ACRES) =    11.49
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     25.43

****************************************************************************
  FLOW PROCESS FROM NODE      2.11 TO NODE      2.12 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5400
  S.C.S. CURVE NUMBER (AMC II) =  98
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   118.00
  UPSTREAM ELEVATION(FEET) =    731.62
  DOWNSTREAM ELEVATION(FEET) =    728.33
  ELEVATION DIFFERENCE(FEET) =      3.29
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.863
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    91.82
           (Reference: Table 3-1B of Hydrology Manual)
```

```
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.143
SUBAREA RUNOFF(CFS) =      0.50
TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE      2.12 TO NODE      2.13 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  728.33  DOWNSTREAM ELEVATION(FEET) =  724.50
  STREET LENGTH(FEET) =   750.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.42
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.41
    HALFSTREET FLOOD WIDTH(FEET) =   13.71
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.83
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.75
  STREET FLOW TRAVEL TIME(MIN.) =   6.83   Tc(MIN.) =   13.70
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.934
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5400
  S.C.S. CURVE NUMBER (AMC II) =  98
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.540
  SUBAREA AREA(ACRES) =    2.68      SUBAREA RUNOFF(CFS) =    5.69
  TOTAL AREA(ACRES) =        2.8        PEAK FLOW RATE(CFS) =       6.01

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.47   HALFSTREET FLOOD WIDTH(FEET) =  17.30
  FLOW VELOCITY(FEET/SEC.) =  2.10   DEPTH*VELOCITY(FT*FT/SEC.) =   0.99
  LONGEST FLOWPATH FROM NODE      2.11 TO NODE      2.13 =     868.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.13 TO NODE      2.14 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   721.50  DOWNSTREAM(FEET) =   719.00
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.50
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.01
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =   13.89
  LONGEST FLOWPATH FROM NODE      2.11 TO NODE      2.14 =     968.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.14 TO NODE      2.15 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   716.00  DOWNSTREAM(FEET) =   630.00
```

```
  FLOW LENGTH(FEET) =   290.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  21.39
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.01
  PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =   14.12
  LONGEST FLOWPATH FROM NODE      2.11 TO NODE      2.15 =    1258.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.14 TO NODE      2.15 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   14.12
  RAINFALL INTENSITY(INCH/HR) =   3.86
  TOTAL STREAM AREA(ACRES) =     2.83
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.01

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   14.12
  RAINFALL INTENSITY(INCH/HR) =   3.86
  TOTAL STREAM AREA(ACRES) =     2.83
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.01
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.8  TC(MIN.) =     14.12
  PEAK FLOW RATE(CFS)   =       6.01
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 5 - 100-Year Hydrologic Analysis for Developed Conditions - Mitigated

```
**************************************************************************

           RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                        2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2015 Advanced Engineering Software (aes)
             Ver. 22.0 Release Date: 07/01/2015  License ID 1643

                          Analysis prepared by:

                             REC Consultants
                             2442 Second St.
                           San Diego, Ca 92101


 ************************* DESCRIPTION OF STUDY *************************
* Proposed Conditions Hydrology - Mitigated                             *
* 100 Year Storm                                                        *
* Greenhills Ranch Phase - 2                                            *
 ************************************************************************

  FILE NAME: 1083PSTD.DAT
  TIME/DATE OF STUDY: 18:18 04/10/2018
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.860
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE      1.11 TO NODE      1.12 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =  98
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    770.00
  DOWNSTREAM ELEVATION(FEET) =    767.08
  ELEVATION DIFFERENCE(FEET) =      2.92
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.562
```

```
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    93.80
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.770
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE      1.12 TO NODE      1.13 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  767.08  DOWNSTREAM ELEVATION(FEET) =  729.22
  STREET LENGTH(FEET) =   480.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.82
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.24
    HALFSTREET FLOOD WIDTH(FEET) =    4.28
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.10
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.22
  STREET FLOW TRAVEL TIME(MIN.) =   1.57   Tc(MIN.) =    9.13
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.109
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =  98
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  SUBAREA AREA(ACRES) =    1.26      SUBAREA RUNOFF(CFS) =    3.09
  TOTAL AREA(ACRES) =        1.4        PEAK FLOW RATE(CFS) =       3.34

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   6.91
  FLOW VELOCITY(FEET/SEC.) =  5.38   DEPTH*VELOCITY(FT*FT/SEC.) =   1.54
  LONGEST FLOWPATH FROM NODE      1.11 TO NODE      1.13 =     580.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.13 TO NODE      1.14 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   726.22  DOWNSTREAM(FEET) =   693.47
  FLOW LENGTH(FEET) =   460.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.76
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.34
  PIPE TRAVEL TIME(MIN.) =   0.71    Tc(MIN.) =    9.84
  LONGEST FLOWPATH FROM NODE      1.11 TO NODE      1.14 =    1040.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.13 TO NODE      1.14 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
```

```
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      1.21 TO NODE      1.22 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =  98
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    731.72
  DOWNSTREAM ELEVATION(FEET) =    729.62
  ELEVATION DIFFERENCE(FEET) =      2.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.296
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.261
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE      1.22 TO NODE      1.23 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  729.62  DOWNSTREAM ELEVATION(FEET) =  698.92
  STREET LENGTH(FEET) =  1180.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.06
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   10.27
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.58
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.24
  STREET FLOW TRAVEL TIME(MIN.) =   5.50   Tc(MIN.) =   10.79
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.587
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =  98
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  SUBAREA AREA(ACRES) =    3.47      SUBAREA RUNOFF(CFS) =    7.64
  TOTAL AREA(ACRES) =        3.5        PEAK FLOW RATE(CFS) =       7.72

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.41   HALFSTREET FLOOD WIDTH(FEET) =  13.71
  FLOW VELOCITY(FEET/SEC.) =  4.12   DEPTH*VELOCITY(FT*FT/SEC.) =   1.68
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.23 =    1235.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.23 TO NODE      1.24 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   695.92  DOWNSTREAM(FEET) =   694.92
  FLOW LENGTH(FEET) =     6.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.43
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.72
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   10.80
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.24 =    1241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.23 TO NODE      1.24 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.80
  RAINFALL INTENSITY(INCH/HR) =   4.59
  TOTAL STREAM AREA(ACRES) =     3.51
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.72

****************************************************************************
  FLOW PROCESS FROM NODE      1.31 TO NODE      1.32 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =  98
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    724.18
  DOWNSTREAM ELEVATION(FEET) =    720.59
  ELEVATION DIFFERENCE(FEET) =      3.59
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.984
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.074
  SUBAREA RUNOFF(CFS) =      0.35
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.35

****************************************************************************
  FLOW PROCESS FROM NODE      1.32 TO NODE      1.33 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  720.59  DOWNSTREAM ELEVATION(FEET) =  698.97
  STREET LENGTH(FEET) =   535.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.87
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    5.84
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.76
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.00
  STREET FLOW TRAVEL TIME(MIN.) =   2.37   Tc(MIN.) =    9.36
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.030
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =  98
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  SUBAREA AREA(ACRES) =    1.26      SUBAREA RUNOFF(CFS) =    3.04
  TOTAL AREA(ACRES) =        1.4        PEAK FLOW RATE(CFS) =       3.33

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   8.34
  FLOW VELOCITY(FEET/SEC.) =  4.09   DEPTH*VELOCITY(FT*FT/SEC.) =   1.27
  LONGEST FLOWPATH FROM NODE      1.31 TO NODE      1.33 =     630.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.33 TO NODE      1.24 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   695.97  DOWNSTREAM(FEET) =   694.92
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.92
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.33
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    9.40
  LONGEST FLOWPATH FROM NODE      1.31 TO NODE      1.24 =     655.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.33 TO NODE      1.24 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.40
  RAINFALL INTENSITY(INCH/HR) =   5.01
  TOTAL STREAM AREA(ACRES) =     1.38
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.33

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        7.72    10.80        4.586          3.51
      2        3.33     9.40        5.014          1.38

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       10.05     9.40       5.014
      2       10.76    10.80       4.586

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.76   Tc(MIN.) =   10.80
  TOTAL AREA(ACRES) =        4.9
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.24 =    1241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.24 TO NODE      1.14 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   694.92  DOWNSTREAM(FEET) =   693.47
  FLOW LENGTH(FEET) =    41.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.2 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.93
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.76
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   10.86
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.14 =    1282.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.21 TO NODE      1.14 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       10.76    10.86       4.569        4.89
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.14 =    1282.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        3.34     9.84       4.868        1.36
  LONGEST FLOWPATH FROM NODE      1.11 TO NODE      1.14 =    1040.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      13.09       9.84        4.868
      2      13.90      10.86        4.569

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      13.90   Tc(MIN.) =   10.86
  TOTAL AREA(ACRES) =        6.2

****************************************************************************
  FLOW PROCESS FROM NODE      1.14 TO NODE      1.15 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   693.47  DOWNSTREAM(FEET) =   688.33
  FLOW LENGTH(FEET) =    65.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.97
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.90
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   10.93
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.15 =    1347.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.14 TO NODE      1.15 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.93
  RAINFALL INTENSITY(INCH/HR) =   4.55
  TOTAL STREAM AREA(ACRES) =     6.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.90

****************************************************************************
  FLOW PROCESS FROM NODE      1.41 TO NODE      1.42 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =  98
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    770.00
  DOWNSTREAM ELEVATION(FEET) =    769.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.337
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    70.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.037
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.11

****************************************************************************
  FLOW PROCESS FROM NODE      1.42 TO NODE      1.43 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  769.00  DOWNSTREAM ELEVATION(FEET) =  691.67
  STREET LENGTH(FEET) =   790.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.67
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    3.16
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.90
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.29
  STREET FLOW TRAVEL TIME(MIN.) =   2.23   Tc(MIN.) =   11.57
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.387
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =  98
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  SUBAREA AREA(ACRES) =    1.49      SUBAREA RUNOFF(CFS) =    3.14
  TOTAL AREA(ACRES) =        1.5        PEAK FLOW RATE(CFS) =       3.23

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   6.28
  FLOW VELOCITY(FEET/SEC.) =  5.91   DEPTH*VELOCITY(FT*FT/SEC.) =   1.62
  LONGEST FLOWPATH FROM NODE      1.41 TO NODE      1.43 =     890.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.43 TO NODE      1.15 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   688.67  DOWNSTREAM(FEET) =   688.33
  FLOW LENGTH(FEET) =     8.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   7.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.57
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       3.23
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =   11.58
  LONGEST FLOWPATH FROM NODE      1.41 TO NODE      1.15 =     898.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.43 TO NODE      1.15 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.58
  RAINFALL INTENSITY(INCH/HR) =   4.38
  TOTAL STREAM AREA(ACRES) =     1.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.23

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       13.90    10.93        4.550          6.25
      2        3.23    11.58        4.383          1.53

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       16.94    10.93       4.550
      2       16.61    11.58       4.383

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      16.94   Tc(MIN.) =   10.93
  TOTAL AREA(ACRES) =        7.8
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.15 =    1347.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.15 TO NODE      1.16 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   688.33  DOWNSTREAM(FEET) =   676.92
  FLOW LENGTH(FEET) =   175.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.74
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.94
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =   11.11
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.16 =    1522.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.15 TO NODE      1.16 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      1.51 TO NODE      1.52 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =  98
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    726.60
  DOWNSTREAM ELEVATION(FEET) =    724.73
  ELEVATION DIFFERENCE(FEET) =      1.87
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.729
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.221
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE      1.52 TO NODE      1.53 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  724.73  DOWNSTREAM ELEVATION(FEET) =  691.37
  STREET LENGTH(FEET) =   492.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.44
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.20
    HALFSTREET FLOOD WIDTH(FEET) =    2.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.65
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.12
  STREET FLOW TRAVEL TIME(MIN.) =   1.45   Tc(MIN.) =    8.18
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.486
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =  98
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  SUBAREA AREA(ACRES) =    0.22      SUBAREA RUNOFF(CFS) =    0.58
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       0.71

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.20   HALFSTREET FLOOD WIDTH(FEET) =   2.00
  FLOW VELOCITY(FEET/SEC.) =  5.65   DEPTH*VELOCITY(FT*FT/SEC.) =   1.12
  LONGEST FLOWPATH FROM NODE      1.51 TO NODE      1.53 =     562.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.53 TO NODE      1.54 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   688.37  DOWNSTREAM(FEET) =   688.00
  FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   3.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.75
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.71
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    8.21
  LONGEST FLOWPATH FROM NODE      1.51 TO NODE      1.54 =     572.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.53 TO NODE      1.54 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.21
  RAINFALL INTENSITY(INCH/HR) =   5.47
  TOTAL STREAM AREA(ACRES) =     0.27
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.71

****************************************************************************
  FLOW PROCESS FROM NODE      1.61 TO NODE      1.62 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =  98
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    726.60
  DOWNSTREAM ELEVATION(FEET) =    725.00
  ELEVATION DIFFERENCE(FEET) =      1.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.088
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.016
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE      1.62 TO NODE      1.63 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  725.00  DOWNSTREAM ELEVATION(FEET) =  691.43
  STREET LENGTH(FEET) =   480.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.40
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    3.09
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.02
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.09
  STREET FLOW TRAVEL TIME(MIN.) =   1.59   Tc(MIN.) =    8.68
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.278
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =  98
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  SUBAREA AREA(ACRES) =    1.02      SUBAREA RUNOFF(CFS) =    2.58
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       2.69

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   6.22
  FLOW VELOCITY(FEET/SEC.) =  4.98   DEPTH*VELOCITY(FT*FT/SEC.) =   1.36
  LONGEST FLOWPATH FROM NODE      1.61 TO NODE      1.63 =     550.00 FEET.

****************************************************************************
```

```
  FLOW PROCESS FROM NODE      1.63 TO NODE      1.54 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   688.43  DOWNSTREAM(FEET) =   688.02
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.52
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.69
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    8.77
  LONGEST FLOWPATH FROM NODE      1.61 TO NODE      1.54 =     580.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.63 TO NODE      1.54 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.77
  RAINFALL INTENSITY(INCH/HR) =   5.24
  TOTAL STREAM AREA(ACRES) =     1.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.69

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.71     8.21        5.473          0.27
      2        2.69     8.77        5.243          1.06

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        3.22     8.21       5.473
      2        3.37     8.77       5.243

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.37   Tc(MIN.) =    8.77
  TOTAL AREA(ACRES) =        1.3
  LONGEST FLOWPATH FROM NODE      1.61 TO NODE      1.54 =     580.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.54 TO NODE      1.16 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   688.02  DOWNSTREAM(FEET) =   676.52
  FLOW LENGTH(FEET) =   135.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.58
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.37
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =    8.97
  LONGEST FLOWPATH FROM NODE      1.61 TO NODE      1.16 =     715.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.54 TO NODE      1.16 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
```

```
==========================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        3.37     8.97       5.170        1.33
  LONGEST FLOWPATH FROM NODE      1.61 TO NODE      1.16 =     715.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       16.94    11.11       4.501        7.78
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.16 =    1522.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      17.04       8.97        5.170
      2      19.87      11.11        4.501

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.87   Tc(MIN.) =   11.11
  TOTAL AREA(ACRES) =        9.1

****************************************************************************
  FLOW PROCESS FROM NODE      1.16 TO NODE      1.17 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   676.52  DOWNSTREAM(FEET) =   668.52
  FLOW LENGTH(FEET) =   110.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.01
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.87
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =   11.22
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.17 =    1632.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.16 TO NODE      1.17 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.22
  RAINFALL INTENSITY(INCH/HR) =   4.47
  TOTAL STREAM AREA(ACRES) =     9.11
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     19.87

****************************************************************************
  FLOW PROCESS FROM NODE      1.71 TO NODE      1.72 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =  98
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    691.20
  DOWNSTREAM ELEVATION(FEET) =    685.00
  ELEVATION DIFFERENCE(FEET) =      6.20
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.513
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.535
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
```

```
  SUBAREA RUNOFF(CFS) =      0.14
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.14

****************************************************************************
  FLOW PROCESS FROM NODE      1.72 TO NODE      1.73 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  685.00  DOWNSTREAM ELEVATION(FEET) =  671.86
  STREET LENGTH(FEET) =   175.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.61
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.20
    HALFSTREET FLOOD WIDTH(FEET) =    2.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.95
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.18
  STREET FLOW TRAVEL TIME(MIN.) =   0.49   Tc(MIN.) =    5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.532
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =  98
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  SUBAREA AREA(ACRES) =    0.26      SUBAREA RUNOFF(CFS) =    0.94
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.08

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.20   HALFSTREET FLOOD WIDTH(FEET) =   2.00
  FLOW VELOCITY(FEET/SEC.) =  5.95   DEPTH*VELOCITY(FT*FT/SEC.) =   1.18
  LONGEST FLOWPATH FROM NODE      1.71 TO NODE      1.73 =     245.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.73 TO NODE      1.17 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   668.86  DOWNSTREAM(FEET) =   668.52
  FLOW LENGTH(FEET) =    26.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.35
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.08
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    5.10
  LONGEST FLOWPATH FROM NODE      1.71 TO NODE      1.17 =     271.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.73 TO NODE      1.17 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.10
```

```
  RAINFALL INTENSITY(INCH/HR) =   7.44
  TOTAL STREAM AREA(ACRES) =     0.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.08

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       19.87    11.22        4.473          9.11
      2        1.08     5.10        7.437          0.30

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       10.12     5.10       7.437
      2       20.53    11.22       4.473

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.53   Tc(MIN.) =   11.22
  TOTAL AREA(ACRES) =        9.4
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.17 =    1632.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.17 TO NODE      1.18 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   668.52  DOWNSTREAM(FEET) =   668.00
  FLOW LENGTH(FEET) =     8.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.36
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.53
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   11.23
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.18 =    1640.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.18 TO NODE      1.18 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.23
  RAINFALL INTENSITY(INCH/HR) =   4.47
  TOTAL STREAM AREA(ACRES) =     9.41
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     20.53

****************************************************************************
  FLOW PROCESS FROM NODE      1.81 TO NODE      1.82 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =  98
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    700.84
  DOWNSTREAM ELEVATION(FEET) =    699.03
  ELEVATION DIFFERENCE(FEET) =      1.81
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.803
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.178
  SUBAREA RUNOFF(CFS) =      0.24
```

```
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.24

 ****************************************************************************
  FLOW PROCESS FROM NODE      1.82 TO NODE      1.18 IS CODE =  62
 ----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ============================================================================
  UPSTREAM ELEVATION(FEET) =  699.03  DOWNSTREAM ELEVATION(FEET) =  671.81
  STREET LENGTH(FEET) =   380.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.31
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    5.53
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.94
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.29
  STREET FLOW TRAVEL TIME(MIN.) =   1.28   Tc(MIN.) =    8.08
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.527
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =  98
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  SUBAREA AREA(ACRES) =    1.56      SUBAREA RUNOFF(CFS) =    4.14
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       4.35

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   8.22
  FLOW VELOCITY(FEET/SEC.) =  5.46   DEPTH*VELOCITY(FT*FT/SEC.) =   1.69
  LONGEST FLOWPATH FROM NODE      1.81 TO NODE      1.18 =     450.00 FEET.

 ****************************************************************************
  FLOW PROCESS FROM NODE      1.82 TO NODE      1.18 IS CODE =   1
 ----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
 ============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.08
  RAINFALL INTENSITY(INCH/HR) =   5.53
  TOTAL STREAM AREA(ACRES) =     1.64
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.35

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       20.53    11.23        4.471          9.41
      2        4.35     8.08        5.527          1.64

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
```

```
      1       20.96     8.08       5.527
      2       24.05    11.23       4.471

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      24.05   Tc(MIN.) =   11.23
  TOTAL AREA(ACRES) =       11.0
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.18 =    1640.00 FEET.

+----------------------------------------------------------------------------+
| The following outflows are per HEC-HMS printout for BMP-1.                 |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      1.18 TO NODE      1.18 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  23.00   RAIN INTENSITY(INCH/HOUR) =  2.82
  TOTAL AREA(ACRES) =    11.00   TOTAL RUNOFF(CFS) =      7.19

****************************************************************************
  FLOW PROCESS FROM NODE      1.18 TO NODE      1.19 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   671.81  DOWNSTREAM(FEET) =   670.00
  FLOW LENGTH(FEET) =    83.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.36
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.19
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =   23.17
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.19 =    1723.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.19 TO NODE      1.10 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   667.00  DOWNSTREAM(FEET) =   653.00
  FLOW LENGTH(FEET) =    60.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  20.00
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.19
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =   23.22
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.10 =    1783.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.19 TO NODE      1.10 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   23.22
  RAINFALL INTENSITY(INCH/HR) =   2.80
  TOTAL STREAM AREA(ACRES) =    11.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.19

****************************************************************************
```

```
  FLOW PROCESS FROM NODE      1.91 TO NODE      1.92 IS CODE =  21
 ----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 ============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  98
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    671.52
  DOWNSTREAM ELEVATION(FEET) =    667.35
  ELEVATION DIFFERENCE(FEET) =      4.17
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.136
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.535
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.46
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.46

 ****************************************************************************
  FLOW PROCESS FROM NODE      1.92 TO NODE      1.11 IS CODE =  62
 ----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ============================================================================
  UPSTREAM ELEVATION(FEET) =  667.35  DOWNSTREAM ELEVATION(FEET) =  656.00
  STREET LENGTH(FEET) =   210.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.41
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.20
    HALFSTREET FLOOD WIDTH(FEET) =    2.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.05
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.00
  STREET FLOW TRAVEL TIME(MIN.) =   0.69   Tc(MIN.) =    2.83
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.535
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  98
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.29      SUBAREA RUNOFF(CFS) =    1.90
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       2.36

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.21   HALFSTREET FLOOD WIDTH(FEET) =   2.72
  FLOW VELOCITY(FEET/SEC.) =  4.54   DEPTH*VELOCITY(FT*FT/SEC.) =   0.96
  LONGEST FLOWPATH FROM NODE      1.91 TO NODE      1.11 =     290.00 FEET.

+----------------------------------------------------------------------------+
| The following outflows are per HEC-HMS for BMP-3.                          |
| The detained outflows from BMP-3 are to confluence with the detained       |
| flows from BMP-1.                                                          |
+----------------------------------------------------------------------------+

 ****************************************************************************
  FLOW PROCESS FROM NODE      1.11 TO NODE      1.11 IS CODE =   7
 ----------------------------------------------------------------------------
```

```
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =   6.00   RAIN INTENSITY(INCH/HOUR) =  6.70
  TOTAL AREA(ACRES) =     0.40   TOTAL RUNOFF(CFS) =      2.09

****************************************************************************
  FLOW PROCESS FROM NODE      1.11 TO NODE      1.11 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.00
  RAINFALL INTENSITY(INCH/HR) =   6.70
  TOTAL STREAM AREA(ACRES) =     0.40
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.09

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        7.19    23.22        2.799         11.00
      2        2.09     6.00        6.699          0.40

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        3.95     6.00       6.699
      2        8.06    23.22       2.799

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       8.06   Tc(MIN.) =   23.22
  TOTAL AREA(ACRES) =       11.4
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.11 =    1783.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.11 TO NODE      1.12 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   653.00  DOWNSTREAM(FEET) =   652.00
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.42
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.06
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =   23.48
  LONGEST FLOWPATH FROM NODE      1.21 TO NODE      1.12 =    1883.00 FEET.

+----------------------------------------------------------------------------+
| Node 1.12 is POC-1.                                                        |
| The area added represent a bypass area (Q100) that goes directly to        |
| POC-1. Water quality and HMP for this area is addressed via tree well.     |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      1.12 TO NODE      1.12 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.779
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  98
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.2557
  SUBAREA AREA(ACRES) =    0.08   SUBAREA RUNOFF(CFS) =    0.19
  TOTAL AREA(ACRES) =       11.5   TOTAL RUNOFF(CFS) =       8.16
  TC(MIN.) =   23.48

****************************************************************************
  FLOW PROCESS FROM NODE      1.12 TO NODE      1.12 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   23.48
  RAINFALL INTENSITY(INCH/HR) =   2.78
  TOTAL STREAM AREA(ACRES) =    11.48
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.16

****************************************************************************
  FLOW PROCESS FROM NODE      2.11 TO NODE      2.12 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5400
  S.C.S. CURVE NUMBER (AMC II) =  98
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   118.00
  UPSTREAM ELEVATION(FEET) =    731.62
  DOWNSTREAM ELEVATION(FEET) =    728.33
  ELEVATION DIFFERENCE(FEET) =      3.29
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.863
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    91.82
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.143
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE      2.12 TO NODE      2.13 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  728.33  DOWNSTREAM ELEVATION(FEET) =  724.50
  STREET LENGTH(FEET) =   750.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.42
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.41
    HALFSTREET FLOOD WIDTH(FEET) =   13.71
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.83
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.75
  STREET FLOW TRAVEL TIME(MIN.) =   6.83   Tc(MIN.) =   13.70
```

```
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.934
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5400
  S.C.S. CURVE NUMBER (AMC II) =  98
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.540
  SUBAREA AREA(ACRES) =    2.68      SUBAREA RUNOFF(CFS) =    5.69
  TOTAL AREA(ACRES) =        2.8        PEAK FLOW RATE(CFS) =       6.01

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.47   HALFSTREET FLOOD WIDTH(FEET) =  17.30
  FLOW VELOCITY(FEET/SEC.) =  2.10   DEPTH*VELOCITY(FT*FT/SEC.) =   0.99
  LONGEST FLOWPATH FROM NODE      2.11 TO NODE      2.13 =     868.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.13 TO NODE      2.14 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   721.50  DOWNSTREAM(FEET) =   719.00
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.50
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.01
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =   13.89
  LONGEST FLOWPATH FROM NODE      2.11 TO NODE      2.14 =     968.00 FEET.

+--------------------------------------------------------------------------+
| The following outflows are per HEC-HMS output for BMP-2 to POC-2.        |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      2.14 TO NODE      2.14 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  17.00   RAIN INTENSITY(INCH/HOUR) =  3.42
  TOTAL AREA(ACRES) =     1.00   TOTAL RUNOFF(CFS) =      1.69

****************************************************************************
  FLOW PROCESS FROM NODE      2.14 TO NODE      2.15 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   716.00  DOWNSTREAM(FEET) =   630.00
  FLOW LENGTH(FEET) =   290.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   3.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.65
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.69
  PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =   17.31
  LONGEST FLOWPATH FROM NODE      2.11 TO NODE      2.15 =    1258.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.14 TO NODE      2.15 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.31
```

```
  RAINFALL INTENSITY(INCH/HR) =   3.38
  TOTAL STREAM AREA(ACRES) =     1.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.69

+---------------------------------------------------------------------------+
| The following outflows are per HEC-HMS printout for BMP-2 to POC-3.       |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  17.00   RAIN INTENSITY(INCH/HOUR) =  3.42
  TOTAL AREA(ACRES) =     1.70   TOTAL RUNOFF(CFS) =      2.42

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.00
  RAINFALL INTENSITY(INCH/HR) =   3.42
  TOTAL STREAM AREA(ACRES) =     1.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.42
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.7  TC(MIN.) =     17.00
  PEAK FLOW RATE(CFS)   =       2.42
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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CHAPTER 6 - MODIFIED-PULS DETENTION ROUTING

6.1 – Rational Method Hydrograph

RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE 1/28/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 9 MIN.
6 HOUR RAINFALL 2.86 INCHES
BASIN AREA 11.41 ACRES
RUNOFF COEFFICIENT 0.37
PEAK DISCHARGE 14.93 CFS

POC-1, Pre.

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 9	DISCHARGE (CFS) = 0.1
TIME (MIN) = 18	DISCHARGE (CFS) = 0.7
TIME (MIN) = 27	DISCHARGE (CFS) = 0.7
TIME (MIN) = 36	DISCHARGE (CFS) = 0.8
TIME (MIN) = 45	DISCHARGE (CFS) = 0.8
TIME (MIN) = 54	DISCHARGE (CFS) = 0.8
TIME (MIN) = 63	DISCHARGE (CFS) = 0.8
TIME (MIN) = 72	DISCHARGE (CFS) = 0.9
TIME (MIN) = 81	DISCHARGE (CFS) = 0.9
TIME (MIN) = 90	DISCHARGE (CFS) = 0.9
TIME (MIN) = 99	DISCHARGE (CFS) = 1
TIME (MIN) = 108	DISCHARGE (CFS) = 1
TIME (MIN) = 117	DISCHARGE (CFS) = 1
TIME (MIN) = 126	DISCHARGE (CFS) = 1.1
TIME (MIN) = 135	DISCHARGE (CFS) = 1.1
TIME (MIN) = 144	DISCHARGE (CFS) = 1.2
TIME (MIN) = 153	DISCHARGE (CFS) = 1.3
TIME (MIN) = 162	DISCHARGE (CFS) = 1.4
TIME (MIN) = 171	DISCHARGE (CFS) = 1.4
TIME (MIN) = 180	DISCHARGE (CFS) = 1.6
TIME (MIN) = 189	DISCHARGE (CFS) = 1.7
TIME (MIN) = 198	DISCHARGE (CFS) = 1.9
TIME (MIN) = 207	DISCHARGE (CFS) = 2.1
TIME (MIN) = 216	DISCHARGE (CFS) = 2.6
TIME (MIN) = 225	DISCHARGE (CFS) = 2.9
TIME (MIN) = 234	DISCHARGE (CFS) = 4.3
TIME (MIN) = 243	DISCHARGE (CFS) = 12.9
TIME (MIN) = 252	DISCHARGE (CFS) = 14.93
TIME (MIN) = 261	DISCHARGE (CFS) = 3.5
TIME (MIN) = 270	DISCHARGE (CFS) = 2.3
TIME (MIN) = 279	DISCHARGE (CFS) = 1.8
TIME (MIN) = 288	DISCHARGE (CFS) = 1.5
TIME (MIN) = 297	DISCHARGE (CFS) = 1.3
TIME (MIN) = 306	DISCHARGE (CFS) = 1.2
TIME (MIN) = 315	DISCHARGE (CFS) = 1.1
TIME (MIN) = 324	DISCHARGE (CFS) = 1
TIME (MIN) = 333	DISCHARGE (CFS) = 0.9
TIME (MIN) = 342	DISCHARGE (CFS) = 0.9
TIME (MIN) = 351	DISCHARGE (CFS) = 0.8
TIME (MIN) = 360	DISCHARGE (CFS) = 0.8
TIME (MIN) = 369	DISCHARGE (CFS) = 0

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RUN DATE 1/28/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 9 MIN.
6 HOUR RAINFALL 2.86 INCHES
BASIN AREA 1.489 ACRES
RUNOFF COEFFICIENT 0.32
PEAK DISCHARGE 2.54 CFS

POC-2, Pre.

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 9	DISCHARGE (CFS) = 0.1
TIME (MIN) = 18	DISCHARGE (CFS) = 0.1
TIME (MIN) = 27	DISCHARGE (CFS) = 0.1
TIME (MIN) = 36	DISCHARGE (CFS) = 0.1
TIME (MIN) = 45	DISCHARGE (CFS) = 0.1
TIME (MIN) = 54	DISCHARGE (CFS) = 0.1
TIME (MIN) = 63	DISCHARGE (CFS) = 0.1
TIME (MIN) = 72	DISCHARGE (CFS) = 0.1
TIME (MIN) = 81	DISCHARGE (CFS) = 0.1
TIME (MIN) = 90	DISCHARGE (CFS) = 0.1
TIME (MIN) = 99	DISCHARGE (CFS) = 0.1
TIME (MIN) = 108	DISCHARGE (CFS) = 0.1
TIME (MIN) = 117	DISCHARGE (CFS) = 0.1
TIME (MIN) = 126	DISCHARGE (CFS) = 0.1
TIME (MIN) = 135	DISCHARGE (CFS) = 0.1
TIME (MIN) = 144	DISCHARGE (CFS) = 0.1
TIME (MIN) = 153	DISCHARGE (CFS) = 0.1
TIME (MIN) = 162	DISCHARGE (CFS) = 0.2
TIME (MIN) = 171	DISCHARGE (CFS) = 0.2
TIME (MIN) = 180	DISCHARGE (CFS) = 0.2
TIME (MIN) = 189	DISCHARGE (CFS) = 0.2
TIME (MIN) = 198	DISCHARGE (CFS) = 0.2
TIME (MIN) = 207	DISCHARGE (CFS) = 0.2
TIME (MIN) = 216	DISCHARGE (CFS) = 0.3
TIME (MIN) = 225	DISCHARGE (CFS) = 0.3
TIME (MIN) = 234	DISCHARGE (CFS) = 0.5
TIME (MIN) = 243	DISCHARGE (CFS) = 0.6
TIME (MIN) = 252	DISCHARGE (CFS) = 2.54
TIME (MIN) = 261	DISCHARGE (CFS) = 0.4
TIME (MIN) = 270	DISCHARGE (CFS) = 0.3
TIME (MIN) = 279	DISCHARGE (CFS) = 0.2
TIME (MIN) = 288	DISCHARGE (CFS) = 0.2
TIME (MIN) = 297	DISCHARGE (CFS) = 0.1
TIME (MIN) = 306	DISCHARGE (CFS) = 0.1
TIME (MIN) = 315	DISCHARGE (CFS) = 0.1
TIME (MIN) = 324	DISCHARGE (CFS) = 0.1
TIME (MIN) = 333	DISCHARGE (CFS) = 0.1
TIME (MIN) = 342	DISCHARGE (CFS) = 0.1
TIME (MIN) = 351	DISCHARGE (CFS) = 0.1
TIME (MIN) = 360	DISCHARGE (CFS) = 0.1
TIME (MIN) = 369	DISCHARGE (CFS) = 0

RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE 1/28/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 9 MIN.
6 HOUR RAINFALL 2.86 INCHES
BASIN AREA 1.555 ACRES
RUNOFF COEFFICIENT 0.3
PEAK DISCHARGE 2.66 CFS

Poc-3, Pre.

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 9	DISCHARGE (CFS) = 0.1
TIME (MIN) = 18	DISCHARGE (CFS) = 0.1
TIME (MIN) = 27	DISCHARGE (CFS) = 0.1
TIME (MIN) = 36	DISCHARGE (CFS) = 0.1
TIME (MIN) = 45	DISCHARGE (CFS) = 0.1
TIME (MIN) = 54	DISCHARGE (CFS) = 0.1
TIME (MIN) = 63	DISCHARGE (CFS) = 0.1
TIME (MIN) = 72	DISCHARGE (CFS) = 0.1
TIME (MIN) = 81	DISCHARGE (CFS) = 0.1
TIME (MIN) = 90	DISCHARGE (CFS) = 0.1
TIME (MIN) = 99	DISCHARGE (CFS) = 0.1
TIME (MIN) = 108	DISCHARGE (CFS) = 0.1
TIME (MIN) = 117	DISCHARGE (CFS) = 0.1
TIME (MIN) = 126	DISCHARGE (CFS) = 0.1
TIME (MIN) = 135	DISCHARGE (CFS) = 0.1
TIME (MIN) = 144	DISCHARGE (CFS) = 0.1
TIME (MIN) = 153	DISCHARGE (CFS) = 0.1
TIME (MIN) = 162	DISCHARGE (CFS) = 0.2
TIME (MIN) = 171	DISCHARGE (CFS) = 0.2
TIME (MIN) = 180	DISCHARGE (CFS) = 0.2
TIME (MIN) = 189	DISCHARGE (CFS) = 0.2
TIME (MIN) = 198	DISCHARGE (CFS) = 0.2
TIME (MIN) = 207	DISCHARGE (CFS) = 0.2
TIME (MIN) = 216	DISCHARGE (CFS) = 0.3
TIME (MIN) = 225	DISCHARGE (CFS) = 0.3
TIME (MIN) = 234	DISCHARGE (CFS) = 0.5
TIME (MIN) = 243	DISCHARGE (CFS) = 0.6
TIME (MIN) = 252	DISCHARGE (CFS) = 2.66
TIME (MIN) = 261	DISCHARGE (CFS) = 0.4
TIME (MIN) = 270	DISCHARGE (CFS) = 0.3
TIME (MIN) = 279	DISCHARGE (CFS) = 0.2
TIME (MIN) = 288	DISCHARGE (CFS) = 0.2
TIME (MIN) = 297	DISCHARGE (CFS) = 0.2
TIME (MIN) = 306	DISCHARGE (CFS) = 0.1
TIME (MIN) = 315	DISCHARGE (CFS) = 0.1
TIME (MIN) = 324	DISCHARGE (CFS) = 0.1
TIME (MIN) = 333	DISCHARGE (CFS) = 0.1
TIME (MIN) = 342	DISCHARGE (CFS) = 0.1
TIME (MIN) = 351	DISCHARGE (CFS) = 0.1
TIME (MIN) = 360	DISCHARGE (CFS) = 0.1
TIME (MIN) = 369	DISCHARGE (CFS) = 0

RATIONAL METHOD HYDROGRAPH PROGRAM

RUN DATE 4/9/2018
HYDROGRAPH FILE NAME BMP-2
TIME OF CONCENTRATION 14 MIN.
6 HOUR RAINFALL 2.86 INCHES
BASIN AREA 2.8 ACRES
RUNOFF COEFFICIENT 0.54
PEAK DISCHARGE 6.01 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 14	DISCHARGE (CFS) = 0.3
TIME (MIN) = 28	DISCHARGE (CFS) = 0.3
TIME (MIN) = 42	DISCHARGE (CFS) = 0.3
TIME (MIN) = 56	DISCHARGE (CFS) = 0.3
TIME (MIN) = 70	DISCHARGE (CFS) = 0.3
TIME (MIN) = 84	DISCHARGE (CFS) = 0.3
TIME (MIN) = 98	DISCHARGE (CFS) = 0.3
TIME (MIN) = 112	DISCHARGE (CFS) = 0.4
TIME (MIN) = 126	DISCHARGE (CFS) = 0.4
TIME (MIN) = 140	DISCHARGE (CFS) = 0.4
TIME (MIN) = 154	DISCHARGE (CFS) = 0.5
TIME (MIN) = 168	DISCHARGE (CFS) = 0.5
TIME (MIN) = 182	DISCHARGE (CFS) = 0.6
TIME (MIN) = 196	DISCHARGE (CFS) = 0.7
TIME (MIN) = 210	DISCHARGE (CFS) = 0.8
TIME (MIN) = 224	DISCHARGE (CFS) = 1.2
TIME (MIN) = 238	DISCHARGE (CFS) = 1.5
TIME (MIN) = 252	DISCHARGE (CFS) = 6.01
TIME (MIN) = 266	DISCHARGE (CFS) = 0.9
TIME (MIN) = 280	DISCHARGE (CFS) = 0.6
TIME (MIN) = 294	DISCHARGE (CFS) = 0.5
TIME (MIN) = 308	DISCHARGE (CFS) = 0.4
TIME (MIN) = 322	DISCHARGE (CFS) = 0.4
TIME (MIN) = 336	DISCHARGE (CFS) = 0.3
TIME (MIN) = 350	DISCHARGE (CFS) = 0.3
TIME (MIN) = 364	DISCHARGE (CFS) = 0.3
TIME (MIN) = 378	DISCHARGE (CFS) = 0

RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE 4/9/2018
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 11 MIN.
6 HOUR RAINFALL 2.86 INCHES
BASIN AREA 11 ACRES
RUNOFF COEFFICIENT 0.48
PEAK DISCHARGE 24.05 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 11	DISCHARGE (CFS) = 0.9
TIME (MIN) = 22	DISCHARGE (CFS) = 0.9
TIME (MIN) = 33	DISCHARGE (CFS) = 1
TIME (MIN) = 44	DISCHARGE (CFS) = 1
TIME (MIN) = 55	DISCHARGE (CFS) = 1
TIME (MIN) = 66	DISCHARGE (CFS) = 1.1
TIME (MIN) = 77	DISCHARGE (CFS) = 1.1
TIME (MIN) = 88	DISCHARGE (CFS) = 1.1
TIME (MIN) = 99	DISCHARGE (CFS) = 1.2
TIME (MIN) = 110	DISCHARGE (CFS) = 1.3
TIME (MIN) = 121	DISCHARGE (CFS) = 1.3
TIME (MIN) = 132	DISCHARGE (CFS) = 1.4
TIME (MIN) = 143	DISCHARGE (CFS) = 1.5
TIME (MIN) = 154	DISCHARGE (CFS) = 1.6
TIME (MIN) = 165	DISCHARGE (CFS) = 1.8
TIME (MIN) = 176	DISCHARGE (CFS) = 1.9
TIME (MIN) = 187	DISCHARGE (CFS) = 2.1
TIME (MIN) = 198	DISCHARGE (CFS) = 2.3
TIME (MIN) = 209	DISCHARGE (CFS) = 2.8
TIME (MIN) = 220	DISCHARGE (CFS) = 3.2
TIME (MIN) = 231	DISCHARGE (CFS) = 4.7
TIME (MIN) = 242	DISCHARGE (CFS) = 6.6
TIME (MIN) = 253	DISCHARGE (CFS) = 24.05
TIME (MIN) = 264	DISCHARGE (CFS) = 3.8
TIME (MIN) = 275	DISCHARGE (CFS) = 2.5
TIME (MIN) = 286	DISCHARGE (CFS) = 2
TIME (MIN) = 297	DISCHARGE (CFS) = 1.7
TIME (MIN) = 308	DISCHARGE (CFS) = 1.5
TIME (MIN) = 319	DISCHARGE (CFS) = 1.3
TIME (MIN) = 330	DISCHARGE (CFS) = 1.2
TIME (MIN) = 341	DISCHARGE (CFS) = 1.1
TIME (MIN) = 352	DISCHARGE (CFS) = 1
TIME (MIN) = 363	DISCHARGE (CFS) = 0.9
TIME (MIN) = 374	DISCHARGE (CFS) = 0

RATIONAL METHOD HYDROGRAPH PROGRAM

RUN DATE 4/9/2018
HYDROGRAPH FILE NAME BMP-3
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 2.86 INCHES
BASIN AREA 0.4 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 2.36 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.1
TIME (MIN) = 10	DISCHARGE (CFS) = 0.1
TIME (MIN) = 15	DISCHARGE (CFS) = 0.1
TIME (MIN) = 20	DISCHARGE (CFS) = 0.1
TIME (MIN) = 25	DISCHARGE (CFS) = 0.1
TIME (MIN) = 30	DISCHARGE (CFS) = 0.1
TIME (MIN) = 35	DISCHARGE (CFS) = 0.1
TIME (MIN) = 40	DISCHARGE (CFS) = 0.1
TIME (MIN) = 45	DISCHARGE (CFS) = 0.1
TIME (MIN) = 50	DISCHARGE (CFS) = 0.1
TIME (MIN) = 55	DISCHARGE (CFS) = 0.1
TIME (MIN) = 60	DISCHARGE (CFS) = 0.1
TIME (MIN) = 65	DISCHARGE (CFS) = 0.1
TIME (MIN) = 70	DISCHARGE (CFS) = 0.1
TIME (MIN) = 75	DISCHARGE (CFS) = 0.1
TIME (MIN) = 80	DISCHARGE (CFS) = 0.1
TIME (MIN) = 85	DISCHARGE (CFS) = 0.1
TIME (MIN) = 90	DISCHARGE (CFS) = 0.1
TIME (MIN) = 95	DISCHARGE (CFS) = 0.1
TIME (MIN) = 100	DISCHARGE (CFS) = 0.1
TIME (MIN) = 105	DISCHARGE (CFS) = 0.1
TIME (MIN) = 110	DISCHARGE (CFS) = 0.1
TIME (MIN) = 115	DISCHARGE (CFS) = 0.1
TIME (MIN) = 120	DISCHARGE (CFS) = 0.1
TIME (MIN) = 125	DISCHARGE (CFS) = 0.1
TIME (MIN) = 130	DISCHARGE (CFS) = 0.1
TIME (MIN) = 135	DISCHARGE (CFS) = 0.1
TIME (MIN) = 140	DISCHARGE (CFS) = 0.1
TIME (MIN) = 145	DISCHARGE (CFS) = 0.1
TIME (MIN) = 150	DISCHARGE (CFS) = 0.1
TIME (MIN) = 155	DISCHARGE (CFS) = 0.1
TIME (MIN) = 160	DISCHARGE (CFS) = 0.1
TIME (MIN) = 165	DISCHARGE (CFS) = 0.1
TIME (MIN) = 170	DISCHARGE (CFS) = 0.1
TIME (MIN) = 175	DISCHARGE (CFS) = 0.1
TIME (MIN) = 180	DISCHARGE (CFS) = 0.1
TIME (MIN) = 185	DISCHARGE (CFS) = 0.1
TIME (MIN) = 190	DISCHARGE (CFS) = 0.2
TIME (MIN) = 195	DISCHARGE (CFS) = 0.2
TIME (MIN) = 200	DISCHARGE (CFS) = 0.2
TIME (MIN) = 205	DISCHARGE (CFS) = 0.2
TIME (MIN) = 210	DISCHARGE (CFS) = 0.2
TIME (MIN) = 215	DISCHARGE (CFS) = 0.2
TIME (MIN) = 220	DISCHARGE (CFS) = 0.3
TIME (MIN) = 225	DISCHARGE (CFS) = 0.3
TIME (MIN) = 230	DISCHARGE (CFS) = 0.4
TIME (MIN) = 235	DISCHARGE (CFS) = 0.5
TIME (MIN) = 240	DISCHARGE (CFS) = 1
TIME (MIN) = 245	DISCHARGE (CFS) = 2.36
TIME (MIN) = 250	DISCHARGE (CFS) = 0.4
TIME (MIN) = 255	DISCHARGE (CFS) = 0.3
TIME (MIN) = 260	DISCHARGE (CFS) = 0.2
TIME (MIN) = 265	DISCHARGE (CFS) = 0.2
TIME (MIN) = 270	DISCHARGE (CFS) = 0.2
TIME (MIN) = 275	DISCHARGE (CFS) = 0.1
TIME (MIN) = 280	DISCHARGE (CFS) = 0.1
TIME (MIN) = 285	DISCHARGE (CFS) = 0.1
TIME (MIN) = 290	DISCHARGE (CFS) = 0.1
TIME (MIN) = 295	DISCHARGE (CFS) = 0.1
TIME (MIN) = 300	DISCHARGE (CFS) = 0.1
TIME (MIN) = 305	DISCHARGE (CFS) = 0.1
TIME (MIN) = 310	DISCHARGE (CFS) = 0.1
TIME (MIN) = 315	DISCHARGE (CFS) = 0.1
TIME (MIN) = 320	DISCHARGE (CFS) = 0.1
TIME (MIN) = 325	DISCHARGE (CFS) = 0.1
TIME (MIN) = 330	DISCHARGE (CFS) = 0.1
TIME (MIN) = 335	DISCHARGE (CFS) = 0.1
TIME (MIN) = 340	DISCHARGE (CFS) = 0.1
TIME (MIN) = 345	DISCHARGE (CFS) = 0.1
TIME (MIN) = 350	DISCHARGE (CFS) = 0.1
TIME (MIN) = 355	DISCHARGE (CFS) = 0.1
TIME (MIN) = 360	DISCHARGE (CFS) = 0.1
TIME (MIN) = 365	DISCHARGE (CFS) = 0

6.2 – Stage-Storage & Stage-Discharge Relationships

Stage-Area for BMP 1

Elevation (ft)	Area (ft^2)	Volume (ft^3)	
0.00	10257	0	
0.25	10575	1042	TOP OF MULCH[2]
0.50	10898	3726	
0.75	11224	6491	
1.00	11553	9338	
1.25	11887	12268	BIOFILTRATION[1], SURFACE DISCHARGE[3]
1.50	12223	15281	
1.75	12565	18380	
2.00	12909	21564	
2.25	13257	24834	
2.50	13609	28193	
2.75	13964	31639	
3.00	14324	35175	
3.10	14467	36615	
3.25	14685	38801	
3.50	15051	42518	EMERGENCY WEIR[4]
4.00	15798	50230	
4.50	16550	58316	

SUB SURFACE STORAGE BMP 1

Elevation (ft)	Area (ft^2)	Volume (ft^3)	
-1.50	11887	5349	Amended Soil Base (0.3 voids)
-3.50	11887	9510	Gravel Base (0.4 voids)[5]

Gravel & Amended Soil	TOTAL =	14859	(ft^3)
Surface Total	TOTAL =	12268	(ft^3)
IMP	TOTAL =	27126	(ft^3)

(1): The area at this surface elevation corresponds to the area of gravel and amended soil (Bio-filtration layer)
(2): The volume for the first 3 inches of surface depth accounts for the voids of mulch
(3): Volume at this elevation coresponds with surface volume for WQ purposes (invert of lowest surface outlet)
(4): This elevation corresponds to the top of the riser elevation.
(5): Gravel Depth includes three (3) inches of storage below the LID orifice.

Effective Depth:	12.38 in	(hydromodification purposes)
Effective Depth:	11.48 in	(water quality purposes)

Stage-Area for BMP 2

Elevation (ft)	Area (ft^2)	Volume (ft^3)	
0.00	1810	0	
0.25	2239	202	TOP OF MULCH[2]
0.50	2694	818	
0.75	3147	1547	
1.00	3623	2393	
1.25	4121	3360	BIOFILTRATION[1], SURFACE DISCHARGE[3]
1.50	4607	4450	
1.75	5163	5671	
2.00	5722	7031	
2.25	6271	8530	
2.50	6871	10172	EMERGENCY WEIR[4]
2.75	7447	11961	
3.00	8047	13897	

SUB SURFACE STORAGE BMP 2

Elevation (ft)	Area (ft^2)	Volume (ft^3)	
-1.50	4121	1854	Amended Soil Base (0.3 voids)
-3.50	4121	3297	Gravel Base (0.4 voids)[5]
Gravel & Amended Soil	**TOTAL =**	5151	(ft^3)
Surface Total	**TOTAL =**	3360	(ft^3)
IMP	**TOTAL =**	**8511**	(ft^3)

(1): The area at this surface elevation corresponds to the area of gravel and amended soil (Bio-filtration layer)
(2): The volume for the first 3 inches of surface depth accounts for the voids of mulch
(3): Volume at this elevation coresponds with surface volume for WQ purposes (invert of lowest surface outlet)
(4): This elevation corresponds to the top of the riser elevation.
(5): Gravel Depth includes three (3) inches of storage below the LID orifice.

Effective Depth:	9.78 in	(hydromodification purposes)
Effective Depth:	8.88 in	(water quality purposes)

Stage-Area for BMP 3

Elevation (ft)	Area (ft^2)	Volume (ft^3)	
0.00	179	0	
0.25	225	20	TOP OF MULCH[2]
0.50	276	83	
0.75	333	159	
1.00	393	249	
1.25	459.3	356	BIOFILTRATION[1], SURFACE DISCHARGE[3]
1.50	530	479	
1.75	605	621	
2.00	687	782	
2.25	771	965	
2.50	861	1168	EMERGENCY WEIR[4]
2.75	956	1395	
3.00	1055	1647	

SUB SURFACE STORAGE BMP 3

Elevation (ft)	Area (ft^2)	Volume (ft^3)	
-1.50	459	207	Amended Soil Base (0.3 voids)
-3.50	459	367	Gravel Base (0.4 voids)[5]
Gravel & Amended Soil	TOTAL =	574	(ft^3)
Surface Total	TOTAL =	356	(ft^3)
IMP	TOTAL =	929	(ft^3)

(1): The area at this surface elevation corresponds to the area of gravel and amended soil (Bio-filtration layer)
(2): The volume for the first 3 inches of surface depth accounts for the voids of mulch
(3): Volume at this elevation coresponds with surface volume for WQ purposes (invert of lowest surface outlet)
(4): This elevation corresponds to the top of the riser elevation.
(5): Gravel Depth includes three (3) inches of storage below the LID orifice.

Effective Depth:	9.29 in	(hydromodification purposes)
Effective Depth:	8.39 in	(water quality purposes)

Outlet structure for Discharge of Detention Basin 1

(note: 0.0 elev corresponds to elev 1.25 ft from above top of ammended soil)

Discharge vs Elevation Table

Low orifice:	1 "	Lower slot		Emergency Weir	
Number:	4	Invert:	1.25 ft	Invert:	2.250 ft
Cg-low:	0.61 ft	B	6.00 ft	B:	12 ft
		h	0.250 ft		
Middle orifice:	1.5 "	Upper slot			
number of orif:	0	Invert:	0.000 ft		
Cg-middle:	0.61	B:	0.00 ft		
invert elev:	0.00 ft	h	0.000 ft		

h (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qemer (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.083	1.000	0.667	0.022	0.021	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.167	2.000	1.333	0.038	0.050	0.038	0.000	0.000	0.000	0.000	0.000	0.000	0.038
0.250	3.000	2.000	0.049	0.057	0.049	0.000	0.000	0.000	0.000	0.000	0.000	0.049
0.333	4.000	2.667	0.058	0.095	0.058	0.000	0.000	0.000	0.000	0.000	0.000	0.058
0.417	5.000	3.333	0.065	0.382	0.065	0.000	0.000	0.000	0.000	0.000	0.000	0.065
0.500	6.000	4.000	0.072	0.723	0.072	0.000	0.000	0.000	0.000	0.000	0.000	0.072
0.583	7.000	4.667	0.079	0.786	0.079	0.000	0.000	0.000	0.000	0.000	0.000	0.079
0.667	8.000	5.333	0.084	0.844	0.084	0.000	0.000	0.000	0.000	0.000	0.000	0.084
0.750	9.000	6.000	0.090	0.899	0.090	0.000	0.000	0.000	0.000	0.000	0.000	0.090
0.833	10.000	6.667	0.095	0.950	0.095	0.000	0.000	0.000	0.000	0.000	0.000	0.095
0.917	11.000	7.333	0.100	0.999	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0.100
1.000	12.000	8.000	0.105	1.045	0.105	0.000	0.000	0.000	0.000	0.000	0.000	0.105
1.083	13.000	8.667	0.109	1.090	0.109	0.000	0.000	0.000	0.000	0.000	0.000	0.109
1.167	14.000	9.333	0.113	1.133	0.113	0.000	0.000	0.000	0.000	0.000	0.000	0.113
1.250	15.000	10.000	0.117	1.174	0.117	0.000	0.000	0.000	0.000	0.000	0.000	0.117
1.333	16.000	10.667	0.121	1.214	0.121	0.000	0.000	0.000	0.447	0.000	0.000	0.569
1.417	17.000	11.333	0.125	1.252	0.125	0.000	0.000	0.000	1.266	0.000	0.000	1.391
1.500	18.000	12.000	0.129	1.290	0.129	0.000	0.000	0.000	2.325	0.000	0.000	2.454
1.583	19.000	12.667	0.133	1.326	0.133	0.000	0.000	0.000	3.352	0.000	0.000	3.484
1.667	20.000	13.333	0.136	1.361	0.136	0.000	0.000	0.000	3.966	0.000	0.000	4.102
1.750	21.000	14.000	0.140	1.396	0.140	0.000	0.000	0.000	4.497	0.000	0.000	4.636
1.833	22.000	14.667	0.143	1.430	0.143	0.000	0.000	0.000	4.971	0.000	0.000	5.114
1.917	23.000	15.333	0.146	1.462	0.146	0.000	0.000	0.000	5.404	0.000	0.000	5.550
2.000	24.000	16.000	0.149	1.495	0.149	0.000	0.000	0.000	5.805	0.000	0.000	5.954
2.083	25.000	16.667	0.153	1.526	0.153	0.000	0.000	0.000	6.180	0.000	0.000	6.333
2.167	26.000	17.333	0.156	1.557	0.156	0.000	0.000	0.000	6.533	0.000	0.000	6.689
2.250	27.000	18.000	0.159	1.587	0.159	0.000	0.000	0.000	6.869	0.000	0.000	7.027
2.333	28.000	18.667	0.162	1.617	0.162	0.000	0.000	0.000	7.188	0.000	0.895	8.245
2.417	29.000	19.333	0.165	1.646	0.165	0.000	0.000	0.000	7.494	0.000	2.531	10.190
2.500	30.000	20.000	0.167	1.674	0.167	0.000	0.000	0.000	7.788	0.000	4.650	12.606
2.583	31.000	20.667	0.170	1.703	0.170	0.000	0.000	0.000	8.072	0.000	7.159	15.401
2.667	32.000	21.333	0.173	1.730	0.173	0.000	0.000	0.000	8.345	0.000	10.005	18.523
2.750	33.000	22.000	0.176	1.758	0.176	0.000	0.000	0.000	8.610	0.000	13.152	21.938
2.833	34.000	22.667	0.178	1.784	0.178	0.000	0.000	0.000	8.867	0.000	16.574	25.619
2.917	35.000	23.333	0.181	1.811	0.181	0.000	0.000	0.000	9.117	0.000	20.249	29.547
3.000	36.000	24.000	0.184	1.837	0.184	0.000	0.000	0.000	9.360	0.000	24.162	33.706
3.083	37.000	24.667	0.186	1.863	0.186	0.000	0.000	0.000	9.597	0.000	28.299	38.083
3.167	38.000	25.333	0.189	1.888	0.189	0.000	0.000	0.000	9.829	0.000	32.648	42.666
3.250	39.000	26.000	0.191	1.913	0.191	0.000	0.000	0.000	10.055	0.000	37.200	47.446

Outlet structure for Discharge of Detention Basin 2

(note: 0.0 elev corresponds to elev 1.25 ft from above top of ammended soil)

Discharge vs Elevation Table

Low orifice:	0.75 "	Lower slot		Emergency Weir	
Number:	2	Invert:	0.75 ft	Invert:	1.250 ft
Cg-low:	0.61 ft	B	6.00 ft	B:	16 ft
		h	0.250 ft		
Middle orifice:	1 "	Upper slot			
number of orif:	0	Invert:	0.000 ft		
Cg-middle:	0.61	B:	0.00 ft		
invert elev:	0.25 ft	h	0.000 ft		

h (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qemer (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.042	0.667	0.000	0.003	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.083	1.333	0.000	0.007	0.008	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.125	2.000	0.000	0.009	0.012	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.009
0.167	2.667	0.000	0.011	0.014	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.208	3.333	0.000	0.013	0.014	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.250	4.000	0.000	0.014	0.023	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.014
0.292	4.667	0.500	0.015	0.057	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.015
0.333	5.333	1.000	0.017	0.147	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.017
0.375	6.000	1.500	0.018	0.176	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.018
0.417	6.667	2.000	0.019	0.186	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.019
0.458	7.333	2.500	0.020	0.196	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.020
0.500	8.000	3.000	0.021	0.206	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.542	8.667	3.500	0.021	0.215	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.583	9.333	4.000	0.022	0.223	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.625	10.000	4.500	0.023	0.231	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.023
0.667	10.667	5.000	0.024	0.239	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.024
0.708	11.333	5.500	0.025	0.247	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.025
0.750	12.000	6.000	0.025	0.255	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.025
0.792	12.667	6.500	0.026	0.262	0.026	0.000	0.000	0.000	0.158	0.000	0.000	0.184
0.833	13.333	7.000	0.027	0.269	0.027	0.000	0.000	0.000	0.447	0.000	0.000	0.474
0.875	14.000	7.500	0.028	0.276	0.028	0.000	0.000	0.000	0.822	0.000	0.000	0.850
0.917	14.667	8.000	0.028	0.283	0.028	0.000	0.000	0.000	1.266	0.000	0.000	1.294
0.958	15.333	8.500	0.029	0.289	0.029	0.000	0.000	0.000	1.769	0.000	0.000	1.798
1.000	16.000	9.000	0.030	0.296	0.030	0.000	0.000	0.000	2.325	0.000	0.000	2.355
1.042	16.667	9.500	0.030	0.302	0.030	0.000	0.000	0.000	2.930	0.000	0.000	2.960
1.083	17.333	10.000	0.031	0.308	0.031	0.000	0.000	0.000	3.352	0.000	0.000	3.382
1.125	18.000	10.500	0.031	0.314	0.031	0.000	0.000	0.000	3.671	0.000	0.000	3.703
1.167	18.667	11.000	0.032	0.320	0.032	0.000	0.000	0.000	3.966	0.000	0.000	3.998
1.208	19.333	11.500	0.033	0.326	0.033	0.000	0.000	0.000	4.239	0.000	0.000	4.272
1.250	20.000	12.000	0.033	0.332	0.033	0.000	0.000	0.000	4.497	0.000	0.000	4.530
1.292	20.667	12.500	0.034	0.337	0.034	0.000	0.000	0.000	4.740	0.000	0.422	5.195
1.333	21.333	13.000	0.034	0.343	0.034	0.000	0.000	0.000	4.971	0.000	1.193	6.199
1.375	22.000	13.500	0.035	0.348	0.035	0.000	0.000	0.000	5.192	0.000	2.192	7.419
1.417	22.667	14.000	0.035	0.354	0.035	0.000	0.000	0.000	5.404	0.000	3.375	8.814
1.458	23.333	14.500	0.036	0.359	0.036	0.000	0.000	0.000	5.608	0.000	4.716	10.361
1.500	24.000	15.000	0.036	0.364	0.036	0.000	0.000	0.000	5.805	0.000	6.200	12.041
1.542	24.667	15.500	0.037	0.369	0.037	0.000	0.000	0.000	5.995	0.000	7.813	13.845
1.583	25.333	16.000	0.037	0.374	0.037	0.000	0.000	0.000	6.180	0.000	9.545	15.763
1.625	26.000	16.500	0.038	0.379	0.038	0.000	0.000	0.000	6.359	0.000	11.390	17.787
1.667	26.667	17.000	0.038	0.384	0.038	0.000	0.000	0.000	6.533	0.000	13.340	19.912
1.708	27.333	17.500	0.039	0.389	0.039	0.000	0.000	0.000	6.703	0.000	15.390	22.132
1.750	28.000	18.000	0.039	0.394	0.039	0.000	0.000	0.000	6.869	0.000	17.536	24.444

Outlet structure for Discharge of Detention Basin 2 (Riser 2-2)

(note: 0.0 elev corresponds to elev 1.25 ft from above top of ammended soi

Discharge vs Elevation Table

Low orifice:	0.75 "	Lower slot		Emergency Weir	
Number:	2	Invert:	0.75 ft	Invert:	1.250 ft
Cg-low:	0.61 ft	B	3.00 ft	B:	8 ft
		h	0.250 ft		
Middle orifice:	1 "	Upper slot			
number of orif:	0	Invert:	0.000 ft		
Cg-middle:	0.61	B:	0.00 ft		
invert elev:	0.25 ft	h	0.000 ft		

h (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qemer (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.042	0.667	0.000	0.003	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.083	1.333	0.000	0.007	0.008	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.125	2.000	0.000	0.009	0.012	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.009
0.167	2.667	0.000	0.011	0.014	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.208	3.333	0.000	0.013	0.014	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.250	4.000	0.000	0.014	0.023	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.014
0.292	4.667	0.500	0.015	0.057	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.015
0.333	5.333	1.000	0.017	0.147	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.017
0.375	6.000	1.500	0.018	0.176	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.018
0.417	6.667	2.000	0.019	0.186	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.019
0.458	7.333	2.500	0.020	0.196	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.020
0.500	8.000	3.000	0.021	0.206	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.542	8.667	3.500	0.021	0.215	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.583	9.333	4.000	0.022	0.223	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.625	10.000	4.500	0.023	0.231	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.023
0.667	10.667	5.000	0.024	0.239	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.024
0.708	11.333	5.500	0.025	0.247	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.025
0.750	12.000	6.000	0.025	0.255	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.025
0.792	12.667	6.500	0.026	0.262	0.026	0.000	0.000	0.000	0.079	0.000	0.000	0.105
0.833	13.333	7.000	0.027	0.269	0.027	0.000	0.000	0.000	0.224	0.000	0.000	0.251
0.875	14.000	7.500	0.028	0.276	0.028	0.000	0.000	0.000	0.411	0.000	0.000	0.439
0.917	14.667	8.000	0.028	0.283	0.028	0.000	0.000	0.000	0.633	0.000	0.000	0.661
0.958	15.333	8.500	0.029	0.289	0.029	0.000	0.000	0.000	0.884	0.000	0.000	0.913
1.000	16.000	9.000	0.030	0.296	0.030	0.000	0.000	0.000	1.162	0.000	0.000	1.192
1.042	16.667	9.500	0.030	0.302	0.030	0.000	0.000	0.000	1.465	0.000	0.000	1.495
1.083	17.333	10.000	0.031	0.308	0.031	0.000	0.000	0.000	1.676	0.000	0.000	1.707
1.125	18.000	10.500	0.031	0.314	0.031	0.000	0.000	0.000	1.836	0.000	0.000	1.867
1.167	18.667	11.000	0.032	0.320	0.032	0.000	0.000	0.000	1.983	0.000	0.000	2.015
1.208	19.333	11.500	0.033	0.326	0.033	0.000	0.000	0.000	2.120	0.000	0.000	2.152
1.250	20.000	12.000	0.033	0.332	0.033	0.000	0.000	0.000	2.248	0.000	0.000	2.281
1.292	20.667	12.500	0.034	0.337	0.034	0.000	0.000	0.000	2.370	0.000	0.211	2.615
1.333	21.333	13.000	0.034	0.343	0.034	0.000	0.000	0.000	2.486	0.000	0.597	3.116
1.375	22.000	13.500	0.035	0.348	0.035	0.000	0.000	0.000	2.596	0.000	1.096	3.727
1.417	22.667	14.000	0.035	0.354	0.035	0.000	0.000	0.000	2.702	0.000	1.687	4.425
1.458	23.333	14.500	0.036	0.359	0.036	0.000	0.000	0.000	2.804	0.000	2.358	5.198
1.500	24.000	15.000	0.036	0.364	0.036	0.000	0.000	0.000	2.903	0.000	3.100	6.039
1.542	24.667	15.500	0.037	0.369	0.037	0.000	0.000	0.000	2.998	0.000	3.906	6.941
1.583	25.333	16.000	0.037	0.374	0.037	0.000	0.000	0.000	3.090	0.000	4.773	7.900
1.625	26.000	16.500	0.038	0.379	0.038	0.000	0.000	0.000	3.180	0.000	5.695	8.913
1.667	26.667	17.000	0.038	0.384	0.038	0.000	0.000	0.000	3.267	0.000	6.670	9.975
1.708	27.333	17.500	0.039	0.389	0.039	0.000	0.000	0.000	3.352	0.000	7.695	11.086
1.750	28.000	18.000	0.039	0.394	0.039	0.000	0.000	0.000	3.434	0.000	8.768	12.242

Outlet structure for Discharge of Detention Basin 2 (Riser 2-3)

(note: 0.0 elev corresponds to elev 1.25 ft from above top of ammended soi

Discharge vs Elevation Table

Low orifice:	0.75 "	Lower slot		Emergency Weir	
Number:	0	Invert:	0.75 ft	Invert:	1.250 ft
Cg-low:	0.61 ft	B	3.00 ft	B:	8 ft
		h	0.250 ft		
Middle orifice:	1 "	Upper slot			
number of orif:	0	Invert:	0.000 ft		
Cg-middle:	0.61	B:	0.00 ft		
invert elev:	0.25 ft	h	0.000 ft		

h (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qemer (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.042	0.667	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.083	1.333	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.125	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.167	2.667	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.208	3.333	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.250	4.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.292	4.667	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.333	5.333	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.375	6.000	1.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.417	6.667	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.458	7.333	2.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.500	8.000	3.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.542	8.667	3.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.583	9.333	4.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.625	10.000	4.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.667	10.667	5.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.708	11.333	5.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.750	12.000	6.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.792	12.667	6.500	0.000	0.000	0.000	0.000	0.000	0.000	0.079	0.000	0.000	0.079
0.833	13.333	7.000	0.000	0.000	0.000	0.000	0.000	0.000	0.224	0.000	0.000	0.224
0.875	14.000	7.500	0.000	0.000	0.000	0.000	0.000	0.000	0.411	0.000	0.000	0.411
0.917	14.667	8.000	0.000	0.000	0.000	0.000	0.000	0.000	0.633	0.000	0.000	0.633
0.958	15.333	8.500	0.000	0.000	0.000	0.000	0.000	0.000	0.884	0.000	0.000	0.884
1.000	16.000	9.000	0.000	0.000	0.000	0.000	0.000	0.000	1.162	0.000	0.000	1.162
1.042	16.667	9.500	0.000	0.000	0.000	0.000	0.000	0.000	1.465	0.000	0.000	1.465
1.083	17.333	10.000	0.000	0.000	0.000	0.000	0.000	0.000	1.676	0.000	0.000	1.676
1.125	18.000	10.500	0.000	0.000	0.000	0.000	0.000	0.000	1.836	0.000	0.000	1.836
1.167	18.667	11.000	0.000	0.000	0.000	0.000	0.000	0.000	1.983	0.000	0.000	1.983
1.208	19.333	11.500	0.000	0.000	0.000	0.000	0.000	0.000	2.120	0.000	0.000	2.120
1.250	20.000	12.000	0.000	0.000	0.000	0.000	0.000	0.000	2.248	0.000	0.000	2.248
1.292	20.667	12.500	0.000	0.000	0.000	0.000	0.000	0.000	2.370	0.000	0.211	2.581
1.333	21.333	13.000	0.000	0.000	0.000	0.000	0.000	0.000	2.486	0.000	0.597	3.082
1.375	22.000	13.500	0.000	0.000	0.000	0.000	0.000	0.000	2.596	0.000	1.096	3.692
1.417	22.667	14.000	0.000	0.000	0.000	0.000	0.000	0.000	2.702	0.000	1.687	4.390
1.458	23.333	14.500	0.000	0.000	0.000	0.000	0.000	0.000	2.804	0.000	2.358	5.162
1.500	24.000	15.000	0.000	0.000	0.000	0.000	0.000	0.000	2.903	0.000	3.100	6.002
1.542	24.667	15.500	0.000	0.000	0.000	0.000	0.000	0.000	2.998	0.000	3.906	6.904
1.583	25.333	16.000	0.000	0.000	0.000	0.000	0.000	0.000	3.090	0.000	4.773	7.863
1.625	26.000	16.500	0.000	0.000	0.000	0.000	0.000	0.000	3.180	0.000	5.695	8.875
1.667	26.667	17.000	0.000	0.000	0.000	0.000	0.000	0.000	3.267	0.000	6.670	9.937
1.708	27.333	17.500	0.000	0.000	0.000	0.000	0.000	0.000	3.352	0.000	7.695	11.047
1.750	28.000	18.000	0.000	0.000	0.000	0.000	0.000	0.000	3.434	0.000	8.768	12.202

Outlet structure for Discharge of Detention Basin 3

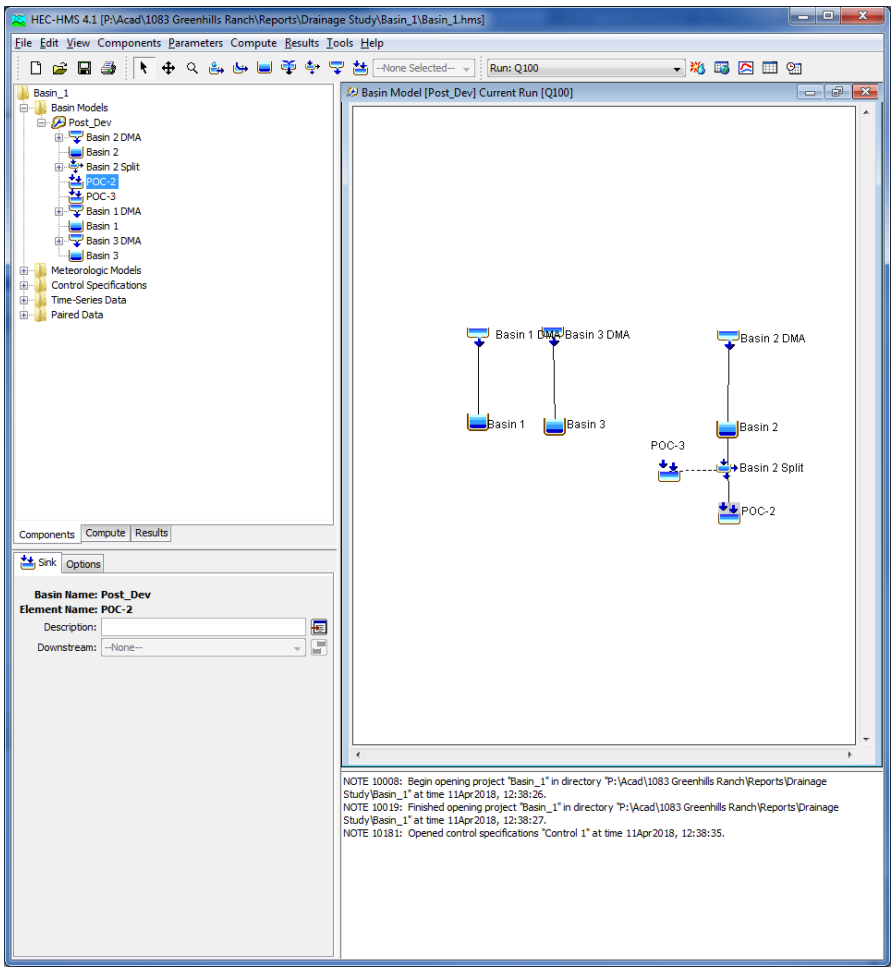
(note: 0.0 elev corresponds to elev 1.25 ft from above top of ammended soil)

Discharge vs Elevation Table

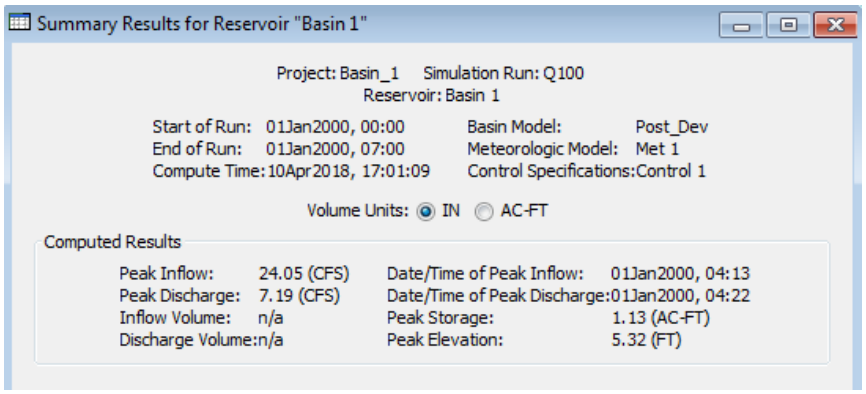
Low orifice:	1 "	Lower slot		Emergency Weir	
Number:	1	Invert:	0.00 ft	Invert:	1.250 ft
Cg-low:	0.61 ft	B	0.00 ft	B:	8 ft
		h	0.167 ft		
Middle orifice:	1 "	Upper slot			
number of orif:	0	Invert:	0.000 ft		
Cg-middle:	0.61	B:	0.00 ft		
invert elev:	0.25 ft	h	0.083 ft		

h (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qemer (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.042	0.500	0.000	0.000	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.083	1.000	0.000	0.005	0.005	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.005
0.125	1.500	0.000	0.008	0.009	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.008
0.167	2.000	0.000	0.009	0.013	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.009
0.208	2.500	0.000	0.011	0.014	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.250	3.000	0.000	0.012	0.014	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.292	3.500	0.500	0.013	0.016	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.333	4.000	1.000	0.014	0.024	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.014
0.375	4.500	1.500	0.015	0.046	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.015
0.417	5.000	2.000	0.016	0.095	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.016
0.458	5.500	2.500	0.017	0.172	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.017
0.500	6.000	3.000	0.018	0.181	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.018
0.542	6.500	3.500	0.019	0.189	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.019
0.583	7.000	4.000	0.020	0.197	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.020
0.625	7.500	4.500	0.020	0.204	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.020
0.667	8.000	5.000	0.021	0.211	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.708	8.500	5.500	0.022	0.218	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.750	9.000	6.000	0.022	0.225	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.792	9.500	6.500	0.023	0.231	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.023
0.833	10.000	7.000	0.024	0.238	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.024
0.875	10.500	7.500	0.024	0.244	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.024
0.917	11.000	8.000	0.025	0.250	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.025
0.958	11.500	8.500	0.026	0.256	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.026
1.000	12.000	9.000	0.026	0.261	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.026
1.042	12.500	9.500	0.027	0.267	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.027
1.083	13.000	10.000	0.027	0.272	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.027
1.125	13.500	10.500	0.028	0.278	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.028
1.167	14.000	11.000	0.028	0.283	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.028
1.208	14.500	11.500	0.029	0.288	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.029
1.250	15.000	12.000	0.029	0.293	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.029
1.292	15.500	12.500	0.030	0.299	0.030	0.000	0.000	0.000	0.000	0.000	0.211	0.241
1.333	16.000	13.000	0.030	0.303	0.030	0.000	0.000	0.000	0.000	0.000	0.597	0.627
1.375	16.500	13.500	0.031	0.308	0.031	0.000	0.000	0.000	0.000	0.000	1.096	1.127
1.417	17.000	14.000	0.031	0.313	0.031	0.000	0.000	0.000	0.000	0.000	1.687	1.719
1.458	17.500	14.500	0.032	0.318	0.032	0.000	0.000	0.000	0.000	0.000	2.358	2.390
1.500	18.000	15.000	0.032	0.322	0.032	0.000	0.000	0.000	0.000	0.000	3.100	3.132
1.542	18.500	15.500	0.033	0.327	0.033	0.000	0.000	0.000	0.000	0.000	3.906	3.939
1.583	19.000	16.000	0.033	0.332	0.033	0.000	0.000	0.000	0.000	0.000	4.773	4.806
1.625	19.500	16.500	0.034	0.336	0.034	0.000	0.000	0.000	0.000	0.000	5.695	5.729
1.667	20.000	17.000	0.034	0.340	0.034	0.000	0.000	0.000	0.000	0.000	6.670	6.704
1.708	20.500	17.500	0.034	0.345	0.034	0.000	0.000	0.000	0.000	0.000	7.695	7.730
1.750	21.000	18.000	0.035	0.349	0.035	0.000	0.000	0.000	0.000	0.000	8.768	8.803

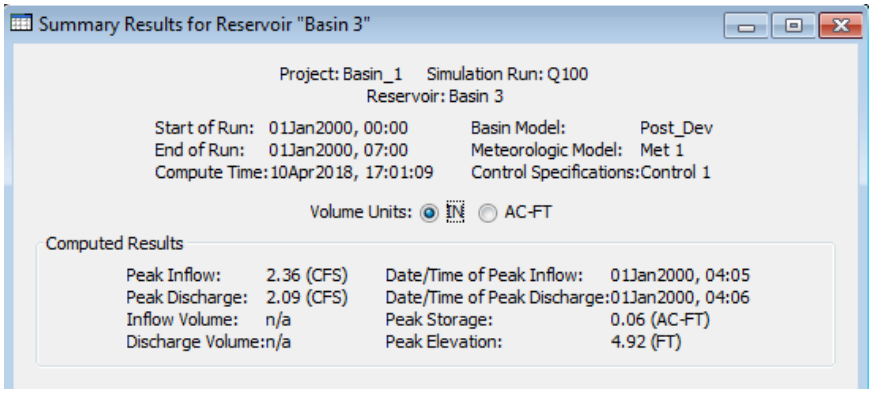
6.3 – HEC-HMS Modified-Puls Routing Results



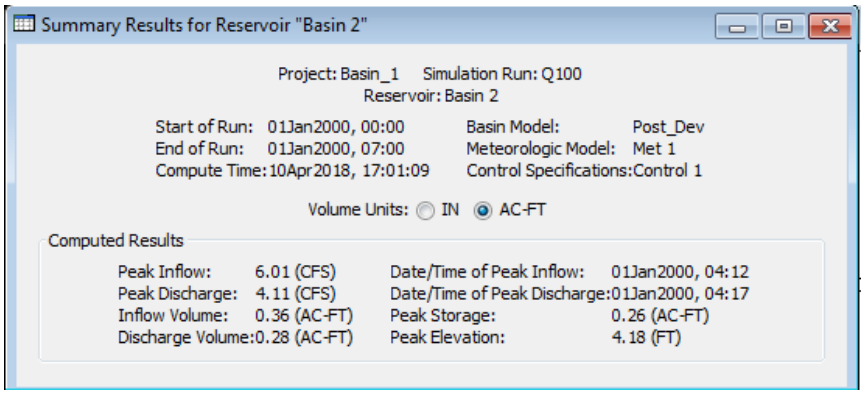
Basin 1 Summary Results



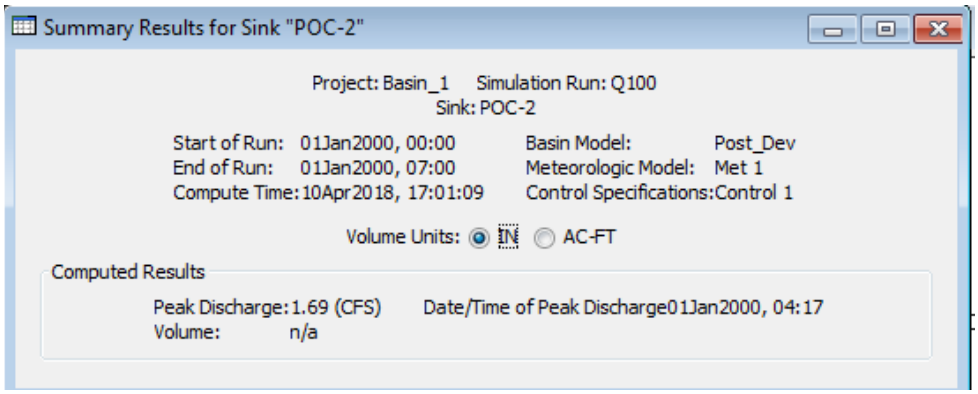
Basin 3 Summary Results

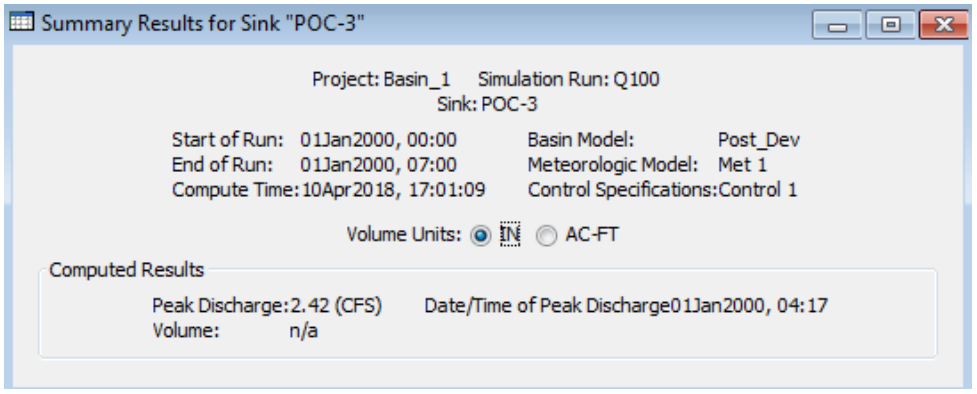


Basin 2 Summary Results



POC-2





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CHAPTER 7 - Hydrology Maps

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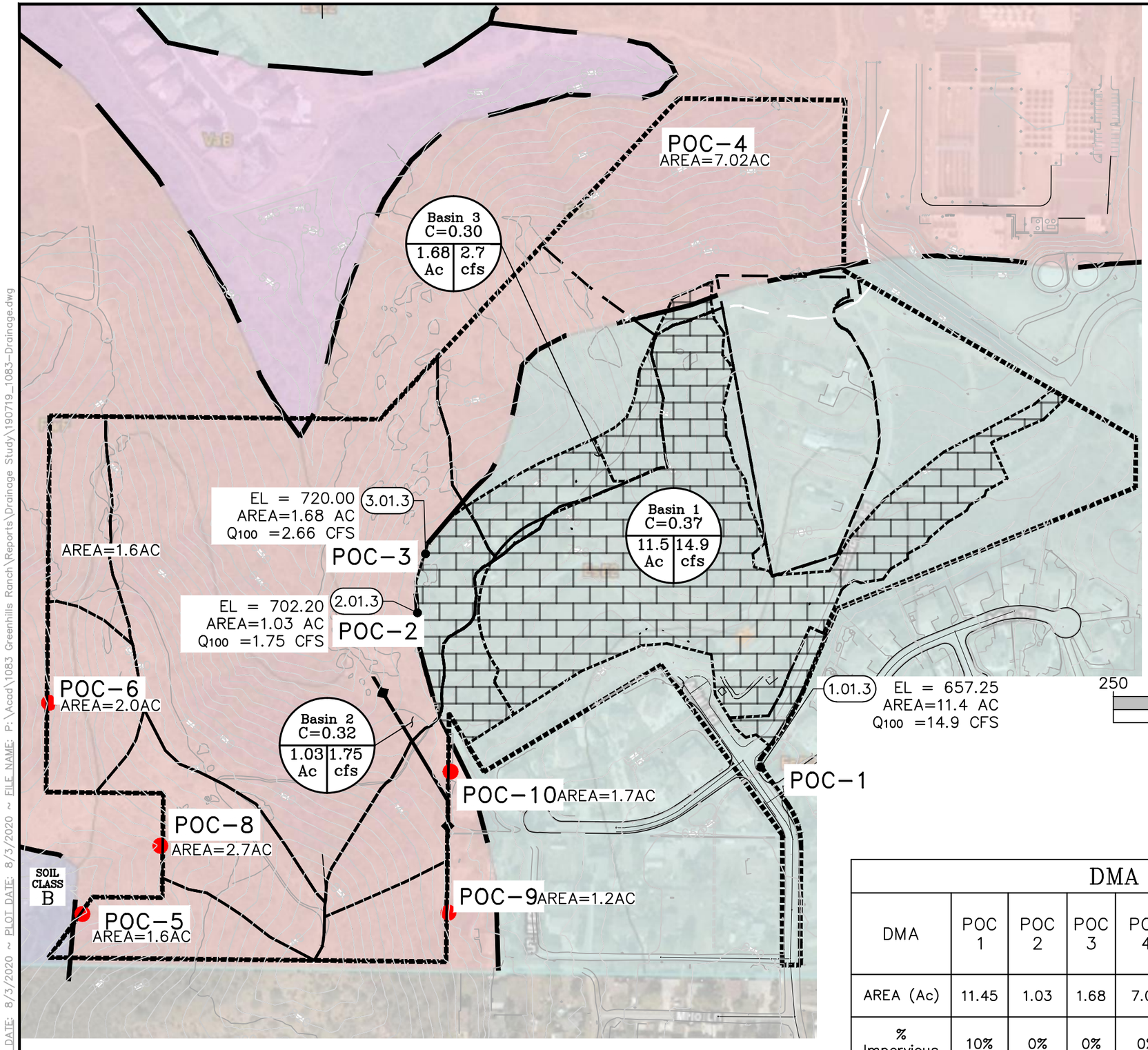

LEGEND

- SOIL TYPE A–B
- SOIL TYPE C
- SOIL TYPE D
- AREA ANALYZED
- DMA BOUNDARY (EXISTING)
- SOIL CLASS BOUNDARY

NODE ELEV. EL=1000.0

NODE NUMBER — BASIN # — SUB-BASIN # — NODE # (3.01.5)

FLOW-LINE

BASIN DESIGNATOR

AREA (AC)

Q (CFS)

250 125 0 250 500 750

SCALE: 1" = 250'

DMA DATA TABLE

DMA	POC 1	POC 2	POC 3	POC 4	POC 5	POC 6	POC 7	POC 8	POC 9	POC 10
AREA (Ac)	11.45	1.03	1.68	7.02	1.6	2.0	1.6	2.7	1.2	1.6
% Impervious	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Civil Engineering · Environmental
Land Surveying
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax
R·E·C Consultants, Inc.

DATE: 07.19.19
SCALE: 1" = 250'
DRAWN: GMB
CHECKED: JRR

SHEET TITLE: DRAINAGE STUDY - EXISTING CONDITIONS

PROJECT: GREENHILLS RANCH - PHASE 2
9385 ADLAI ROAD
LAKESIDE, CA 92040

SHEET 1 OF 1 SHEETS

SAVE DATE: 8/3/2020 ~ PLOT DATE: 8/3/2020 ~ FILE NAME: P:\Acad\1083 Greenhills Ranch\Reports\Drainage Study\190719_1083-Drainage.dwg

LEGEND

- DMA BOUNDARY
- SOIL CLASS BOUNDARY
- (1.11) NODE
- NODE ELEV. EL=1000.0
- PROPERTY BOUNDARY

SOIL CLASS A

SOIL CLASS D

SOIL CLASS C

SOIL CLASS B

NOT A PART

POC-4
AREA=6.86AC

POC-7
AREA=1.6AC

POC-6
AREA=2.0AC

POC-8
AREA=2.7AC

POC-5
AREA=1.6AC

POC-9
AREA=1.2AC

POC-10
AREA=1.7AC

POC-3
EL = 720.00
AREA=1.75 AC
Q_{100} =2.4 CFS*
*AFTER BASIN ROUTING AND CONLUENCE

POC-2
EL = 702.20
AREA=1.08 AC
Q_{100} =1.7 CFS*
*AFTER BASIN ROUTING AND CONLUENCE

BMP-2
BIOFILTRATION BASIN
3,642 SF
719.00 FS
716.00 IE OUT
Q_{100}(in)=6.01 CFS
Q_{100}(out)=1.7 CFS (TO POC-2)
Q_{100}(out)=2.4 CFS (TO POC-3)

BMP-1
BIOFILTRATION BASIN
13,066 SF
670.00 FS
667.00 IE OUT
Q_{100}(in)=24.05 CFS
Q_{100}(out)=7.19 CFS

BMP-3
BIOFILTRATION BASIN
626 SF
656.00 FS
653.00 IE IN
653.00 IE OUT
Q_{100}(in)=2.36 CFS
Q_{100}(out)=2.09 CFS

EL = 657.25
AREA=11.49 AC
Q_{100} =8.16 CFS*
*AFTER BASIN ROUTING AND CONLUENCE

1-1-D
2-2-C
3-1-C
2-2-D
1-3-C

770.00 FG
767.08 FG
769.00 FG
731.62 FG
729.22 FG
726.22 IE
731.72 FG
728.33 FG
729.62 FG
724.50 FG
721.50 IE
720.59 FG
724.18 FG
693.47 IE
691.67 FG
688.67 IE
694.92 IE
698.97 FG
695.97 IE
688.33 IE
699.03 FG
668.00 IE
700.84 FG
724.73 FG
726.60 FG
725.00 FG
691.37 FG
688.37 IE
688.00 IE
691.43 FG
688.43 IE
691.20 FG
685.00 FG
676.52 IE
668.52 IE
671.86 FG
668.86 IE
671.52 FG
667.35 FG
656.00 FG

100 50 0 100 200 300
SCALE: 1" = 100'

DMA DATA TABLE

DMA	1-1-C	1-1-D	1-3-C	2-2-C	2-2-D	3-1-C
AREA (SqFt)	478,667	3,457	16,002	122,909	23,392	72,105
Pervious (SqFt)	219,365	3,457	5,875	55,859	11,473	72,105
Impervious (SqFt)*	259,302	0	10,127	67,050	11,919	0
% Impervious	54.1%	0.0%	63.2%	54.6%	51.0%	0.0%
SLOPE						
FLOW WIDTH (L.F.)						

* EACH LOT WILL INCLUDE APPROX. 3,500 SqFt OF IMPERVIOUS SURFACE, INCLUDING RESIDENCE, WALKWAYS AND DRIVEWAY.

NOTE:
POCS 5-10 WILL REMAIN UNCHANGED AFTER DEVELOPMENT OF THIS PROJECT

REC Consultants, Inc.
Civil Engineering - Environmental
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

GREENHILLS RANCH-PHASE 2
HYDROLOGY MAP
PROPOSED CONDITIONS