DRAINAGE REPORT

FOR

ROQUET RANCH – TTM 19983
CITY OF COLTON

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INTRODUCTION

PURPOSE

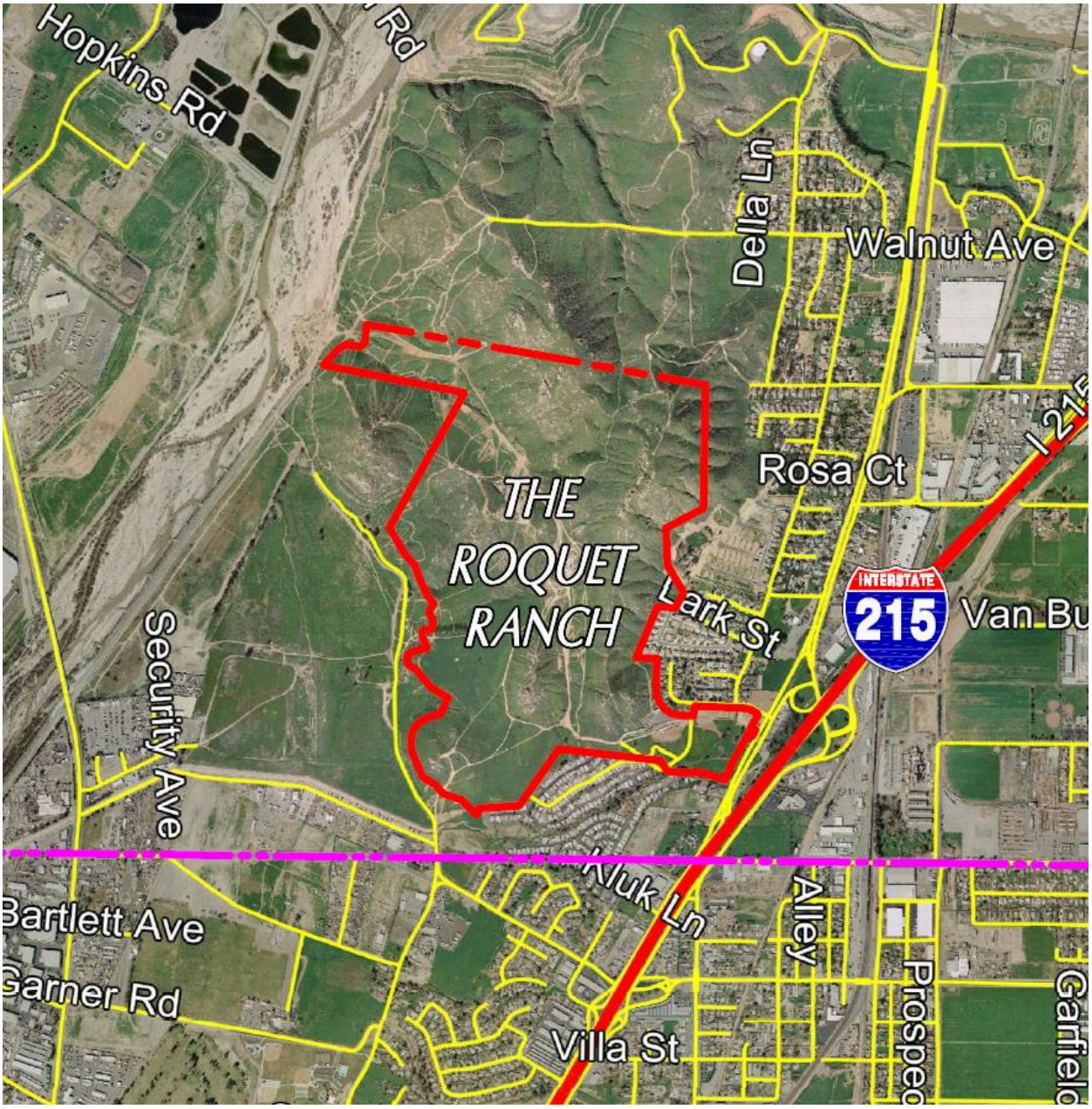
This drainage study has been prepared in order to support the drainage system design of the Roquet Ranch – TTM 19983 development. This report identifies drainage patterns and offsite flow tributary to this subject site and provides evaluation runoff from the site under full development as Mix Use Development. The primary purpose of the calculations is to design storm drain system within the project and to provide hydraulic calculations for the proposed Roquet Ranch Storm Drain systems.

Roquet Ranch project comprises approximately 335 acres and is a mixed use development which will include a school site, commercial area, apartments, various open spaces and a public park. Residential development will be the primary development with 900 dwelling units proposed. Project located at La Loma Hills, west of La Cadena Drive, east of Santa Ana River and north of County of Riverside boundary in City of Colton. The project bounded on the south by residential development and the Riverside/San Bernardino County Line, on the west by the Santa Ana River, on the north by vacant land, and on the east by residential developments and La Cadena Drive.

SETTING

The project study is located at La Loma Hills, west of La Cadena Drive, east of Santa Ana River and north of County of Riverside boundary in City of Colton, in southerly San Bernardino County. Most of the immediate surrounding areas are either developed or planned for the development of single family residential neighborhoods and commercial uses, or comprise undeveloped vacant land.
See Figure 1a - Vicinity Map.
The site ranges in elevation from approximately 850 feet above mean sea level in the southwest corner of the site to approximately 1480 feet above mean sea level.

With the City of Colton being a co-permitee on San Bernardino Counties' MS4 permit, certain post development water quality features need to be designed into the project for water quality treatment of daily nuisance flows and first flush storm flows after the project is constructed and homes are occupied.



Roquet Ranch

Figure 1a: Vicinity Map

EXISTING CONDITIONS

The Roquet Ranch – TTM 19983 projects comprises approximately 335 acres and is located at La Loma Hills, west of La Cadena Drive, east of Santa Ana River and north of County of Riverside boundary in City of Colton, California. The majority of the site is currently vacant with an overhead electric power transmission line that generally bisects the property, trending southeast in the northern portion of the property and north-south in the central portion of the site. Along the southern boundary of the site, the transmission line turns to the east and exits the site at the eastern boundary.

Numerous dirt access roads and trails cross the site. Numerous dirt access roads and trails cross the site. There are a few piles of stockpiled material as well as debris and trash in the central portion of the site. Various equipment and stockpiles of asphalt grindings associated with Roquet Paving operations were observed in the southeastern portion of the site.

Plant growth currently consists of an assortment of native grasses and brush, with very heavy vegetation in some areas, as well as a few mature trees occurring in the southwestern portion of the site. The steeper hillside areas of the site have little to no vegetation due to the rock outcrops. Some of the gently sloping low lying areas appear to have been recently disked.

Figure 1b: Aerial Picture Current Condition

Hydrology - Existing Condition:

Hydrologic parameters used in this analysis are as presented in the San Bernardino County Hydrology Manual.

There are two (2) watersheds drainage areas in this study, Drainage Area A drains to Highgrove Channel along the southern boundary of the project side. Drainage Area B drains to northwest toward Santa Ana River.
The first watershed Drainage Area A is approximately 184 acres, consists of several streams (sub-drainage areas AA through AI) tributary to the majority of the project site except the northern portion. Drainage Area A is tributary to existing Highgrove Channel along the south side of the project boundary.
The second watershed Drainage Area B is approximately 157 acres, tributary to the northern portion of the project site. Drainage Area B is tributary to Santa Ana River.

PROPOSED CONDITIONS

Roquet Ranch is a mixed use development which will include mixed density residential, neighborhood commercial, public institution, various open spaces and a public park. Residential development will be the primary development with approximately 900 dwelling units proposed.

The proposed street alignments and rough grading as shown on the Hydrology Maps were used to modify the natural drainage patterns and boundaries to determine the post-development hydrology.
Drainage patterns will generally remain as in the existing condition as much as practical.

Hydrology - Proposed Condition:

Hydrologic parameters used in this analysis are as presented in the San Bernardino County Hydrology Manual.

There are two (2) watersheds drainage areas in this study, Drainage Area A drains to Highgrove Channel along the southern boundary of the project side. Drainage Area B drains to northwest toward Santa Ana River.
The first watershed Drainage Area A (drainage subareas AA through AH) is approximately 188 acres from the project site and tributary to the existing Highgrove Channel.
The second watershed Drainage Area B is approximately 100 acres and tributary direct to the Santa Ana River.

See Land Use Map below for project proposed land use used in the proposed condition hydrology calculation.

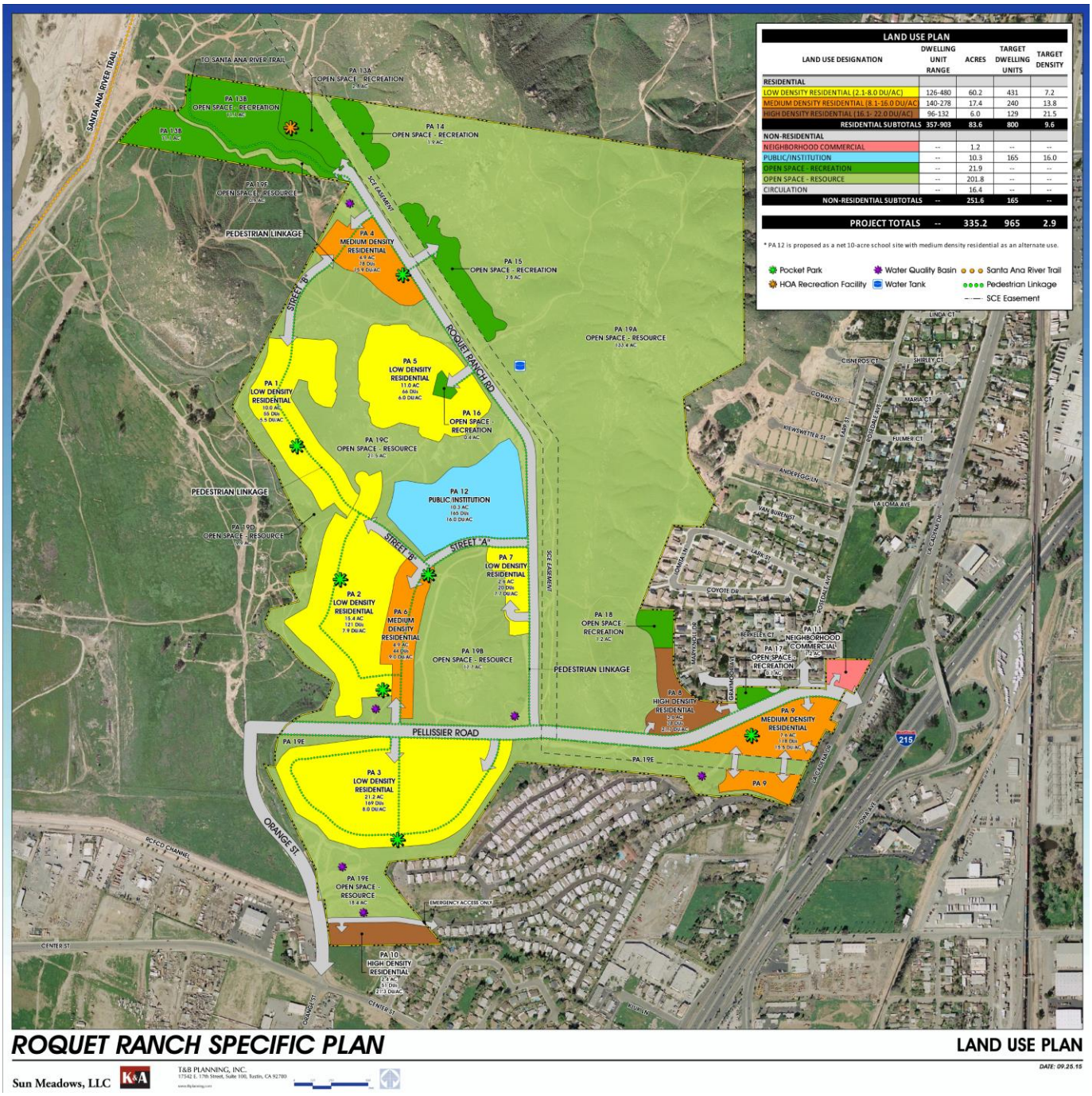


Figure 1c: Land Use Map

METHODOLOGY

The hydrology calculations for determining the on-site and offsite flows have been conducted using the Rational Method as incorporated into the CivilCADD Rational Method Hydrology software. The rational method relates rainfall intensity, the ratio of runoff to rainfall, and the drainage area size to the peak storm runoff and is expressed by the equation: Q = CIA. Where Q = runoff (in cubic feet per second), C = runoff coefficient relating the ratio of runoff to rainfall, I = rainfall intensity (in inches per hour), A = drainage area (in acres).

The San Bernardino County uses the SCS soils classification system, which classifies soils into four (4) types: A through D with D being the least pervious, thus providing the highest runoff potential.

The soil type used in the analysis is a majority Type C. Applicable soil types and limits are shown on the enclosed hydrology maps.

Figure 2 and Figure 3 are the onsite, off-site existing and proposed condition hydrology maps, respectively, summarize the results of the hydrologic analysis, including drainage areas, subareas, node numbers, elevations and cumulative Q_{10} and Q_{100} values at points of concentration or discharge.

RESULTS

The design discharge in the various sub-drainage areas considered in this study are listed in the table below:

Summary Hydrology Drainage Sub-areas for Existing Condition – Rational Method 10-year storm (see Attachment for calculation):

Drainage Area	Area in Acre	Q_{10} sub-area in cfs	Q_{10} conf. in cfs
AA-1	7.85	15.65	
AA-2	5.15	7.72	23.37
AB-1	5.73	11.42	
AB-2	9.85	15.68	27.09
AC-1	4.85	9.67	
AC-2	9.49	14.94	24.61
AC-3	16.54	23.48	48.09
AC-4	20.50	21.18	69.27
AD-1	3.73	5.81	
AE-1	7.05	12.11	
AE-2	20.10	32.83	44.94
AF-1	4.17	7.92	
AF-2	14.92	22.86	30.78
AG-1	7.10	12.58	
AG-2	10.12	15.03	27.62

AG-3	14.64	17.78	45.40
AH-1	8.12	15.11	
AI-1	8.64	14.04	
AI-2	11.54	18.75	32.79
BA-1	6.99	13.17	
BA-2	8.23	12.88	26.05
BA-3	19.54	27.78	53.83
BA-4	35.41	44.62	98.45
BA-5	87.05	98.77	197.22

Summary Hydrology Drainage Sub-areas for Existing Condition – Rational Method 100-year storm (see Attachment for calculation):

Drainage Area	Area in Acre	Q_{100} sub-area in cfs	Q_{100} conf. in cfs
AA-1	7.85	23.27	
AA-2	5.15	12.04	35.31
AB-1	5.73	16.98	
AB-2	9.85	24.14	41.12
AC-1	4.85	14.37	
AC-2	9.49	23.17	37.55
AC-3	16.54	36.87	74.42
AC-4	20.50	35.21	109.62
AD-1	3.73	8.75	
AE-1	7.05	18.16	
AE-2	20.10	49.61	67.77
AF-1	4.17	11.80	
AF-2	14.92	35.31	47.11
AG-1	7.10	18.82	
AG-2	10.12	23.19	42.01
AG-3	14.64	28.33	70.34
AH-1	8.12	22.55	
AI-1	8.64	21.11	
AI-2	11.54	28.20	49.31
BA-1	6.99	19.64	
BA-2	8.23	19.83	39.46
BA-3	19.54	43.32	82.64
BA-4	35.41	70.85	153.64
BA-5	87.05	159.27	312.91

Summary Hydrology Drainage Sub-areas for Proposed Condition – Rational Method 10-year storm (see Attachment for calculation):

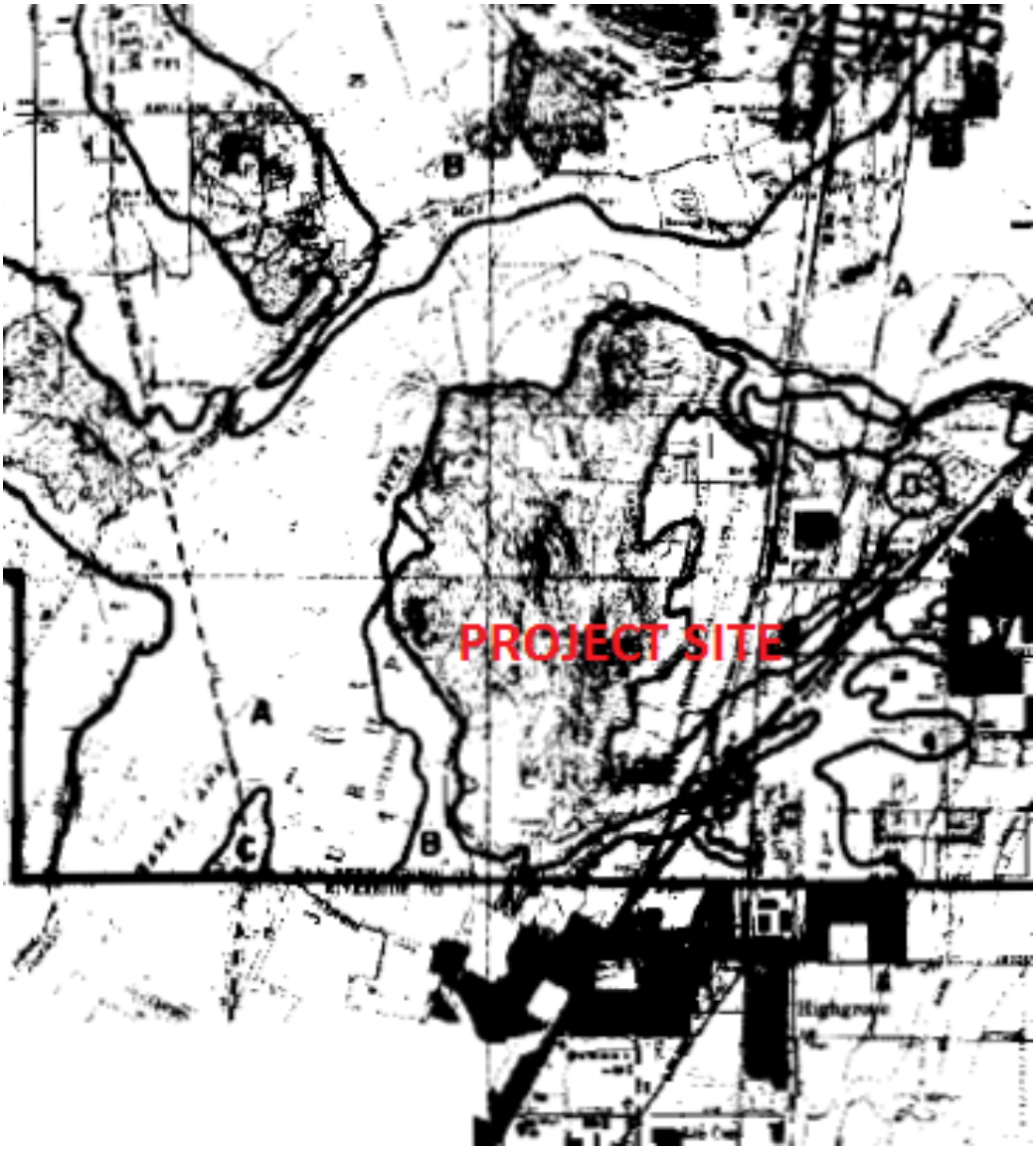
Drainage Area	Area in Acre	Q_{10} sub-area in cfs	Q_{10} conf. in cfs
AA-1	5.70	10.90	
AA-2	6.46	10.17	21.07
AA-3	5.40	6.97	28.04
AA-4	4.28	6.90	34.95
AA-5	3.84	4.80	39.75
AA-6	1.08	1.27	41.02
AA-7	4.47	8.41	
AA-8	4.28	6.86	15.27
AA-9	1.15	3.56	
AA-10	1.75	3.54	7.09
		Node 105	59.24
AA-11	7.60	13.68	
		Node 111	72.61
AA-12	4.46	7.80	
AA-13	6.96	12.52	20.32
AA-14	1.59	3.10	23.41
AA-15	7.23	8.82	32.24
AA-16	2.64	3.05	35.29
AA-17	3.57	5.41	40.70
		Node 120	110.99
AB-1	4.88	8.64	
AB-2	6.02	9.48	18.12
AB-3	10.20	16.96	35.08
AB-4	2.35	2.61	37.68
AC-1	3.13	7.65	
AC-2	3.75	5.24	12.89
AC-3	0.46	0.73	13.62
AD-1	2.24	4.91	
AE-1	5.25	11.05	
AE-2	11.80	22.02	33.06
AE-3	3.85	5.51	38.57
AE-4	5.88	8.82	47.38
AE-5	3.86	2.54	49.92
AE-6	3.85	6.27	56.20
AF-1	4.38	11.64	
AF-2	4.54	12.06	23.70
AF-3	10.20	25.48	49.18
AF-4	1.29	2.77	51.95
BA-1	5.14	10.29	
BA-2	5.32	9.47	19.76

	1.00	2.08	21.84
BA-3	25.60	48.37	70.21
BA-4	17.80	30.19	100.39
BA-5	2.53	4.14	104.53
	1.00	2.01	106.54
BA-6	2.41	6.08	
BA-7	9.05	19.86	25.94
BA-8	0.77	1.33	27.27
		NODE 704	130.69
BA-9	18.70	23.47	154.17
BA-10	8.80	14.98	
	2.00	3.78	172.93
		NODE 705	172.93
AG-1	5.27	10.83	
AH-1	4.10	9.00	
AH-2	5.85	12.84	21.84
AH-3	12.41	27.37	49.21

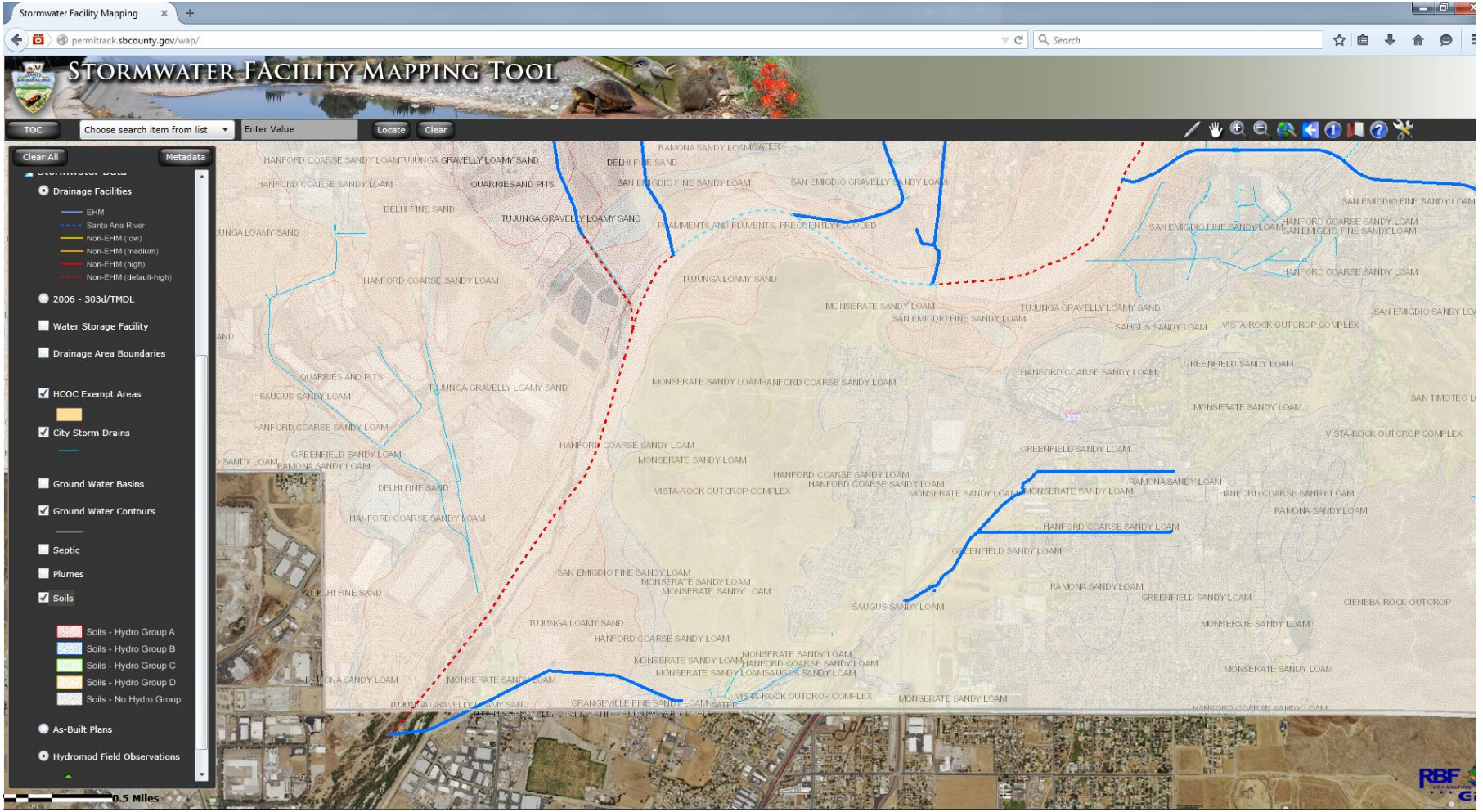
Summary Hydrology Drainage Sub-areas for Proposed Condition – Rational Method 100-year storm (see Attachment for calculation):

Drainage Area	Area in Acre	Q_{100} sub-area in cfs	Q_{100} conf. in cfs
AA-1	5.70	15.96	
AA-2	6.46	15.18	31.14
AA-3	5.40	10.63	41.77
AA-4	4.28	10.25	52.02
AA-5	3.84	7.32	59.34
AA-6	1.08	2.03	61.37
AA-7	4.47	12.32	
AA-8	4.28	10.24	22.56
AA-9	1.15	5.04	
AA-10	1.75	5.19	10.23
		Node 105	88.39
AA-11	7.60	20.05	
		Node 111	105.73
AA-12	4.46	11.47	
AA-13	6.96	18.24	29.70
AA-14	1.59	4.40	34.11
AA-15	7.23	13.62	47.72
AA-16	2.64	4.69	52.41
AA-17	3.57	8.08	60.50
		Node 120	166.15
AB-1	4.88	12.39	
AB-2	6.02	13.78	26.17
AB-3	10.20	24.49	50.65
AB-4	2.35	4.04	54.69
AC-1	3.13	10.86	
AC-2	3.75	7.81	18.67
AC-3	0.46	1.10	19.78
AD-1	2.24	7.03	
AE-1	5.25	16.11	
AE-2	11.80	32.61	48.72
AE-3	3.85	8.44	57.16
AE-4	5.88	13.42	70.57
AE-5	3.86	4.48	75.05
AE-6	3.85	9.43	84.48
AF-1	4.38	16.52	
AF-2	4.54	17.12	33.64
AF-3	10.20	36.51	70.16
AF-4	1.29	4.08	74.24
BA-1	5.14	15.03	
BA-2	5.32	14.06	29.10
	1.00	2.97	32.07

BA-3	25.60	71.21	103.27
BA-4	17.80	45.03	148.30
BA-5	2.53	6.19	154.50
	1.00	2.88	157.37
BA-6	2.41	8.63	
BA-7	9.05	28.77	37.40
BA-8	0.77	2.01	39.41
		NODE 704	192.24
BA-9	18.70	36.62	228.86
BA-10	8.80	22.34	251.20
	2.00	5.46	
		NODE 705	256.66
AG-1	5.27	15.81	
AH-1	4.10	13.11	
AH-2	5.85	18.71	31.82
AH-3	12.41	39.13	70.95



HYDROLOGIC SOILS GROUP


Stormwater Facility Mapping
permitrack.sbcounty.gov/wap/
STORMWATER FACILITY MAPPING TOOL
TOC
Choose search item from list
Enter Value
Locate
Clear
Clear All
Metadata
Drainage Facilities
EHM
Santa Ana River
Non-EHM (low)
Non-EHM (medium)
Non-EHM (high)
Non-EHM (default-high)
2006 - 303d/TMDL
Water Storage Facility
Drainage Area Boundaries
HCOC Exempt Areas
City Storm Drains
Ground Water Basins
Ground Water Contours
Septic
Plumes
Soils
Soils - Hydro Group A
Soils - Hydro Group B
Soils - Hydro Group C
Soils - Hydro Group D
Soils - No Hydro Group
As-Built Plans
Hydromod Field Observations
0.5 Miles

GIS Soil Map

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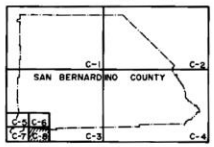
HYDROLOGY MANUAL



INDEX MAP

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

SCALE 1:48,000

SCALE REDUCED BY 1/2

HYDROLOGIC SOILS GROUP MAP
FOR
SOUTHWEST-D AREA

C-29

FIGURE C-16

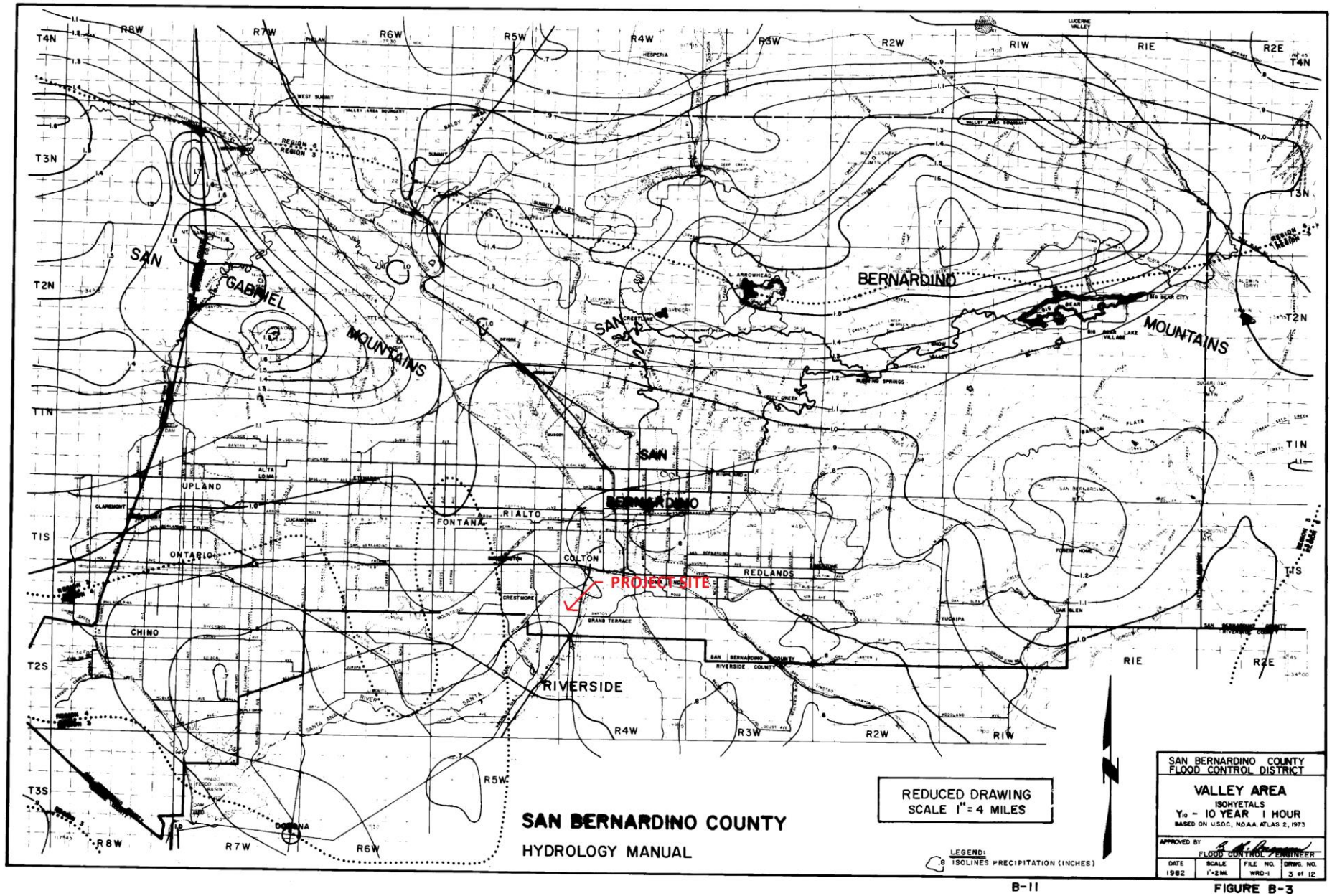


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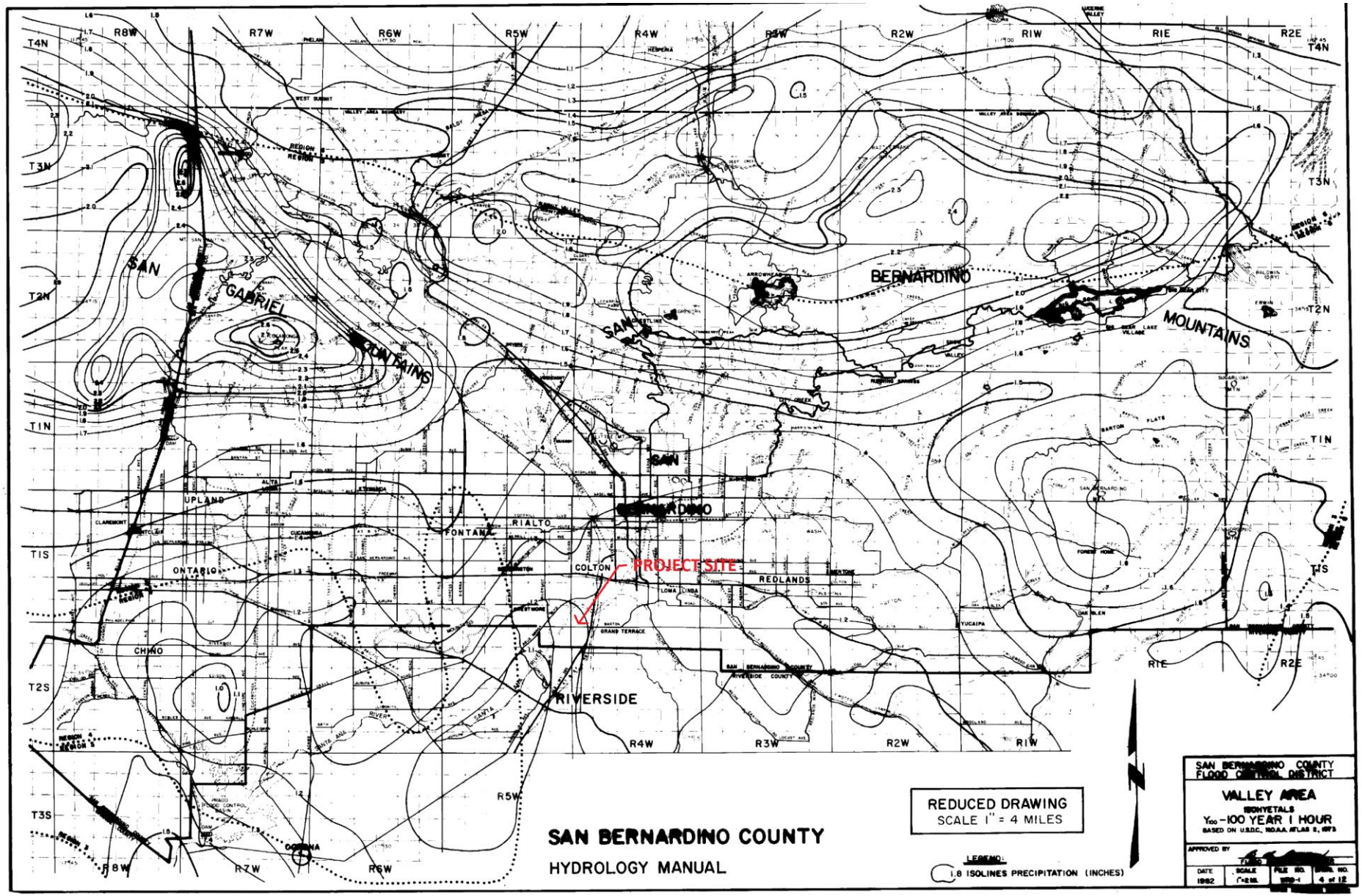
FIGURE B-3



B-12

FIGURE B-4

Curve (1) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparral, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparral, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	71	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent.)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	25	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		77	86	91	94

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CURVE NUMBERS FOR PERVIOUS AREAS

Figure C-3 (1 of 2)

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent (2)
Natural or Agriculture	0 - 0	0
Public Park	10 - 25	15
School	30 - 50	40
Single Family Residential: (3)		
2.5 acre lots	5 - 15	10
1 acre lots	10 - 25	20
2 dwellings/acre	20 - 40	30
3-4 dwellings/acre	30 - 50	40
5-7 dwellings/acre	35 - 55	50
8-10 dwellings/acre	50 - 70	60
More than 10 dwellings/acre	65 - 90	80
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 - 100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area shall always be made, and a review of aerial photos, where available, may assist in estimating the percentage of impervious cover in developed areas.

3. For typical equestrian subdivisions increase impervious area 5 percent over the values recommended in the table above.

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ACTUAL IMPERVIOUS COVER FOR DEVELOPED AREAS

Figure C-4

HYDRAULICS

Storm Drain System Calculations

Open Channel, Pipe and Inlet program Flow Master by Haestad Methods, Reference 7 was used to determine the street capacity, ditch capacity and inlet sizing.

Main line system: the following assumptions and criteria were used to design the main line system:

1. n = 0.013 for reinforced concrete pipe, n = 0.014 for reinforced concrete box, and n = 0.015 for concrete V-ditch.
2. The minor losses considered in this study are as follows: friction loss, junction loss, transition loss, and manhole loss. In order to minimize junction structure losses, all junctions are inleting the main line at an angle of approximately 45 degrees.

Preliminary pipe sizing were determined by using full flow pipe capacity. When storm drain system profile is available then WSPG will be used to determine Hydraulic Grade Line of the proposed storm drain system.

See below calculations:

Rating Table for Circular Pipe - with slope 0.01

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Normal Depth	4.00	ft
Diameter	4.00	ft
Discharge	143.64	ft³/s

Diameter (ft)	Normal Depth (ft)	Discharge (ft³/s)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
1.50	1.50	10.50	5.94	1.77	4.71	0.00
2.00	2.00	22.62	7.20	3.14	6.28	0.00
2.50	2.50	41.01	8.36	4.91	7.85	0.00
3.00	3.00	66.69	9.44	7.07	9.42	0.00
3.50	3.50	100.60	10.46	9.62	11.00	0.00
4.00	4.00	143.64	11.43	12.57	12.57	0.00
4.50	4.50	196.64	12.36	15.90	14.14	0.00
5.00	5.00	260.43	13.26	19.63	15.71	0.00
5.50	5.50	335.79	14.13	23.76	17.28	0.00
6.00	6.00	423.49	14.98	28.27	18.85	0.00

Summary Mainline Storm Drain Pipe sizing based on 100-year storm:

Drainage Area	Area in Acre	Q_{100} sub-area in cfs	Q_{100} conf. in cfs	Estimate Mainline Pipe size (dia. in inches)
A-1	5.70	15.96		24”
A-2	6.46	15.18	31.14	30”
A-3	5.40	10.63	41.77	
A-4	4.28	10.25	52.02	36”
A-5	3.84	7.32	59.34	36”
A-6	1.08	2.83	61.37	
A-7	4.47	12.32		24”
A-8	4.28	10.24	22.56	30”
A-9	1.15	5.04		
A-10	1.75	5.19	10.23	18”
		Node 105	88.39	42”
A-11	7.60	20.05		24”
		Node 111	105.73	42”
A-12	4.46	11.47		
A-13	6.96	18.24	29.70	
A-14	1.59	4.40	34.11	30”
A-15	7.23	13.62	47.72	36”
A-16	2.64	4.69	52.41	36”
A-17	3.57	8.08	60.50	36”
		Node 120	166.15	48”
B-1	4.88	12.39		24”
B-2	6.02	13.78	26.17	24”
B-3	10.20	24.49	50.65	36”
B-4	2.35	4.04	54.69	36”
C-1	3.13	10.86		18”
C-2	3.75	7.81	18.67	
C-3	4.12	10.40	29.08	30”
C-4	0.23	0.50	29.58	30”
D-1	2.24	7.03		18”
E-1	5.25	16.11		channel
E-2	11.80	32.61	48.72	channel
E-3	3.85	8.44	57.16	channel
E-4	5.88	13.42	70.57	channel
				36”
E-5	3.86	4.48	75.05	channel
E-6	3.85	9.43	84.48	42”
F-1	4.38	16.52		
F-2	4.54	17.12	33.64	30”
F-3	10.20	36.51	70.16	36”
F-4	1.29	4.08	74.24	42”

G-1	5.14	15.03		channel
G-2	5.32	14.06	29.10	channel
	1.00	2.97	32.07	30” culvert
G-3	25.60	71.21	103.27	channel
				42” culvert
G-4	17.80	45.03	148.30	channel
				48” culvert
G-5	2.53	6.19	154.50	
	1.00	2.88	157.37	channel
G-6	2.41	8.63		
G-7	9.05	28.77	37.40	30”
G-8	0.77	2.01	39.41	30”
		NODE 704	192.24	54” culvert
G-9	18.70	36.62	228.86	channel
G-10	8.80	22.34	251.20	channel
	2.00	5.46		channel
		NODE 705	256.66	channel
H-1	5.27	15.81		24”
I-1	4.10	13.11		
I-2	5.85	18.71	31.82	30”
I-3	12.41	39.13	70.95	36”

Rating Table for Trapezoidal Channel - Conc. Channel

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.0100	ft/ft
Left Side Slope	1.50	ft/ft (H:V)
Right Side Slope	1.50	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	50.00	ft³/s

Channel Slope (ft/ft)	Bottom Width (ft)	Normal Depth (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.0100	1.00	1.65	8.71	5.74	6.95	5.95
0.0100	1.50	1.52	8.70	5.75	6.98	6.06
0.0100	2.00	1.41	8.66	5.77	7.07	6.22
0.0100	2.50	1.31	8.59	5.82	7.21	6.42
0.0100	3.00	1.22	8.50	5.88	7.39	6.65
0.0100	3.50	1.14	8.40	5.95	7.62	6.92
0.0100	4.00	1.07	8.29	6.03	7.87	7.22
0.0150	1.00	1.51	10.15	4.93	6.44	5.53
0.0150	1.50	1.38	10.12	4.94	6.48	5.65
0.0150	2.00	1.27	10.06	4.97	6.59	5.82
0.0150	2.50	1.18	9.96	5.02	6.74	6.03
0.0150	3.00	1.09	9.85	5.08	6.95	6.28
0.0150	3.50	1.02	9.71	5.15	7.19	6.57
0.0150	4.00	0.96	9.57	5.22	7.46	6.88
0.0200	1.00	1.42	11.30	4.42	6.11	5.25
0.0200	1.50	1.29	11.26	4.44	6.16	5.37
0.0200	2.00	1.18	11.18	4.47	6.27	5.55
0.0200	2.50	1.09	11.06	4.52	6.44	5.78
0.0200	3.00	1.01	10.92	4.58	6.65	6.04
0.0200	3.50	0.95	10.76	4.65	6.91	6.34
0.0200	4.00	0.89	10.59	4.72	7.20	6.66
0.0250	1.00	1.35	12.29	4.07	5.86	5.04
0.0250	1.50	1.22	12.24	4.09	5.91	5.17
0.0250	2.00	1.12	12.14	4.12	6.04	5.36
0.0250	2.50	1.03	12.00	4.17	6.21	5.59
0.0250	3.00	0.95	11.83	4.23	6.44	5.86
0.0250	3.50	0.89	11.64	4.29	6.70	6.17
0.0250	4.00	0.83	11.44	4.37	7.00	6.50
0.0300	1.00	1.29	13.15	3.80	5.66	4.88
0.0300	1.50	1.17	13.09	3.82	5.73	5.02
0.0300	2.00	1.07	12.98	3.85	5.85	5.21
0.0300	2.50	0.98	12.82	3.90	6.04	5.45
0.0300	3.00	0.91	12.63	3.96	6.27	5.72

0.0300	3.50	0.84	12.41	4.03	6.55	6.03
0.0300	4.00	0.79	12.19	4.10	6.85	6.37
0.0350	1.00	1.25	13.93	3.59	5.50	4.75
0.0350	1.50	1.13	13.87	3.61	5.57	4.89
0.0350	2.00	1.03	13.73	3.64	5.71	5.08
0.0350	2.50	0.94	13.56	3.69	5.90	5.33
0.0350	3.00	0.87	13.34	3.75	6.14	5.61
0.0350	3.50	0.81	13.11	3.81	6.42	5.93
0.0350	4.00	0.76	12.86	3.89	6.73	6.27
0.0400	1.00	1.21	14.65	3.41	5.37	4.63
0.0400	1.50	1.09	14.57	3.43	5.44	4.78
0.0400	2.00	0.99	14.43	3.47	5.58	4.98
0.0400	2.50	0.91	14.23	3.51	5.78	5.23
0.0400	3.00	0.84	13.99	3.57	6.03	5.52
0.0400	3.50	0.78	13.73	3.64	6.31	5.84
0.0400	4.00	0.73	13.46	3.71	6.63	6.19
0.0450	1.00	1.18	15.31	3.27	5.25	4.54
0.0450	1.50	1.06	15.22	3.29	5.33	4.69
0.0450	2.00	0.96	15.05	3.32	5.48	4.89
0.0450	2.50	0.88	14.84	3.37	5.68	5.15
0.0450	3.00	0.81	14.58	3.43	5.93	5.44
0.0450	3.50	0.75	14.31	3.49	6.22	5.76
0.0450	4.00	0.70	14.03	3.57	6.54	6.11
0.0500	1.00	1.15	15.92	3.14	5.15	4.45
0.0500	1.50	1.04	15.83	3.16	5.23	4.61
0.0500	2.00	0.94	15.64	3.20	5.38	4.81
0.0500	2.50	0.86	15.42	3.24	5.59	5.07
0.0500	3.00	0.79	15.14	3.30	5.85	5.37
0.0500	3.50	0.73	14.84	3.37	6.14	5.70
0.0500	4.00	0.68	14.53	3.44	6.47	6.05

CONCLUSIONS

The proposed project grading areas and proposed drainage systems are in conformance with Specific Plan, Drainage Master Plan and proposed Land Use. The proposed grading and the proposed storm drain system will connect to existing facilities where it is reasonably feasible, and/or outlet to existing drainage facilities. Potential project impacts related to drainage runoff and water quality will be mitigated according to County/City requirements.

The proposed backbone storm drain systems are designed for ultimate / proposed condition for 100-year storm event. A final report will be prepared to accurately document the catch basin sizing, storm drain water surface profile as well as storm drain system to include water quality BMPs to make sure that the system capable to pass the 100 year event and the various water quality BMPs mitigation currently proposed through the City review and approval process.

REFERENCES

1. County of San Bernardino County Hydrology Manual, August 1986, as incorporated in the Civildesign Rational Method Hydrology Software.

2. CivilCADD/Design Engineering Software, version 7.1.

3. Roquet Ranch Tentative Tract Map 19983.

4. WSPG, Los Angeles County Public Works Water Surface Profile software - Storm Drain Analysis Plus by CivilSoft.

5. Hydraulic Calculations software by Haestad Method, Inc., Flow Master V6.0

FIGURES

FIGURE 2

Hydrology Map – Existing Condition

Summary Hydrology Drainage Sub-areas for Existing Condition – Rational Method 10-year storm:

Drainage Area	Area in Acre	Q_{10} sub-area in cfs	Q_{10} conf. in cfs
AA-1	7.85	15.65	
AA-2	5.15	7.72	23.37
AB-1	5.73	11.42	
AB-2	9.85	15.68	27.09
AC-1	4.85	9.67	
AC-2	9.49	14.94	24.61
AC-3	16.54	23.48	48.09
AC-4	20.50	21.18	69.27
AD-1	3.73	5.81	
AE-1	7.05	12.11	
AE-2	20.10	32.83	44.94
AF-1	4.17	7.92	
AF-2	14.92	22.86	30.78
AG-1	7.10	12.58	
AG-2	10.12	15.03	27.62
AG-3	14.64	17.78	45.40
AH-1	8.12	15.11	
AI-1	8.64	14.04	
AI-2	11.54	18.75	32.79
BA-1	6.99	13.17	
BA-2	8.23	12.88	26.05
BA-3	19.54	27.78	53.83
BA-4	35.41	44.62	98.45
BA-5	87.05	98.77	197.22

Summary Hydrology Drainage Sub-areas for Existing Condition – Rational Method 100-year storm:

Drainage Area	Area in Acre	Q_{100} sub-area in cfs	Q_{100} conf. in cfs
AA-1	7.85	23.27	
AA-2	5.15	12.04	35.31
AB-1	5.73	16.98	
AB-2	9.85	24.14	41.12
AC-1	4.85	14.37	
AC-2	9.49	23.17	37.55
AC-3	16.54	36.87	74.42
AC-4	20.50	35.21	109.62
AD-1	3.73	8.75	
AE-1	7.05	18.16	
AE-2	20.10	49.61	67.77
AF-1	4.17	11.80	
AF-2	14.92	35.31	47.11
AG-1	7.10	18.82	
AG-2	10.12	23.19	42.01
AG-3	14.64	28.33	70.34
AH-1	8.12	22.55	
AI-1	8.64	21.11	
AI-2	11.54	28.20	49.31
BA-1	6.99	19.64	
BA-2	8.23	19.83	39.46
BA-3	19.54	43.32	82.64
BA-4	35.41	70.85	153.64
BA-5	87.05	159.27	312.91

ROQUET RANCH - TTM 19983
HYDROLOGY MAP

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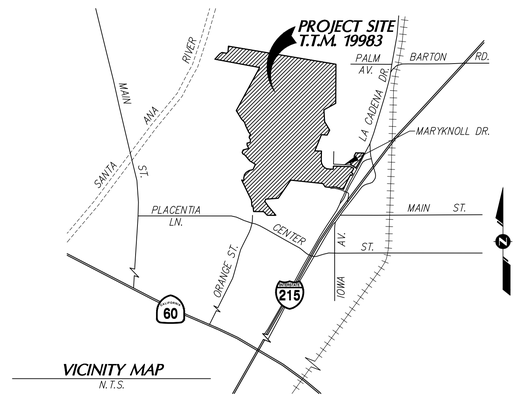
FIGURE 3

Hydrology Map - Proposed Condition



VICINITY MAP
N.T.S.

Summary Hydrology Drainage Sub-areas for Proposed Condition – Rational Method 10-year storm:

Drainage Area	Area in Acre	Q_{10} sub-area in cfs	Q_{10} conf. in cfs
AA-1	5.70	10.90	
AA-2	6.46	10.17	21.07
AA-3	5.40	6.97	28.04
AA-4	4.28	6.90	34.95
AA-5	3.84	4.80	39.75
AA-6	1.08	1.27	41.02
AA-7	4.47	8.41	
AA-8	4.28	6.86	15.27
AA-9	1.15	3.56	
AA-10	1.75	3.54	7.09
		Node 105	59.24
AA-11	7.60	13.68	
		Node 111	72.61
AA-12	4.46	7.80	
AA-13	6.96	12.52	20.32
AA-14	1.59	3.10	23.41
AA-15	7.23	8.82	32.24
AA-16	2.64	3.05	35.29
AA-17	3.57	5.41	40.70
		Node 120	110.99
AB-1	4.88	8.64	
AB-2	6.02	9.48	18.12
AB-3	10.20	16.96	35.08
AB-4	2.35	2.61	37.68
AC-1	3.13	7.65	
AC-2	3.75	5.24	12.89
AC-3	0.46	0.73	13.62
AD-1	2.24	4.91	
AE-1	5.25	11.05	
AE-2	11.80	22.02	33.06
AE-3	3.85	5.51	38.57
AE-4	5.88	8.82	47.38
AE-5	3.86	2.54	49.92
AE-6	3.85	6.27	56.20
AF-1	4.38	11.64	
AF-2	4.54	12.06	23.70
AF-3	10.20	25.48	49.18
AF-4	1.29	2.77	51.95
BA-1	5.14	10.29	
BA-2	5.32	9.47	19.76
	1.00	2.08	21.84
BA-3	25.60	48.37	70.21
BA-4	17.80	30.19	100.39
BA-5	2.53	4.14	104.53
	1.00	2.01	106.54
BA-6	2.41	6.08	
BA-7	9.05	19.86	25.94
BA-8	0.77	1.33	27.27
		NODE 704	130.69
BA-9	18.70	23.47	154.17
BA-10	8.80	14.98	
	2.00	3.78	172.93
		NODE 705	172.93
AG-1	5.27	10.83	
AH-1	4.10	9.00	
AH-2	5.85	12.84	21.84
AH-3	12.41	27.37	49.21

Summary Hydrology Drainage Sub-areas for Proposed Condition – Rational Method 100-year storm:

Drainage Area	Area in Acre	Q_{100} sub-area in cfs	Q_{100} conf. in cfs
AA-1	5.70	15.96	
AA-2	6.46	15.18	31.14
AA-3	5.40	10.63	41.77
AA-4	4.28	10.25	52.02
AA-5	3.84	7.32	59.34
AA-6	1.08	2.03	61.37
AA-7	4.47	12.32	
AA-8	4.28	10.24	22.56
AA-9	1.15	5.04	
AA-10	1.75	5.19	10.23
		Node 105	88.39
AA-11	7.60	20.05	
		Node 111	105.73
AA-12	4.46	11.47	
AA-13	6.96	18.24	29.70
AA-14	1.59	4.40	34.11
AA-15	7.23	13.62	47.72
AA-16	2.64	4.69	52.41
AA-17	3.57	8.08	60.50
		Node 120	166.15
AB-1	4.88	12.39	
AB-2	6.02	13.78	26.17
AB-3	10.20	24.49	50.65
AB-4	2.35	4.04	54.69
AC-1	3.13	10.86	
AC-2	3.75	7.81	18.67
AC-3	0.46	1.10	19.78
AD-1	2.24	7.03	
AE-1	5.25	16.11	
AE-2	11.80	32.61	48.72
AE-3	3.85	8.44	57.16
AE-4	5.88	13.42	70.57
AE-5	3.86	4.48	75.05
AE-6	3.85	9.43	84.48
AF-1	4.38	16.52	
AF-2	4.54	17.12	33.64
AF-3	10.20	36.51	70.16
AF-4	1.29	4.08	74.24
BA-1	5.14	15.03	
BA-2	5.32	14.06	29.10
	1.00	2.97	32.07
BA-3	25.60	71.21	103.27
BA-4	17.80	45.03	148.30
BA-5	2.53	6.19	154.50
	1.00	2.88	157.37
BA-6	2.41	8.63	
BA-7	9.05	28.77	37.40
BA-8	0.77	2.01	39.41
		NODE 704	192.24
BA-9	18.70	36.62	228.86
BA-10	8.80	22.34	251.20
	2.00	5.46	
		NODE 705	256.66
AG-1	5.27	15.81	
AH-1	4.10	13.11	
AH-2	5.85	18.71	31.82
AH-3	12.41	39.13	70.95

PROPOSED CONDITION

ROQUET RANCH - TTM 19983
HYDROLOGY MAP

FIGURE 3

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FAX (951) 279-4380

Drawing: R:\26933S\Final\Design\Working\HYD\33S - EXH - HYD - PROP-1116.dwg Layout: 36x55P Saved: 11/17/2016 9:01 AM Plotted: 11/17/2016 9:26 AM Plot Scale: 1:1 By: Johannes Yostanto

ATTACHMENTS

ATTACHMENT A

Rational Method Hydrology
Existing Condition
(10 Year & 100 Year storm)

ATTACHMENT A
Rational Method Hydrology
Existing Condition

(10-Year storm)

```
            San Bernardino County Rational Hydrology Program

                (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2005 Version 7.1
       Rational Hydrology Study        Date: 02/10/16
--------------------------------------------------------------------------
Roquet Ranch Project
Existing Condition
10-year storm

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

Program License Serial Number 4029

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

--------------------------------------------------------------------------
Rational hydrology study storm event year is    10.0
Computed rainfall intensity:
Storm year =    10.00   1 hour rainfall =     0.850 (In.)
Slope used for rainfall intensity curve b =  0.6000
Soil antecedent moisture condition (AMC) = 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   660.000(Ft.)
Top (of initial area) elevation =  1099.000(Ft.)
Bottom (of initial area) elevation =   925.000(Ft.)
Difference in elevation =   174.000(Ft.)
Slope =    0.26364  s(%)=      26.36
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.200 min.
Rainfall intensity =      2.618(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.761
Subarea runoff =     15.649(CFS)
Total initial stream area =        7.850(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.423(Ft.), Average velocity =   6.649(Ft/s)
       ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
```

```
       1             0.00             5.00
       2            20.00             0.00
       3            25.00             0.00
       4            51.00             5.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =     19.553(CFS)
  '     '     flow top width =      8.894(Ft.)
  '     '    velocity=    6.649(Ft/s)
  '     '     area =      2.941(Sq.Ft)
  '     '     Froude number =     2.038

Upstream point elevation =   925.000(Ft.)
Downstream point elevation =   863.000(Ft.)
Flow length =   570.000(Ft.)
Travel time  =    1.43 min.
Time of concentration =   10.63 min.
Depth of flow =   0.423(Ft.)
Average velocity =   6.649(Ft/s)
Total irregular channel flow =    19.553(CFS)
Irregular channel normal depth above invert elev. =   0.423(Ft.)
Average velocity of channel(s) =   6.649(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.401(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.749
Subarea runoff =      7.724(CFS) for    5.150(Ac.)
Total runoff =     23.373(CFS)
Effective area this stream =       13.00(Ac.)
Total Study Area (Main Stream No. 1) =       13.00(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.466(Ft.), Average velocity =   7.016(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      111.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   667.000(Ft.)
Top (of initial area) elevation =  1121.000(Ft.)
Bottom (of initial area) elevation =   942.000(Ft.)
Difference in elevation =   179.000(Ft.)
Slope =    0.26837  s(%)=      26.84
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.206 min.
Rainfall intensity =      2.617(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.761
Subarea runoff =     11.417(CFS)
```

```
Total initial stream area =        5.730(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      112.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.456(Ft.), Average velocity =   6.844(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              5.00
       2             22.00              0.00
       3             26.00              0.00
       4             52.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     19.290(CFS)
  '     '     flow top width =      8.373(Ft.)
  '     '    velocity=    6.844(Ft/s)
  '     '     area =      2.818(Sq.Ft)
  '     '     Froude number =     2.079

Upstream point elevation =   942.000(Ft.)
Downstream point elevation =   853.000(Ft.)
Flow length =   790.000(Ft.)
Travel time  =    1.92 min.
Time of concentration =   11.13 min.
Depth of flow =   0.456(Ft.)
Average velocity =   6.844(Ft/s)
Total irregular channel flow =    19.290(CFS)
Irregular channel normal depth above invert elev. =   0.456(Ft.)
Average velocity of channel(s) =   6.844(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.336(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.745
Subarea runoff =     15.676(CFS) for    9.850(Ac.)
Total runoff =     27.093(CFS)
Effective area this stream =       15.58(Ac.)
Total Study Area (Main Stream No. 1) =       28.58(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.544(Ft.), Average velocity =   7.542(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      120.000 to Point/Station      121.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
```

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Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   845.000(Ft.)
Top (of initial area) elevation =  1477.000(Ft.)
Bottom (of initial area) elevation =  1112.000(Ft.)
Difference in elevation =   365.000(Ft.)
Slope =    0.43195  s(%)=      43.20
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.201 min.
Rainfall intensity =      2.618(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.761
Subarea runoff =      9.668(CFS)
Total initial stream area =        4.850(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


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Process from Point/Station      121.000 to Point/Station      122.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.280(Ft.), Average velocity =   5.542(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              4.00
       2             15.00              0.00
       3             25.00              0.00
       4             40.00              4.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     17.174(CFS)
  '     '      flow top width =     12.103(Ft.)
  '     '    velocity=    5.542(Ft/s)
  '     '      area =      3.099(Sq.Ft)
  '     '      Froude number =     1.930

Upstream point elevation =  1112.000(Ft.)
Downstream point elevation =  1037.000(Ft.)
Flow length =   710.000(Ft.)
Travel time  =    2.14 min.
Time of concentration =   11.34 min.
Depth of flow =   0.280(Ft.)
Average velocity =   5.542(Ft/s)
Total irregular channel flow =    17.174(CFS)
Irregular channel normal depth above invert elev. =   0.280(Ft.)
Average velocity of channel(s) =   5.542(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.310(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.743
```

```
Subarea runoff =     14.939(CFS) for    9.490(Ac.)
Total runoff =     24.607(CFS)
Effective area this stream =       14.34(Ac.)
Total Study Area (Main Stream No. 1) =       42.92(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.346(Ft.), Average velocity =   6.295(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      123.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.595(Ft.), Average velocity =   7.900(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              5.00
       2             20.00              0.00
       3             25.00              0.00
       4             51.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     36.390(CFS)
  '     '     flow top width =     10.477(Ft.)
  '     '    velocity=    7.900(Ft/s)
  '     '     area =      4.606(Sq.Ft)
  '     '     Froude number =     2.099

Upstream point elevation =  1037.000(Ft.)
Downstream point elevation =   957.000(Ft.)
Flow length =   760.000(Ft.)
Travel time  =    1.60 min.
Time of concentration =   12.94 min.
Depth of flow =   0.595(Ft.)
Average velocity =   7.900(Ft/s)
Total irregular channel flow =    36.390(CFS)
Irregular channel normal depth above invert elev. =   0.595(Ft.)
Average velocity of channel(s) =   7.900(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.134(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.730
Subarea runoff =     23.483(CFS) for   16.540(Ac.)
Total runoff =     48.089(CFS)
Effective area this stream =       30.88(Ac.)
Total Study Area (Main Stream No. 1) =       59.46(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.688(Ft.), Average velocity =   8.556(Ft/s)


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Process from Point/Station      123.000 to Point/Station      124.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
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Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.611(Ft.), Average velocity =   7.506(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              6.00
       2             25.00              0.00
       3             35.00              0.00
       4             65.00              6.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     58.726(CFS)
  '     '     flow top width =     15.602(Ft.)
  '     '    velocity=    7.506(Ft/s)
  '     '     area =      7.824(Sq.Ft)
  '     '     Froude number =     1.868

Upstream point elevation =   957.000(Ft.)
Downstream point elevation =   859.000(Ft.)
Flow length =  1235.000(Ft.)
Travel time  =    2.74 min.
Time of concentration =   15.68 min.
Depth of flow =   0.611(Ft.)
Average velocity =   7.506(Ft/s)
Total irregular channel flow =    58.726(CFS)
Irregular channel normal depth above invert elev. =   0.611(Ft.)
Average velocity of channel(s) =   7.506(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      1.901(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.709
Subarea runoff =     21.177(CFS) for   20.500(Ac.)
Total runoff =     69.266(CFS)
Effective area this stream =       51.38(Ac.)
Total Study Area (Main Stream No. 1) =       79.96(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.670(Ft.), Average velocity =   7.909(Ft/s)


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Process from Point/Station      130.000 to Point/Station      131.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   970.000(Ft.)
Top (of initial area) elevation =   957.000(Ft.)
Bottom (of initial area) elevation =   857.000(Ft.)
Difference in elevation =   100.000(Ft.)
```

```
Slope =    0.10309  s(%)=      10.31
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.949 min.
Rainfall intensity =      2.133(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.730
Subarea runoff =      5.806(CFS)
Total initial stream area =        3.730(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


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Process from Point/Station      140.000 to Point/Station      141.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1103.000(Ft.)
Bottom (of initial area) elevation =   888.000(Ft.)
Difference in elevation =   215.000(Ft.)
Slope =    0.21500  s(%)=      21.50
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.315 min.
Rainfall intensity =      2.313(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.743
Subarea runoff =     12.113(CFS)
Total initial stream area =        7.050(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


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Process from Point/Station      141.000 to Point/Station      142.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.501(Ft.), Average velocity =   7.848(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             20.00              0.00
      3             25.00              0.00
      4             50.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     28.554(CFS)
  '     '     flow top width =      9.513(Ft.)
  '     '    velocity=    7.848(Ft/s)
  '     '     area =      3.638(Sq.Ft)
  '     '     Froude number =     2.236

Upstream point elevation =   888.000(Ft.)
Downstream point elevation =   853.000(Ft.)
Flow length =   280.000(Ft.)
```

```
Travel time  =    0.59 min.
Time of concentration =   11.91 min.
Depth of flow =   0.501(Ft.)
Average velocity =   7.848(Ft/s)
Total irregular channel flow =    28.554(CFS)
Irregular channel normal depth above invert elev. =   0.501(Ft.)
Average velocity of channel(s) =   7.848(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.243(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.738
Subarea runoff =     32.826(CFS) for   20.100(Ac.)
Total runoff =     44.939(CFS)
Effective area this stream =       27.15(Ac.)
Total Study Area (Main Stream No. 1) =      110.84(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.637(Ft.), Average velocity =   8.959(Ft/s)


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Process from Point/Station      150.000 to Point/Station      151.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   715.000(Ft.)
Top (of initial area) elevation =  1066.000(Ft.)
Bottom (of initial area) elevation =   909.000(Ft.)
Difference in elevation =   157.000(Ft.)
Slope =    0.21958  s(%)=      21.96
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.853 min.
Rainfall intensity =      2.513(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =      7.916(CFS)
Total initial stream area =        4.170(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


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Process from Point/Station      151.000 to Point/Station      152.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.540(Ft.), Average velocity =   5.650(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
```

```
       1             0.00             4.00
       2            15.00             0.00
       3            20.00             0.00
       4            25.00             4.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =     19.373(CFS)
  '     '     flow top width =      7.700(Ft.)
  '     '    velocity=    5.650(Ft/s)
  '     '     area =      3.429(Sq.Ft)
  '     '     Froude number =     1.492

Upstream point elevation =   909.000(Ft.)
Downstream point elevation =   863.000(Ft.)
Flow length =   845.000(Ft.)
Travel time  =    2.49 min.
Time of concentration =   12.35 min.
Depth of flow =   0.540(Ft.)
Average velocity =   5.650(Ft/s)
Total irregular channel flow =    19.373(CFS)
Irregular channel normal depth above invert elev. =   0.540(Ft.)
Average velocity of channel(s) =   5.650(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.195(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.735
Subarea runoff =     22.860(CFS) for   14.920(Ac.)
Total runoff =     30.777(CFS)
Effective area this stream =       19.09(Ac.)
Total Study Area (Main Stream No. 1) =      129.93(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.699(Ft.), Average velocity =   6.522(Ft/s)


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Process from Point/Station      160.000 to Point/Station      161.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   950.000(Ft.)
Top (of initial area) elevation =  1219.000(Ft.)
Bottom (of initial area) elevation =   991.000(Ft.)
Difference in elevation =   228.000(Ft.)
Slope =    0.24000  s(%)=      24.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.844 min.
Rainfall intensity =      2.372(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.747
Subarea runoff =     12.581(CFS)
```

```
Total initial stream area =        7.100(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


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Process from Point/Station      161.000 to Point/Station      162.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.537(Ft.), Average velocity =   5.920(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              4.00
       2             15.00              0.00
       3             20.00              0.00
       4             25.00              4.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     20.147(CFS)
  '     '     flow top width =      7.683(Ft.)
  '     '    velocity=    5.920(Ft/s)
  '     '     area =      3.403(Sq.Ft)
  '     '     Froude number =     1.568

Upstream point elevation =   991.000(Ft.)
Downstream point elevation =   957.000(Ft.)
Flow length =   565.000(Ft.)
Travel time  =    1.59 min.
Time of concentration =   12.44 min.
Depth of flow =   0.537(Ft.)
Average velocity =   5.920(Ft/s)
Total irregular channel flow =    20.147(CFS)
Irregular channel normal depth above invert elev. =   0.537(Ft.)
Average velocity of channel(s) =   5.920(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.185(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.734
Subarea runoff =     15.034(CFS) for   10.120(Ac.)
Total runoff =     27.615(CFS)
Effective area this stream =       17.22(Ac.)
Total Study Area (Main Stream No. 1) =      147.15(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.640(Ft.), Average velocity =   6.532(Ft/s)


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Process from Point/Station      162.000 to Point/Station      163.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.661(Ft.), Average velocity =   6.933(Ft/s)
       ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              5.00
       2             20.00              0.00
       3             25.00              0.00
       4             50.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     36.556(CFS)
  '     '     flow top width =     10.950(Ft.)
  '     '    velocity=    6.933(Ft/s)
  '     '     area =      5.273(Sq.Ft)
  '     '     Froude number =     1.761

Upstream point elevation =   957.000(Ft.)
Downstream point elevation =   893.000(Ft.)
Flow length =   890.000(Ft.)
Travel time  =    2.14 min.
Time of concentration =   14.57 min.
Depth of flow =   0.661(Ft.)
Average velocity =   6.933(Ft/s)
Total irregular channel flow =    36.556(CFS)
Irregular channel normal depth above invert elev. =   0.661(Ft.)
Average velocity of channel(s) =   6.933(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      1.987(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.717
Subarea runoff =     17.784(CFS) for   14.640(Ac.)
Total runoff =     45.399(CFS)
Effective area this stream =       31.86(Ac.)
Total Study Area (Main Stream No. 1) =      161.79(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.739(Ft.), Average velocity =   7.372(Ft/s)


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Process from Point/Station      170.000 to Point/Station      171.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   857.000(Ft.)
Top (of initial area) elevation =  1138.000(Ft.)
Bottom (of initial area) elevation =   903.000(Ft.)
Difference in elevation =   235.000(Ft.)
Slope =    0.27421  s(%)=      27.42
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.133 min.
```

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Rainfall intensity =      2.471(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.753
Subarea runoff =     15.109(CFS)
Total initial stream area =        8.120(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


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Process from Point/Station      180.000 to Point/Station      181.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   996.000(Ft.)
Top (of initial area) elevation =  1038.000(Ft.)
Bottom (of initial area) elevation =   893.000(Ft.)
Difference in elevation =   145.000(Ft.)
Slope =    0.14558  s(%)=      14.56
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.214 min.
Rainfall intensity =      2.209(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.736
Subarea runoff =     14.040(CFS)
Total initial stream area =        8.640(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      180.000 to Point/Station      181.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Time of concentration =    12.21 min.
Rainfall intensity =      2.209(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.736
Subarea runoff =     18.752(CFS) for   11.540(Ac.)
Total runoff =     32.792(CFS)
Effective area this stream =       20.18(Ac.)
Total Study Area (Main Stream No. 1) =      190.09(Ac.)
Area averaged Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
```

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Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   850.000(Ft.)
Top (of initial area) elevation =  1422.000(Ft.)
Bottom (of initial area) elevation =  1172.000(Ft.)
Difference in elevation =   250.000(Ft.)
Slope =    0.29412  s(%)=      29.41
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.959 min.
Rainfall intensity =      2.497(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =     13.169(CFS)
Total initial stream area =        6.990(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.387(Ft.), Average velocity =   8.185(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              4.00
       2             15.00              0.00
       3             20.00              0.00
       4             30.00              4.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     19.653(CFS)
  '     '     flow top width =      7.417(Ft.)
  '     '    velocity=    8.185(Ft/s)
  '     '     area =      2.401(Sq.Ft)
  '     '     Froude number =     2.535

Upstream point elevation =  1172.000(Ft.)
Downstream point elevation =  1053.000(Ft.)
Flow length =   696.000(Ft.)
Travel time  =    1.42 min.
Time of concentration =   11.38 min.
Depth of flow =   0.387(Ft.)
Average velocity =   8.185(Ft/s)
Total irregular channel flow =    19.653(CFS)
Irregular channel normal depth above invert elev. =   0.387(Ft.)
Average velocity of channel(s) =   8.185(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.305(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

```
rational method)(Q=KCIA) is C = 0.742
Subarea runoff =     12.881(CFS) for    8.230(Ac.)
Total runoff =     26.049(CFS)
Effective area this stream =       15.22(Ac.)
Total Study Area (Main Stream No. 1) =      205.31(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.453(Ft.), Average velocity =   8.957(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.695(Ft.), Average velocity =   7.077(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              5.00
       2             20.00              0.00
       3             25.00              0.00
       4             50.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     39.989(CFS)
  '     '     flow top width =     11.257(Ft.)
  '     '    velocity=    7.077(Ft/s)
  '     '     area =      5.651(Sq.Ft)
  '     '     Froude number =     1.760

Upstream point elevation =  1053.000(Ft.)
Downstream point elevation =  1003.000(Ft.)
Flow length =   705.000(Ft.)
Travel time  =    1.66 min.
Time of concentration =   13.04 min.
Depth of flow =   0.695(Ft.)
Average velocity =   7.077(Ft/s)
Total irregular channel flow =    39.989(CFS)
Irregular channel normal depth above invert elev. =   0.695(Ft.)
Average velocity of channel(s) =   7.077(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.124(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.729
Subarea runoff =     27.783(CFS) for   19.540(Ac.)
Total runoff =     53.832(CFS)
Effective area this stream =       34.76(Ac.)
Total Study Area (Main Stream No. 1) =      224.85(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.810(Ft.), Average velocity =   7.694(Ft/s)


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Process from Point/Station      203.000 to Point/Station      204.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
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_____________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.887(Ft.), Average velocity =   8.601(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              6.00
      2             30.00              0.00
      3             36.00              0.00
      4             60.00              6.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =     76.185(CFS)
  '     '     flow top width =     13.980(Ft.)
  '     '    velocity=    8.601(Ft/s)
  '     '     area =      8.857(Sq.Ft)
  '     '     Froude number =     1.904

Upstream point elevation =  1003.000(Ft.)
Downstream point elevation =   930.000(Ft.)
Flow length =   950.000(Ft.)
Travel time  =    1.84 min.
Time of concentration =   14.88 min.
Depth of flow =   0.887(Ft.)
Average velocity =   8.601(Ft/s)
Total irregular channel flow =    76.185(CFS)
Irregular channel normal depth above invert elev. =   0.887(Ft.)
Average velocity of channel(s) =   8.601(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      1.962(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.715
Subarea runoff =     44.618(CFS) for   35.410(Ac.)
Total runoff =     98.450(CFS)
Effective area this stream =       70.17(Ac.)
Total Study Area (Main Stream No. 1) =      260.26(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   1.010(Ft.), Average velocity =   9.240(Ft/s)


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Process from Point/Station      204.000 to Point/Station      205.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   1.342(Ft.), Average velocity =   8.451(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              7.00
      2             30.00              0.00
      3             37.00              0.00
      4             70.00              7.00
Manning's 'N' friction factor =   0.035
```

```
------------------------------------------------------------------
Sub-Channel flow  =    147.861(CFS)
  '     '     flow top width =     19.077(Ft.)
  '     '    velocity=    8.451(Ft/s)
  '     '     area =     17.497(Sq.Ft)
  '     '     Froude number =     1.555

Upstream point elevation =   930.000(Ft.)
Downstream point elevation =   876.000(Ft.)
Flow length =  1190.000(Ft.)
Travel time  =    2.35 min.
Time of concentration =   17.22 min.
Depth of flow =   1.342(Ft.)
Average velocity =   8.451(Ft/s)
Total irregular channel flow =   147.861(CFS)
Irregular channel normal depth above invert elev. =   1.342(Ft.)
Average velocity of channel(s) =   8.451(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      1.797(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.698
Subarea runoff =     98.770(CFS) for   87.050(Ac.)
Total runoff =    197.219(CFS)
Effective area this stream =      157.22(Ac.)
Total Study Area (Main Stream No. 1) =      347.31(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   1.546(Ft.), Average velocity =   9.137(Ft/s)
End of computations, Total Study Area =          347.31 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number =  78.0
```

ATTACHMENT A
Rational Method Hydrology
Existing Condition

(100-Year storm)

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              San Bernardino County Rational Hydrology Program

                  (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2005 Version 7.1
       Rational Hydrology Study        Date: 02/10/16
-----------------------------------------------------------------------
Roquet Ranch Project
Existing Condition
100-year storm

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

Program License Serial Number 4029

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

-----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
Computed rainfall intensity:
Storm year =   100.00   1 hour rainfall =     1.200 (In.)
Slope used for rainfall intensity curve b =  0.6000
Soil antecedent moisture condition (AMC) = 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   660.000(Ft.)
Top (of initial area) elevation =  1099.000(Ft.)
Bottom (of initial area) elevation =   925.000(Ft.)
Difference in elevation =   174.000(Ft.)
Slope =    0.26364  s(%)=      26.36
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.200 min.
Rainfall intensity =      3.697(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.802
Subarea runoff =     23.266(CFS)
Total initial stream area =        7.850(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.526(Ft.), Average velocity =   7.504(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              5.00
       2             20.00              0.00
       3             25.00              0.00
       4             51.00              5.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =     29.315(CFS)
  '     '     flow top width =      9.843(Ft.)
  '     '    velocity=    7.504(Ft/s)
  '     '     area =      3.907(Sq.Ft)
  '     '     Froude number =     2.099

Upstream point elevation =   925.000(Ft.)
Downstream point elevation =   863.000(Ft.)
Flow length =   570.000(Ft.)
Travel time  =    1.27 min.
Time of concentration =   10.47 min.
Depth of flow =   0.526(Ft.)
Average velocity =   7.504(Ft/s)
Total irregular channel flow =    29.315(CFS)
Irregular channel normal depth above invert elev. =   0.526(Ft.)
Average velocity of channel(s) =   7.504(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      3.421(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.794
Subarea runoff =     12.044(CFS) for    5.150(Ac.)
Total runoff =     35.310(CFS)
Effective area this stream =       13.00(Ac.)
Total Study Area (Main Stream No. 1) =       13.00(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.581(Ft.), Average velocity =   7.923(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      111.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   667.000(Ft.)
Top (of initial area) elevation =  1121.000(Ft.)
Bottom (of initial area) elevation =   942.000(Ft.)
Difference in elevation =   179.000(Ft.)
Slope =    0.26837  s(%)=      26.84
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.206 min.
Rainfall intensity =      3.695(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.802
Subarea runoff =     16.975(CFS)
Total initial stream area =        5.730(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      112.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.564(Ft.), Average velocity =   7.694(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              5.00
       2             22.00              0.00
       3             26.00              0.00
       4             52.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     29.090(CFS)
  '     '     flow top width =      9.412(Ft.)
  '     '    velocity=    7.694(Ft/s)
  '     '     area =      3.781(Sq.Ft)
  '     '     Froude number =     2.139

Upstream point elevation =   942.000(Ft.)
Downstream point elevation =   853.000(Ft.)
Flow length =   790.000(Ft.)
Travel time  =    1.71 min.
Time of concentration =   10.92 min.
Depth of flow =   0.564(Ft.)
Average velocity =   7.694(Ft/s)
Total irregular channel flow =    29.090(CFS)
Irregular channel normal depth above invert elev. =   0.564(Ft.)
Average velocity of channel(s) =   7.694(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      3.336(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.791
Subarea runoff =     24.142(CFS) for    9.850(Ac.)
Total runoff =     41.117(CFS)
Effective area this stream =       15.58(Ac.)
Total Study Area (Main Stream No. 1) =       28.58(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.672(Ft.), Average velocity =   8.472(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      120.000 to Point/Station      121.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
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```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   845.000(Ft.)
Top (of initial area) elevation =  1477.000(Ft.)
Bottom (of initial area) elevation =  1112.000(Ft.)
Difference in elevation =   365.000(Ft.)
Slope =    0.43195  s(%)=      43.20
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.201 min.
Rainfall intensity =      3.696(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.802
Subarea runoff =     14.374(CFS)
Total initial stream area =        4.850(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      121.000 to Point/Station      122.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.357(Ft.), Average velocity =   6.418(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              4.00
       2             15.00              0.00
       3             25.00              0.00
       4             40.00              4.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     26.005(CFS)
  '     '     flow top width =     12.680(Ft.)
  '     '    velocity=    6.418(Ft/s)
  '     '     area =      4.052(Sq.Ft)
  '     '     Froude number =     2.001

Upstream point elevation =  1112.000(Ft.)
Downstream point elevation =  1037.000(Ft.)
Flow length =   710.000(Ft.)
Travel time  =    1.84 min.
Time of concentration =   11.04 min.
Depth of flow =   0.357(Ft.)
Average velocity =   6.418(Ft/s)
Total irregular channel flow =    26.005(CFS)
Irregular channel normal depth above invert elev. =   0.357(Ft.)
Average velocity of channel(s) =   6.418(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      3.313(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.790
Subarea runoff =     23.173(CFS) for    9.490(Ac.)
Total runoff =     37.547(CFS)
Effective area this stream =       14.34(Ac.)
Total Study Area (Main Stream No. 1) =       42.92(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.442(Ft.), Average velocity =   7.286(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      123.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.744(Ft.), Average velocity =   8.931(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              5.00
       2             20.00              0.00
       3             25.00              0.00
       4             51.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     56.009(CFS)
  '     '     flow top width =     11.848(Ft.)
  '     '    velocity=    8.932(Ft/s)
  '     '     area =      6.271(Sq.Ft)
  '     '     Froude number =     2.164

Upstream point elevation =  1037.000(Ft.)
Downstream point elevation =   957.000(Ft.)
Flow length =   760.000(Ft.)
Travel time  =    1.42 min.
Time of concentration =   12.46 min.
Depth of flow =   0.744(Ft.)
Average velocity =   8.931(Ft/s)
Total irregular channel flow =    56.009(CFS)
Irregular channel normal depth above invert elev. =   0.744(Ft.)
Average velocity of channel(s) =   8.931(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      3.081(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.782
Subarea runoff =     36.869(CFS) for   16.540(Ac.)
Total runoff =     74.416(CFS)
Effective area this stream =       30.88(Ac.)
Total Study Area (Main Stream No. 1) =       59.46(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.860(Ft.), Average velocity =   9.666(Ft/s)


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Process from Point/Station      123.000 to Point/Station      124.000
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**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
____________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.784(Ft.), Average velocity =   8.639(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              6.00
      2             25.00              0.00
      3             35.00              0.00
      4             65.00              6.00
Manning's 'N' friction factor =   0.035
--------------------------------------------------------------------
Sub-Channel flow  =     92.050(CFS)
  '     '     flow top width =     17.186(Ft.)
  '     '    velocity=    8.639(Ft/s)
  '     '     area =     10.655(Sq.Ft)
  '     '     Froude number =     1.934

Upstream point elevation =   957.000(Ft.)
Downstream point elevation =   859.000(Ft.)
Flow length =  1235.000(Ft.)
Travel time  =    2.38 min.
Time of concentration =   14.85 min.
Depth of flow =   0.784(Ft.)
Average velocity =   8.639(Ft/s)
Total irregular channel flow =    92.050(CFS)
Irregular channel normal depth above invert elev. =   0.784(Ft.)
Average velocity of channel(s) =   8.639(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.774(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.769
Subarea runoff =     35.205(CFS) for   20.500(Ac.)
Total runoff =    109.621(CFS)
Effective area this stream =       51.38(Ac.)
Total Study Area (Main Stream No. 1) =       79.96(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.862(Ft.), Average velocity =   9.112(Ft/s)


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Process from Point/Station      130.000 to Point/Station      131.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   970.000(Ft.)
Top (of initial area) elevation =   957.000(Ft.)
```

```
Bottom (of initial area) elevation =   857.000(Ft.)
Difference in elevation =   100.000(Ft.)
Slope =    0.10309  s(%)=      10.31
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.949 min.
Rainfall intensity =      3.011(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.779
Subarea runoff =      8.754(CFS)
Total initial stream area =        3.730(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


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Process from Point/Station      140.000 to Point/Station      141.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1103.000(Ft.)
Bottom (of initial area) elevation =   888.000(Ft.)
Difference in elevation =   215.000(Ft.)
Slope =    0.21500  s(%)=      21.50
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.315 min.
Rainfall intensity =      3.265(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.789
Subarea runoff =     18.155(CFS)
Total initial stream area =        7.050(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


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Process from Point/Station      141.000 to Point/Station      142.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.623(Ft.), Average velocity =   8.846(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             20.00              0.00
      3             25.00              0.00
      4             50.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     42.996(CFS)
  '     '     flow top width =     10.606(Ft.)
  '     '    velocity=    8.846(Ft/s)
  '     '     area =      4.861(Sq.Ft)
  '     '     Froude number =     2.303

Upstream point elevation =   888.000(Ft.)
```

```
Downstream point elevation =   853.000(Ft.)
Flow length =   280.000(Ft.)
Travel time  =    0.53 min.
Time of concentration =   11.84 min.
Depth of flow =   0.623(Ft.)
Average velocity =   8.846(Ft/s)
Total irregular channel flow =    42.995(CFS)
Irregular channel normal depth above invert elev. =   0.623(Ft.)
Average velocity of channel(s) =   8.846(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      3.177(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.786
Subarea runoff =     49.611(CFS) for   20.100(Ac.)
Total runoff =     67.766(CFS)
Effective area this stream =       27.15(Ac.)
Total Study Area (Main Stream No. 1) =      110.84(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.788(Ft.), Average velocity =  10.064(Ft/s)


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Process from Point/Station      150.000 to Point/Station      151.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   715.000(Ft.)
Top (of initial area) elevation =  1066.000(Ft.)
Bottom (of initial area) elevation =   909.000(Ft.)
Difference in elevation =   157.000(Ft.)
Slope =    0.21958  s(%)=      21.96
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.853 min.
Rainfall intensity =      3.548(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.798
Subarea runoff =     11.800(CFS)
Total initial stream area =        4.170(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


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Process from Point/Station      151.000 to Point/Station      152.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.683(Ft.), Average velocity =   6.437(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              4.00
       2             15.00              0.00
       3             20.00              0.00
       4             25.00              4.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =     29.487(CFS)
  '     '     flow top width =      8.415(Ft.)
  '     '    velocity=    6.437(Ft/s)
  '     '     area =      4.580(Sq.Ft)
  '     '     Froude number =     1.538

Upstream point elevation =   909.000(Ft.)
Downstream point elevation =   863.000(Ft.)
Flow length =   845.000(Ft.)
Travel time  =    2.19 min.
Time of concentration =   12.04 min.
Depth of flow =   0.683(Ft.)
Average velocity =   6.437(Ft/s)
Total irregular channel flow =    29.487(CFS)
Irregular channel normal depth above invert elev. =   0.683(Ft.)
Average velocity of channel(s) =   6.437(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      3.145(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.785
Subarea runoff =     35.310(CFS) for   14.920(Ac.)
Total runoff =     47.109(CFS)
Effective area this stream =       19.09(Ac.)
Total Study Area (Main Stream No. 1) =      129.93(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.883(Ft.), Average velocity =   7.407(Ft/s)


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Process from Point/Station      160.000 to Point/Station      161.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   950.000(Ft.)
Top (of initial area) elevation =  1219.000(Ft.)
Bottom (of initial area) elevation =   991.000(Ft.)
Difference in elevation =   228.000(Ft.)
Slope =    0.24000  s(%)=      24.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.844 min.
Rainfall intensity =      3.349(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.792
Subarea runoff =     18.823(CFS)
Total initial stream area =        7.100(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


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Process from Point/Station      161.000 to Point/Station      162.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.676(Ft.), Average velocity =   6.731(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              4.00
       2             15.00              0.00
       3             20.00              0.00
       4             25.00              4.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     30.447(CFS)
  '     '     flow top width =      8.381(Ft.)
  '     '    velocity=    6.731(Ft/s)
  '     '     area =      4.523(Sq.Ft)
  '     '     Froude number =     1.615

Upstream point elevation =   991.000(Ft.)
Downstream point elevation =   957.000(Ft.)
Flow length =   565.000(Ft.)
Travel time  =    1.40 min.
Time of concentration =   12.24 min.
Depth of flow =   0.676(Ft.)
Average velocity =   6.731(Ft/s)
Total irregular channel flow =    30.447(CFS)
Irregular channel normal depth above invert elev. =   0.676(Ft.)
Average velocity of channel(s) =   6.731(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      3.114(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.783
Subarea runoff =     23.185(CFS) for   10.120(Ac.)
Total runoff =     42.008(CFS)
Effective area this stream =       17.22(Ac.)
Total Study Area (Main Stream No. 1) =      147.15(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.807(Ft.), Average velocity =   7.417(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      162.000 to Point/Station      163.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
```

```
Depth of flow =   0.825(Ft.), Average velocity =   7.825(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             20.00              0.00
      3             25.00              0.00
      4             50.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     56.203(CFS)
  '     '     flow top width =     12.421(Ft.)
  '     '    velocity=    7.825(Ft/s)
  '     '     area =      7.182(Sq.Ft)
  '     '     Froude number =     1.814

Upstream point elevation =   957.000(Ft.)
Downstream point elevation =   893.000(Ft.)
Flow length =   890.000(Ft.)
Travel time  =    1.90 min.
Time of concentration =   14.14 min.
Depth of flow =   0.825(Ft.)
Average velocity =   7.825(Ft/s)
Total irregular channel flow =    56.203(CFS)
Irregular channel normal depth above invert elev. =   0.825(Ft.)
Average velocity of channel(s) =   7.825(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.856(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.773
Subarea runoff =     28.326(CFS) for   14.640(Ac.)
Total runoff =     70.335(CFS)
Effective area this stream =       31.86(Ac.)
Total Study Area (Main Stream No. 1) =      161.79(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.923(Ft.), Average velocity =   8.325(Ft/s)


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Process from Point/Station      170.000 to Point/Station      171.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   857.000(Ft.)
Top (of initial area) elevation =  1138.000(Ft.)
Bottom (of initial area) elevation =   903.000(Ft.)
Difference in elevation =   235.000(Ft.)
Slope =    0.27421  s(%)=      27.42
```

```
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.133 min.
Rainfall intensity =      3.488(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.796
Subarea runoff =     22.545(CFS)
Total initial stream area =        8.120(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      180.000 to Point/Station      181.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   996.000(Ft.)
Top (of initial area) elevation =  1038.000(Ft.)
Bottom (of initial area) elevation =   893.000(Ft.)
Difference in elevation =   145.000(Ft.)
Slope =    0.14558  s(%)=      14.56
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.214 min.
Rainfall intensity =      3.119(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.784
Subarea runoff =     21.113(CFS)
Total initial stream area =        8.640(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      180.000 to Point/Station      181.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Time of concentration =    12.21 min.
Rainfall intensity =      3.119(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.784
Subarea runoff =     28.199(CFS) for   11.540(Ac.)
Total runoff =     49.312(CFS)
Effective area this stream =       20.18(Ac.)
Total Study Area (Main Stream No. 1) =      190.09(Ac.)
Area averaged Fm value =    0.404(In/Hr)


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Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
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UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   850.000(Ft.)
Top (of initial area) elevation =  1422.000(Ft.)
Bottom (of initial area) elevation =  1172.000(Ft.)
Difference in elevation =   250.000(Ft.)
Slope =    0.29412  s(%)=      29.41
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.959 min.
Rainfall intensity =      3.525(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.797
Subarea runoff =     19.636(CFS)
Total initial stream area =        6.990(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


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Process from Point/Station      201.000 to Point/Station      202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.487(Ft.), Average velocity =   9.323(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              4.00
       2             15.00              0.00
       3             20.00              0.00
       4             30.00              4.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     29.578(CFS)
  '     '     flow top width =      8.041(Ft.)
  '     '    velocity=    9.323(Ft/s)
  '     '     area =      3.173(Sq.Ft)
  '     '     Froude number =     2.616

Upstream point elevation =  1172.000(Ft.)
Downstream point elevation =  1053.000(Ft.)
Flow length =   696.000(Ft.)
Travel time  =    1.24 min.
Time of concentration =   11.20 min.
Depth of flow =   0.487(Ft.)
Average velocity =   9.323(Ft/s)
Total irregular channel flow =    29.577(CFS)
Irregular channel normal depth above invert elev. =   0.487(Ft.)
Average velocity of channel(s) =   9.323(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
```

```
Rainfall intensity =      3.284(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.789
Subarea runoff =     19.827(CFS) for    8.230(Ac.)
Total runoff =     39.463(CFS)
Effective area this stream =       15.22(Ac.)
Total Study Area (Main Stream No. 1) =      205.31(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   0.571(Ft.), Average velocity =  10.193(Ft/s)


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Process from Point/Station      202.000 to Point/Station      203.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.863(Ft.), Average velocity =   7.971(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              5.00
       2             20.00              0.00
       3             25.00              0.00
       4             50.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     61.154(CFS)
  '     '      flow top width =     12.771(Ft.)
  '     '    velocity=    7.971(Ft/s)
  '     '      area =      7.672(Sq.Ft)
  '     '      Froude number =     1.812

Upstream point elevation =  1053.000(Ft.)
Downstream point elevation =  1003.000(Ft.)
Flow length =   705.000(Ft.)
Travel time  =    1.47 min.
Time of concentration =   12.68 min.
Depth of flow =   0.863(Ft.)
Average velocity =   7.971(Ft/s)
Total irregular channel flow =    61.154(CFS)
Irregular channel normal depth above invert elev. =   0.863(Ft.)
Average velocity of channel(s) =   7.971(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      3.050(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.781
Subarea runoff =     43.319(CFS) for   19.540(Ac.)
Total runoff =     82.782(CFS)
Effective area this stream =       34.76(Ac.)
Total Study Area (Main Stream No. 1) =      224.85(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   1.004(Ft.), Average velocity =   8.660(Ft/s)


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Process from Point/Station      203.000 to Point/Station      204.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
____________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   1.108(Ft.), Average velocity =   9.718(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              6.00
      2             30.00              0.00
      3             36.00              0.00
      4             60.00              6.00
Manning's 'N' friction factor =   0.035
--------------------------------------------------------------------
Sub-Channel flow  =    118.238(CFS)
  '     '     flow top width =     15.969(Ft.)
  '     '    velocity=    9.718(Ft/s)
  '     '     area =     12.167(Sq.Ft)
  '     '     Froude number =     1.962

Upstream point elevation =  1003.000(Ft.)
Downstream point elevation =   930.000(Ft.)
Flow length =   950.000(Ft.)
Travel time  =    1.63 min.
Time of concentration =   14.31 min.
Depth of flow =   1.108(Ft.)
Average velocity =   9.718(Ft/s)
Total irregular channel flow =   118.237(CFS)
Irregular channel normal depth above invert elev. =   1.108(Ft.)
Average velocity of channel(s) =   9.718(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.836(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.772
Subarea runoff =     70.853(CFS) for   35.410(Ac.)
Total runoff =    153.635(CFS)
Effective area this stream =       70.17(Ac.)
Total Study Area (Main Stream No. 1) =      260.26(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   1.261(Ft.), Average velocity =  10.437(Ft/s)


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Process from Point/Station      204.000 to Point/Station      205.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
____________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   1.678(Ft.), Average velocity =   9.558(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              7.00
      2             30.00              0.00
      3             37.00              0.00
```

```
       4             70.00              7.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =    233.305(CFS)
  '     '     flow top width =     22.099(Ft.)
  '     '    velocity=    9.558(Ft/s)
  '     '     area =     24.409(Sq.Ft)
  '     '     Froude number =     1.603

Upstream point elevation =   930.000(Ft.)
Downstream point elevation =   876.000(Ft.)
Flow length =  1190.000(Ft.)
Travel time  =    2.08 min.
Time of concentration =   16.38 min.
Depth of flow =   1.678(Ft.)
Average velocity =   9.558(Ft/s)
Total irregular channel flow =   233.305(CFS)
Irregular channel normal depth above invert elev. =   1.678(Ft.)
Average velocity of channel(s) =   9.558(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.615(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.761
Subarea runoff =    159.270(CFS) for   87.050(Ac.)
Total runoff =    312.905(CFS)
Effective area this stream =      157.22(Ac.)
Total Study Area (Main Stream No. 1) =      347.31(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Depth of flow =   1.930(Ft.), Average velocity =  10.333(Ft/s)
End of computations, Total Study Area =          347.31 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number =  78.0
```

ATTACHMENT B

Rational Method Hydrology
Proposed Condition
(10 Year & 100 Year storm)

ATTACHMENT A
Rational Method Hydrology
Proposed Condition

(10-Year storm)

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            San Bernardino County Rational Hydrology Program

                (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2005 Version 7.1
      Rational Hydrology Study        Date: 02/23/16
-----------------------------------------------------------------------
Roquet Ranch Project - TTM 19983
Proposed Condition
10-year storm

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


Program License Serial Number 4029

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

-----------------------------------------------------------------------
Rational hydrology study storm event year is    10.0
Computed rainfall intensity:
Storm year =    10.00   1 hour rainfall =     0.850 (In.)
Slope used for rainfall intensity curve b =  0.6000
Soil antecedent moisture condition (AMC) = 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.274(In/Hr)
Initial subarea data:
Initial area flow distance =   998.000(Ft.)
Top (of initial area) elevation =  1015.600(Ft.)
Bottom (of initial area) elevation =   951.000(Ft.)
Difference in elevation =    64.600(Ft.)
Slope =    0.06473  s(%)=       6.47
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.651 min.
Rainfall intensity =      2.398(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.797
Subarea runoff =     10.897(CFS)
Total initial stream area =        5.700(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.274(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   943.000(Ft.)
Downstream point/station elevation =   931.000(Ft.)
Pipe length  =   900.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.897(CFS)
Nearest computed pipe diameter  =     18.00(In.)
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Calculated individual pipe flow  =    10.897(CFS)
Normal flow depth in pipe =   13.34(In.)
Flow top width inside pipe =   15.77(In.)
Critical Depth =   15.17(In.)
Pipe flow velocity =      7.77(Ft/s)
Travel time through pipe =    1.93 min.
Time of concentration (TC) =    12.58 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
RESIDENTIAL(8 - 10 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.4000     Max loss rate(Fm)=     0.219(In/Hr)
Time of concentration =    12.58 min.
Rainfall intensity =      2.170(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.798
Subarea runoff =     10.171(CFS) for    6.460(Ac.)
Total runoff =     21.069(CFS)
Effective area this stream =       12.16(Ac.)
Total Study Area (Main Stream No. 1) =       12.16(Ac.)
Area averaged Fm value =    0.245(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   931.000(Ft.)
Downstream point/station elevation =   915.000(Ft.)
Pipe length  =  1010.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.069(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    21.069(CFS)
Normal flow depth in pipe =   15.36(In.)
Flow top width inside pipe =   23.04(In.)
Critical Depth =   19.73(In.)
Pipe flow velocity =      9.92(Ft/s)
Travel time through pipe =    1.70 min.
Time of concentration (TC) =    14.28 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
RESIDENTIAL(8 - 10 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.4000     Max loss rate(Fm)=     0.219(In/Hr)
Time of concentration =    14.28 min.
Rainfall intensity =      2.011(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

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rational method)(Q=KCIA) is C = 0.794
Subarea runoff =      6.974(CFS) for    5.400(Ac.)
Total runoff =     28.043(CFS)
Effective area this stream =       17.56(Ac.)
Total Study Area (Main Stream No. 1) =       17.56(Ac.)
Area averaged Fm value =    0.237(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
RESIDENTIAL(8 - 10 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.4000     Max loss rate(Fm)=     0.219(In/Hr)
Time of concentration =    14.28 min.
Rainfall intensity =      2.011(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.796
Subarea runoff =      6.904(CFS) for    4.280(Ac.)
Total runoff =     34.946(CFS)
Effective area this stream =       21.84(Ac.)
Total Study Area (Main Stream No. 1) =       21.84(Ac.)
Area averaged Fm value =    0.233(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   915.000(Ft.)
Downstream point/station elevation =   910.000(Ft.)
Pipe length  =   440.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    34.946(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    34.946(CFS)
Normal flow depth in pipe =   20.30(In.)
Flow top width inside pipe =   28.07(In.)
Critical Depth =   24.09(In.)
Pipe flow velocity =      9.90(Ft/s)
Travel time through pipe =    0.74 min.
Time of concentration (TC) =    15.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
RESIDENTIAL(8 - 10 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.4000     Max loss rate(Fm)=     0.219(In/Hr)
Time of concentration =    15.02 min.
Rainfall intensity =      1.951(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.793
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```
Subarea runoff =      4.804(CFS) for    3.840(Ac.)
Total runoff =     39.750(CFS)
Effective area this stream =       25.68(Ac.)
Total Study Area (Main Stream No. 1) =       25.68(Ac.)
Area averaged Fm value =    0.231(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   910.000(Ft.)
Downstream point/station elevation =   905.000(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    39.750(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    39.750(CFS)
Normal flow depth in pipe =   16.03(In.)
Flow top width inside pipe =   22.61(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.83(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    15.11 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.466(In/Hr)
Time of concentration =    15.11 min.
Rainfall intensity =      1.944(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.789
Subarea runoff =      1.269(CFS) for    1.080(Ac.)
Total runoff =     41.019(CFS)
Effective area this stream =       26.76(Ac.)
Total Study Area (Main Stream No. 1) =       26.76(Ac.)
Area averaged Fm value =    0.241(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     26.760(Ac.)
Runoff from this stream =     41.019(CFS)
Time of concentration =   15.11 min.
Rainfall intensity =     1.944(In/Hr)
Area averaged loss rate (Fm) =    0.2408(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4395


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Process from Point/Station      106.000 to Point/Station      107.000
**** INITIAL AREA EVALUATION ****
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_____________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.274(In/Hr)
Initial subarea data:
Initial area flow distance =   855.000(Ft.)
Top (of initial area) elevation =   998.000(Ft.)
Bottom (of initial area) elevation =   962.000(Ft.)
Difference in elevation =    36.000(Ft.)
Slope =    0.04211  s(%)=       4.21
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.911 min.
Rainfall intensity =      2.364(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.796
Subarea runoff =      8.407(CFS)
Total initial stream area =        4.470(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.274(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =   955.000(Ft.)
Downstream point/station elevation =   905.000(Ft.)
Pipe length  =   950.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.407(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.407(CFS)
Normal flow depth in pipe =    8.09(In.)
Flow top width inside pipe =   14.95(In.)
Critical Depth =   13.59(In.)
Pipe flow velocity =     12.45(Ft/s)
Travel time through pipe =    1.27 min.
Time of concentration (TC) =    12.18 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      105.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.274(In/Hr)
Time of concentration =    12.18 min.
Rainfall intensity =      2.212(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.789
Subarea runoff =      6.858(CFS) for    4.280(Ac.)
Total runoff =     15.265(CFS)
Effective area this stream =        8.75(Ac.)
Total Study Area (Main Stream No. 1) =       35.51(Ac.)
Area averaged Fm value =    0.274(In/Hr)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      8.750(Ac.)
Runoff from this stream =     15.265(CFS)
Time of concentration =   12.18 min.
Rainfall intensity =     2.212(In/Hr)
Area averaged loss rate (Fm) =    0.2740(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Initial subarea data:
Initial area flow distance =   525.000(Ft.)
Top (of initial area) elevation =   994.400(Ft.)
Bottom (of initial area) elevation =   932.000(Ft.)
Difference in elevation =    62.400(Ft.)
Slope =    0.11886  s(%)=      11.89
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.701 min.
Rainfall intensity =      3.489(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.886
Subarea runoff =      3.555(CFS)
Total initial stream area =        1.150(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.055(In/Hr)


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Process from Point/Station      109.000 to Point/Station      110.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   932.000(Ft.)
End of street segment elevation =   916.800(Ft.)
Length of street segment  =   610.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.500(Ft.)
Distance from crown to crossfall grade break  =   2.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.500(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      5.356(CFS)
Depth of flow =   0.353(Ft.), Average velocity =   3.813(Ft/s)
```

```
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  11.305(Ft.)
Flow velocity =   3.81(Ft/s)
Travel time =    2.67 min.     TC =    8.37  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Rainfall intensity =      2.772(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.882
Subarea runoff =      3.537(CFS) for    1.750(Ac.)
Total runoff =      7.091(CFS)
Effective area this stream =        2.90(Ac.)
Total Study Area (Main Stream No. 1) =       38.41(Ac.)
Area averaged Fm value =    0.055(In/Hr)
Street flow at end of street =      7.091(CFS)
Half street flow at end of street =      7.091(CFS)
Depth of flow =   0.381(Ft.), Average velocity =   4.073(Ft/s)
Flow width (from curb towards crown)=  12.705(Ft.)


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Process from Point/Station      110.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   909.000(Ft.)
Downstream point/station elevation =   905.000(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.091(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     7.091(CFS)
Normal flow depth in pipe =    9.77(In.)
Flow top width inside pipe =    9.33(In.)
Critical depth could not be calculated.
Pipe flow velocity =     10.34(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =     8.53 min.


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Process from Point/Station      110.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      2.900(Ac.)
Runoff from this stream =      7.091(CFS)
Time of concentration =    8.53 min.
Rainfall intensity =     2.740(In/Hr)
Area averaged loss rate (Fm) =    0.0548(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1     41.02    26.760     15.11    0.241      1.944
2     15.27     8.750     12.18    0.274      2.212
```

```
3      7.09     2.900      8.53    0.055      2.740
Qmax(1) =
          1.000 *    1.000 *    41.019) +
          0.862 *    1.000 *    15.265) +
          0.703 *    1.000 *     7.091) + =      59.159
Qmax(2) =
          1.158 *    0.806 *    41.019) +
          1.000 *    1.000 *    15.265) +
          0.803 *    1.000 *     7.091) + =      59.239
Qmax(3) =
          1.468 *    0.564 *    41.019) +
          1.272 *    0.700 *    15.265) +
          1.000 *    1.000 *     7.091) + =      54.656

Total of 3 streams to confluence:
Flow rates before confluence point:
      41.019      15.265       7.091
Maximum flow rates at confluence using above data:
       59.159       59.239       54.656
Area of streams before confluence:
       26.760        8.750        2.900
Effective area values after confluence:
       38.410       33.220       24.125
Results of confluence:
Total flow rate =     59.239(CFS)
Time of concentration =    12.182 min.
Effective stream area after confluence =     33.220(Ac.)
Study area average Pervious fraction(Ap) =  0.428
Study area average soil loss rate(Fm) =    0.234(In/Hr)
Study area total (this main stream) =      38.41(Ac.)


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Process from Point/Station      105.000 to Point/Station      111.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   905.000(Ft.)
Downstream point/station elevation =   904.000(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    59.239(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    59.239(CFS)
Normal flow depth in pipe =   23.77(In.)
Flow top width inside pipe =   29.63(In.)
Critical Depth =   29.73(In.)
Pipe flow velocity =     12.95(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    12.26 min.


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Process from Point/Station      105.000 to Point/Station      111.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     33.220(Ac.)
Runoff from this stream =     59.239(CFS)
Time of concentration =   12.26 min.
Rainfall intensity =     2.204(In/Hr)
Area averaged loss rate (Fm) =    0.2343(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4276
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      113.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Initial subarea data:
Initial area flow distance =   990.000(Ft.)
Top (of initial area) elevation =  1100.000(Ft.)
Bottom (of initial area) elevation =   925.000(Ft.)
Difference in elevation =   175.000(Ft.)
Slope =    0.17677  s(%)=      17.68
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.720 min.
Rainfall intensity =      2.264(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.795
Subarea runoff =     13.675(CFS)
Total initial stream area =        7.600(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.265(In/Hr)


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Process from Point/Station      113.000 to Point/Station      111.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =   918.000(Ft.)
Downstream point/station elevation =   904.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.675(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    13.675(CFS)
Normal flow depth in pipe =    9.19(In.)
Flow top width inside pipe =   14.62(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.36(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    11.86 min.


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Process from Point/Station      113.000 to Point/Station      111.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      7.600(Ac.)
Runoff from this stream =     13.675(CFS)
Time of concentration =   11.86 min.
Rainfall intensity =     2.248(In/Hr)
Area averaged loss rate (Fm) =    0.2651(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

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


1     59.24    33.220     12.26    0.234      2.204
```

```
2     13.68     7.600     11.86    0.265      2.248
Qmax(1) =
          1.000 *    1.000 *    59.239) +
          0.978 *    1.000 *    13.675) + =      72.612
Qmax(2) =
          1.022 *    0.968 *    59.239) +
          1.000 *    1.000 *    13.675) + =      72.277

Total of 2 streams to confluence:
Flow rates before confluence point:
      59.239      13.675
Maximum flow rates at confluence using above data:
       72.612       72.277
Area of streams before confluence:
       33.220        7.600
Effective area values after confluence:
       40.820       39.748
Results of confluence:
Total flow rate =     72.612(CFS)
Time of concentration =    12.260 min.
Effective stream area after confluence =     40.820(Ac.)
Study area average Pervious fraction(Ap) =  0.534
Study area average soil loss rate(Fm) =    0.240(In/Hr)
Study area total (this main stream) =      40.82(Ac.)


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Process from Point/Station      111.000 to Point/Station      120.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   904.000(Ft.)
Downstream point/station elevation =   899.000(Ft.)
Pipe length  =   715.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    72.612(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    72.612(CFS)
Normal flow depth in pipe =   30.09(In.)
Flow top width inside pipe =   37.86(In.)
Critical Depth =   32.02(In.)
Pipe flow velocity =      9.84(Ft/s)
Travel time through pipe =    1.21 min.
Time of concentration (TC) =    13.47 min.


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Process from Point/Station      111.000 to Point/Station      120.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     40.820(Ac.)
Runoff from this stream =     72.612(CFS)
Time of concentration =   13.47 min.
Rainfall intensity =     2.083(In/Hr)
Area averaged loss rate (Fm) =    0.2400(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5342


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Process from Point/Station      121.000 to Point/Station      122.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.274(In/Hr)
Initial subarea data:
Initial area flow distance =   795.000(Ft.)
Top (of initial area) elevation =  1075.000(Ft.)
Bottom (of initial area) elevation =  1058.000(Ft.)
Difference in elevation =    17.000(Ft.)
Slope =    0.02138  s(%)=       2.14
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.136 min.
Rainfall intensity =      2.217(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.789
Subarea runoff =      7.801(CFS)
Total initial stream area =        4.460(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.274(In/Hr)


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Process from Point/Station      121.000 to Point/Station      122.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
RESIDENTIAL(8 - 10 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.4000     Max loss rate(Fm)=     0.219(In/Hr)
Time of concentration =    12.14 min.
Rainfall intensity =      2.217(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.802
Subarea runoff =     12.518(CFS) for    6.960(Ac.)
Total runoff =     20.319(CFS)
Effective area this stream =       11.42(Ac.)
Total Study Area (Main Stream No. 1) =       57.43(Ac.)
Area averaged Fm value =    0.241(In/Hr)


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Process from Point/Station      121.000 to Point/Station      122.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Time of concentration =    12.14 min.
Rainfall intensity =      2.217(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.812
Subarea runoff =      3.095(CFS) for    1.590(Ac.)
Total runoff =     23.414(CFS)
Effective area this stream =       13.01(Ac.)
Total Study Area (Main Stream No. 1) =       59.02(Ac.)
Area averaged Fm value =    0.218(In/Hr)
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Process from Point/Station      122.000 to Point/Station      123.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1050.000(Ft.)
Downstream point/station elevation =   980.000(Ft.)
Pipe length  =  1850.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.414(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    23.414(CFS)
Normal flow depth in pipe =   13.69(In.)
Flow top width inside pipe =   20.01(In.)
Critical Depth =   19.93(In.)
Pipe flow velocity =     14.10(Ft/s)
Travel time through pipe =    2.19 min.
Time of concentration (TC) =    14.32 min.


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Process from Point/Station      122.000 to Point/Station      123.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.274(In/Hr)
Time of concentration =    14.32 min.
Rainfall intensity =      2.008(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.793
Subarea runoff =      8.824(CFS) for    7.230(Ac.)
Total runoff =     32.238(CFS)
Effective area this stream =       20.24(Ac.)
Total Study Area (Main Stream No. 1) =       66.25(Ac.)
Area averaged Fm value =    0.238(In/Hr)


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Process from Point/Station      123.000 to Point/Station      124.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   980.000(Ft.)
Downstream point/station elevation =   932.000(Ft.)
Pipe length  =   785.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    32.238(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    32.238(CFS)
Normal flow depth in pipe =   14.51(In.)
Flow top width inside pipe =   19.41(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.19(Ft/s)
Travel time through pipe =    0.72 min.
Time of concentration (TC) =    15.04 min.


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Process from Point/Station      123.000 to Point/Station      124.000
**** SUBAREA FLOW ADDITION ****
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_____________________________________________________________________________
RESIDENTIAL(8 - 10 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.4000     Max loss rate(Fm)=     0.219(In/Hr)
Time of concentration =    15.04 min.
Rainfall intensity =      1.949(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.791
Subarea runoff =      3.052(CFS) for    2.640(Ac.)
Total runoff =     35.289(CFS)
Effective area this stream =       22.88(Ac.)
Total Study Area (Main Stream No. 1) =       68.89(Ac.)
Area averaged Fm value =    0.236(In/Hr)


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Process from Point/Station      123.000 to Point/Station      124.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =    15.04 min.
Rainfall intensity =      1.949(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.789
Subarea runoff =      5.412(CFS) for    3.570(Ac.)
Total runoff =     40.701(CFS)
Effective area this stream =       26.45(Ac.)
Total Study Area (Main Stream No. 1) =       72.46(Ac.)
Area averaged Fm value =    0.240(In/Hr)


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Process from Point/Station      124.000 to Point/Station      120.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =   932.000(Ft.)
Downstream point/station elevation =   898.000(Ft.)
Pipe length  =  1070.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    40.701(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    40.701(CFS)
Normal flow depth in pipe =   17.25(In.)
Flow top width inside pipe =   25.94(In.)
Critical Depth =   25.21(In.)
Pipe flow velocity =     15.19(Ft/s)
Travel time through pipe =    1.17 min.
Time of concentration (TC) =    16.22 min.


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Process from Point/Station      124.000 to Point/Station      120.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
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Along Main Stream number: 1 in normal stream number 2
Stream flow area =     26.450(Ac.)
Runoff from this stream =     40.701(CFS)
Time of concentration =   16.22 min.
Rainfall intensity =     1.864(In/Hr)
Area averaged loss rate (Fm) =    0.2397(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5071
Summary of stream data:

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


1     72.61    40.820     13.47    0.240      2.083
2     40.70    26.450     16.22    0.240      1.864
Qmax(1) =
          1.000 *    1.000 *    72.612) +
          1.135 *    0.831 *    40.701) + =     110.989
Qmax(2) =
          0.881 *    1.000 *    72.612) +
          1.000 *    1.000 *    40.701) + =     104.668

Total of 2 streams to confluence:
Flow rates before confluence point:
      72.612      40.701
Maximum flow rates at confluence using above data:
      110.989      104.668
Area of streams before confluence:
       40.820       26.450
Effective area values after confluence:
       62.792       67.270
Results of confluence:
Total flow rate =    110.989(CFS)
Time of concentration =    13.471 min.
Effective stream area after confluence =     62.792(Ac.)
Study area average Pervious fraction(Ap) =  0.524
Study area average soil loss rate(Fm) =    0.240(In/Hr)
Study area total (this main stream) =      67.27(Ac.)


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Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
RESIDENTIAL(11+ dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.110(In/Hr)
Initial subarea data:
Initial area flow distance =   825.000(Ft.)
Top (of initial area) elevation =   914.700(Ft.)
Bottom (of initial area) elevation =   910.300(Ft.)
Difference in elevation =     4.400(Ft.)
Slope =    0.00533  s(%)=       0.53
TC = k(0.324)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.543 min.
Rainfall intensity =      2.076(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.852
Subarea runoff =      8.637(CFS)
Total initial stream area =        4.880(Ac.)
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Pervious area fraction = 0.200
Initial area Fm value =    0.110(In/Hr)


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Process from Point/Station      201.000 to Point/Station      202.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   903.000(Ft.)
Downstream point/station elevation =   899.000(Ft.)
Pipe length  =   506.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.637(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.637(CFS)
Normal flow depth in pipe =   13.66(In.)
Flow top width inside pipe =   15.39(In.)
Critical Depth =   13.65(In.)
Pipe flow velocity =      6.00(Ft/s)
Travel time through pipe =    1.41 min.
Time of concentration (TC) =    14.95 min.


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Process from Point/Station      201.000 to Point/Station      202.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
RESIDENTIAL(11+ dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.110(In/Hr)
Time of concentration =    14.95 min.
Rainfall intensity =      1.957(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.850
Subarea runoff =      9.484(CFS) for    6.020(Ac.)
Total runoff =     18.121(CFS)
Effective area this stream =       10.90(Ac.)
Total Study Area (Main Stream No. 1) =       83.36(Ac.)
Area averaged Fm value =    0.110(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
RESIDENTIAL(11+ dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.110(In/Hr)
Time of concentration =    14.95 min.
Rainfall intensity =      1.957(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.850
Subarea runoff =     16.957(CFS) for   10.200(Ac.)
Total runoff =     35.078(CFS)
Effective area this stream =       21.10(Ac.)
Total Study Area (Main Stream No. 1) =       93.56(Ac.)
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Area averaged Fm value =    0.110(In/Hr)


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Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   899.000(Ft.)
Downstream point/station elevation =   857.000(Ft.)
Pipe length  =   675.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    35.078(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    35.078(CFS)
Normal flow depth in pipe =   15.40(In.)
Flow top width inside pipe =   18.57(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.56(Ft/s)
Travel time through pipe =    0.61 min.
Time of concentration (TC) =    15.56 min.


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Process from Point/Station      202.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =    15.56 min.
Rainfall intensity =      1.911(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.841
Subarea runoff =      2.605(CFS) for    2.350(Ac.)
Total runoff =     37.683(CFS)
Effective area this stream =       23.45(Ac.)
Total Study Area (Main Stream No. 1) =       95.91(Ac.)
Area averaged Fm value =    0.125(In/Hr)


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Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =   920.000(Ft.)
Bottom (of initial area) elevation =   857.000(Ft.)
Difference in elevation =    63.000(Ft.)
Slope =    0.06300  s(%)=       6.30
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.375 min.
Rainfall intensity =      2.770(In/Hr) for a    10.0 year storm
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Effective runoff coefficient used for area (Q=KCIA) is C = 0.882
Subarea runoff =      7.649(CFS)
Total initial stream area =        3.130(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.055(In/Hr)


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Process from Point/Station      301.000 to Point/Station      302.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   851.000(Ft.)
Downstream point/station elevation =   846.000(Ft.)
Pipe length  =  1250.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.649(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     7.649(CFS)
Normal flow depth in pipe =   13.73(In.)
Flow top width inside pipe =   19.98(In.)
Critical Depth =   12.29(In.)
Pipe flow velocity =      4.59(Ft/s)
Travel time through pipe =    4.54 min.
Time of concentration (TC) =    12.92 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Time of concentration =    12.92 min.
Rainfall intensity =      2.136(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.877
Subarea runoff =      5.238(CFS) for    3.750(Ac.)
Total runoff =     12.888(CFS)
Effective area this stream =        6.88(Ac.)
Total Study Area (Main Stream No. 1) =      102.79(Ac.)
Area averaged Fm value =    0.055(In/Hr)


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Process from Point/Station      302.000 to Point/Station      303.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   846.000(Ft.)
Downstream point/station elevation =   842.000(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.888(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    12.888(CFS)
Normal flow depth in pipe =    9.89(In.)
Flow top width inside pipe =   14.22(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.00(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    12.98 min.
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Process from Point/Station      302.000 to Point/Station      303.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =    12.98 min.
Rainfall intensity =      2.130(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.871
Subarea runoff =      0.731(CFS) for    0.460(Ac.)
Total runoff =     13.619(CFS)
Effective area this stream =        7.34(Ac.)
Total Study Area (Main Stream No. 1) =      103.25(Ac.)
Area averaged Fm value =    0.068(In/Hr)


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Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
APARTMENT subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.110(In/Hr)
Initial subarea data:
Initial area flow distance =   615.000(Ft.)
Top (of initial area) elevation =   862.000(Ft.)
Bottom (of initial area) elevation =   852.000(Ft.)
Difference in elevation =    10.000(Ft.)
Slope =    0.01626  s(%)=       1.63
TC = k(0.324)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.635 min.
Rainfall intensity =      2.547(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.861
Subarea runoff =      4.913(CFS)
Total initial stream area =        2.240(Ac.)
Pervious area fraction = 0.200
Initial area Fm value =    0.110(In/Hr)


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Process from Point/Station      500.000 to Point/Station      501.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Initial subarea data:
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Initial area flow distance =   847.000(Ft.)
Top (of initial area) elevation =  1393.600(Ft.)
Bottom (of initial area) elevation =  1044.000(Ft.)
Difference in elevation =   349.600(Ft.)
Slope =    0.41275  s(%)=      41.28
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.293 min.
Rainfall intensity =      2.603(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.808
Subarea runoff =     11.045(CFS)
Total initial stream area =        5.250(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.265(In/Hr)


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Process from Point/Station      501.000 to Point/Station      502.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1044.000(Ft.)
Downstream point elevation =   995.000(Ft.)
Channel length thru subarea  =   895.000(Ft.)
Channel base width  =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     22.099(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     22.099(CFS)
Depth of flow =   0.568(Ft.), Average velocity =  12.418(Ft/s)
Channel flow top width =    4.270(Ft.)
Flow Velocity =   12.42(Ft/s)
Travel time  =    1.20 min.
Time of concentration =   10.49 min.
Critical depth =      1.094(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Rainfall intensity =      2.420(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.801
Subarea runoff =     22.015(CFS) for   11.800(Ac.)
Total runoff =     33.060(CFS)
Effective area this stream =       17.05(Ac.)
Total Study Area (Main Stream No. 1) =      122.54(Ac.)
Area averaged Fm value =    0.265(In/Hr)
Depth of flow =   0.700(Ft.), Average velocity =  13.891(Ft/s)
Critical depth =      1.344(Ft.)


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Process from Point/Station      502.000 to Point/Station      503.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   995.000(Ft.)
Downstream point elevation =   984.000(Ft.)
Channel length thru subarea  =   505.000(Ft.)
Channel base width  =    2.000(Ft.)
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Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   0.000
Estimated mean flow rate at midpoint of channel =     35.844(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     35.844(CFS)
Depth of flow =   1.098(Ft.), Average velocity =  10.544(Ft/s)
Channel flow top width =    4.195(Ft.)
Flow Velocity =   10.54(Ft/s)
Travel time  =    0.80 min.
Time of concentration =   11.29 min.
Critical depth =      1.641(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Rainfall intensity =      2.315(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.797
Subarea runoff =      5.507(CFS) for    3.850(Ac.)
Total runoff =     38.566(CFS)
Effective area this stream =       20.90(Ac.)
Total Study Area (Main Stream No. 1) =      126.39(Ac.)
Area averaged Fm value =    0.265(In/Hr)
Depth of flow =   1.142(Ft.), Average velocity =  10.746(Ft/s)
Critical depth =      1.703(Ft.)


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Process from Point/Station      503.000 to Point/Station      504.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   984.000(Ft.)
Downstream point elevation =   939.000(Ft.)
Channel length thru subarea  =   688.000(Ft.)
Channel base width  =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     43.008(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     43.008(CFS)
Depth of flow =   0.765(Ft.), Average velocity =  15.922(Ft/s)
Channel flow top width =    5.061(Ft.)
Flow Velocity =   15.92(Ft/s)
Travel time  =    0.72 min.
Time of concentration =   12.01 min.
Critical depth =      1.531(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Rainfall intensity =      2.231(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.793
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Subarea runoff =      8.818(CFS) for    5.880(Ac.)
Total runoff =     47.384(CFS)
Effective area this stream =       26.78(Ac.)
Total Study Area (Main Stream No. 1) =      132.27(Ac.)
Area averaged Fm value =    0.265(In/Hr)
Depth of flow =   0.804(Ft.), Average velocity =  16.346(Ft/s)
Critical depth =      1.609(Ft.)


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Process from Point/Station      504.000 to Point/Station      505.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   939.000(Ft.)
Downstream point elevation =   905.000(Ft.)
Channel length thru subarea  =  1140.000(Ft.)
Channel base width  =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     48.689(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     48.689(CFS)
Depth of flow =   0.990(Ft.), Average velocity =  12.349(Ft/s)
Channel flow top width =    5.962(Ft.)
Flow Velocity =   12.35(Ft/s)
Travel time  =    1.54 min.
Time of concentration =   13.55 min.
Critical depth =      1.625(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Rainfall intensity =      2.075(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.785
Subarea runoff =      2.538(CFS) for    3.860(Ac.)
Total runoff =     49.923(CFS)
Effective area this stream =       30.64(Ac.)
Total Study Area (Main Stream No. 1) =      136.13(Ac.)
Area averaged Fm value =    0.265(In/Hr)
Depth of flow =   1.003(Ft.), Average velocity =  12.431(Ft/s)
Critical depth =      1.641(Ft.)


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Process from Point/Station      504.000 to Point/Station      505.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =    13.55 min.
Rainfall intensity =      2.075(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
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rational method)(Q=KCIA) is C = 0.785
Subarea runoff =      6.273(CFS) for    3.850(Ac.)
Total runoff =     56.196(CFS)
Effective area this stream =       34.49(Ac.)
Total Study Area (Main Stream No. 1) =      139.98(Ac.)
Area averaged Fm value =    0.265(In/Hr)


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Process from Point/Station      600.000 to Point/Station      601.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Initial subarea data:
Initial area flow distance =   865.000(Ft.)
Top (of initial area) elevation =   994.400(Ft.)
Bottom (of initial area) elevation =   913.600(Ft.)
Difference in elevation =    80.800(Ft.)
Slope =    0.09341  s(%)=       9.34
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.305 min.
Rainfall intensity =      3.007(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.884
Subarea runoff =     11.638(CFS)
Total initial stream area =        4.380(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.055(In/Hr)


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Process from Point/Station      600.000 to Point/Station      601.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Time of concentration =     7.30 min.
Rainfall intensity =      3.007(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.884
Subarea runoff =     12.063(CFS) for    4.540(Ac.)
Total runoff =     23.701(CFS)
Effective area this stream =        8.92(Ac.)
Total Study Area (Main Stream No. 1) =      148.90(Ac.)
Area averaged Fm value =    0.055(In/Hr)


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Process from Point/Station      601.000 to Point/Station      602.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   908.000(Ft.)
Downstream point/station elevation =   885.000(Ft.)
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Pipe length  =   300.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.701(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    23.701(CFS)
Normal flow depth in pipe =   12.35(In.)
Flow top width inside pipe =   16.71(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.35(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     7.58 min.


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Process from Point/Station      601.000 to Point/Station      602.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
APARTMENT subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.110(In/Hr)
Time of concentration =     7.58 min.
Rainfall intensity =      2.942(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.874
Subarea runoff =     25.475(CFS) for   10.200(Ac.)
Total runoff =     49.176(CFS)
Effective area this stream =       19.12(Ac.)
Total Study Area (Main Stream No. 1) =      159.10(Ac.)
Area averaged Fm value =    0.084(In/Hr)


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Process from Point/Station      602.000 to Point/Station      603.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   885.000(Ft.)
Downstream point/station elevation =   882.000(Ft.)
Pipe length  =    80.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    49.176(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    49.176(CFS)
Normal flow depth in pipe =   18.61(In.)
Flow top width inside pipe =   24.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.83(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     7.66 min.


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Process from Point/Station      602.000 to Point/Station      603.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
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Time of concentration =     7.66 min.
Rainfall intensity =      2.923(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.871
Subarea runoff =      2.771(CFS) for    1.290(Ac.)
Total runoff =     51.947(CFS)
Effective area this stream =       20.41(Ac.)
Total Study Area (Main Stream No. 1) =      160.39(Ac.)
Area averaged Fm value =    0.095(In/Hr)


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Process from Point/Station      700.000 to Point/Station      701.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Initial subarea data:
Initial area flow distance =   998.000(Ft.)
Top (of initial area) elevation =  1477.000(Ft.)
Bottom (of initial area) elevation =  1082.000(Ft.)
Difference in elevation =   395.000(Ft.)
Slope =    0.39579  s(%)=      39.58
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.007 min.
Rainfall intensity =      2.490(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.804
Subarea runoff =     10.290(CFS)
Total initial stream area =        5.140(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.265(In/Hr)


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Process from Point/Station      701.000 to Point/Station      702.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1082.000(Ft.)
Downstream point elevation =   983.000(Ft.)
Channel length thru subarea  =   800.000(Ft.)
Channel base width  =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     15.064(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     15.064(CFS)
Depth of flow =   0.370(Ft.), Average velocity =  14.834(Ft/s)
Channel flow top width =    3.482(Ft.)
Flow Velocity =   14.83(Ft/s)
Travel time  =    0.90 min.
Time of concentration =   10.91 min.
Critical depth =      0.898(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
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Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Rainfall intensity =      2.364(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.799
Subarea runoff =      9.472(CFS) for    5.320(Ac.)
Total runoff =     19.762(CFS)
Effective area this stream =       10.46(Ac.)
Total Study Area (Main Stream No. 1) =      170.85(Ac.)
Area averaged Fm value =    0.265(In/Hr)
Depth of flow =   0.430(Ft.), Average velocity =  16.078(Ft/s)
Critical depth =      1.031(Ft.)


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Process from Point/Station      701.000 to Point/Station      702.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Time of concentration =    10.91 min.
Rainfall intensity =      2.364(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.806
Subarea runoff =      2.079(CFS) for    1.000(Ac.)
Total runoff =     21.841(CFS)
Effective area this stream =       11.46(Ac.)
Total Study Area (Main Stream No. 1) =      171.85(Ac.)
Area averaged Fm value =    0.247(In/Hr)


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Process from Point/Station      701.000 to Point/Station      702.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =    10.91 min.
Rainfall intensity =      2.364(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.801
Subarea runoff =     48.366(CFS) for   25.600(Ac.)
Total runoff =     70.207(CFS)
Effective area this stream =       37.06(Ac.)
Total Study Area (Main Stream No. 1) =      197.45(Ac.)
Area averaged Fm value =    0.259(In/Hr)


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Process from Point/Station      702.000 to Point/Station      703.000
**** IMPROVED CHANNEL TRAVEL TIME ****
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Upstream point elevation =   983.000(Ft.)
Downstream point elevation =   973.000(Ft.)
Channel length thru subarea  =   435.000(Ft.)
Channel base width  =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     85.328(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     85.328(CFS)
Depth of flow =   1.380(Ft.), Average velocity =  12.987(Ft/s)
Channel flow top width =    7.521(Ft.)
Flow Velocity =   12.99(Ft/s)
Travel time  =    0.56 min.
Time of concentration =   11.46 min.
Critical depth =      2.125(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Rainfall intensity =      2.295(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.798
Subarea runoff =     30.185(CFS) for   17.800(Ac.)
Total runoff =    100.392(CFS)
Effective area this stream =       54.86(Ac.)
Total Study Area (Main Stream No. 1) =      215.25(Ac.)
Area averaged Fm value =    0.261(In/Hr)
Depth of flow =   1.489(Ft.), Average velocity =  13.542(Ft/s)
Critical depth =      2.297(Ft.)


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Process from Point/Station      703.000 to Point/Station      704.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   973.000(Ft.)
Downstream point/station elevation =   953.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   100.392(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =   100.392(CFS)
Normal flow depth in pipe =   19.80(In.)
Flow top width inside pipe =   23.87(In.)
Critical depth could not be calculated.
Pipe flow velocity =     32.13(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    11.54 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      703.000 to Point/Station      704.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
```

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SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =    11.54 min.
Rainfall intensity =      2.285(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.797
Subarea runoff =      4.141(CFS) for    2.530(Ac.)
Total runoff =    104.533(CFS)
Effective area this stream =       57.39(Ac.)
Total Study Area (Main Stream No. 1) =      217.78(Ac.)
Area averaged Fm value =    0.261(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      703.000 to Point/Station      704.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Time of concentration =    11.54 min.
Rainfall intensity =      2.285(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.798
Subarea runoff =      2.007(CFS) for    1.000(Ac.)
Total runoff =    106.540(CFS)
Effective area this stream =       58.39(Ac.)
Total Study Area (Main Stream No. 1) =      218.78(Ac.)
Area averaged Fm value =    0.258(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      703.000 to Point/Station      704.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     58.390(Ac.)
Runoff from this stream =    106.540(CFS)
Time of concentration =   11.54 min.
Rainfall intensity =     2.285(In/Hr)
Area averaged loss rate (Fm) =    0.2579(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9692


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Process from Point/Station      705.000 to Point/Station      706.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Initial subarea data:
Initial area flow distance =   800.000(Ft.)
Top (of initial area) elevation =  1058.800(Ft.)
Bottom (of initial area) elevation =  1017.000(Ft.)
```

```
Difference in elevation =    41.800(Ft.)
Slope =    0.05225  s(%)=       5.22
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.952 min.
Rainfall intensity =      2.858(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.883
Subarea runoff =      6.079(CFS)
Total initial stream area =        2.410(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.055(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      706.000 to Point/Station      707.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1017.000(Ft.)
End of street segment elevation =   994.000(Ft.)
Length of street segment  =   485.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.500(Ft.)
Distance from crown to crossfall grade break  =   2.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.500(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     16.061(CFS)
Depth of flow =   0.437(Ft.), Average velocity =   6.328(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.528(Ft.)
Flow velocity =   6.33(Ft/s)
Travel time =    1.28 min.     TC =    9.23  min.
 Adding area flow to street
APARTMENT subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.110(In/Hr)
Rainfall intensity =      2.613(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.866
Subarea runoff =     19.863(CFS) for    9.050(Ac.)
Total runoff =     25.943(CFS)
Effective area this stream =       11.46(Ac.)
Total Study Area (Main Stream No. 1) =      230.24(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     25.943(CFS)
Half street flow at end of street =     25.943(CFS)
Depth of flow =   0.494(Ft.), Average velocity =   7.477(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  16.500(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      707.000 to Point/Station      708.000
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**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =   987.000(Ft.)
Downstream point/station elevation =   967.000(Ft.)
Pipe length  =   200.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    25.943(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    25.943(CFS)
Normal flow depth in pipe =   11.98(In.)
Flow top width inside pipe =   16.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.80(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =     9.39 min.


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Process from Point/Station      707.000 to Point/Station      708.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =     9.39 min.
Rainfall intensity =      2.586(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.862
Subarea runoff =      1.332(CFS) for    0.770(Ac.)
Total runoff =     27.274(CFS)
Effective area this stream =       12.23(Ac.)
Total Study Area (Main Stream No. 1) =      231.01(Ac.)
Area averaged Fm value =    0.109(In/Hr)


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Process from Point/Station      708.000 to Point/Station      704.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =   967.000(Ft.)
Downstream point/station elevation =   953.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    27.274(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    27.274(CFS)
Normal flow depth in pipe =   12.75(In.)
Flow top width inside pipe =   16.36(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.39(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =     9.51 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      708.000 to Point/Station      704.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     12.230(Ac.)
Runoff from this stream =     27.274(CFS)
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Time of concentration =    9.51 min.
Rainfall intensity =     2.566(In/Hr)
Area averaged loss rate (Fm) =    0.1086(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2307
Summary of stream data:

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


1    106.54    58.390     11.54    0.258      2.285
2     27.27    12.230      9.51    0.109      2.566
Qmax(1) =
          1.000 *    1.000 *   106.540) +
          0.886 *    1.000 *    27.274) + =     130.694
Qmax(2) =
          1.139 *    0.824 *   106.540) +
          1.000 *    1.000 *    27.274) + =     127.258

Total of 2 streams to confluence:
Flow rates before confluence point:
     106.540      27.274
Maximum flow rates at confluence using above data:
      130.694      127.258
Area of streams before confluence:
       58.390       12.230
Effective area values after confluence:
       70.620       60.352
Results of confluence:
Total flow rate =    130.694(CFS)
Time of concentration =    11.542 min.
Effective stream area after confluence =     70.620(Ac.)
Study area average Pervious fraction(Ap) =  0.841
Study area average soil loss rate(Fm) =    0.232(In/Hr)
Study area total (this main stream) =      70.62(Ac.)


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Process from Point/Station      704.000 to Point/Station      709.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =   953.000(Ft.)
Downstream point elevation =   876.000(Ft.)
Channel length thru subarea  =  1370.000(Ft.)
Channel base width  =    5.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =    142.477(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    142.477(CFS)
Depth of flow =   1.032(Ft.), Average velocity =  19.533(Ft/s)
Channel flow top width =    9.130(Ft.)
Flow Velocity =   19.53(Ft/s)
Travel time  =    1.17 min.
Time of concentration =   12.71 min.
Critical depth =      2.188(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
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```
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Rainfall intensity =      2.157(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.800
Subarea runoff =     23.472(CFS) for   18.700(Ac.)
Total runoff =    154.167(CFS)
Effective area this stream =       89.32(Ac.)
Total Study Area (Main Stream No. 1) =      249.71(Ac.)
Area averaged Fm value =    0.239(In/Hr)
Depth of flow =   1.078(Ft.), Average velocity =  19.991(Ft/s)
Critical depth =      2.281(Ft.)


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Process from Point/Station      704.000 to Point/Station      709.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =    12.71 min.
Rainfall intensity =      2.157(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.799
Subarea runoff =     14.982(CFS) for    8.800(Ac.)
Total runoff =    169.148(CFS)
Effective area this stream =       98.12(Ac.)
Total Study Area (Main Stream No. 1) =      258.51(Ac.)
Area averaged Fm value =    0.241(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      704.000 to Point/Station      709.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Time of concentration =    12.71 min.
Rainfall intensity =      2.157(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.801
Subarea runoff =      3.784(CFS) for    2.000(Ac.)
Total runoff =    172.932(CFS)
Effective area this stream =      100.12(Ac.)
Total Study Area (Main Stream No. 1) =      260.51(Ac.)
Area averaged Fm value =    0.238(In/Hr)


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Process from Point/Station      800.000 to Point/Station      801.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Initial subarea data:
Initial area flow distance =   575.000(Ft.)
Top (of initial area) elevation =  1078.000(Ft.)
Bottom (of initial area) elevation =   986.000(Ft.)
Difference in elevation =    92.000(Ft.)
Slope =    0.16000  s(%)=      16.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.621 min.
Rainfall intensity =      2.549(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.806
Subarea runoff =     10.833(CFS)
Total initial stream area =        5.270(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.265(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      900.000 to Point/Station      901.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Initial subarea data:
Initial area flow distance =   573.000(Ft.)
Top (of initial area) elevation =  1095.000(Ft.)
Bottom (of initial area) elevation =   946.000(Ft.)
Difference in elevation =   149.000(Ft.)
Slope =    0.26003  s(%)=      26.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.718 min.
Rainfall intensity =      2.704(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.812
Subarea runoff =      9.001(CFS)
Total initial stream area =        4.100(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.265(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      900.000 to Point/Station      901.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =     8.72 min.
Rainfall intensity =      2.704(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
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rational method)(Q=KCIA) is C = 0.812
Subarea runoff =     12.843(CFS) for    5.850(Ac.)
Total runoff =     21.843(CFS)
Effective area this stream =        9.95(Ac.)
Total Study Area (Main Stream No. 1) =      275.73(Ac.)
Area averaged Fm value =    0.265(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      902.000 to Point/Station      903.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   940.000(Ft.)
Downstream point/station elevation =   936.000(Ft.)
Pipe length  =   335.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.843(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    21.843(CFS)
Normal flow depth in pipe =   17.53(In.)
Flow top width inside pipe =   21.30(In.)
Critical Depth =   20.04(In.)
Pipe flow velocity =      8.88(Ft/s)
Travel time through pipe =    0.63 min.
Time of concentration (TC) =     9.35 min.


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Process from Point/Station      902.000 to Point/Station      903.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Time of concentration =     9.35 min.
Rainfall intensity =      2.594(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.849
Subarea runoff =     27.366(CFS) for   12.410(Ac.)
Total runoff =     49.210(CFS)
Effective area this stream =       22.36(Ac.)
Total Study Area (Main Stream No. 1) =      288.14(Ac.)
Area averaged Fm value =    0.148(In/Hr)
End of computations, Total Study Area =          288.14 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.652
Area averaged SCS curve number =  77.8
```

ATTACHMENT A
Rational Method Hydrology
Existing Condition

(100-Year storm)

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              San Bernardino County Rational Hydrology Program

                  (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2005 Version 7.1
       Rational Hydrology Study        Date: 02/23/16
------------------------------------------------------------------------
Roquet Ranch Project - TTM 19883
Proposed Condition
100-year storm

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


Program License Serial Number 4029

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

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
Computed rainfall intensity:
Storm year =   100.00   1 hour rainfall =     1.200 (In.)
Slope used for rainfall intensity curve b =  0.6000
Soil antecedent moisture condition (AMC) = 2


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Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.274(In/Hr)
Initial subarea data:
Initial area flow distance =   998.000(Ft.)
Top (of initial area) elevation =  1015.600(Ft.)
Bottom (of initial area) elevation =   951.000(Ft.)
Difference in elevation =    64.600(Ft.)
Slope =    0.06473  s(%)=       6.47
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.651 min.
Rainfall intensity =      3.386(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.827
Subarea runoff =     15.963(CFS)
Total initial stream area =        5.700(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.274(In/Hr)


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Process from Point/Station      101.000 to Point/Station      102.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   943.000(Ft.)
Downstream point/station elevation =   931.000(Ft.)
Pipe length  =   900.00(Ft.)   Manning's N = 0.013
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No. of pipes = 1  Required pipe flow  =    15.963(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    15.963(CFS)
Normal flow depth in pipe =   15.19(In.)
Flow top width inside pipe =   18.79(In.)
Critical Depth =   17.69(In.)
Pipe flow velocity =      8.57(Ft/s)
Travel time through pipe =    1.75 min.
Time of concentration (TC) =    12.40 min.


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Process from Point/Station      101.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
RESIDENTIAL(8 - 10 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.4000     Max loss rate(Fm)=     0.219(In/Hr)
Time of concentration =    12.40 min.
Rainfall intensity =      3.090(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.829
Subarea runoff =     15.178(CFS) for    6.460(Ac.)
Total runoff =     31.141(CFS)
Effective area this stream =       12.16(Ac.)
Total Study Area (Main Stream No. 1) =       12.16(Ac.)
Area averaged Fm value =    0.245(In/Hr)


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Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   931.000(Ft.)
Downstream point/station elevation =   915.000(Ft.)
Pipe length  =  1010.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    31.141(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    31.141(CFS)
Normal flow depth in pipe =   18.26(In.)
Flow top width inside pipe =   25.27(In.)
Critical Depth =   23.10(In.)
Pipe flow velocity =     10.89(Ft/s)
Travel time through pipe =    1.55 min.
Time of concentration (TC) =    13.95 min.


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Process from Point/Station      102.000 to Point/Station      103.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
RESIDENTIAL(8 - 10 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.4000     Max loss rate(Fm)=     0.219(In/Hr)
Time of concentration =    13.95 min.
```

```
Rainfall intensity =      2.880(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.826
Subarea runoff =     10.630(CFS) for    5.400(Ac.)
Total runoff =     41.771(CFS)
Effective area this stream =       17.56(Ac.)
Total Study Area (Main Stream No. 1) =       17.56(Ac.)
Area averaged Fm value =    0.237(In/Hr)


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Process from Point/Station      102.000 to Point/Station      103.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
RESIDENTIAL(8 - 10 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.4000     Max loss rate(Fm)=     0.219(In/Hr)
Time of concentration =    13.95 min.
Rainfall intensity =      2.880(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.827
Subarea runoff =     10.250(CFS) for    4.280(Ac.)
Total runoff =     52.021(CFS)
Effective area this stream =       21.84(Ac.)
Total Study Area (Main Stream No. 1) =       21.84(Ac.)
Area averaged Fm value =    0.233(In/Hr)


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Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   915.000(Ft.)
Downstream point/station elevation =   910.000(Ft.)
Pipe length  =   440.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    52.021(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    52.021(CFS)
Normal flow depth in pipe =   24.98(In.)
Flow top width inside pipe =   28.30(In.)
Critical Depth =   28.39(In.)
Pipe flow velocity =     10.77(Ft/s)
Travel time through pipe =    0.68 min.
Time of concentration (TC) =    14.63 min.


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Process from Point/Station      103.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
RESIDENTIAL(8 - 10 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.4000     Max loss rate(Fm)=     0.219(In/Hr)
Time of concentration =    14.63 min.
Rainfall intensity =      2.799(In/Hr) for a   100.0 year storm
```

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Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.826
Subarea runoff =      7.319(CFS) for    3.840(Ac.)
Total runoff =     59.341(CFS)
Effective area this stream =       25.68(Ac.)
Total Study Area (Main Stream No. 1) =       25.68(Ac.)
Area averaged Fm value =    0.231(In/Hr)


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Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   910.000(Ft.)
Downstream point/station elevation =   905.000(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    59.341(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    59.341(CFS)
Normal flow depth in pipe =   19.24(In.)
Flow top width inside pipe =   24.44(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.58(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    14.71 min.


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Process from Point/Station      104.000 to Point/Station      105.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.466(In/Hr)
Time of concentration =    14.71 min.
Rainfall intensity =      2.789(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =      2.033(CFS) for    1.080(Ac.)
Total runoff =     61.374(CFS)
Effective area this stream =       26.76(Ac.)
Total Study Area (Main Stream No. 1) =       26.76(Ac.)
Area averaged Fm value =    0.241(In/Hr)


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Process from Point/Station      104.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     26.760(Ac.)
Runoff from this stream =     61.374(CFS)
Time of concentration =   14.71 min.
Rainfall intensity =     2.789(In/Hr)
Area averaged loss rate (Fm) =    0.2408(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4395


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Process from Point/Station      106.000 to Point/Station      107.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.274(In/Hr)
Initial subarea data:
Initial area flow distance =   855.000(Ft.)
Top (of initial area) elevation =   998.000(Ft.)
Bottom (of initial area) elevation =   962.000(Ft.)
Difference in elevation =    36.000(Ft.)
Slope =    0.04211  s(%)=       4.21
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.911 min.
Rainfall intensity =      3.337(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.826
Subarea runoff =     12.322(CFS)
Total initial stream area =        4.470(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.274(In/Hr)


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Process from Point/Station      107.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =   955.000(Ft.)
Downstream point/station elevation =   905.000(Ft.)
Pipe length  =   950.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.322(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    12.322(CFS)
Normal flow depth in pipe =   10.44(In.)
Flow top width inside pipe =   13.80(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.51(Ft/s)
Travel time through pipe =    1.17 min.
Time of concentration (TC) =    12.08 min.


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Process from Point/Station      107.000 to Point/Station      105.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.274(In/Hr)
Time of concentration =    12.08 min.
Rainfall intensity =      3.139(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =     10.238(CFS) for    4.280(Ac.)
Total runoff =     22.560(CFS)
Effective area this stream =        8.75(Ac.)
Total Study Area (Main Stream No. 1) =       35.51(Ac.)
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Area averaged Fm value =    0.274(In/Hr)


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Process from Point/Station      107.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      8.750(Ac.)
Runoff from this stream =     22.560(CFS)
Time of concentration =   12.08 min.
Rainfall intensity =     3.139(In/Hr)
Area averaged loss rate (Fm) =    0.2740(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


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Process from Point/Station      108.000 to Point/Station      109.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Initial subarea data:
Initial area flow distance =   525.000(Ft.)
Top (of initial area) elevation =   994.400(Ft.)
Bottom (of initial area) elevation =   932.000(Ft.)
Difference in elevation =    62.400(Ft.)
Slope =    0.11886  s(%)=      11.89
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.701 min.
Rainfall intensity =      4.926(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.890
Subarea runoff =      5.042(CFS)
Total initial stream area =        1.150(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.055(In/Hr)


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Process from Point/Station      109.000 to Point/Station      110.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =   932.000(Ft.)
End of street segment elevation =   916.800(Ft.)
Length of street segment  =   610.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.500(Ft.)
Distance from crown to crossfall grade break  =   2.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.500(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
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Estimated mean flow rate at midpoint of street =      7.681(CFS)
Depth of flow =   0.389(Ft.), Average velocity =   4.151(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.128(Ft.)
Flow velocity =   4.15(Ft/s)
Travel time =    2.45 min.     TC =    8.15  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Rainfall intensity =      3.975(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.888
Subarea runoff =      5.191(CFS) for    1.750(Ac.)
Total runoff =     10.233(CFS)
Effective area this stream =        2.90(Ac.)
Total Study Area (Main Stream No. 1) =       38.41(Ac.)
Area averaged Fm value =    0.055(In/Hr)
Street flow at end of street =     10.233(CFS)
Half street flow at end of street =     10.233(CFS)
Depth of flow =   0.422(Ft.), Average velocity =   4.447(Ft/s)
Flow width (from curb towards crown)=  14.747(Ft.)


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Process from Point/Station      110.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   909.000(Ft.)
Downstream point/station elevation =   905.000(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.233(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    10.233(CFS)
Normal flow depth in pipe =   10.08(In.)
Flow top width inside pipe =   14.09(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.68(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     8.29 min.


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Process from Point/Station      110.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      2.900(Ac.)
Runoff from this stream =     10.233(CFS)
Time of concentration =    8.29 min.
Rainfall intensity =     3.934(In/Hr)
Area averaged loss rate (Fm) =    0.0548(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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

```
1     61.37    26.760     14.71    0.241      2.789
2     22.56     8.750     12.08    0.274      3.139
3     10.23     2.900      8.29    0.055      3.934
Qmax(1) =
          1.000 *    1.000 *    61.374) +
          0.878 *    1.000 *    22.560) +
          0.705 *    1.000 *    10.233) + =      88.393
Qmax(2) =
          1.137 *    0.821 *    61.374) +
          1.000 *    1.000 *    22.560) +
          0.795 *    1.000 *    10.233) + =      88.019
Qmax(3) =
          1.449 *    0.564 *    61.374) +
          1.278 *    0.686 *    22.560) +
          1.000 *    1.000 *    10.233) + =      80.153

Total of 3 streams to confluence:
Flow rates before confluence point:
      61.374      22.560      10.233
Maximum flow rates at confluence using above data:
       88.393       88.019       80.153
Area of streams before confluence:
       26.760        8.750        2.900
Effective area values after confluence:
       38.410       33.629       23.988
Results of confluence:
Total flow rate =     88.393(CFS)
Time of concentration =    14.712 min.
Effective stream area after confluence =     38.410(Ac.)
Study area average Pervious fraction(Ap) =  0.428
Study area average soil loss rate(Fm) =    0.234(In/Hr)
Study area total (this main stream) =      38.41(Ac.)


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Process from Point/Station      105.000 to Point/Station      111.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   905.000(Ft.)
Downstream point/station elevation =   904.000(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    88.393(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    88.393(CFS)
Normal flow depth in pipe =   27.09(In.)
Flow top width inside pipe =   35.92(In.)
Critical Depth =   34.95(In.)
Pipe flow velocity =     14.36(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    14.78 min.


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Process from Point/Station      105.000 to Point/Station      111.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     38.410(Ac.)
Runoff from this stream =     88.393(CFS)
Time of concentration =   14.78 min.
Rainfall intensity =     2.781(In/Hr)
Area averaged loss rate (Fm) =    0.2343(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4276
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Process from Point/Station      112.000 to Point/Station      113.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Initial subarea data:
Initial area flow distance =   990.000(Ft.)
Top (of initial area) elevation =  1100.000(Ft.)
Bottom (of initial area) elevation =   925.000(Ft.)
Difference in elevation =   175.000(Ft.)
Slope =    0.17677  s(%)=      17.68
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.720 min.
Rainfall intensity =      3.197(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.825
Subarea runoff =     20.053(CFS)
Total initial stream area =        7.600(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.265(In/Hr)


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Process from Point/Station      113.000 to Point/Station      111.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   918.000(Ft.)
Downstream point/station elevation =   904.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    20.053(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    20.053(CFS)
Normal flow depth in pipe =   10.31(In.)
Flow top width inside pipe =   17.81(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.16(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    11.85 min.


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Process from Point/Station      113.000 to Point/Station      111.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      7.600(Ac.)
Runoff from this stream =     20.053(CFS)
Time of concentration =   11.85 min.
Rainfall intensity =     3.176(In/Hr)
Area averaged loss rate (Fm) =    0.2651(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

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

```
1     88.39    38.410     14.78    0.234      2.781
2     20.05     7.600     11.85    0.265      3.176
Qmax(1) =
          1.000 *    1.000 *    88.393) +
          0.864 *    1.000 *    20.053) + =     105.729
Qmax(2) =
          1.155 *    0.802 *    88.393) +
          1.000 *    1.000 *    20.053) + =     101.891

Total of 2 streams to confluence:
Flow rates before confluence point:
      88.393      20.053
Maximum flow rates at confluence using above data:
      105.729      101.891
Area of streams before confluence:
       38.410        7.600
Effective area values after confluence:
       46.010       38.393
Results of confluence:
Total flow rate =    105.729(CFS)
Time of concentration =    14.782 min.
Effective stream area after confluence =     46.010(Ac.)
Study area average Pervious fraction(Ap) =  0.522
Study area average soil loss rate(Fm) =    0.239(In/Hr)
Study area total (this main stream) =      46.01(Ac.)


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Process from Point/Station      111.000 to Point/Station      120.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   904.000(Ft.)
Downstream point/station elevation =   899.000(Ft.)
Pipe length  =   715.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   105.729(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   105.729(CFS)
Normal flow depth in pipe =   34.97(In.)
Flow top width inside pipe =   42.69(In.)
Critical Depth =   37.35(In.)
Pipe flow velocity =     10.79(Ft/s)
Travel time through pipe =    1.10 min.
Time of concentration (TC) =    15.89 min.


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Process from Point/Station      111.000 to Point/Station      120.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     46.010(Ac.)
Runoff from this stream =    105.729(CFS)
Time of concentration =   15.89 min.
Rainfall intensity =     2.664(In/Hr)
Area averaged loss rate (Fm) =    0.2394(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5222


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Process from Point/Station      121.000 to Point/Station      122.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
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RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.274(In/Hr)
Initial subarea data:
Initial area flow distance =   795.000(Ft.)
Top (of initial area) elevation =  1075.000(Ft.)
Bottom (of initial area) elevation =  1058.000(Ft.)
Difference in elevation =    17.000(Ft.)
Slope =    0.02138  s(%)=       2.14
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.136 min.
Rainfall intensity =      3.131(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.821
Subarea runoff =     11.466(CFS)
Total initial stream area =        4.460(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.274(In/Hr)


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Process from Point/Station      121.000 to Point/Station      122.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
RESIDENTIAL(8 - 10 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.4000     Max loss rate(Fm)=     0.219(In/Hr)
Time of concentration =    12.14 min.
Rainfall intensity =      3.131(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =     18.237(CFS) for    6.960(Ac.)
Total runoff =     29.704(CFS)
Effective area this stream =       11.42(Ac.)
Total Study Area (Main Stream No. 1) =       57.43(Ac.)
Area averaged Fm value =    0.241(In/Hr)


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Process from Point/Station      121.000 to Point/Station      122.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Time of concentration =    12.14 min.
Rainfall intensity =      3.131(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.837
Subarea runoff =      4.401(CFS) for    1.590(Ac.)
Total runoff =     34.105(CFS)
Effective area this stream =       13.01(Ac.)
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Total Study Area (Main Stream No. 1) =       59.02(Ac.)
Area averaged Fm value =    0.218(In/Hr)


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Process from Point/Station      122.000 to Point/Station      123.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1050.000(Ft.)
Downstream point/station elevation =   980.000(Ft.)
Pipe length  =  1850.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    34.105(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    34.105(CFS)
Normal flow depth in pipe =   15.87(In.)
Flow top width inside pipe =   22.72(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.47(Ft/s)
Travel time through pipe =    1.99 min.
Time of concentration (TC) =    14.13 min.


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Process from Point/Station      122.000 to Point/Station      123.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.274(In/Hr)
Time of concentration =    14.13 min.
Rainfall intensity =      2.858(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.825
Subarea runoff =     13.615(CFS) for    7.230(Ac.)
Total runoff =     47.720(CFS)
Effective area this stream =       20.24(Ac.)
Total Study Area (Main Stream No. 1) =       66.25(Ac.)
Area averaged Fm value =    0.238(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      123.000 to Point/Station      124.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   980.000(Ft.)
Downstream point/station elevation =   932.000(Ft.)
Pipe length  =   785.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    47.720(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    47.720(CFS)
Normal flow depth in pipe =   17.04(In.)
Flow top width inside pipe =   21.78(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.00(Ft/s)
Travel time through pipe =    0.65 min.
Time of concentration (TC) =    14.78 min.


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Process from Point/Station      123.000 to Point/Station      124.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
RESIDENTIAL(8 - 10 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.4000     Max loss rate(Fm)=     0.219(In/Hr)
Time of concentration =    14.78 min.
Rainfall intensity =      2.781(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.824
Subarea runoff =      4.692(CFS) for    2.640(Ac.)
Total runoff =     52.413(CFS)
Effective area this stream =       22.88(Ac.)
Total Study Area (Main Stream No. 1) =       68.89(Ac.)
Area averaged Fm value =    0.236(In/Hr)


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Process from Point/Station      123.000 to Point/Station      124.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =    14.78 min.
Rainfall intensity =      2.781(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =      8.084(CFS) for    3.570(Ac.)
Total runoff =     60.496(CFS)
Effective area this stream =       26.45(Ac.)
Total Study Area (Main Stream No. 1) =       72.46(Ac.)
Area averaged Fm value =    0.240(In/Hr)


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Process from Point/Station      124.000 to Point/Station      120.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =   932.000(Ft.)
Downstream point/station elevation =   898.000(Ft.)
Pipe length  =  1070.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    60.496(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    60.496(CFS)
Normal flow depth in pipe =   20.81(In.)
Flow top width inside pipe =   27.66(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.65(Ft/s)
Travel time through pipe =    1.07 min.
Time of concentration (TC) =    15.85 min.


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Process from Point/Station      124.000 to Point/Station      120.000
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**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     26.450(Ac.)
Runoff from this stream =     60.496(CFS)
Time of concentration =   15.85 min.
Rainfall intensity =     2.667(In/Hr)
Area averaged loss rate (Fm) =    0.2397(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5071
Summary of stream data:

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


1    105.73    46.010     15.89    0.239      2.664
2     60.50    26.450     15.85    0.240      2.667
Qmax(1) =
          1.000 *    1.000 *   105.729) +
          0.999 *    1.000 *    60.496) + =     166.146
Qmax(2) =
          1.001 *    0.998 *   105.729) +
          1.000 *    1.000 *    60.496) + =     166.153

Total of 2 streams to confluence:
Flow rates before confluence point:
     105.729      60.496
Maximum flow rates at confluence using above data:
      166.146      166.153
Area of streams before confluence:
       46.010       26.450
Effective area values after confluence:
       72.460       72.368
Results of confluence:
Total flow rate =    166.153(CFS)
Time of concentration =    15.855 min.
Effective stream area after confluence =     72.368(Ac.)
Study area average Pervious fraction(Ap) =  0.517
Study area average soil loss rate(Fm) =    0.239(In/Hr)
Study area total (this main stream) =      72.46(Ac.)


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Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________
RESIDENTIAL(11+ dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.110(In/Hr)
Initial subarea data:
Initial area flow distance =   825.000(Ft.)
Top (of initial area) elevation =   914.700(Ft.)
Bottom (of initial area) elevation =   910.300(Ft.)
Difference in elevation =     4.400(Ft.)
Slope =    0.00533  s(%)=       0.53
TC = k(0.324)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.543 min.
Rainfall intensity =      2.931(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.866
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Subarea runoff =     12.392(CFS)
Total initial stream area =        4.880(Ac.)
Pervious area fraction = 0.200
Initial area Fm value =    0.110(In/Hr)


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Process from Point/Station      201.000 to Point/Station      202.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   903.000(Ft.)
Downstream point/station elevation =   899.000(Ft.)
Pipe length  =   506.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.392(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    12.392(CFS)
Normal flow depth in pipe =   15.28(In.)
Flow top width inside pipe =   18.70(In.)
Critical Depth =   15.73(In.)
Pipe flow velocity =      6.61(Ft/s)
Travel time through pipe =    1.28 min.
Time of concentration (TC) =    14.82 min.


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Process from Point/Station      201.000 to Point/Station      202.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
RESIDENTIAL(11+ dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.110(In/Hr)
Time of concentration =    14.82 min.
Rainfall intensity =      2.777(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.864
Subarea runoff =     13.775(CFS) for    6.020(Ac.)
Total runoff =     26.167(CFS)
Effective area this stream =       10.90(Ac.)
Total Study Area (Main Stream No. 1) =       83.36(Ac.)
Area averaged Fm value =    0.110(In/Hr)


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Process from Point/Station      201.000 to Point/Station      202.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
RESIDENTIAL(11+ dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.110(In/Hr)
Time of concentration =    14.82 min.
Rainfall intensity =      2.777(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.864
Subarea runoff =     24.487(CFS) for   10.200(Ac.)
Total runoff =     50.654(CFS)
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Effective area this stream =       21.10(Ac.)
Total Study Area (Main Stream No. 1) =       93.56(Ac.)
Area averaged Fm value =    0.110(In/Hr)


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Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   899.000(Ft.)
Downstream point/station elevation =   857.000(Ft.)
Pipe length  =   675.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    50.654(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    50.654(CFS)
Normal flow depth in pipe =   17.77(In.)
Flow top width inside pipe =   21.05(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.32(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =    15.37 min.


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Process from Point/Station      202.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =    15.37 min.
Rainfall intensity =      2.717(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.859
Subarea runoff =      4.037(CFS) for    2.350(Ac.)
Total runoff =     54.691(CFS)
Effective area this stream =       23.45(Ac.)
Total Study Area (Main Stream No. 1) =       95.91(Ac.)
Area averaged Fm value =    0.125(In/Hr)


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Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =   920.000(Ft.)
Bottom (of initial area) elevation =   857.000(Ft.)
Difference in elevation =    63.000(Ft.)
Slope =    0.06300  s(%)=       6.30
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
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Initial area time of concentration =    8.375 min.
Rainfall intensity =      3.911(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.887
Subarea runoff =     10.862(CFS)
Total initial stream area =        3.130(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.055(In/Hr)


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Process from Point/Station      301.000 to Point/Station      302.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   851.000(Ft.)
Downstream point/station elevation =   846.000(Ft.)
Pipe length  =  1250.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.862(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    10.862(CFS)
Normal flow depth in pipe =   15.63(In.)
Flow top width inside pipe =   22.87(In.)
Critical Depth =   14.18(In.)
Pipe flow velocity =      5.01(Ft/s)
Travel time through pipe =    4.16 min.
Time of concentration (TC) =    12.53 min.


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Process from Point/Station      301.000 to Point/Station      302.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Time of concentration =    12.53 min.
Rainfall intensity =      3.071(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.884
Subarea runoff =      7.811(CFS) for    3.750(Ac.)
Total runoff =     18.673(CFS)
Effective area this stream =        6.88(Ac.)
Total Study Area (Main Stream No. 1) =      102.79(Ac.)
Area averaged Fm value =    0.055(In/Hr)


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Process from Point/Station      302.000 to Point/Station      303.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   846.000(Ft.)
Downstream point/station elevation =   842.000(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.673(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    18.673(CFS)
Normal flow depth in pipe =   10.97(In.)
Flow top width inside pipe =   17.56(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.54(Ft/s)
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Travel time through pipe =    0.06 min.
Time of concentration (TC) =    12.59 min.


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Process from Point/Station      302.000 to Point/Station      303.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =    12.59 min.
Rainfall intensity =      3.062(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.880
Subarea runoff =      1.103(CFS) for    0.460(Ac.)
Total runoff =     19.776(CFS)
Effective area this stream =        7.34(Ac.)
Total Study Area (Main Stream No. 1) =      103.25(Ac.)
Area averaged Fm value =    0.068(In/Hr)


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Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
APARTMENT subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.110(In/Hr)
Initial subarea data:
Initial area flow distance =   615.000(Ft.)
Top (of initial area) elevation =   862.000(Ft.)
Bottom (of initial area) elevation =   852.000(Ft.)
Difference in elevation =    10.000(Ft.)
Slope =    0.01626  s(%)=       1.63
TC = k(0.324)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.635 min.
Rainfall intensity =      3.595(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.873
Subarea runoff =      7.027(CFS)
Total initial stream area =        2.240(Ac.)
Pervious area fraction = 0.200
Initial area Fm value =    0.110(In/Hr)


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Process from Point/Station      500.000 to Point/Station      501.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
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Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Initial subarea data:
Initial area flow distance =   847.000(Ft.)
Top (of initial area) elevation =  1393.600(Ft.)
Bottom (of initial area) elevation =  1044.000(Ft.)
Difference in elevation =   349.600(Ft.)
Slope =    0.41275  s(%)=      41.28
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.293 min.
Rainfall intensity =      3.674(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.835
Subarea runoff =     16.108(CFS)
Total initial stream area =        5.250(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.265(In/Hr)


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Process from Point/Station      501.000 to Point/Station      502.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1044.000(Ft.)
Downstream point elevation =   995.000(Ft.)
Channel length thru subarea  =   895.000(Ft.)
Channel base width  =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     32.442(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     32.442(CFS)
Depth of flow =   0.693(Ft.), Average velocity =  13.819(Ft/s)
Channel flow top width =    4.773(Ft.)
Flow Velocity =   13.82(Ft/s)
Travel time  =    1.08 min.
Time of concentration =   10.37 min.
Critical depth =      1.328(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Rainfall intensity =      3.440(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =     32.608(CFS) for   11.800(Ac.)
Total runoff =     48.716(CFS)
Effective area this stream =       17.05(Ac.)
Total Study Area (Main Stream No. 1) =      122.54(Ac.)
Area averaged Fm value =    0.265(In/Hr)
Depth of flow =   0.852(Ft.), Average velocity =  15.432(Ft/s)
Critical depth =      1.625(Ft.)


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Process from Point/Station      502.000 to Point/Station      503.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   995.000(Ft.)
Downstream point elevation =   984.000(Ft.)
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Channel length thru subarea  =   505.000(Ft.)
Channel base width  =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   0.000
Estimated mean flow rate at midpoint of channel =     52.977(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     52.977(CFS)
Depth of flow =   1.355(Ft.), Average velocity =  11.657(Ft/s)
Channel flow top width =    4.709(Ft.)
Flow Velocity =   11.66(Ft/s)
Travel time  =    0.72 min.
Time of concentration =   11.09 min.
Critical depth =      2.016(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Rainfall intensity =      3.304(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.828
Subarea runoff =      8.440(CFS) for    3.850(Ac.)
Total runoff =     57.156(CFS)
Effective area this stream =       20.90(Ac.)
Total Study Area (Main Stream No. 1) =      126.39(Ac.)
Area averaged Fm value =    0.265(In/Hr)
Depth of flow =   1.410(Ft.), Average velocity =  11.884(Ft/s)
Critical depth =      2.094(Ft.)


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Process from Point/Station      503.000 to Point/Station      504.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   984.000(Ft.)
Downstream point elevation =   939.000(Ft.)
Channel length thru subarea  =   688.000(Ft.)
Channel base width  =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     63.906(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     63.906(CFS)
Depth of flow =   0.933(Ft.), Average velocity =  17.711(Ft/s)
Channel flow top width =    5.733(Ft.)
Flow Velocity =   17.71(Ft/s)
Travel time  =    0.65 min.
Time of concentration =   11.74 min.
Critical depth =      1.859(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Rainfall intensity =      3.193(In/Hr) for a   100.0 year storm
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Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.825
Subarea runoff =     13.416(CFS) for    5.880(Ac.)
Total runoff =     70.572(CFS)
Effective area this stream =       26.78(Ac.)
Total Study Area (Main Stream No. 1) =      132.27(Ac.)
Area averaged Fm value =    0.265(In/Hr)
Depth of flow =   0.980(Ft.), Average velocity =  18.184(Ft/s)
Critical depth =      1.953(Ft.)


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Process from Point/Station      504.000 to Point/Station      505.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   939.000(Ft.)
Downstream point elevation =   905.000(Ft.)
Channel length thru subarea  =  1140.000(Ft.)
Channel base width  =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     72.857(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     72.857(CFS)
Depth of flow =   1.204(Ft.), Average velocity =  13.727(Ft/s)
Channel flow top width =    6.816(Ft.)
Flow Velocity =   13.73(Ft/s)
Travel time  =    1.38 min.
Time of concentration =   13.13 min.
Critical depth =      1.969(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Rainfall intensity =      2.987(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.820
Subarea runoff =      4.478(CFS) for    3.860(Ac.)
Total runoff =     75.050(CFS)
Effective area this stream =       30.64(Ac.)
Total Study Area (Main Stream No. 1) =      136.13(Ac.)
Area averaged Fm value =    0.265(In/Hr)
Depth of flow =   1.221(Ft.), Average velocity =  13.834(Ft/s)
Critical depth =      2.000(Ft.)


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Process from Point/Station      504.000 to Point/Station      505.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =    13.13 min.
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Rainfall intensity =      2.987(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.820
Subarea runoff =      9.430(CFS) for    3.850(Ac.)
Total runoff =     84.480(CFS)
Effective area this stream =       34.49(Ac.)
Total Study Area (Main Stream No. 1) =      139.98(Ac.)
Area averaged Fm value =    0.265(In/Hr)


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Process from Point/Station      600.000 to Point/Station      601.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Initial subarea data:
Initial area flow distance =   865.000(Ft.)
Top (of initial area) elevation =   994.400(Ft.)
Bottom (of initial area) elevation =   913.600(Ft.)
Difference in elevation =    80.800(Ft.)
Slope =    0.09341  s(%)=       9.34
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.305 min.
Rainfall intensity =      4.245(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =     16.519(CFS)
Total initial stream area =        4.380(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.055(In/Hr)


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Process from Point/Station      600.000 to Point/Station      601.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Time of concentration =     7.30 min.
Rainfall intensity =      4.245(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.888
Subarea runoff =     17.123(CFS) for    4.540(Ac.)
Total runoff =     33.642(CFS)
Effective area this stream =        8.92(Ac.)
Total Study Area (Main Stream No. 1) =      148.90(Ac.)
Area averaged Fm value =    0.055(In/Hr)


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Process from Point/Station      601.000 to Point/Station      602.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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Upstream point/station elevation =   908.000(Ft.)
Downstream point/station elevation =   885.000(Ft.)
Pipe length  =   300.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    33.642(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    33.642(CFS)
Normal flow depth in pipe =   13.78(In.)
Flow top width inside pipe =   19.95(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.10(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =     7.55 min.


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Process from Point/Station      601.000 to Point/Station      602.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
APARTMENT subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.110(In/Hr)
Time of concentration =     7.55 min.
Rainfall intensity =      4.161(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.882
Subarea runoff =     36.513(CFS) for   10.200(Ac.)
Total runoff =     70.155(CFS)
Effective area this stream =       19.12(Ac.)
Total Study Area (Main Stream No. 1) =      159.10(Ac.)
Area averaged Fm value =    0.084(In/Hr)


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Process from Point/Station      602.000 to Point/Station      603.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   885.000(Ft.)
Downstream point/station elevation =   882.000(Ft.)
Pipe length  =    80.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    70.155(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    70.155(CFS)
Normal flow depth in pipe =   21.89(In.)
Flow top width inside pipe =   26.65(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.26(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     7.63 min.


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Process from Point/Station      602.000 to Point/Station      603.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
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SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =     7.63 min.
Rainfall intensity =      4.137(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.879
Subarea runoff =      4.083(CFS) for    1.290(Ac.)
Total runoff =     74.238(CFS)
Effective area this stream =       20.41(Ac.)
Total Study Area (Main Stream No. 1) =      160.39(Ac.)
Area averaged Fm value =    0.095(In/Hr)


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Process from Point/Station      700.000 to Point/Station      701.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Initial subarea data:
Initial area flow distance =   998.000(Ft.)
Top (of initial area) elevation =  1477.000(Ft.)
Bottom (of initial area) elevation =  1082.000(Ft.)
Difference in elevation =   395.000(Ft.)
Slope =    0.39579  s(%)=      39.58
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.007 min.
Rainfall intensity =      3.515(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.832
Subarea runoff =     15.032(CFS)
Total initial stream area =        5.140(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.265(In/Hr)


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Process from Point/Station      701.000 to Point/Station      702.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1082.000(Ft.)
Downstream point elevation =   983.000(Ft.)
Channel length thru subarea  =   800.000(Ft.)
Channel base width  =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     22.112(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     22.112(CFS)
Depth of flow =   0.457(Ft.), Average velocity =  16.615(Ft/s)
Channel flow top width =    3.827(Ft.)
Flow Velocity =   16.61(Ft/s)
Travel time  =    0.80 min.
Time of concentration =   10.81 min.
Critical depth =      1.094(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Rainfall intensity =      3.356(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.829
Subarea runoff =     14.062(CFS) for    5.320(Ac.)
Total runoff =     29.095(CFS)
Effective area this stream =       10.46(Ac.)
Total Study Area (Main Stream No. 1) =      170.85(Ac.)
Area averaged Fm value =    0.265(In/Hr)
Depth of flow =   0.529(Ft.), Average velocity =  17.981(Ft/s)
Critical depth =      1.266(Ft.)


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Process from Point/Station      701.000 to Point/Station      702.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Time of concentration =    10.81 min.
Rainfall intensity =      3.356(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =      2.971(CFS) for    1.000(Ac.)
Total runoff =     32.066(CFS)
Effective area this stream =       11.46(Ac.)
Total Study Area (Main Stream No. 1) =      171.85(Ac.)
Area averaged Fm value =    0.247(In/Hr)


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Process from Point/Station      701.000 to Point/Station      702.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =    10.81 min.
Rainfall intensity =      3.356(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.830
Subarea runoff =     71.207(CFS) for   25.600(Ac.)
Total runoff =    103.273(CFS)
Effective area this stream =       37.06(Ac.)
Total Study Area (Main Stream No. 1) =      197.45(Ac.)
Area averaged Fm value =    0.259(In/Hr)


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Process from Point/Station      702.000 to Point/Station      703.000
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**** IMPROVED CHANNEL TRAVEL TIME ****
____________________________________________________________________________
Upstream point elevation =   983.000(Ft.)
Downstream point elevation =   973.000(Ft.)
Channel length thru subarea  =   435.000(Ft.)
Channel base width  =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =    125.825(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =    125.825(CFS)
Depth of flow =   1.653(Ft.), Average velocity =  14.349(Ft/s)
Channel flow top width =    8.611(Ft.)
Flow Velocity =   14.35(Ft/s)
Travel time  =    0.51 min.
Time of concentration =   11.32 min.
Critical depth =      2.563(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Rainfall intensity =      3.265(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.828
Subarea runoff =     45.032(CFS) for   17.800(Ac.)
Total runoff =    148.304(CFS)
Effective area this stream =       54.86(Ac.)
Total Study Area (Main Stream No. 1) =      215.25(Ac.)
Area averaged Fm value =    0.261(In/Hr)
Depth of flow =   1.782(Ft.), Average velocity =  14.964(Ft/s)
Critical depth =      2.750(Ft.)


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Process from Point/Station      703.000 to Point/Station      704.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =   973.000(Ft.)
Downstream point/station elevation =   953.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   148.304(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =   148.304(CFS)
Normal flow depth in pipe =   24.33(In.)
Flow top width inside pipe =   23.49(In.)
Critical depth could not be calculated.
Pipe flow velocity =     34.78(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    11.39 min.


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Process from Point/Station      703.000 to Point/Station      704.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
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Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =    11.39 min.
Rainfall intensity =      3.253(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.828
Subarea runoff =      6.191(CFS) for    2.530(Ac.)
Total runoff =    154.496(CFS)
Effective area this stream =       57.39(Ac.)
Total Study Area (Main Stream No. 1) =      217.78(Ac.)
Area averaged Fm value =    0.261(In/Hr)


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Process from Point/Station      703.000 to Point/Station      704.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Time of concentration =    11.39 min.
Rainfall intensity =      3.253(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.829
Subarea runoff =      2.878(CFS) for    1.000(Ac.)
Total runoff =    157.374(CFS)
Effective area this stream =       58.39(Ac.)
Total Study Area (Main Stream No. 1) =      218.78(Ac.)
Area averaged Fm value =    0.258(In/Hr)


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Process from Point/Station      703.000 to Point/Station      704.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     58.390(Ac.)
Runoff from this stream =    157.374(CFS)
Time of concentration =   11.39 min.
Rainfall intensity =     3.253(In/Hr)
Area averaged loss rate (Fm) =    0.2579(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9692


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Process from Point/Station      705.000 to Point/Station      706.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Initial subarea data:
Initial area flow distance =   800.000(Ft.)
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Top (of initial area) elevation =  1058.800(Ft.)
Bottom (of initial area) elevation =  1017.000(Ft.)
Difference in elevation =    41.800(Ft.)
Slope =    0.05225  s(%)=       5.22
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.952 min.
Rainfall intensity =      4.034(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =      8.632(CFS)
Total initial stream area =        2.410(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.055(In/Hr)


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Process from Point/Station      706.000 to Point/Station      707.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1017.000(Ft.)
End of street segment elevation =   994.000(Ft.)
Length of street segment  =   485.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.500(Ft.)
Distance from crown to crossfall grade break  =   2.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.500(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     23.049(CFS)
Depth of flow =   0.480(Ft.), Average velocity =   7.134(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.500(Ft.)
Flow velocity =   7.13(Ft/s)
Travel time =    1.13 min.     TC =    9.09  min.
 Adding area flow to street
APARTMENT subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.110(In/Hr)
Rainfall intensity =      3.724(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.876
Subarea runoff =     28.771(CFS) for    9.050(Ac.)
Total runoff =     37.403(CFS)
Effective area this stream =       11.46(Ac.)
Total Study Area (Main Stream No. 1) =      230.24(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     37.403(CFS)
Half street flow at end of street =     37.403(CFS)
Depth of flow =   0.555(Ft.), Average velocity =   8.241(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    2.21(Ft.)
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Flow width (from curb towards crown)=  16.500(Ft.)


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Process from Point/Station      707.000 to Point/Station      708.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   987.000(Ft.)
Downstream point/station elevation =   967.000(Ft.)
Pipe length  =   200.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    37.403(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    37.403(CFS)
Normal flow depth in pipe =   13.52(In.)
Flow top width inside pipe =   20.11(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.84(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     9.23 min.


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Process from Point/Station      707.000 to Point/Station      708.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =     9.23 min.
Rainfall intensity =      3.689(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.874
Subarea runoff =      2.007(CFS) for    0.770(Ac.)
Total runoff =     39.410(CFS)
Effective area this stream =       12.23(Ac.)
Total Study Area (Main Stream No. 1) =      231.01(Ac.)
Area averaged Fm value =    0.109(In/Hr)


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Process from Point/Station      708.000 to Point/Station      704.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   967.000(Ft.)
Downstream point/station elevation =   953.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    39.410(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    39.410(CFS)
Normal flow depth in pipe =   14.39(In.)
Flow top width inside pipe =   19.51(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.43(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     9.34 min.


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Process from Point/Station      708.000 to Point/Station      704.000
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**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     12.230(Ac.)
Runoff from this stream =     39.410(CFS)
Time of concentration =    9.34 min.
Rainfall intensity =     3.663(In/Hr)
Area averaged loss rate (Fm) =    0.1086(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2307
Summary of stream data:

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


1    157.37    58.390     11.39    0.258      3.253
2     39.41    12.230      9.34    0.109      3.663
Qmax(1) =
          1.000 *    1.000 *   157.374) +
          0.885 *    1.000 *    39.410) + =     192.237
Qmax(2) =
          1.137 *    0.820 *   157.374) +
          1.000 *    1.000 *    39.410) + =     186.210

Total of 2 streams to confluence:
Flow rates before confluence point:
     157.374      39.410
Maximum flow rates at confluence using above data:
      192.237      186.210
Area of streams before confluence:
       58.390       12.230
Effective area values after confluence:
       70.620       60.138
Results of confluence:
Total flow rate =    192.237(CFS)
Time of concentration =    11.387 min.
Effective stream area after confluence =     70.620(Ac.)
Study area average Pervious fraction(Ap) =  0.841
Study area average soil loss rate(Fm) =    0.232(In/Hr)
Study area total (this main stream) =      70.62(Ac.)


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Process from Point/Station      704.000 to Point/Station      709.000
**** IMPROVED CHANNEL TRAVEL TIME ****
____________________________________________________________________
Upstream point elevation =   953.000(Ft.)
Downstream point elevation =   876.000(Ft.)
Channel length thru subarea  =  1370.000(Ft.)
Channel base width  =    5.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =    210.578(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    210.578(CFS)
Depth of flow =   1.275(Ft.), Average velocity =  21.882(Ft/s)
Channel flow top width =   10.099(Ft.)
Flow Velocity =   21.88(Ft/s)
Travel time  =    1.04 min.
Time of concentration =   12.43 min.
Critical depth =      2.688(Ft.)
 Adding area flow to channel
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UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Rainfall intensity =      3.086(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.830
Subarea runoff =     36.622(CFS) for   18.700(Ac.)
Total runoff =    228.859(CFS)
Effective area this stream =       89.32(Ac.)
Total Study Area (Main Stream No. 1) =      249.71(Ac.)
Area averaged Fm value =    0.239(In/Hr)
Depth of flow =   1.332(Ft.), Average velocity =  22.408(Ft/s)
Critical depth =      2.813(Ft.)


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Process from Point/Station      704.000 to Point/Station      709.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =    12.43 min.
Rainfall intensity =      3.086(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.830
Subarea runoff =     22.341(CFS) for    8.800(Ac.)
Total runoff =    251.200(CFS)
Effective area this stream =       98.12(Ac.)
Total Study Area (Main Stream No. 1) =      258.51(Ac.)
Area averaged Fm value =    0.241(In/Hr)


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Process from Point/Station      704.000 to Point/Station      709.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Time of concentration =    12.43 min.
Rainfall intensity =      3.086(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =      5.456(CFS) for    2.000(Ac.)
Total runoff =    256.656(CFS)
Effective area this stream =      100.12(Ac.)
Total Study Area (Main Stream No. 1) =      260.51(Ac.)
Area averaged Fm value =    0.238(In/Hr)
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Process from Point/Station      800.000 to Point/Station      801.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Initial subarea data:
Initial area flow distance =   575.000(Ft.)
Top (of initial area) elevation =  1078.000(Ft.)
Bottom (of initial area) elevation =   986.000(Ft.)
Difference in elevation =    92.000(Ft.)
Slope =    0.16000  s(%)=      16.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.621 min.
Rainfall intensity =      3.599(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.834
Subarea runoff =     15.811(CFS)
Total initial stream area =        5.270(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.265(In/Hr)


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Process from Point/Station      900.000 to Point/Station      901.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Initial subarea data:
Initial area flow distance =   573.000(Ft.)
Top (of initial area) elevation =  1095.000(Ft.)
Bottom (of initial area) elevation =   946.000(Ft.)
Difference in elevation =   149.000(Ft.)
Slope =    0.26003  s(%)=      26.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.718 min.
Rainfall intensity =      3.818(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.838
Subarea runoff =     13.110(CFS)
Total initial stream area =        4.100(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.265(In/Hr)


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Process from Point/Station      900.000 to Point/Station      901.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
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SCS curve number for soil(AMC 2)  = 86.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.265(In/Hr)
Time of concentration =     8.72 min.
Rainfall intensity =      3.818(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.838
Subarea runoff =     18.705(CFS) for    5.850(Ac.)
Total runoff =     31.815(CFS)
Effective area this stream =        9.95(Ac.)
Total Study Area (Main Stream No. 1) =      275.73(Ac.)
Area averaged Fm value =    0.265(In/Hr)


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Process from Point/Station      902.000 to Point/Station      903.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   940.000(Ft.)
Downstream point/station elevation =   936.000(Ft.)
Pipe length  =   335.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    31.815(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    31.815(CFS)
Normal flow depth in pipe =   20.81(In.)
Flow top width inside pipe =   22.70(In.)
Critical Depth =   23.31(In.)
Pipe flow velocity =      9.68(Ft/s)
Travel time through pipe =    0.58 min.
Time of concentration (TC) =     9.29 min.


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Process from Point/Station      902.000 to Point/Station      903.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Time of concentration =     9.29 min.
Rainfall intensity =      3.674(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.864
Subarea runoff =     39.132(CFS) for   12.410(Ac.)
Total runoff =     70.947(CFS)
Effective area this stream =       22.36(Ac.)
Total Study Area (Main Stream No. 1) =      288.14(Ac.)
Area averaged Fm value =    0.148(In/Hr)
End of computations, Total Study Area =          288.14 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.652
Area averaged SCS curve number =  77.8
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